DATA-DRIVEN TRANSFORMATION

Towards a future where data enables positive transformations

TRACK LEGACY

Februari 2018 - October 2020

Amsterdam University of Applied Sciences

DIGITAL SOCIETY SCHOOL

(1) DIGITAL SOCIETY SCHOOL

Our projects are clustered in intensive three-year programmes called ‘tracks.’ These tracks are focused on particularly relevant topics in today’s society. Each track enrols multidisciplinary teams, each including various roles in design, development, and research, to work on challenges that aim to address the Sustainable Development Goals developed by the United Nations. Tracks that are running from September 2020 to January 2021, in addition to the Data-Driven Transformation track, are Digital to Physical, Systems for Sharing, Design Across Cultures, Edtech for Social Change.

(2) DATA-DRIVEN TRANSFORMATION TRACK

Data is becoming increasingly important within our society. In the past few years, the number of data initiatives and the amount of data produced in Amsterdam has increased significantly. While the amount of data grows, the meaning or purpose of this amount of data is not always clear. We need to give meaning and purpose to this data, and for this we need tools, methods and insights. The question we are facing is: how can we work with the data to provide actionable knowledge and a better understanding of a certain topic in order to enable positive transformations within society?

Within the Data-Driven Transformation track, we work towards a future where data will be used to enable positive transformations in our society, with the best interests for us all. We want to cultivate data literacy and design thinking so that everyone can critically engage with data and data processing technologies. Hence, we focus on bridging the gap between technology and design, and on fostering ethics, transparency, and accountability.

We create digital tools, digital methods, and educational materials in tight collaboration with the variety of stakeholders who are at the core of our inclusive design process. In all our projects, we put humans, society, and the Sustainable Development Goals at the heart of our motivation. We strive to develop positive changes *and* to develop the people that would build those changes. Thus, our interventions are rooted in a variety of human organisations, from public institutions and grass-roots associations to small and large companies.

Throughout our track's legacy we have been most fortunate to walk those crucial steps towards a brighter future with multidisciplinary, multicultural, and multigenerational teams. Together we explore three domains of action I) Health and Communities, II) Climate Communication and III) Public Recreational Spaces, identified in the Sustainable Development Goals of the United Nations[1]:

- Health and Communities (SDG 3, 10, 11);
- Climate Communication (SDG 12, 13);
- Public Recreational Spaces (SDG 5, 9, 10, 11, 12).

We invite you to explore these topics with us and to embark together on a course to address these crucial challenges with digital technologies and sustainability.

How can we ensure that data is harnessed in a way that benefits society?

We explore this question within the domains of climate action, health, and user experience.

What future digital tools and digital communities could support our physical and mental health?

We invite you to explore this topic in (3).

How can digital media and digital conversations shape our understanding of the climate crisis and its potential solutions?

We invite you to explore this topic in (4).

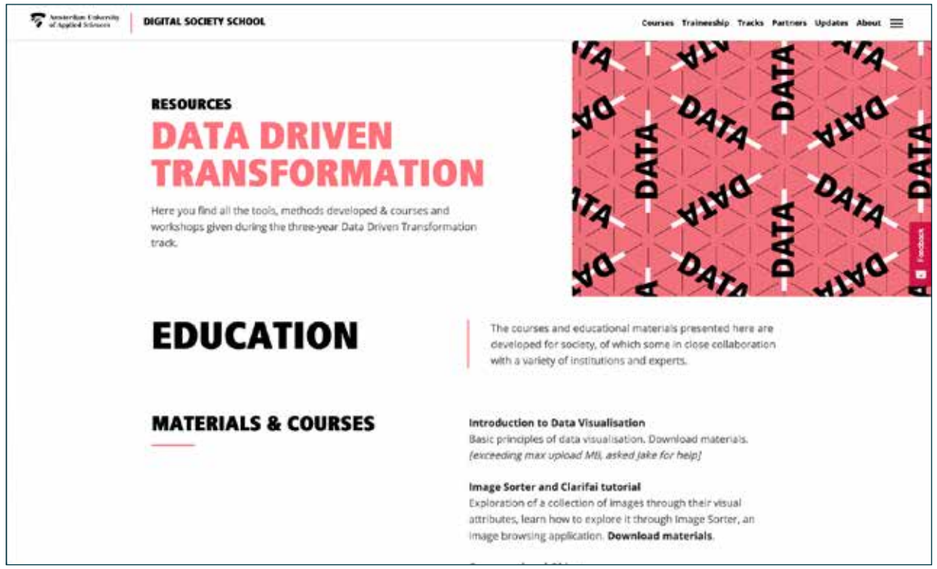
What future interactive technologies could be used to develop more inclusive communities in public spaces dedicated to recreation and cultural experiences?

We invite you to explore this topic in (5).

For these three topics, we have administered several projects which address the needs of actual users and stakeholders, from both public and private organisations. We have explored the design space and implemented prototypes and tools that address user needs or help stakeholders investigate the problems they face. An index of the tools, methods, prototypes, and source code we delivered can be found at the end of this overview (7), and a more detailed interactive overview can be found here: https://digitalsocietyschool.org/data-driven-transformation-output/.

Besides working on concrete projects with actual stakeholders, we have also developed educational materials, talks, and courses that address a diversity of the public: professionals or students acquiring new skills to deal with the digital society, academics studying specific aspects of the digital society, designers learning to code, or coders learning to design. We invite you to explore the talks and materials we presented at public events (8), and educational materials that you are welcome to use (6).

All presented materials can be found here as well: https://digitalsocietyschool.org/data-driven-transformation-output/.
A short video introduction of the track is available here: https://vimeo.com/429545495.



All presented materials can be found on our website:
https://digitalsocietyschool.org/data-driven- transformation-output/.

(3) HEALTH AND COMMUNITIES

Health is a multifaceted concept which concerns not only personal health and well-being, but also public health organisations and policies. The 6 multidisciplinary projects in this chapter investigate these facets, and include health issues arising from digital systems themselves (e.g., mental health issues arising from online harassment).

We invite you to explore with us how digital tools and data visualisations can support migraine patients and their healthcare practitioners (3.1), provide a platform for public health data to reach policymakers and citizens (3.2), provide data-driven recommendations to limit future health risks (3.4), or enable better use of data collections by public health institutions (3.5).

We also invite you to explore two novel applications of chatbots, which use conversational technologies to address difficult societal issues. And lastly, we invite you to reflect with us on the potential of chatbots to address online harassment by discussing with abusers themselves (3.3), and to address sexual abuses at large by enabling social workers to train themselves with chatbots before dealing with actual victims of abuse.

Healthcare has been continuously transformed by the ubiquity of data; personal tracking technology is being used by proponents of the quantified self movement, while public health data is being collected and used to create policy recommendations. Moreover, public forums, such as Twitter, are experiencing increased levels of harassment which compromise the psychological safety of the victims.

We hope this work contributes to the ongoing efforts to develop positive transformations in the health community. Our perspective is to drive data-driven transformations towards creating digital ecosystems that empower both patients and public health workers, and towards helping all members of society to develop their health and their understanding of health issues, recommendations, health data, and public health policies.

(3.1) DATA-DRIVEN MIGRAINE MITIGATION

Keywords: AI for Health, Health monitoring, Doctor-patient relationship, Visualisation of health logs, Interaction design for impaired users, Chronic disease, Migraine.

Time: Sept 2018 - Jan 2019

Related SDG's

Stakeholders

Partners: Hoofdpijncentra (VNHC), SAP and Delaware
Digital Transformation Designer and Project Lead: Abdelrahman Hassan
Team: Crystal Shan, Immanuel von Detten, and Merijn Kleinreesink

Challenge

How can we gather and use data to reveal insights to both patients and healthcare professionals, which, in the end, empowers patients with cluster headaches, migraines and tension headaches with means to monitor and improve their condition, and to gain control over their disease?

Problem

It is estimated that around two million Dutch residents currently suffer from headaches. The triggers and causes of headaches are often unknown, and a communication gap between patients and healthcare practitioners often stands in the way of offering proper diagnosis and after-care. The cost, otherwise referred to as the burden of headaches, often extends beyond physical pain and includes “substantial personal suffering, impaired quality of life and financial cost” (WHO, 2016).

The process of collecting and sharing insights related to migraine-focused healthcare becomes a crucial challenge: how can we create a collaborative, inclusive and well-integrated platform insight pool that better enhances the migraine headache patient’s experience and health care? The collaborative and inclusive aspects of the aforementioned platform challenge aim to distribute the responsibility and ownership of the insights between the patients and the healthcare professionals (i.e. How can we make the platform empowering for the patients, time-saving for the health care professionals, all while providing valuable insights to both parties?). Moreover, the challenge aims to stress the importance of creating a solution that bridges the information gap between patients and practitioners, combining both medical and lifestyle data.

The challenge that this project poses can be summarised in this question: how can we gather and use data to reveal insights to both patients and healthcare professionals, which, in the end, empowers patients with cluster headaches, migraines and tension headaches with means to monitor and improve their condition, and to gain control over their disease? This project was completed in partnership with The Dutch national center for headaches *Vereniging van Nederlandse Hoofdpijncentra* (VNHC), SAP, and Delaware.

Output

The project has produced multiple artefacts:

- A data logging app prototype for patients. The prototype gives users an intuitive and simple way to log the data necessary for a diagnosis. Information about the frequency of headaches, the severity of headaches, adherence to medication as well as habit-related migraine triggers is collected through a text-based chatbot. The chatbot takes on the persona of an empathetic assistant, walking the user through various phases of data-input. Furthermore, when it comes to logging the location and severity of the migraines, facial recognition technology is used; users can simply scan their faces and annotate in the app where the migraine is most present.

- A headache mode which can assist patients suffering from an ongoing migraine attack. It reduces sensory overload by dimming connecting IoT devices, lowering phone brightness, blocking incoming calls, and notifications. Users can also send pre-written texts to contacts attempting to reach them.

- Link to the prototype can be found here.

- A dashboard for doctors which allows them to view patterns in the condition of their patients. Doctors can see in a calendar view, the times and severity at which the migraine attacks occurred, as well as the medication(s) used.

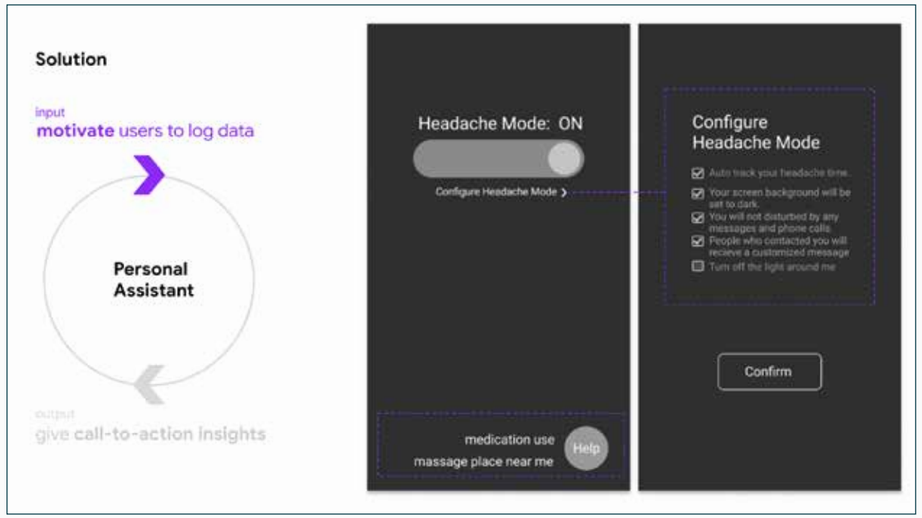


Figure 3.1.1
Headache mode.

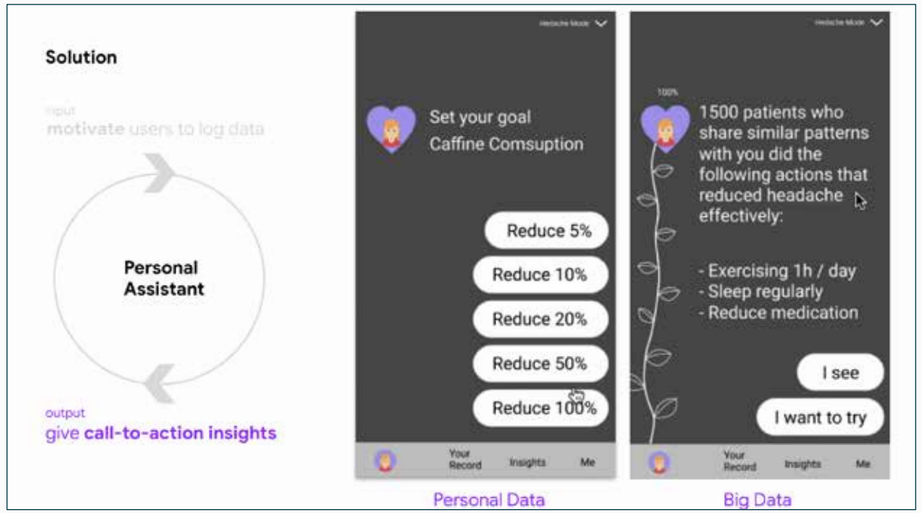


Figure 3.1.2
Personal assistant for data.

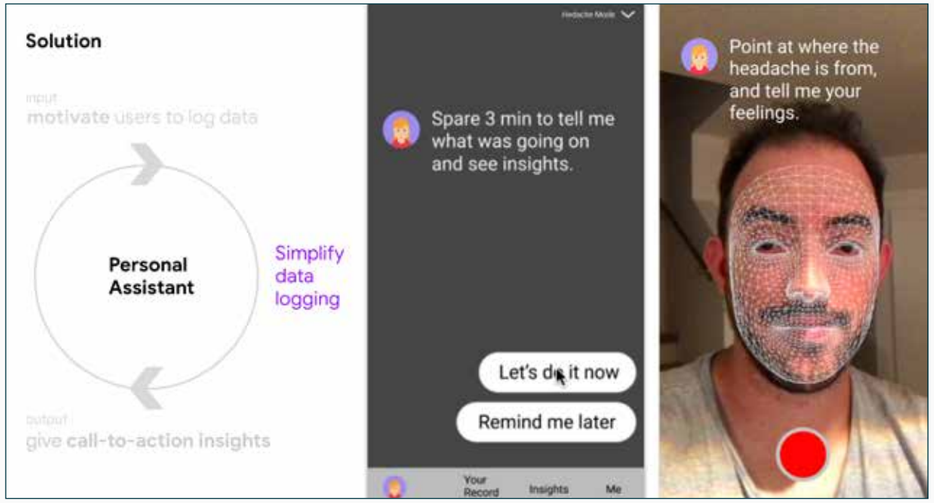


Figure 3.1.3
Facial Recognition
for headache logging.

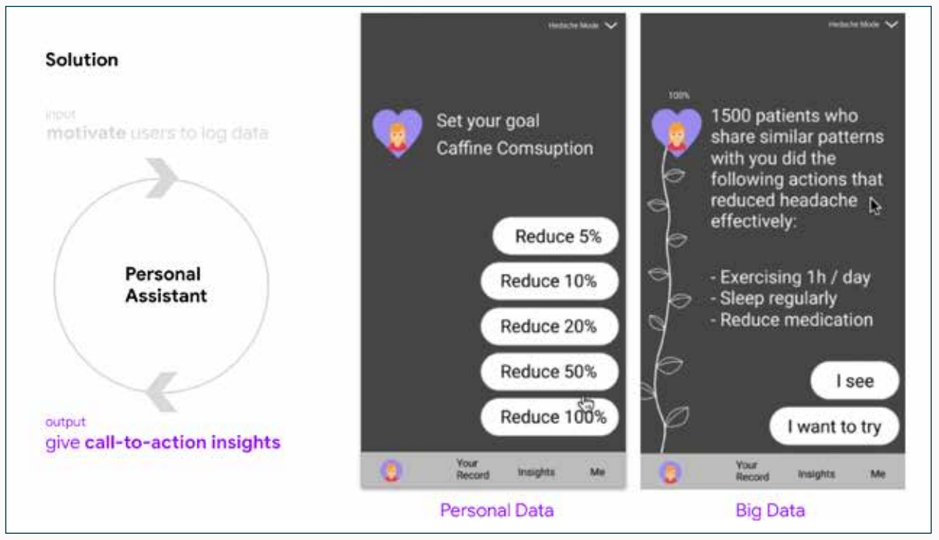


Figure 3.1.4
Enabling self exploration through
logging of triggers and lifestyle data.

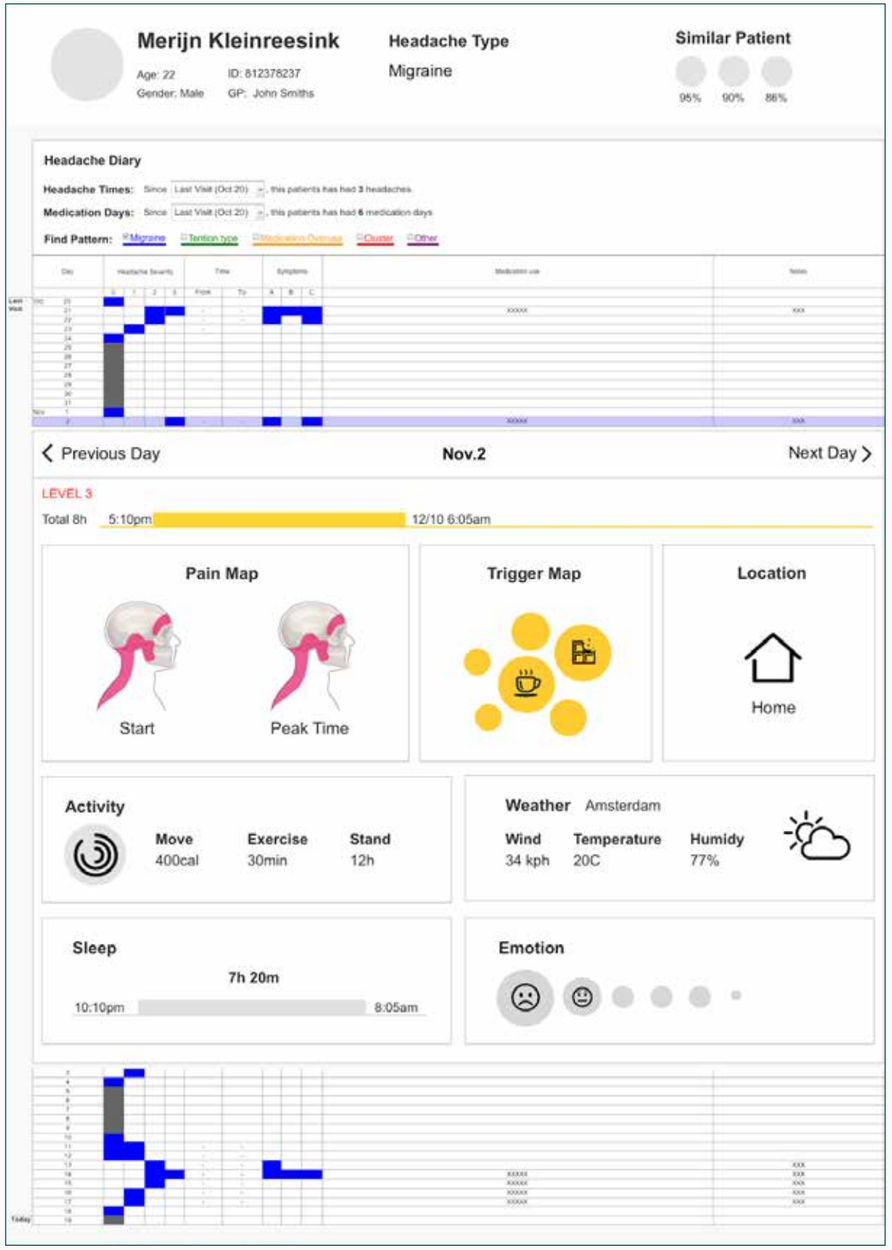


Figure 3.1.5
Dashboard for doctors showing a
summary of metrics for a given user.

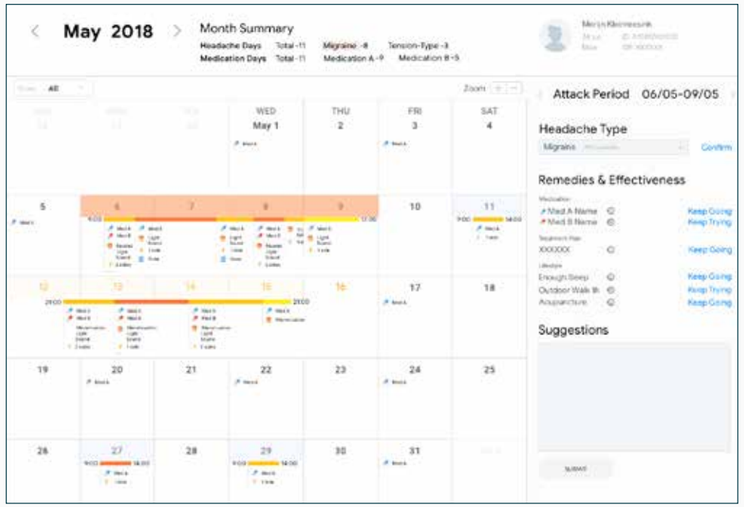


Figure 3.1.6
Monthly summary of attacks, severity and medication.

Methods

We adopted an iterative, user-centered design framework to build the prototype. We started with collecting literature about the Dutch health care system, the social burden of headaches, and state of the art quantified self methods, as well as shared decision-making frameworks. From these sources, we were able to gauge the different data needs of doctors and patients.

The literature review allowed us to conduct more in-depth interviews with migraine patients. We conducted eight interviews and received more than 200 survey responses. The results of the survey, paired with a competitive analysis of already existing migraine solutions in the android app store, such as Migraine Buddy, helped us generate relevant ideas for our platform. The platforms were then tested by migraine users and VNHC doctors to measure adaptability, followed by iterations throughout four sprints.

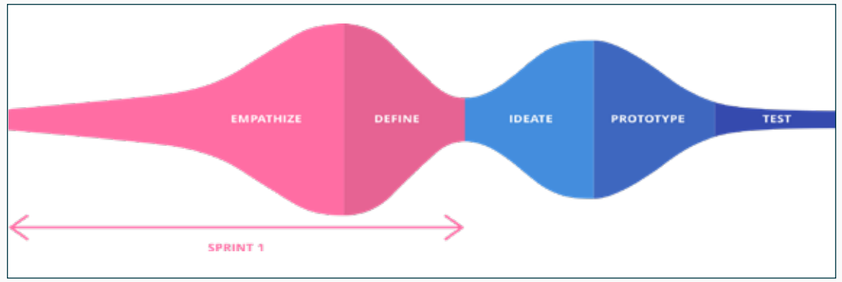


Figure 3.1.7
User-centered design methodology.

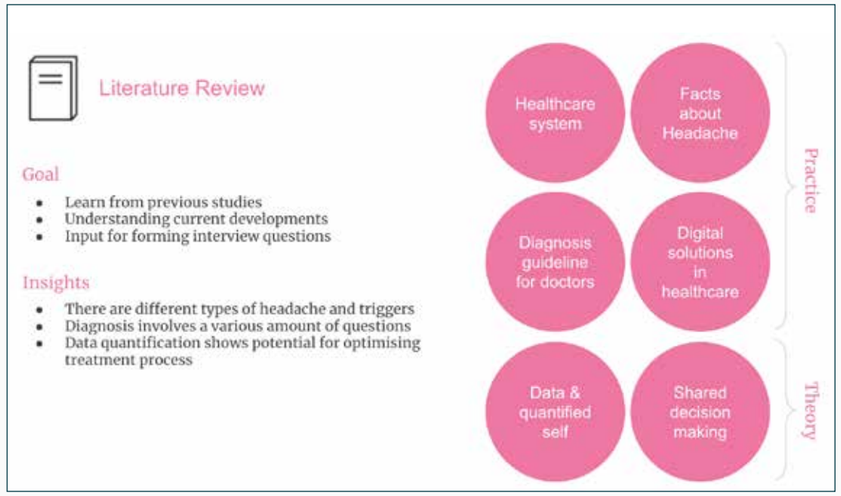


Figure 3.1.8
Literature Review.

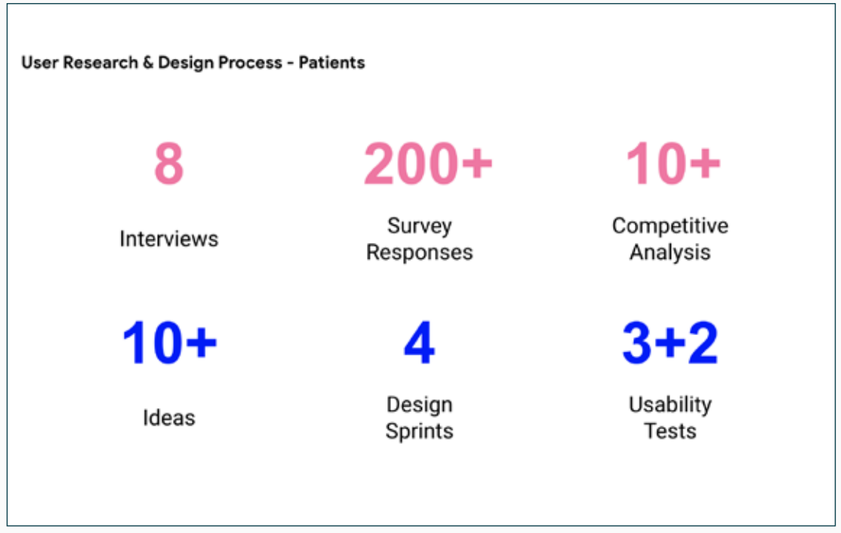


Figure 3.1.9
User research process.

Results

Results from the questionnaires, interviews, and literature research highlighted the multilayered relationship patients have with their migraines. Patients often use data logging apps, not only to explore and better understand their illness but also as a communication tool with doctors. Patient needs are temporal; they change before, during, and after a migraine attack. The needs differ between newer patients and more experienced ones. Patients also feel more engaged with a friendly and empathetic platform.

User research helped to identify a framework for a tool that can help doctors and patients better collaborate. Using the model in Figure 3.1.12, we can provide a platform which motivates users to log data, but also provide habit-related suggestions to better manage migraine triggers. The tool can relay relevant patterns to doctors, as doctors are often interested in the recurrence and severity of migraine attacks and patient adherence to medication. Inversely, doctors are less concerned with identifying and managing the patients' triggers. The framework can aid patients in their self-exploration process and can aid doctors with identifying relevant patterns to help them prescribe the appropriate medication in response.

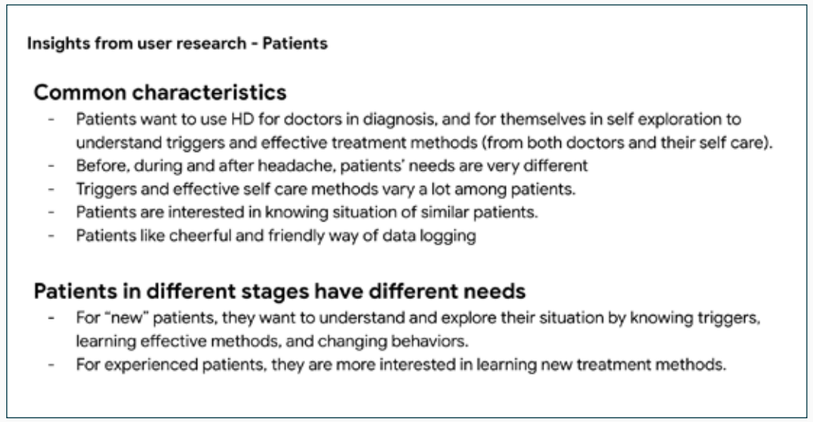


Figure 3.1.10
User research insights 1.

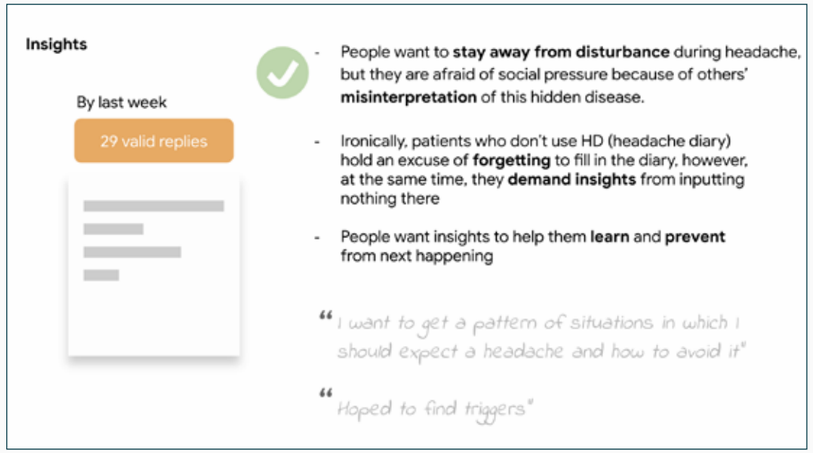


Figure 3.1.11
User research insights 2.

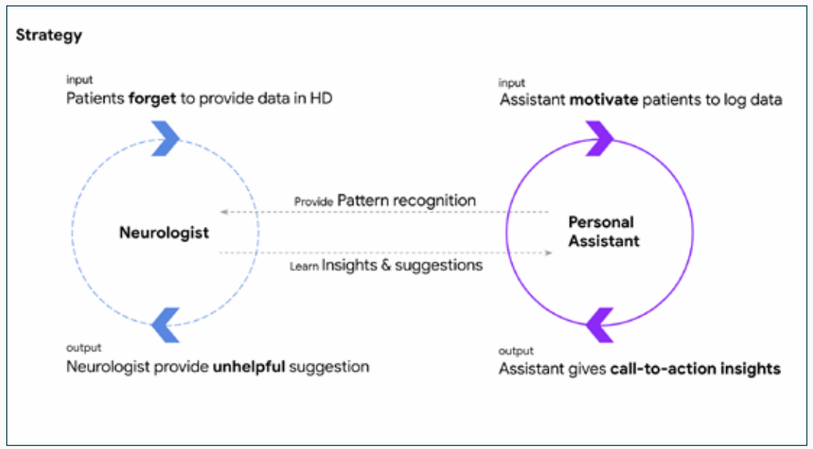


Figure 3.1.12
Solution framework.

Discussion

The tool created has proven to be an adequate response to the user needs of both the doctors and the patients. The doctors expressed that the tool provides a more efficient way to identify useful patterns in their patients and reduce unnecessary communication. The patients were better supported in managing their condition, as they were not only provided with improved and simplified data logging, but also given suggestions by the platform. The tool also addressed the 'social burden' of headaches through the headache mode, which reduces sensory stimulation for patients experiencing an attack.

However, since the solution is multifaceted and includes multiple technologies (e.g. facial recognition, data logging, and Internet of Things), concerns about the synergy of all the different solutions remain unaddressed. We were able to separately test and validate the data logging assistant, the IoT-based headache mode, and the dashboard for doctors, but the combined framework was not tested as a whole.

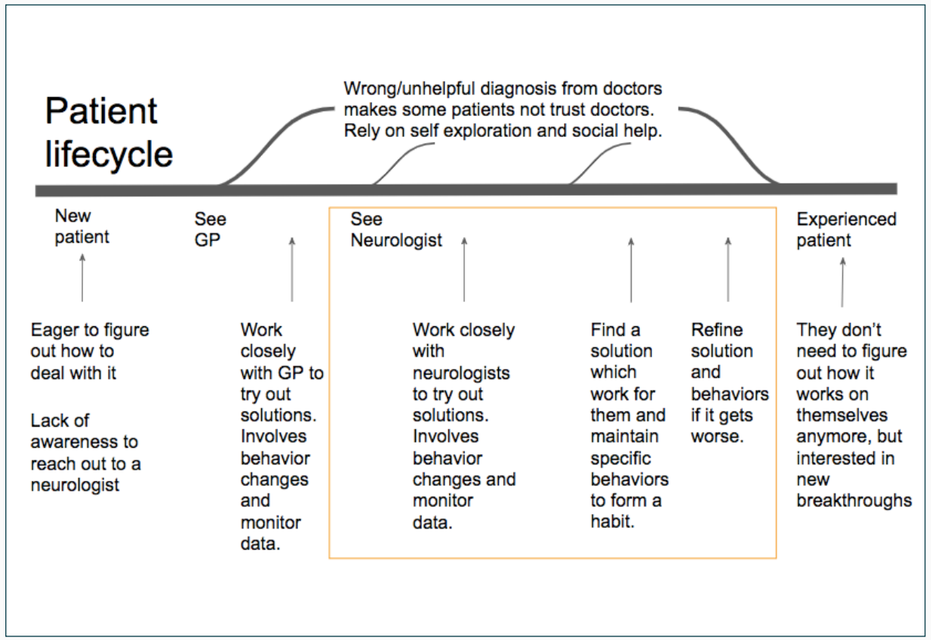


Figure 3.1.13
Migraine patient lifecycle and associated pain points.

Future Work

The SAP Mobile Innovation Lab was able to construct a high fidelity prototype of the data-logging assistant we created to be tested with migraine patients. The afterlife of this project then lies in the implementation of the envisioned concepts. A technical pipeline connecting data input with a dashboard for doctors would be a logical next step for this project. Once the pipeline is complete and implemented, usability testing can be carried out over some time to ensure the sustainability and robustness of the solution.

Furthermore, since patients were interested in learning from the experiences of other patients, artificial intelligence could be used to match patients with similar profiles. Two patients would have a similar profile if they share lifestyle choices or migraine attack patterns. This artificial intelligent assisted pattern recognition can also assist doctors in making better-informed prescriptions.
For example, prescribing the same medicine to two patients with similar profiles.

References

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(3.2) PARTICIPATORY ECOSYSTEM FOR PUBLIC HEALTH

Keywords: Public Data, Public health, Public space, Urban green space, Storytelling.

Time: Febr 2019 - June 2019

Related SDG's

Stakeholders

Partners: Gemeenschappelijke gezondheidsdienst (GGD), General Public in Amsterdam, Municipal-level Policymakers, Public Health researchers

Digital Transformation Designer and Project Lead: Abdelrahman Hassan

Team: Dania Awin, Merlijn, Charlotte Petertil, Diego López, and Sila Unal

Challenge

How can we use storytelling to visualise public health & environmental data to better understand their interconnectedness, as well as foster public engagement in policymaking?

Problem

In a project done in collaboration with the Gemeentelijke Gezondheidsdienst (GGD), the public health service in Amsterdam, we explore how to leverage existing public datasets to build a data ecosystem where citizens can gain insights on public health data, and where policymakers and researchers can make data-driven decisions in the urban environment of Amsterdam.

The problem was phrased as **'**How can we use storytelling to visualise public health & environmental data to better understand their interconnectedness, as well as foster public engagement in policymaking? Here, environmental data refers to publicly available air quality, noise-level, and green space data in the city of Amsterdam. Public Health data refers to the Amsterdam Health monitor data, available on GGD's online platform, Gezondheid in Beeld (Health in the picture)**.** The platform includes datasets collected through resident surveys on physical and mental health, demographic information, and living environment.

Data interconnectedness raises questions about its usage: who uses the data? What kind of conclusions and correlations can be made from the various datasets? What is the afterlife of the insights created? The project attempts to adopt the concept of "global data literacy" (Grey et al., 2018), which advocates for an understanding of data literacy which moves beyond numerical and statistical analysis. Additionally, It addresses the ability to "account for, intervene around and participate in the wider socio-technical infrastructures through which data is created, stored and analysed" (Grey et al, 2018).

In a rigid mathematical and statistical sense, correlations between environmental and public health data are hard to expose given the current data. For instance, a neighbourhood that is greener and quieter, but has a higher percentage of smoking, doesn't necessarily mean green space and smoking are correlated. However, the opportunity exists for us to package, frame, visualise, and present the data in order to innovatively connect it to its intended public. In our case, this means that the data can be used to monitor alarming trends in public health, inform policy decisions, and include the general public in such decisions.

Output

- The outcome of the project is a platform on which we can build our data ecosystem. The platform consists of four elements: an interactive visualisation in which environmental and public health data are overlaid, a district dashboard overview for policymakers, curated reports for researchers, and a virtual reality (VR) installation to foster public engagement;

- The interactive visualisation prompts users to explore new connections between datasets by interjecting datasets from different sources. This fixes the rupture between the environmental data and the public health monitor data, without having to force correlations;

- The district dashboards are designed to serve policy-makers. The dashboard gives an overview of the public health trends in a neighbourhood, matching health monitor data with public perception data. For example, the health monitor data can show an increase in physical activity over time in Amsterdam East. The dashboard would give prominence to this positive trend, and allow the public to reinforce the data with reasons why this was or wasn't the case for them. This ultimately provides a trend-centric, holistic view of public health;

- To 'deepen' and 'thicken' reports, the prototype also includes curated reports. Such reports are curated by GGD professionals and include profiles of citizens with different health care issues affecting different demographics. The reports contextualize the trends and data reflected in the district dashboards. Such reports allow GGD researchers to delve deeper into specific topics. For example, an increase in smoking in young adults in Amsterdam West can be put in the spotlight. This would typically include the monitor data, data from user surveys, and links to relevant civil society organisations, as well as to relevant studies on the subject;

- A VR installation was created to physicalise the monitor data and to bring it closer to the public which it serves. Users can interact with a physical installation that shows a map of Amsterdam with a QR code to access the VR content (Figure 3.2.3). By scanning each district users are provided with VR content (a data visualisation) that can give insights into the public health challenges their city faces. The results are then sent back to the website for policymakers to use as part of a neighbourhood monitor, or for GGD professionals to use in a curated report.

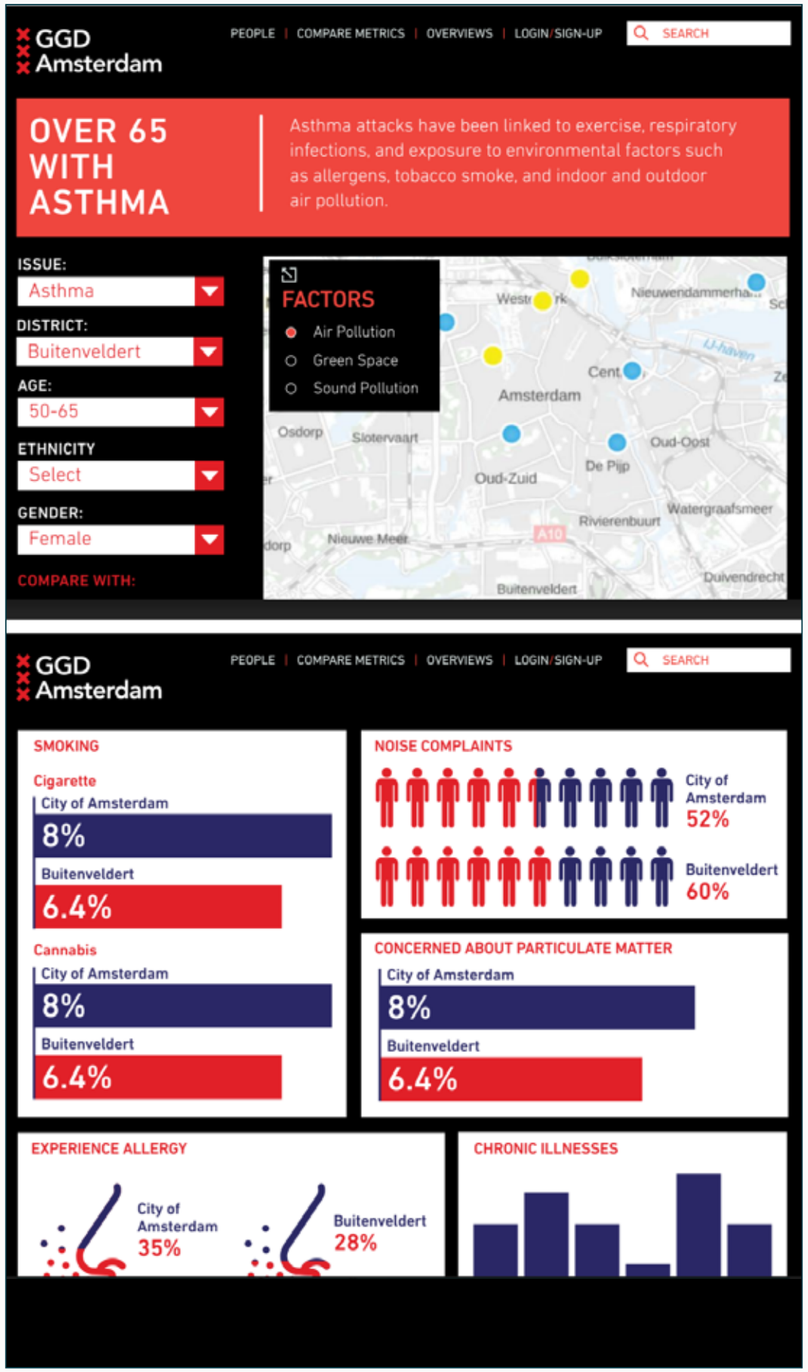

Figure 3.2.1
Outcome: Platform.

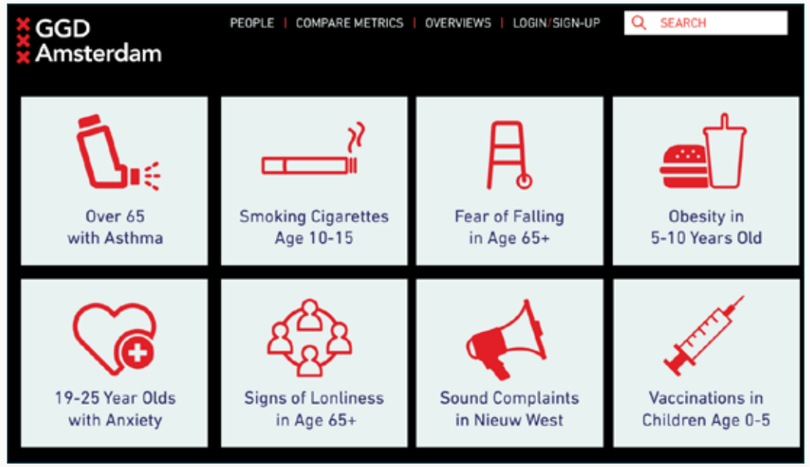

Figure 3.2.2
Curated Reports.

Figure 3.2.3
VR installation of health monitor data.

Figure 3.2.4
Interactive visualisation overlaying Health Monitor data with environment data.

Methods

The team adopted an iterative design thinking approach throughout 6 sprints. During the first 3 sprints we focused on exploring, framing and redefining the issue at hand. This included a co-design session with the GGD researchers, a familiarisation and mapping of the monitor data and desk research into good visualisation practice and visualising for public literacy. Sprints 3 to 6 were dedicated to developing and delivering an effective prototype.

During the exploration phase of the project (Sprint 1-3):

- The team performed desk research to establish a theoretical framework for the project. The framework focuses on building data infrastructures that serve different public needs and highlights the importance of building data worlds (Gray, 2018). We researched the applicability of thick data (Alles et al., 2014) as well as the relevance of data storytelling, which is "the process of building a narrative around raw data" (TWDI, 2020);
- The team designed a participatory data-mapping visualisation to understand priorities in urban spaces (Figure 3.2.7);
- The team conducted interviews with stakeholders, including a GGD policymaker and a representative from a grassroots organisation, to better understand their informational needs and use cases;
- The team aggregated a list of open public health datasets from the city of Amsterdam, then created a map of relationships between all the collected datasets;
- Once all the informational needs and use cases had been identified, Concept Sketches (AUAS, 2014) were used to inform initial designs for the platform.

Implementation phase of the project (Sprint 4-6):

Initial concepts were then tested with our collaborators from GGD, and a second design iteration was performed to refine our concepts and integrate our partner's feedback on the concept sketches.

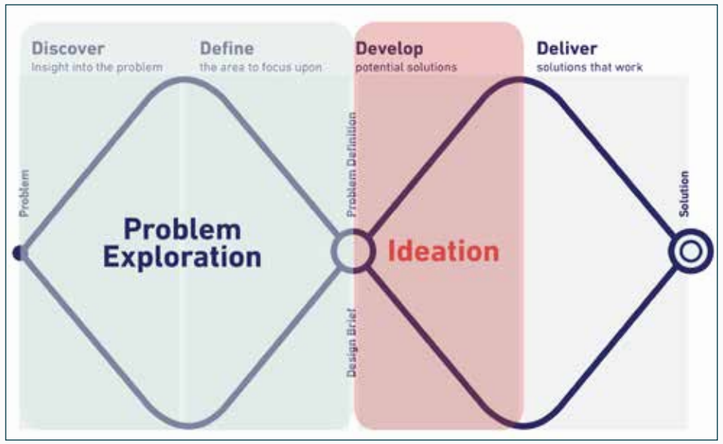

Figure 3.2.5
Double Diamond innovation process.

Figure 3.2.6
Priorities in urban spaces.

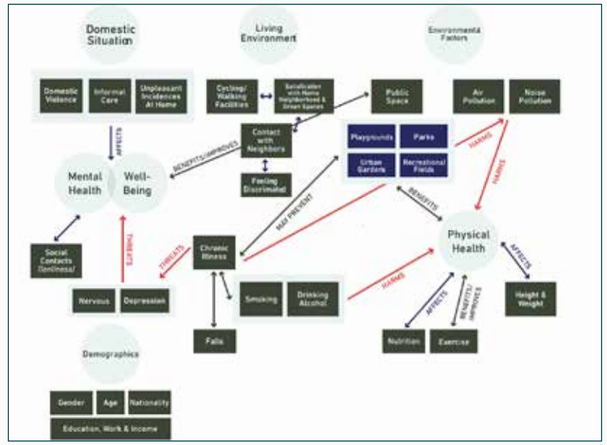

Figure 3.2.7
Participatory data-mapping visualisation.

Results

Our investigation and design processes lead the following three results:

1) A multidimensional visualisation connecting several of Amsterdam's public health datasets. D3.js [2] was used to perform the visualisation and allow the user to explore relations between different datasets in a website;
2) A simple dashboard that helped policymakers make informed data-driven decisions;
3) Data-led storytelling in the form of curated reports which allow researchers to delve deeper into the context behind the data, and which also allow citizens to engage with the data. This was done through developing an augmented reality (AR) installation, using A-frame and AR.js, to allow users to explore different datasets related to their neighborhood.

A write-up of the results can be found on the Medium account of Digital Society School.

Discussion

We established the following design principles to guide us through the process of creating a more connected data ecosystem where citizens can relate to the case of public health data.

1) The data must be accessible to the public who use it; the data needs to be understandable in a mathematical sense and organised logically in an interface where its different aspects are easy to reach. Understandability can then be organised in multiple metrics: understandability of the data, of the interface which contains the data, and of the impacts that this data can have on policy and society;
2) The data must tell stories. We adopt a data-storytelling perspective which dictates that data must be supplemented by narrative. This is most evident in the curated reports part of our platform;
3) The data world must allow for the data to evolve and for its users to develop new content. Due to the limited time and scope of the project, we considered the extendability of the platform. How can we better supplement the current health monitor data with online survey data? How do we empower the various stakeholders, such as researchers and policymakers, to collaborate on critical public health issues? Although we have different sections in the prototype which support different stakeholders, more user testing is needed to make conclusions about the ability of the platform to foster collaboration amongst different stakeholders;

4) The data ecosystem is self-critical. The platform prototyped should express to the user its own bias and shortcomings. This means the platform should explain instances where data is incomplete or misleading. A critical data infrastructure is one that is constantly posing the questions 'who is left out from the visualisation,' 'who is miscategorised' and 'what data practices can be employed for inclusion?' D'Ignazio and Klien outline a framework for inclusive data visualisation practices in their paper "Feminist Data visualisation" (D'Ignazio & Klein, 2016).

It is hard to determine whether the platform the team prototyped in the duration of the project fulfils these principles, as more user studies are still needed. The prototype is by no means comprehensive nor complete, but it is a step closer to the data world we need to build. Despite adopting a constructive and generally positivist approach, it is not visibly self-critical; that is, the biases that are inherent in the data and the connections which are made are not made explicit.

Future Work

One way this project can be extended is to expand data sources for the public health monitor. The monitor data relies mostly on questionnaires mailed to selected residents in each neighbourhood. However, a larger sample of data can be collected by installing physical interactive installations, such as the AR installation produced in this project. The platform we created can also be expanded to foster community-led discussions on public health. This could either come in the form of direct annotations to data visualisation, as is the case with OpenStreetMaps [3]. This would provide a direct outlet for the public to build a narrative around the already available public health data.

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(3.3) ANTI-HARASSMENT CHATBOTS

Keywords: Online Abuse, Harassment, Cyberbullying, Conversation design, Social media, Classification, NLP, Ethics.

Time: Sept 2019 to Jan 2020.

Related SDG's

Stakeholders

Impacted groups: Radicalised and marginalised groups on social media platforms, content moderators.
Digital Transformation Designer and Project Lead: Abdelrahman Hassan
Team: Hillary Jaap, Zara Sokoot and Maxine Hanrieder
Advisor: Caroline Sinders

Challenge

How can conversational agents (bots) help to understand or combat online harassment on Twitter?

Problem

In 2018, Amnesty International reported that 70% of social media users have witnessed someone being harassed, while 40% have been harassed themselves. (Toxic Twitter - A Toxic Place for Women).

During the fall 2019 semester, a multidisciplinary team spent 20 weeks building a framework to more deeply understand the phenomenon of online harassment. Since most existing research focuses on supporting victims, we adopted a proactive stance in addressing the harassers themselves. We sought to address the following design challenge: how can conversational agents (bots) help to understand or combat online harassment on Twitter?

More specifically, we aimed to focus on hate speech as a form of online harassment. The United Nations defines hate speech as "any kind of communication [...], that attacks or uses pejorative or discriminatory language regarding a person or a group based on who they are, in other words, based on their religion, ethnicity, nationality, race, colour, descent, gender or other identity factors" (Guterres, 2019).

Even then, the question quickly proved to be multifaceted; Twitter is a networked public space where abuse is ambiguous and digital methods of monitoring and recording data on users are limited; hence three subproblems have arisen:

1) *How does Twitter currently handle harmful content?*

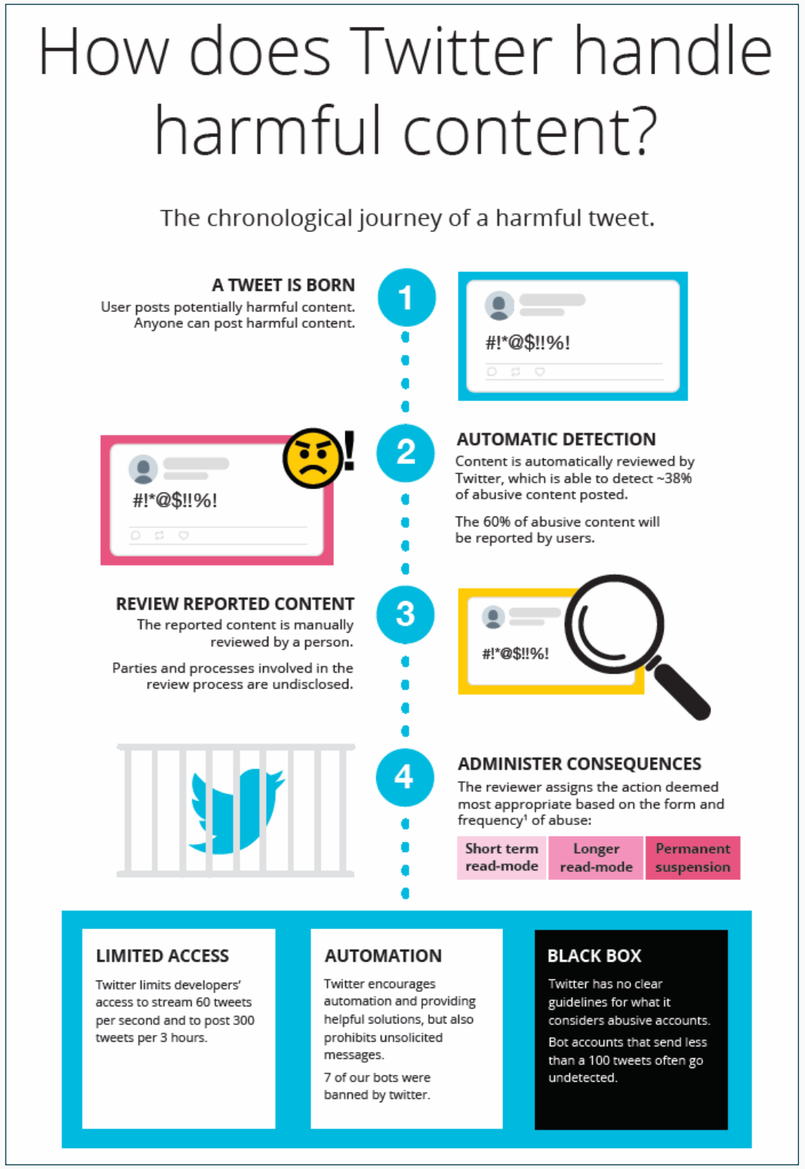

Figure 3.3.1.
How Twitter currently handles abusive tweets.

2) *How do we identify abuse?*

This sub-question is about distinguishing instances of abuse from other instances of interaction. Especially as we turn to automation, machine learning models, and abuse-detection at scale, we must reflect on our methodology to ensure that the amount of false positives is kept to a minimum.

3) *How do we converse with the abusers and measure impact?*

Once abuse has been identified, the next challenge is engaging with the abusers in a way that does not enable or further his/her aggression. How can we build an automated conversation with the aggressors that encourages positive behaviour change? How can we measure such change?

4) *How do we engage the public with our mission?*

At its core, this is an issue of free speech and safe online spaces. The subjectivities and ambiguities of classification and engagement need to be the product of community engagement. The team has set out to engage the public with the chatbot's mission and inner workings, exposing how the automated agent works as well as the kinds of ethical dilemmas it might face.

Output

The project produced tools and datasets which detect hate speech (data scraper, classification models, pipeline of classifiers) and which design conversational strategies (board game to explore ethical and technical issues).

Twitter Scraper

We built a Twitter scraper to collect a sample of tweets containing terms of hate speech. The terms were collected based on their rankings from Hatebase [4], an online data repository "of structured, multilingual, usage-based hate speech". The code, dataset, and search queries for collecting tweets can be found here: https://safe.dss.cloud/s/qBsB7XLMpy4RR3F.

Classification system

Classifying abusive messages is challenging, and is an active research area. We relied on six different datasets labelled for hate speech, available publicly or on request. Table 3.3.2 shows an overview of the characteristics of these datasets.

The 'Keywords' column indicates whether the source has been filtered and, if yes, how the keywords were collected. The 'Labeling' column refers to the method the authors used for annotating their dataset. In this column, 'trained' means annotators received some kind of training on the dataset's topic prior to annotation.

Using these existing datasets we built a classification system that combines several classification models. We trained several classifiers with different classification methods, namely Logistic Regression, Support Vector Machines, and Random Forest. We compared their performance against each other.

We also used the toxicity level from Google and Jigsaw's Perspective API [5], a machine learning tool that estimates the impact a message might have on a conversation. This tool uses ground-truth datasets where humans have assigned different toxicity levels to messages, including 'toxic' and 'severely toxic.'

We used the Perspective API's toxicity level, combined with a majority vote from our trained models, to decide whether a tweet should be classified as abusive or not.

authors	year	classes	source	total	abusive	balanced	keywords	labeling
Waseem [21]	2016	racism, sexism, none	Twitter	11k	26%	7k	none	expert, authors
Waseem & Hovy [22]	2016	racism, sexism, both, none	Twitter	6k	14%	2k	none	experts, CrowdFlower
Davidson et al. [23]	2017	hate, offensive, none	Twitter	25k	6%	3.5k	Hatebase *(unknown)*	CrowdFlower
Golbeck et al. [24]	2017	harassment, none	Twitter	20k	24%	12k	research *(see App.Fig.9)*	authors *(trained)*
Founta et al. [25]	2018	hate, abusive, spam, none	Twitter	53k	4%	5k	none	CrowdFlower *(trained)*
Qian et al. [26]	2019	hate, none	Gab	28k	50%	28k	Hatebase *(see App.Fig.10)*	CrowdFlower

Table 3.3.2
Overview of Datasets for abuse classification.

Botopoly game

To explore the potential of chatbots and their ethical and technical challenges we created a board game to foster public engagement. The game runs on a simple concept similar to that of Monopoly. Players impersonate a chatbot, and must navigate the game to have meaningful interactions with online abusers. The first player who collects all the conversational cards wins. However, to collect the cards, players must face multiple challenges, some technical, and some ethical. Players can face five types of challenges:

1) No abuse: When a player gets a non-abusive tweet, nothing happens;
2) Abuse: When a player gets an abusive tweet, they start an interaction with the abuser, and collect a card from the conversational card deck;
3) Ambiguous tweet: When a player gets an Ambiguous tweet, they must read out the tweet and decide whether the tweet is abusive or not. Afterwards, if more than half of the players agree with this decision, the player receives a point;
4) Events: Events are interactions with the chatbots. They range from likes and retweets, which are rewarded with points, to chatbot malfunctions, which are penalized with point deductions;
5) Suspension: A suspension of a player's Twitter account disrupts their activities. The player loses points, and skips their next turn.

Figure 3.3.3 Image of the Botopoly board game.

Figure 3.3.4 Example of a card containing an abusive tweet.

Methods

Understanding conversational strategies: an experiment

Counterspeech theory (Benesch, 2016) posits that hateful speech must be met with positive speech to counter negative or harmful discourse in the public sphere. Using counterspeech theory, five strategies were developed to test on a total of 230 manually identified abusive tweets. The effectiveness of each strategy was then measured with simple metrics of engagement: numbers of retweets, comments, and likes. The assumption was that the more interaction a tweet acquires, the more effective it is. The limitation of our assumption is that if a tweet receives high engagement, it doesn't necessarily mean that it was successful at combating abuse. The opposite also holds: just because a tweet receives low engagement, it doesn't mean it failed to mitigate abuse.

We identified 5 common strategies to apply counter speech, after reviewing relevant literature on the subject. The first strategy is Affiliation, or an affirmation that we share a common ground with the abuser, but hold an alternate belief. The second is Humor, which aims to defuse the abuse by making the situation less serious. The third is Labeling, which consists of invoking a label on the action of perpetrators, to hold them accountable. The fourth is Warning, which aims at alerting the perpetrator about the negative consequences of their abuse. The fifth strategy is Empathy, which tries to validate the feelings of the perpetrator, but also to signal that a change of attitude is needed.

We held a co-creation session to draft appropriate chatbot responses for each strategy. The responses had to fit in the tweet limit of 280 characters. The tweets used for the five strategies are shown in Figure 3.3.5.

Figure 3.3.5
Tweets drafted for each strategy.

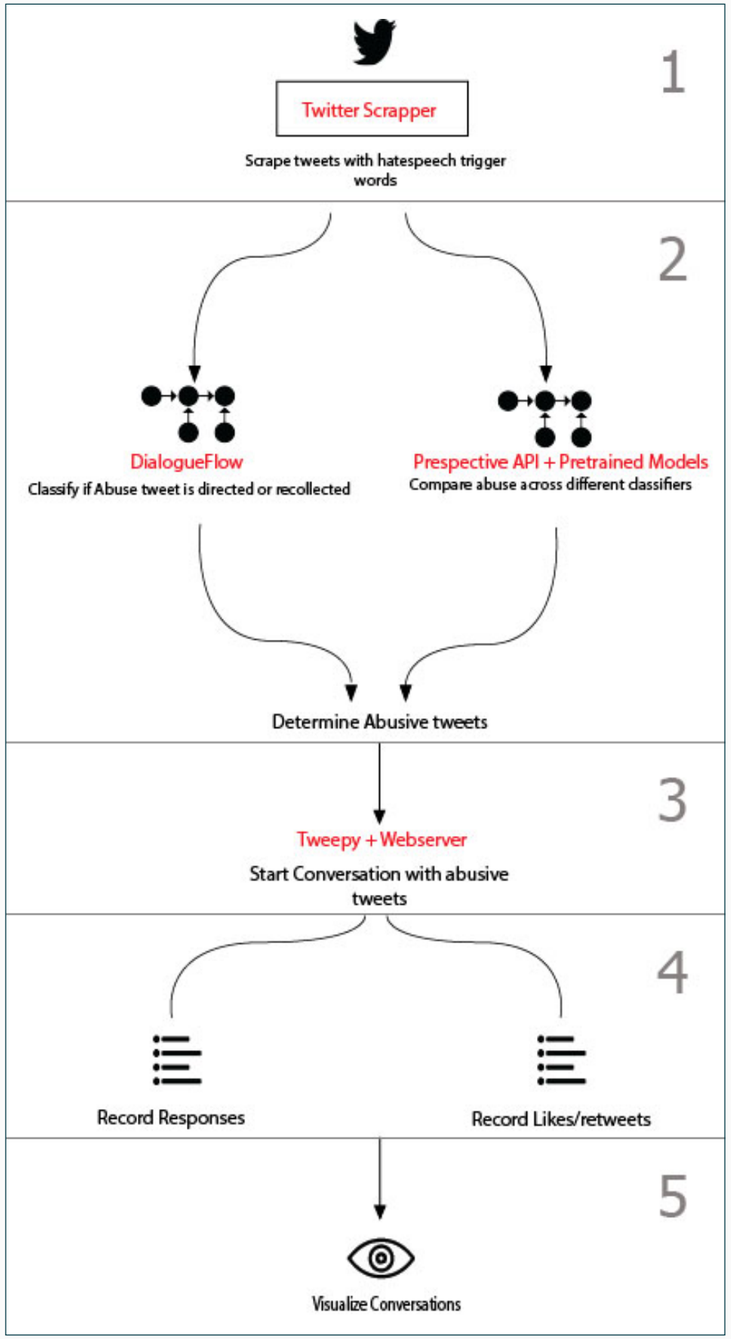

Figure 3.3.6 Classification and Conversation System.

Building the automated conversational agent

A conversational agent was built to be triggered by our classification system. The system is shown in Figure 3.3.6, and described below.

1) Find tweets: The tweets are first scraped based on 20 keywords of racialized hate speech, extracted from Hatebase.org (Table 3.3.2). Preprocessing removes tweets that are in a language other than English, that are not a response to another tweet, or that contain non-textual components such as videos and links;
2) Classify tweets: We focus only on tweets directed at a person, to focus on preventing harm to targeted victims. The tweets are classified by 6 pre-trained models of hate speech, and by the Google Perspective classifier. The final classification will be the majority vote. If multiple classes can be given for hateful content (e.g. racist and sexist), we combined these classes into one. If the multiple classes refer to the degree of abuse, we used only the highest degree of abuse, and lower degrees of abuse are considered non-abusive. This strategy aims to limit False Positives. Otherwise, non-abusive users would be engaged by our chatbot, which would, in our consideration, be unethical;
3) Start dialogue for directed abuse: If a tweet is found to be abusive after the classification process, it is sent to the conversational agent and a conversation is initiated. The conversational agent first invokes the DialogFlow API, an open source

Google Cloud service that is powered by the machine learning suites Google Could AutoML [6] and Google Cloud Natural Language. It incorporates features for intent matching, entity recognition, and allows customized training of classification models. Using DialogFlow interface, we trained a conversational agent that is able to identify whether an abusive tweet was invoked or recollected. Invoked tweets are abuse directed at a subject. Recollected tweets are a description of an abuse that occurred elsewhere. For example, "I was called a n*gger by angry crowd the other day" is recollected abuse. We focus only on invoked abuse, and discard recollected abuse;

4) Try different dialogues: Two types of conversation were tested. An empathetic conversation and a neutral conversation. The neutral conversation attempts at correcting abusers' behaviour, without trying to validate their feelings. The empathetic conversation also tries to change abusers' behaviour, but also to validate their feelings. Each conversation consists of four responses to the users.

> #fuckniggers', 'youfuckingnigger', 'fuckingmuslim', 'fuckingfaggot', 'religionofhate', #fromQianetal, 'nigger', 'boojie', 'hillbilly', 'whitenigger', 'bitterclinger', 'rube', 'house-nigger', 'camelfucker', 'bint', 'twat', 'cunt', #added'sandnigger', 'sandnigger', 'cameljoc-key', 'cameljockey', 'dunecoon', 'dunecoon', 'raghead', 'raghead', 'terroristlover', 'sand-monkey', 'muzzie', 'sheboon', 'porchmonkey', 'pavementape', 'coonass', 'mooncricket', 'spic', 'spick', 'chink', 'wetback', 'beaner', 'prairienigger', 'bamboocoon', 'chinaman', 'sidewayspussy', 'whigger', 'wigger', 'wiggerette', 'redneck', 'trailerparktrash', 'trailer-trash', 'whitetrash', 'yobbo', 'plasticpaddy', 'zionazi', 'surrendermonkey', 'dyke', 'faggot'

Figure 3.3.7 Search terms used to scrape abusive tweets.

Results

We ran our conversational agent twice, with different conversational flows. Once a tweet is sent out in response to an abusive tweet, every subsequent response from the abuser is recorded, along with the number of likes, comments, and retweets it received from other users.

Understanding conversational strategies experiment: results

We conducted an experiment to test how the five identified conversational strategies performed with Twitter audiences. We divided our dataset of 230 abusive tweets into five subsets of 46 tweets. We then responded to the tweets in each of the subsets with a different conversational strategy. Thereafter, we then recorded the engagement metrics (likes, retweets, comments) for each strategy (Figure 3.3.9).

Strategy	Likes	Retweets	Comments	Total
Affiliation	3	0	4	7
Humor	3	0	2	5
Labeling	2	0	3	5
Warning	0	0	0	0
Empathy	9	0	1	9

Figure 3.3.8 Engagement metrics for our chatbot's responses to abusive tweets.

Although our sample of tweets is small and not sufficient, we can observe an initial trend in users giving more likes for the Empathy approach, and avoid reacting to the Warning approach. Finally, we should mention that not all metrics equally reflect users' engagement. For example, a comment could be a stronger method of engagement than a like.

Comparison of Classifiers

We trained and tested several classifiers, using different classification methods and training sets. We selected 6 classifiers which had the best precision score. We combined them into a classification system that would use the majority vote of all classifiers. To compare the performance of our classifiers, we evaluated them using a small dataset of 210 tweets, which were scraped from Twitter with our list of keywords and manually labelled. The performance of each classifier, and their combination using majority vote, is shown in Figure 3.3.9.

	prec.	rec.
Waseem1	0.0	0.0
Waseem2	0.0	0.0
Davidson	0.681	0.405
Golbeck	0.5	0.172
Founta	0.75	0.052
Qian	**0.708**	**0.397**
Combined	0.618	0.773
Majority	**1.0**	**0.017**

Figure 3.3.9
Performance of the 6 classifiers and their combination with the highest precision score highlighted.

Blocked chatbot account & keywords

A test run of our conversational agent over a 24-hour period successfully detected 476 instances of abuse and replied to them. However, after only a short time from the start of the test run, the Twitter account linked to our conversational agent was suspended. This means that all replies from our bot sent after this moment were not visible to other users, including the user it responded to. We were able to record one full conversation before the suspension of our account and registered one bystander reply. We analysed the distribution of keywords from our predefined list that was used by the 476 detected abusive messages and found that “n*gger” was used by far the most in almost 300 cases, followed by “c*nt” with a bit more than 100 cases. A plot of all keywords used with their counts can be found in Figure 3.3.10.

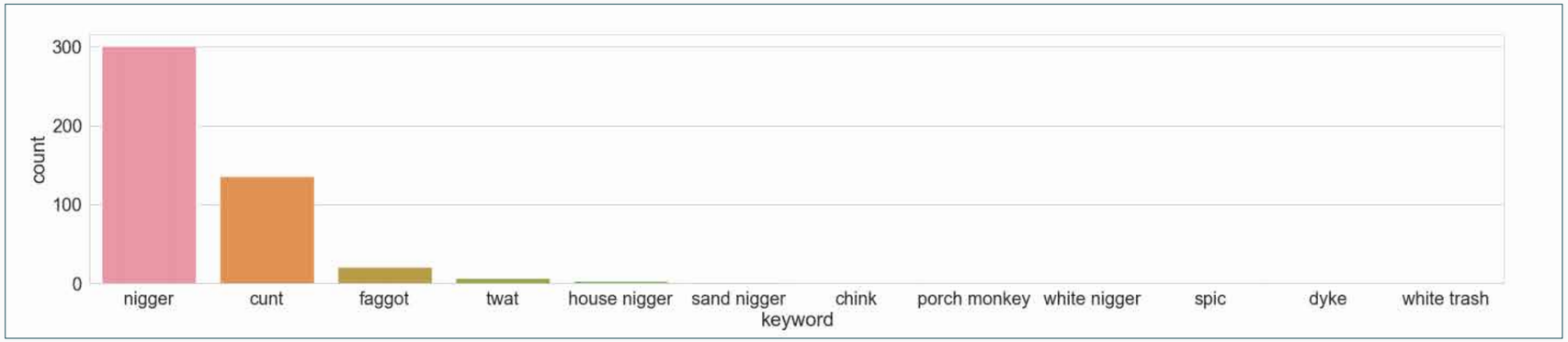

Figure 3.3.10
Frequency of hate speech terms in the scrapped tweets.

Discussion

Should we use such chatbot on Twitter? Since we were primarily interested in understanding the motivations of abusers, our approach was built upon theories of counterspeech (Benesch, 2016), within the affordances of Twitter as a platform. We had to deal with the ethical consideration of whether we had the right to intervene on Twitter, and whether Twitter was truly a public sphere. We subscribed to the idea of Twitter Publics (Ausserhofer & Maireder, 2013) which states that people "are interconnected through fluid conversations," and "the ability of tweets to link to other media content and vice versa makes Twitter an integral part of the 'networked public sphere' that emerges alongside the mass-mediated public". In addition, there has been a general enthusiasm for using public Twitter data to support public health (Mikal, Hurst, & Conway, 2016). Indeed, our project does aim to support public health, as systemic abuse creates long-term mental health at a large scale. Our conversational agent has then adopted a role as an active bystander in the Twitter public, which at least counterbalances the implicit tolerance of abuse of passive bystanders. Considering the team's positionality and approach, multiple insights have arisen from the various phases of the project:

1) *Hate speech detection is a multifaceted problem*

The definition of hate speech in this project was limited to tweets containing certain racialised terms because aggression was otherwise hard to detect. Foul language is often used endearingly (e.g., "Ahah you bastard! that was fun!"). Verbal dehumanization (which frames another person or group as 'less human' based on race, sex, gender or disability) has a terminology that evolves very quickly on social media. Even when dealing with racialised terms, such as the n-word, we often find out that a term has been 'reclaimed' by the group it was set out to harm. Every term has its history, and a different life cycle of use, misuse, appropriation, and reclamation. Reclaimed terms such as the n-word are often used endearingly by African Americans. Some hate speech terms often have innocent meanings as well. For instance, the word towel-head is used to racialise a middle eastern person, while other times it literally means towel on a head. This is why a model trained on a dataset that targets a specific kind of abuse will easily be incompatible with a slightly different form of abuse. Furthermore, hate speech and abuse are often contextual, with no clear signifier in the text. A tweet can allude to a racist, sexist or homophobic stereotype without using inherent racist, sexist or homophobic terminology.

2) *A case for empathetic counter-speech*

Counterspeech strategies have been effective in engaging abusers in conversation about their motives. However, beyond engagement such as likes and retweets, we had no further metric to understanding whether the behaviours of abusers would change. To investigate this, observations over longer periods of time are needed. However, such a time frame was beyond the scope of this project.

3) *Twitter as an ally*

Although Twitter poses itself as a bot-friendly environment, our bot was restricted or banned several times. It was often accused of starting unsolicited conversations. It shows that Twitter's vision for bots on the platform is passive: bots should only speak when spoken to. The capacity for mass-automation of our bot is thus heavily reduced. What role can bots play in combating online abuse with such regulation? Bots have often been misused to inflict the abuse, or in some cases, spread misinformation. How can we design regulations that enable chatbots against abusers, but not chatbots that perpetuate abuse?

Future Work

Our classification system performs relatively well in identifying tweets that are most certainly abusive for a specific hate speech terminology. However, as we put effort on minimising the number of false positives (i.e. innocent people treated as abusers by our bot), we have limited our bot's ability to capture all instances of abuse. So far our bot only interacts with a few cases in the entire stream of abusive tweets.
For a more in-depth development of classification systems, a larger, independent dataset should be created to enable better detection of different terminologies, types, and levels of abuse.

Community-based abuse detection?

Many tweets were found to be ambiguous, either due to the nature of the term, or because the tweet can be seen as righteous anger, or because the tweet responds to an attack or another instance of hate speech. As the Botopoly game demonstrates, ambiguous instances of abuse warrant a lot of discussion from players. Further discussions and design tools are needed to help us to collectively decide what the best strategies are for chatbots to use to respond to ambiguous tweets and to other types and levels of abuse,

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Appendix A: List of search terms used in the tweet crawler

uckniggers',youfuckingnigger',fuckingmuslim',fuckingfaggot',' religionofhate',#fromQianetal.'nigger','boojie','hillbilly','whitenigger', 'bitterclinger','rube','housenigger','camelfucker','bint','twat','cunt', #added'sandnigger','sandnigger','cameljockey','cameljockey','dunecoon', 'dunecoon','raghead','raghead','terroristlover','sandmonkey','muzzie', 'sheboon','porchmonkey','pavementape','coonass','mooncricket','spic', 'spick','chink','wetback','beaner','prairienigger','bamboocoon','chinaman', 'sidewayspussy','whigger','wigger','wiggerette','redneck','trailerparktrash', 'trailertrash','whitetrash','yobbo','plasticpaddy','zionazi', 'surrendermonkey','dyke','faggot'

(3.4) HABIT FOR HEALTH

Keywords: Quantified self, Habit change, Bayesian networks.

Time: Febr 2020 - June 2020

Related SDG's

Stakeholders

Partners: TNO, Zilveren Kruis, Imagination of Things

Stretchers: Jarah de Jong, Gino Kalkman, Eugene van Someren, Zilveren Kruis, Beter Leven

Digital Transformation Designer and Project Lead: Abdelrahman Hassan

Team: Sarah Binta Alam Shoilee, Erika Verebelyi and Rafailia Asimakopoulou

Challenge

How can we communicate this abundant information in a way that addresses different user groups and inspires positive behavioural change?

Problem

The widespread use of self-tracking technologies has given rise to a new era of healthcare which enables individuals to monitor their biological and psychological states. On the Apple Store alone, there are more than 44,000 applications for self-tracking and healthcare (Mikulic, 2019), and more applications exist with wearable technology and other platforms. This data tracking trend is often associated with the Quantified Self (QS) movement, which encourages extensive self-tracking of one's activities. The diversity of behaviours that can be tracked, and the diversity of self-tracking goals, bring to light a need for personalization: How can we communicate this abundant information in a way that addresses different user groups and inspires positive behavioural change?

The Netherlands Organisation for Applied Scientific Research (TNO) has devised a machine learning model which can make lifestyle recommendations to guide users toward more healthy behaviour, after receiving input from a user on their biological and psycho-social health determinants. The recommendations provide a preventative health program geared toward improving mental and physical health, and reducing non-communicable diseases. During the 20-week program, the collaboration between DSS and TNO aims at creating a digital platform that empowers adults to improve and maintain a healthy lifestyle in a way that is inspiring, actionable, inclusive and understandable. This endeavour requires communicating recommendations and insights on health issues that are easy to understand and to integrate into the lives of adults with different lifestyles, identities, and attitudes toward health and self-tracking.

Personalizing the content delivered to each user would help to motivate users and to engage them with their health and health advice, while addressing their specific needs with an inclusive design that accounts for their gender, wealth, culture, and lifestyle.

Output

The project delivered two platforms for users to explore their health status, the impact of their habits, and the health recommendations: a creative visualisation with a custom design of the graphs, and a dashboard with more common graphs.

1) *Tree visualisation*

In collaboration with Imagination of Things [7], we designed a visualisation that uses the metaphor of a tree (Figures 3.4.1, 3.4.3). The tree has branches with leaves, and each branch represents a specific habit. The colour of the leaves represent the healthiness of the current habit. The length of the leaves represent the user's health score, calculated by TNO's model dependent on the user's current habits. The length of the branches represents the impact of changing a habit into a healthier habit (i.e., the max health score that can be achieved).

The visualisation highlights the most influential habits which, if changed, would most increase the health score. When clicking on a branch, users are provided with recommendations about changing this habit, and more information on what the habit entails. The user's health score is also compared with global and cohort averages. These are visualized as hills in the background of the tree (Figures 3.4.2, 3.4.3).

The tree shows eleven habits, which are the variables that TNO's model uses to predict risks of developing non-communicable disease, and to compute the health scores. These habits are: Job Strain, Smoking, Alcohol Consumption, Coffee Consumption, Sleeping Time, Physical Activity, Screen Time, Adherence to a Mediterranean Diet, Weight, Blood Pressure and Cholesterol Levels. Other variables are inputted by users and used by TNO's model. They are not visualized on the tree because these are not habits, and the users cannot change them. These variables are: Age, Gender, Height, Family History of Diabete, and Family History of Heart Disease.

The prototype that has been realised can be found here.

Figure 3.4.1
Personalized health tree.

Figure 3.4.2
Hills for average comparisons.

Figure 3.4.3
Tree visualisation.

2) *Dashboard*

We developed an alternative visualisation: a dashboard offering basic visualisations of the health score and the recommendations of habits to change. The health score is shown as a pedometer, and histograms are used to compare how impactful a change of habit would be.
The dashboard has functionalities for users to explore and play with different habits, to see how they impact the health score.

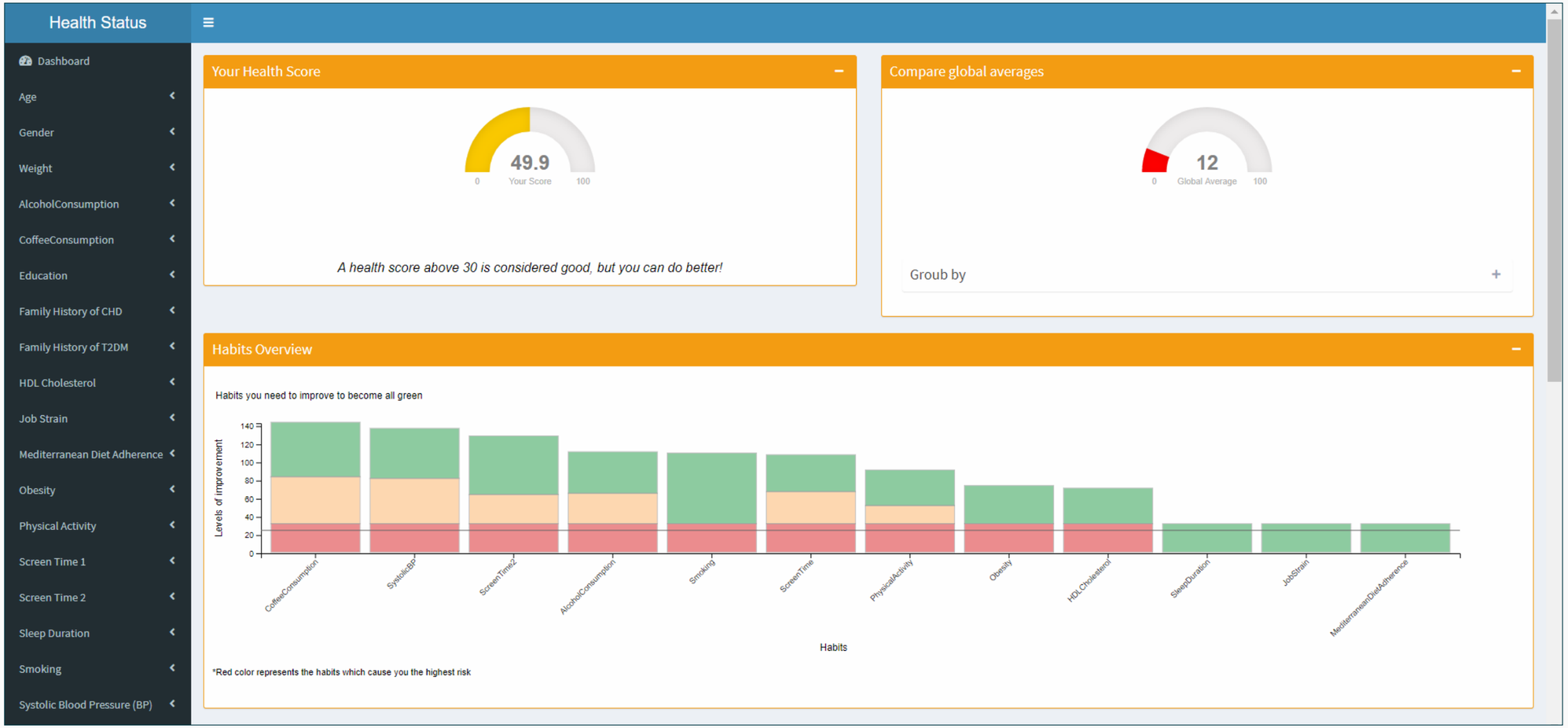

Figure 3.4.4
Dashboard.

Methods

Over the course of the project, we used a variety of methods for informing our design (literature review, user personas, benchmark of mobile apps) and prototyping our visualisations (rapid prototyping, user studies, web development).

Literature Review

In the early phases of the project, we conducted an initial literature review to build a deeper understanding of the quantified-self movement, and of habit change. The "Hooked" model (Eyal, 2014) provided valuable insights into the process of habit-forming, e.g., to develop new healthier habits. The model highlights the importance of providing gradual rewards to the user. It inspired us a visualisation method that would show rewards visually, e.g., with a plant or a pet that grows as the user's health improves with a change of habits. By highlighting the gradual health improvements, we can encourage users to take small achievable steps, and get rewards at each step. We also considered social rewards: by displaying a comparing users' health score with their peers, we provide them with a sense of community and achievement. The "hooked" model states that once users start to accumulate rewards, they tend to feel invested in their activity, and develop inherent impulse to use the platform again (internal triggers, Figure 3.4.5).

Figure 3.4.5
The four phases of the Hooked Model.

User Personas

We conducted informal interviews to empathise with the potential users of our platform, and to better understand how someone adheres to self-tracking, to healthy or unhealthy habits, and develop a will to change their habits. We were able to coin 6 personas (Figure 3.4.5).

1) The Dinosaur: This persona upholds traditional values, low adherence to new technologies or the Quantified Self movement, and low trust in quantification methods. However, the dinosaur is often conscious about health issues. For our app, dinosaurs may prefer simple and intuitive interfaces.
2) The Sloth: This persona has a general indifference towards health, and a low motivation for changing their habits. In our app, sloths may be attracted through gamification.
3) The Penguin: This persona is willing to change, but has a strong need to rely on community. Penguins need a sense of belonging, and require social support to sustain progress. For our app, penguins may be retained by community features and social rewards (e.g., building and sharing success stories).
4) The Space Dog: This persona is interested in both health and technology. Space dogs proactively look for new solutions, and are constantly seeking new information for their self exploration. For our app, space dogs may prefer apps that offer a rich and diverse palette of information and features.
5) The Cat: This persona has lots of energy, and is willing to try new apps. But cats may also quickly lose interest. Cats are interested in health and technology, but they need a strong reward system to reinforce positive behaviours. For our app, cats may be retained by community features and social rewards (as penguins) and a rich palette of information and features (as space dogs).
6) The Dolphin: This persona has a natural drive to live a long life, and constantly search for improvement. Dolphins are open to new solutions, but they may be hindered by demanding social lifestyles. For our app, dolphins may need a flexible solution that would not demand to adhere to a strict planning for changing their habits.

Figure 3.4.5
User personas.

Benchmark of Mobile Apps

We surveyed 15 mobile applications from the Android Play Store. We searched for the 5 most popular apps in two categories: health, habit and motivation. For each app, we identified its main features, its most prominent positive and negative reviews, and its self-advertised selling point (Figure 3.4.6).

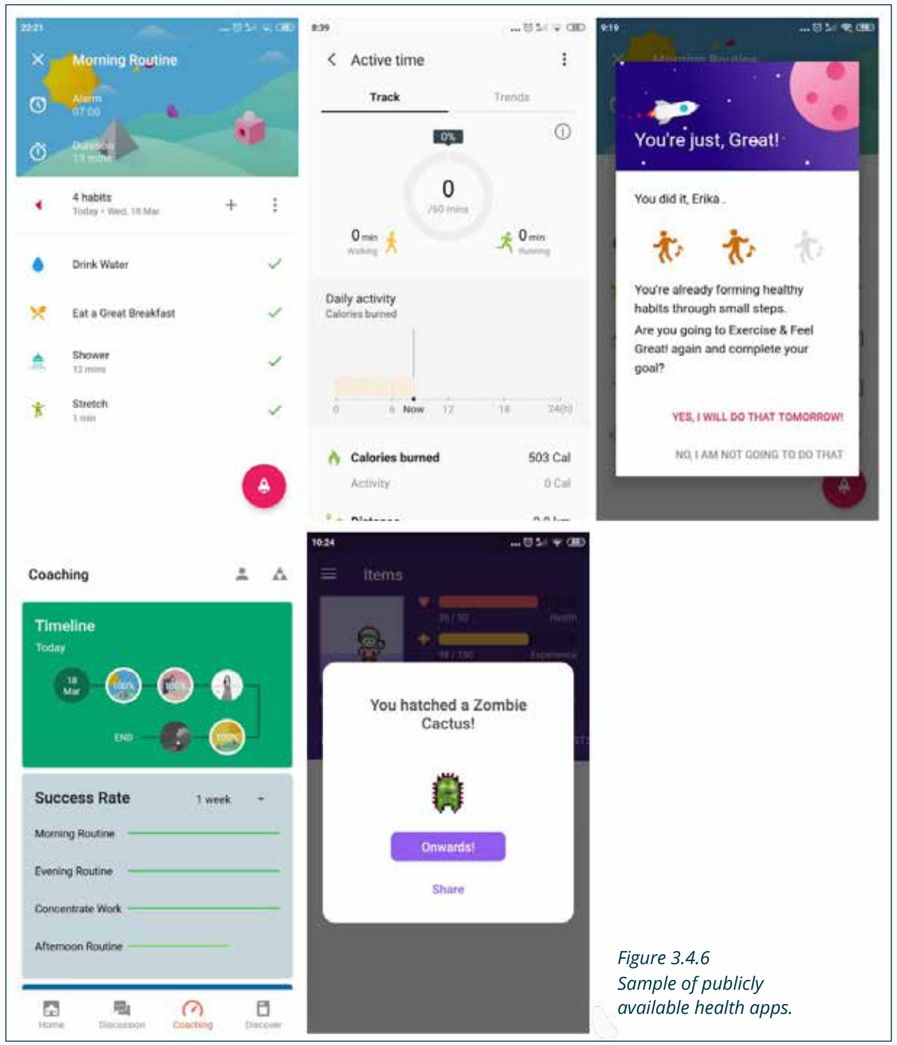

Figure 3.4.6
Sample of publicly available health apps.

Rapid Prototyping

Rapid prototyping was held in day-long sessions. Our sessions started with a brief of our design goals (e.g., facilitate user input). Then, each team member would produce a concept sketch and present it to the team. Based on the feedback from other team members, a second round of sketching was performed. Using the dot voting [8] method, we chose two concepts. We converted them into low-fi clickable prototypes, presented them to the partner for validation, and submitted them to user studies.

First user study

We held an initial user study to better understand the user needs, and the suitability of our visualisation concepts. We used low-fi clickable prototypes of the tree visualisation (Figure 3.4.3) and dashboard (Figure 3.4.4). We asked users about their information needs, their experience with the visualisations, and how likely they are to follow the health recommendation. Participants were members of our partner organisations Zilveren Kruis and TNO.

Second user study

Our second study focused on refining the user experience and the interaction design of the visualisations. We conducted the survey and live testing of the prototypes using MouseFlow [9], during the DSS showcase on 17th June 2020, via the online expo tool *Hopin* [10]. Showcase visitors who visited the project booth were asked to participate in the study. Participants were all based in The Netherlands, aged between 20 and 60-year-old, male and female, and young to senior-level professionals.

Web Development

We used NodeJS to build the tree prototype, the web app communicates with the model through an API provided by TNO. The dashboard prototype, however, was written directly on top of the model with R.

Results

From our initial design research (literature review, user personas, and benchmark of mobile apps) we found three factors that are important to support users in adhering to new healthier habit:

- Providing users with rewards (e.g., seeing a healthy tree grow as health improves, comparing with peers);
- Recommending small achievable steps, instead of demanding or unattainable leaps. Furthermore, small steps provide more regular rewards, instead of obtaining rewards only after making a big leap;
- Simplicity is key to avoid overwhelming users who may be stressed with their health risks and the difficulty to change their habits. The interaction design and the visualisation should require the least effort. However, depending on their profile, some users may prefer a richer set of information and features (e.g., persona's Space Dog and Cat).

We addressed these factors in our tree visualisation. However, usability issues were identified during testing, and the collected feedback suggested design improvements.

Usability issues

The interactive visualisation and its tree metaphor were found attractive, understandable, and visually rewarding, as the tree grows as the users explore the health benefits of specific changes in habits. The incremental growth of the tree provided rewards and small achievable steps, and encouraged users to explore the factors that impact their health.

However, the detailed health recommendations were not easy to find. Furthermore, users often sought information on their health risks (e.g., which non-communicable disease threatens them exactly) and how the AI system estimates the risks. We did not provide such information. The legend was not interactive, yet users often tried to click on it to find more information about the system and health risks. This reduced the simplicity of our interaction design.

Design improvements

The interaction and layout design should make it easier to find and access the recommendations. The content of the recommendations should provide more details about the means to achieve a specific change of habits, e.g., even smaller steps to guide users on a daily basis, and provide them with daily rewards.

Discussion

Positive:

- Participants are satisfied to see their health representation with a tree;
- The metaphor perfectly represents its purpose;
- The input form is quite trivial; the participant feels it up with less friction;
- The user finds it triggering to explore health score change with different input;
- The information communicated through the platform is easy and understandable.

Negative:

- A recommendation is not prominently visible;
- Some users find the information confusing and complex;
- Non-clickable component confuses participants sometimes.

Recommendation:

- The responsive interface may alleviate user experience;
- The legend representation can be improved;
- Recommendation for habit change should be offered in a more prominent way;
- Step-by-step guide for the recommendation will make things actionable.

Future Work

As already mentioned various methods have been used on this project and as a result there are a few different ways in which this project could grow.

Even though we took responsibility for it for about 20 weeks, in order to end up with a final product we might need more time or years. It is a big project related to healthcare, well-being, data collection and smart engines. We will be glad if either all of us or some of us or even 'third parties' can come up with a final product that serves our main aim, create a good impact on society.

Lately, I have been thinking how some existing smart engines work. And by smart engines I mean those that get fed by you but mainly feed you! Let's take for example Medium, a blog post platform, where the authors might be writers, journalists, software developers, psychologists, actors etc., but all help you to somehow improve your life by providing you with new knowledge, different perspectives and so on. But how does this engine work? Well the answer to this question is one way we could follow and see our project grow.

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(3.5) GGD MONITOR

Keywords:
Data curation, Visualisation, D3js.

Time: Oct 2019 - March 2020

Related SDGs

Stakeholders

Partner: GGD

Digital Society School: Emma Beauxis-Aussalet (design, code), Abdelrahman Hassan (code), Jake Henderson (code), Nicoleta Pana (design), Wouter Meys (project management).

Challenge

How to visualize the collection of datasets from GGD collaborator in order to help them to identify the datasets of interest, and to find out how to further explore them

Problem

The Dutch national health institute (GGD) addresses a variety of missions about public health for all demographics and health concerns. Each of its departments collects a variety of data to monitor public health (e.g. questionnaires, census, longitudinal studies, etc). It can be difficult for GGD workers to find and share datasets beyond their own immediate department. We identified two main difficulties:

- There is no central index of all datasets from all GGD departments;
- There is such a quantity of datasets (120+) about many topics and populations which constitute a volume that may be overwhelming to explore.

Data visualisation can be of great help to explore the large collection of datasets. Our project did not aim at visualizing the content of the datasets themselves (as existing tools can already handle such complex tasks). Instead, our project aimed at visualizing the collection of datasets, and their key high-level characteristics, without displaying too many details about the dataset contents.

Therefore, the problem is to visualize the collection of datasets in order to help GGD collaborators to identify the datasets of interest, and to find out how to further explore them (i.e., which department and colleague to contact).

Output

We delivered an interactive D3 visualisation (Figure 3.5.1). The visualisation uses glyphs to show multiple dataset characteristics (also called metadata), and includes functionalities to filter data, view datasets details, and edit the datasets and their characteristics (i.e. for long-term curation, with a database to maintain the information about the datasets). The visualisation tool is accessible only to GGD employees, but a public demo with fictitious datasets is available here.

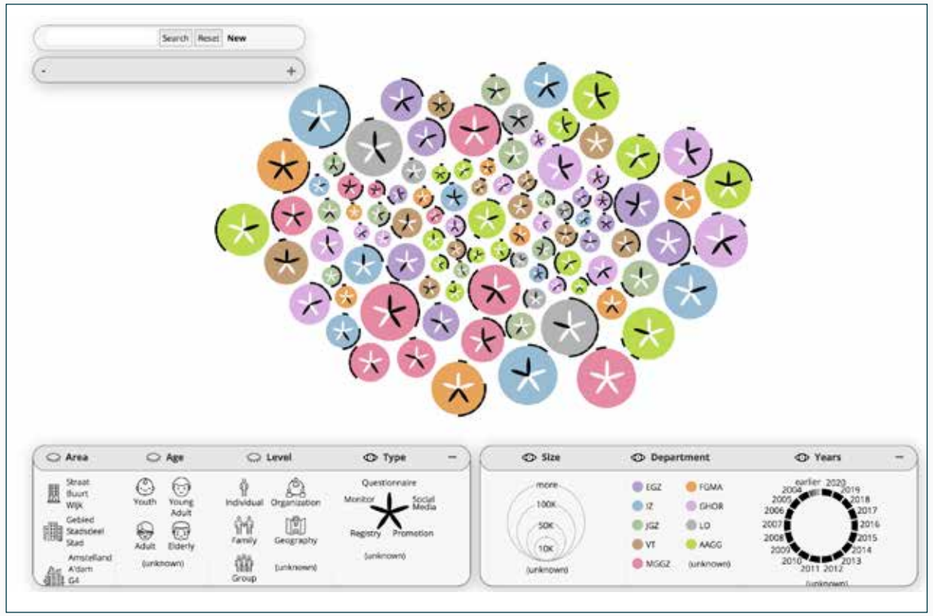

Figure 3.5.1
Interactive visualisation tool. Each colored circle (also called glyph or bubble) represents a dataset. The dataset features (e.g. area, age group, level, type, etc) are encoded using colors, contours, sizes, and icons. The datasets shown in this example are fictitious and were randomly generated, for confidentiality.

Methods

We conducted an iterative and user-centered design session, together with GGD stakeholders. Our collaborators at GGD provided a list of 120+ datasets and their characteristics. With input from GGD, we refined the ways to encode the datasets' characteristics into variables and their possible values (e.g. with numerical or discretized values, or categorical variables with multi-label or single-label values).

Once we agreed on the database schema, we designed the encoding of data variables into visual dimensions. After vetting and validating our design decisions, together with GGD, we implemented the tool using D3.js and agile development methods.

Results

We achieved a design that encodes multiple data dimensions and interactive features while keeping the interface clear, uncluttered, and attractive. To keep the interface attractive and dynamic, as well as comfortable for the eye, we used both vivid and pastel colors. To encode the multiple data dimensions while keeping the interface uncluttered, we decided not to display all features together at all times. Some features are displayed only on demand, by changing the icons at the center of the bubbles. To enable multiple interactive functionalities while keeping the interface clear, we organized the interface into several panels, grouping together 2 high-level tasks: exploring the collection of datasets (e.g. filter, hide/show dataset characteristics), and handling a dataset's characteristics (e.g. display all characteristics, edit them).

The group of coloured bubbles shows the collection of datasets (Figure 3.5.1). Each bubble represents a dataset and its characteristics. The top left panel shows the detailed features of a dataset (in Figure 3.5.1, the selected dataset is titled Simulated Data). The dataset features can be edited, or searched with free text, using the upper left bar.

The datasets have many features, which are shown in the bubbles using different visual elements: color, size, contour, and inner icons. The bottom panels show their legend. The bottom right panel shows the legend for the bubbles' size (by number of data points), color (correlating to the department owning the datasets), and contour (the years for which data points were collected, represented as black sections of the contour).

The bottom left panel shows the legend of the icons that are displayed inside the bubbles. In Figure 3.5.1, the icons show the type of dataset. These are labels that GGD uses to classify the data collection process and purpose. Multiple types can be assigned to each dataset, and they are represented as black branches of the icon.

Several dataset features can be visualized in each bubble, but not all at the same time. The inner bubble glyphs can display 4 possible features, shown in the bottom left panel, but only one at a time. In Figure 3.5.2, instead of showing the type of datasets, the bubbles show the age groups as a set of 4 icons (as a dataset can have multiple age groups).

Users can select which features to display using the headers of the bottom panels. The clickable eye icons control which dimensions are, or are not, visualized. The bottom panels can also be used to filter the bubbles, or to select datasets from a single department or age group.

Each label in the bottom panels can be selected as a filter. For example, in Figure 3.5.2, the department EGZ was selected as a filter in the bottom right panel. All the bubbles that are not from this department (i.e. that are not purple) are filtered out.

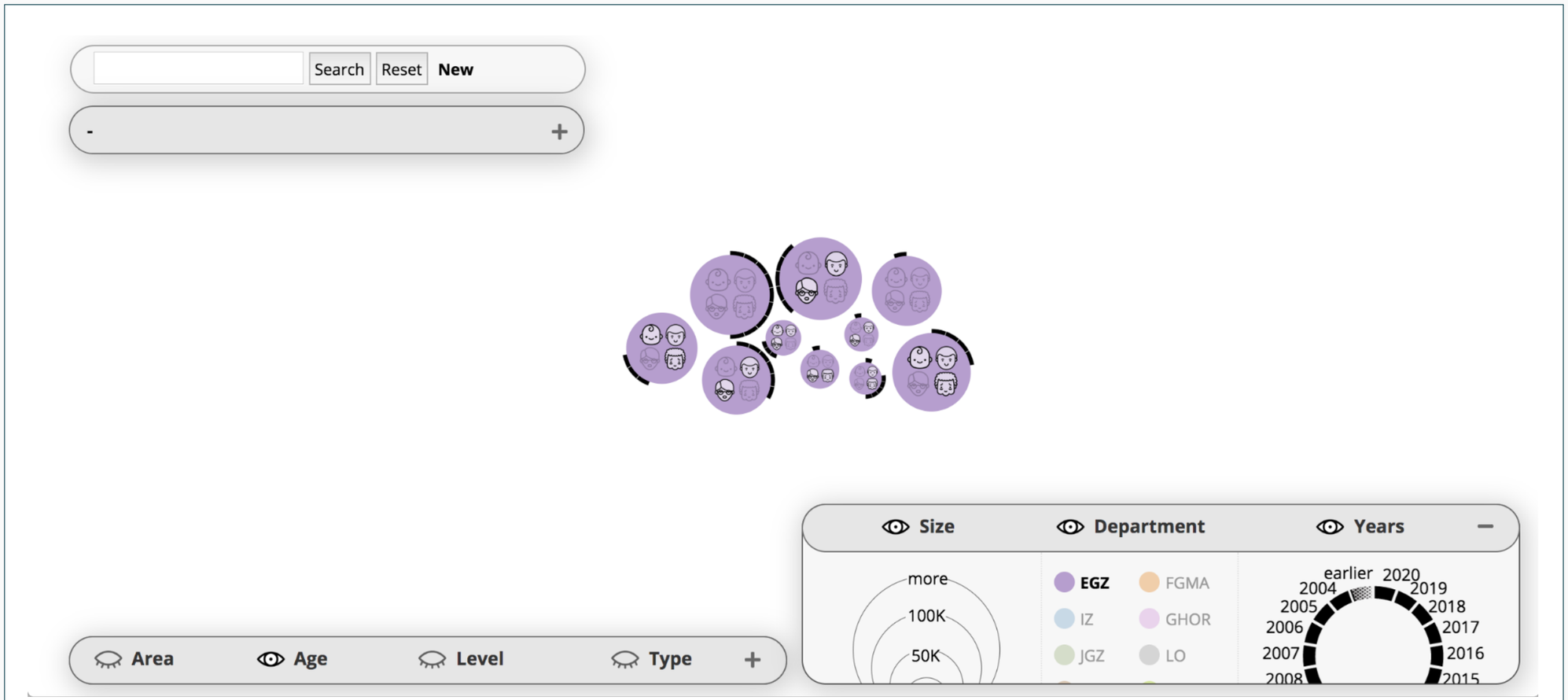

Figure 3.5.2
Interactive visualisation tool, filtered. The bottom right panel is used to filter datasets from a single department (EGZ is selected in the bottom right panel). The panels can be collapsed, and the bubbles' position dynamically adapts to the space left between the panels, and to the window size (a small window in this example). The inner content of the panels scales dynamically too, but is kept at a minimum size for readability (users need to scroll to see all the content — which may not be an optimal design).

Discussion

There is a visual redundancy between the top left panel and the bottom panels. The main dataset features are represented twice in different panels, and in a visually similar manner. The icons representing age groups are displayed both in the top left and bottom left panels. This redundancy may clutter the visualisation, and could confuse users. In this section, we discuss the trade off for this design.

Multi-dimension & multi-function

It seems to be a bad idea to duplicate the labels of the data features in the interface. For instance, there are 4 labels and icons for the age groups, 5 for the levels, and they are represented twice (top left and bottom panels). So just for these two features, age and level, our design tries to fit in 18 small icons!

The datasets have five other features (also called dimensions). The more the dimensions, the more space is needed to fit their labels twice in the panels. We could not fit all the icons in the top left panel. We used icons only for age and level. Other dimensions were stripped of their visual elements and shown as plain text (area, type, size, time).

The advantage of using fewer visual elements in the left panel is that this makes the left panel visually distinct from the bottom panels. This may help users to understand that the panels have different functionalities. The multiple functionalities make the visual design challenging, in addition to the multiple dimensions of the data.

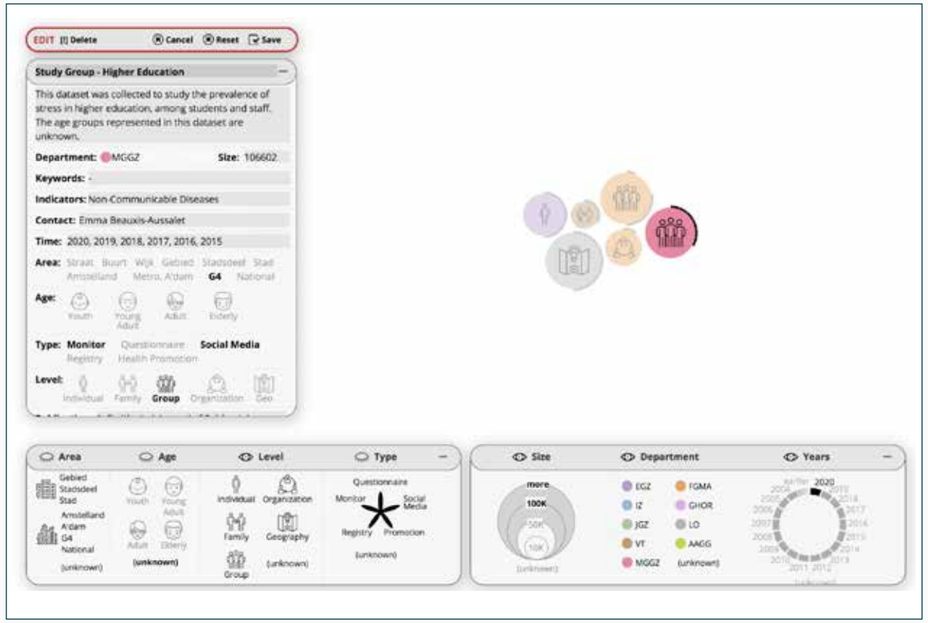

Figure 3.5.3
The datasets are filtered to find recent datasets (year 2020, right panel) of large size (50K or more, right panel) with unknown age group (left panel). The icons inside the bubbles show the Level of the dataset (a label used by our partner). A dataset is selected and is ready to be edited.

All-in-one

The interactive visualisation has multiple functions:

- Overview the collection of datasets (bubbles);
- Caption the graph with legends explaining the visual elements (bottom panels);
- Filter the datasets with specific features (bottom panels);
- Show/hide visual dimensions (bottom panel headers);
- Detail a dataset's features (top left panel);
- Search with text in all datasets features (upmost left bar);
- Edit, delete or create a dataset (top left panel, Figure 3.5.3).

There are many functionalities in a single page interface. Other designs can explore the use of two or more different pages for editing and overviewing the datasets.

The panels combine several functionalities: three for the bottom panels (filters, legend, and showing/hiding the visuals) and two for the top left panel (detail datasets, edit/create). Having multifunctional panels limits the visual space needed to include the functionalities. We found that we could include all the necessary functionalities into the two types of panels (bottom and left panels).

But the content of these panels is redundant: all the labels of the multiple dimensions must be displayed twice. We could attempt to fit everything all together in one place, instead of having to display these labels several times. Let's discuss how that could work.

Removing redundancy

The difficulty with having an all-in-one display, is that each label needs to be selectable for different functionalities: for filtering (as in the bottom panels), or for detailing and editing a dataset's features (as in the top left panel).

For instance, in Figure 3.5.4 the year 2020 is selected in the bottom right panel. It is also part of the labels in the top left panel (editable as text fields). Now let's assume that we get rid of the top left panel. Now the bottom right panel has all the functionalities. So the panel needs to show the years used for filtering and the years that apply to a specific dataset

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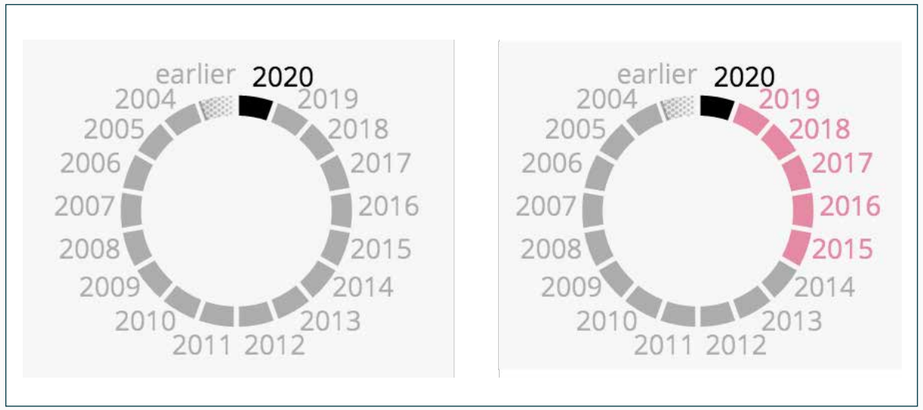

Figure3.5 4
Adaptation of the widget used to show the years (bottom right panel). The left widget shows only the years selected as a filter. The right widget also shows the years that apply to a specific dataset (e.g. the one selected in Figure 3.5.3).

Let's take the wheel showing the years, which appears in the bottom right corner of Figure 3.5.3, and let's try to show that year 2020 is selected (as a filter) and that years 2015–2020 are also selected (as the features of a specific dataset). This is not easy, but one option is to do as in Figure 3.5.4.

Basically we can use a bubble's color, which is pink in this case, as the bubble selected in Figure 3.5.3, to show the years that apply only to this bubble. In this way we can use different visual elements to show what is selected for what. Black is for what is selected as filters, and color is for what applies to a specific dataset.

This design is not successful. The consistency is broken between the time widget and the bubbles. The bubble contour can only be black or transparent. If the time widget also serves as legend, then the pink color is quite confusing.

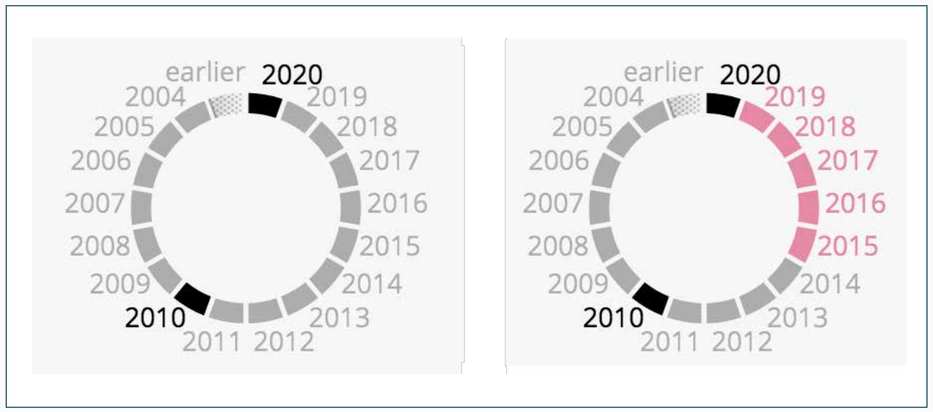

Figure 3.5.5
Adaption of the time widget, as in Figure 3.5.4, but year 2010 is also selected.

Another issue occurs when several years are selected as filters. For instance, if years 2020 *and* 2010 are selected as filters, both years are shown in black, as in Figure 3.5.5. The selected dataset does not have year 2010, but won't be filtered out because we keep bubbles that have year 2010 *or* 2020 (not 2010 *and* 2020, as we'd have lots of empty results). Looking at the right wheel in Figure 3.5.5 it is impossible to know if the selected dataset has the year 2010 or 2020. It must have at least one of these, but it is unclear which one.

Let's try again...

Another option is to show the dataset's years 2015–2020 in black, and use another color for the years selected as filters. But the bubbles are already using too many colours. We tried to differentiate color tones that were too similar by using saturation to distinguish between the versions by using combinations such as saturated orange and light pink, or saturated bright green and unsaturated dark green.

Perhaps it would be better to display either the filters or the dataset features, but not both at the same time. If a dataset is selected, the bottom panels show its features. If no dataset is selected, the bottom panels show the filters. We would still need a visual element that indicates what the panels are showing (filters or dataset features). For instance, when showing a dataset's features the color of the panel headers can reflect the color of the dataset's bubble.

In any case, we would need to add another panel to show the dataset features that are not in the bottom panels (description, keywords, indicators, contact, publication). The features of a dataset would then

be split into several panels, and users would probably spend extra effort to locate information, remember where to find it, and perceive lots of content changes in the panels as they explore the bubbles.

Both eyes at a time

With an all-in-one design it is difficult to show both the features of a specific bubble and the features used as filters at the same time. It is difficult to maintain the visual consistency of the legends, and to show filters and dataset features that do not match perfectly. Our eyes would have to interpret different combinations with the same visual elements, which can lead to confusion and fatigue.

On the other hand, if we keep the top left panel, we may duplicate the feature labels, but at least the function of the labels would be clear. The bottom labels are for filters — and for legends, too, to be opportunistic. But it's all about controlling the group of bubbles in the visualisation. The top left labels are only about controlling one specific bubble, for detailing its characteristics or for editing them. It remains simpler visually and cognitively: bottom is for the group of bubbles, top left is for a specific bubble.

When the user looks at the top left panels, there is no need to know what the bottom panels show. And vice versa. Users can keep both eyes at the same location: bottom or top left. Ultimately, we can wonder if there really is an issue with redundancy when in practice users do not (or cannot) keep both panels in sight (or in mind) at the same time.

Future Work

We better do user studies to find out, instead of speculating like that… but we first need to invent designs, and speculate about them, before testing them :)

(4) CLIMATE COMMUNICATION

Over the past few years the tone of the debate around climate change has shifted from sceptical to soberingly urgent as the global community has prioritised the research into solutions which will mitigate greenhouse gas emissions. So far this research has been insufficient. One of the major problems for driving public and private stakeholders to implement existing solutions and research new ones is how we communicate about climate change (Stoknes, 2014). There seems to be a lack of common language that drives the scientific community away from policymakers and the public. Due to this lack, it is hard to translate findings into viable and sustainable solutions and to adopt new climate-neutral economies and habits. Through six projects, we reflect on different aspects of this problem:

- Bridging the action gap between scientists and green entrepreneurs (4.1);
- Uncovering the main messages of climate advocates (4.2);
- Celebrating the rise of youth climate movements (4.3);
- Investigating the role of recommendation algorithms in the spread of climate misinformation (4.4);
- Eliciting methods to study the climate debate and its imagery Project (4.5);
- Contributing to the climate futures imaginaries with the help of dreaming machines (4.6).

Our work produced a collection of working prototypes, curated datasets, and documented methods. Our contributions aim at providing an overview of how the global community communicates about climate change on different platforms. The tools and insights we provide pave the way toward the design of new common languages to discuss the climate crisis, toward the design of potential solutions, and toward engaging a variety of stakeholders.

We hope that our work gives you a better understanding of how data can be used to impact the climate debate, and the stakeholders who have a role to play in enabling concrete solutions. We also hope that our work inspires you with new ways to use data and data-driven technologies for addressing the climate crisis. We hope you will thrive, as we did, from exploring the many ways in which data and data-driven technologies can support the tremendous human efforts needed to address the climate crisis.

(4.1) CLIMATE CHANGE SOLUTIONS

Keywords: Data literacy, Climate literacy, Action gap, Carbon sequestration, Green entrepreneurship, Doughnut economics.

Time: Sept 2018 - Jan 2018

Related SDG's

Stakeholders

Partners: Climate Cleanup, Visual Methodologies Collective
Digital Transformation Designer and Project Lead: Carlo De Gaetano
Team: Andy Docket, Namrata Babu and Mokhtar Hussein
Target Users: Green entrepreneurs working with carbon removal strategies

Challenge

How can we bridge the action gap between researchers, entrepreneurs, policymakers, and the general public, to make climate change solutions more actionable?

Problem

Climate Cleanup is a network of people (entrepreneurs, investors, scientists, and others) who are committed to reverse global warming by implementing scalable climate solutions that remove carbon dioxide (CO_2) from the air and water while creating solid business ecosystems.

Climate Cleanup is interested in researching Natural Climate Solutions to mitigate CO_2 emissions while developing a communication strategy to activate stakeholders on the local scale where solutions are put in practice. They do this by mapping the different public, technologies, and concepts in the climate change debate. The design challenge that we addressed in this project follows: How can we bridge the action gap between researchers, entrepreneurs, policymakers, and the general public, to make climate change solutions more actionable?

Outputs

- *Carbon dating:* A speed dating tool to find possible relationships between climate change solutions and different stakeholders. Cards printing files
- *Decarbonator:* A real-time stakeholder mapping tool to discover which sectors of society are actively addressing climate change. Print file for the board, laser-cut .ai files, Dataset of people contacts during the National Sustainability Congress
- *Donometer:* A decision-making tool designed to make climate change more actionable by visualising the impact of choices and helping find better solutions. Folder with code, video tutorial, app screenshot 1, app screenshot 2.

Figure 4.1.1
Example of two types of cards from the carbon dating deck: a carbon sequestration method (left) and a stakeholder card (right).

Figure 4.1.2
The Decarbonator in action during the National Sustainability Congress, 8 November 2018.

Figure 4.1.3
An excerpt from the explanatory video showing the use of the Donometer.

Methods

Carbon dating

The concept of 'carbon dating' takes inspiration from the real-life activity of 'speed dating.' This activity involves creating new potential relationships between those that haven't met before. The goal of this tool is to fall in love with the problem of climate change by exploring the possible relationships between different stakeholders and methods of carbon sequestration.

To design the dating-like game, the team selected seven relevant carbon sequestration methods (Seaweed Farming, Carbon Farming, Afforestation, Sustainable wood, Carbon Storing Construction materials, Mineral Weathering, Biopolymers) and seven relevant stakeholders (Consumers, Environmental Groups, Sustainable Development Goals, Government, Industry, Green Investors, Research groups). The selection was made through desk research and a focus group with the partners, Climate Cleanup and Visual Methodologies Collective.

For each method and stakeholder, an identity card was designed. Each card has a description on the front regarding the 'method' or 'stakeholder' chosen, providing information about the process and potential. The other side of each card has a few conversation starters and limericks that could help the flow of exchange of information. The attempt is to have a free-flowing conversation by personifying the cards and the information on them.

Figure 4.1.4
A moment during the user testing of the carbon dating prototype.

In a controlled group setting, fourteen people were invited to take the role of one carbon sequestration method or one stakeholder. In rounds of two minutes, each method had to talk to each stakeholder, as they would in a speed dating event. After each conversation, the participants were invited to score the viability of the relationships on a scale from one to ten, and to give a short pitch about their best match.

Decarbonator

On the 8th of November 2018, the team was invited to the National Sustainability Congress, where Climate Cleanup launched the Dutch translation of The Drawdown Book, which is one of the most critically acclaimed publications on climate change solutions. The goal was to develop a live stakeholder map to understand which sector of society was participating in the congress. At the same time, this tool was useful to expand the network of Climate Cleanup and to invite green investors to join them.

'The Decarbonator' is a live stakeholder map that holds 1500 black cards. Each card represents 1 gigaton of carbon. The stakeholder map is divided into seven segments that represent different sectors of society (business, citizen, entrepreneurship, NGO, public sector, research, investment).

The tool invites people to 'remove 1 gigaton of carbon' from the atmosphere by picking a black card from the sector they identify with and replacing it with their business card. Each black card includes a call to action and a point of contact at Climate Cleanup to which participants can reach out to in order to become a part of the Climate Cleanup network.

To select the social sectors and define the call to action for The Decarbonator, the team designed a group exercise with different Amsterdam University of Applied Sciences partners to plot the most relevant stakeholders on a board and to associate them with different action verbs.

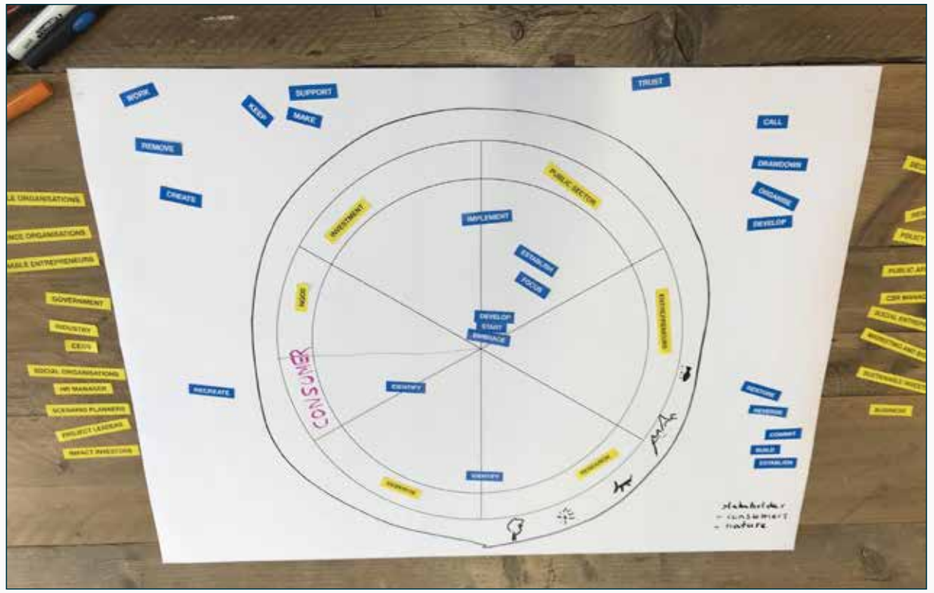

Figure 4.1.5
A 'plot party' moment during a sprint review. The partners were invited to plot different actions on a board and associate them with most relevant 'green' stakeholders.

Donometer

To develop the Donometer, the team tapped into existing research to qualitatively assess the impacts of specific steps in the value-chain (from farming, harvesting, transportation, transformation, storing, etc.) to the ecological factors and social foundations of the Doughnut Economic Model. By replacing the steps in an existing value chain with more sustainable choices, the interface will show the positive impact of this choice on the different sectors of the doughnut model.

Two ideation sessions with the partners were planned to define key parts of the project branding (such as brand name, 'look and feel', etc).

Results

Carbon dating

The research developed to build this tool helped the team to:

- Discover the main groupings of stakeholders;
- Understand how value is created through partnerships;
- Discover the various methods of carbon sequestration.

The tool itself was useful to:

- Explore stakeholder relationships from a fresh perspective;
- Communicate complex and ambiguous concepts to a new audience;
- Facilitate participative decision making within Climate Cleanup.

Decarbonator

With this tool it was possible to collect the business card details of about 200 stakeholders, and, on the day after the congress, Climate Cleanup's inbox was filling up with messages from various participants. The tool was useful as a conversation starter: the team had a valuable discussion with professors, students, policymakers, entrepreneurs, researchers, and businessmen regarding the different roles of society in taking action against climate change. The Decarbonator proved to be a viable prototype to facilitate networking and communicating with a purpose.

Donometer

The use of a drag and drop interface proved effective for, and could be a starting point for, further investigations regarding data-binding and user gestures. Contact with a wider public at the Digital Society School showcase in January 2019 suggested that the Donometer App could have potential as a teaching tool rather than a decision-making tool. For product pitching, it proved effective to communicate the need it fulfills rather than focusing on the viability of the actual product.

Discussion

- Carbon dating helped us to fill the action gap between research, the public, and policy makers with a playful take on the climate change debate. It showed how people with little to no knowledge about specific climate change solutions could be quickly introduced to the different forces at play. **useful as a conversational object *educational material for different public;*
- The Decarbonator worked well as a conversation starter with a more knowledgeable and diverse public. It helped Climate Cleanup expand their network of green entrepreneurs and investors, but the prototype needs to be improved reusability;
- The Donometer's drag and drop interface showed great potential during user interaction at the showcase. This could be applied to a wide range of applications. We found that further work on applying the Doughnut Economic Model to real world situations would be a worthwhile endeavor.

The main risk was to become too involved with the functionality of the Donometer App. It was difficult at times to keep the scope of the app to a working pitch-ready proof of concept, and not a fully working demo. Delving too deeply into the technical and conceptual shortcomings of the app would have absorbed too much time to produce the product. The team was able to identify which parts of the app were most important to convey the general idea by inviting people to use the app during the production phase.

Future Work

There is still work to be done in user testing and implementation of the Donometer App. Specifically, it would be relevant to question to what extent the data underlying the interface is understandable to the user. The interface still lacks some technical adjustment to successfully bind data to SVG interface elements and make them react in a meaningful way to the user. More work is required to narrow down the profile of the intended user, because the current scope is too wide for such a niche product.

Andy Dockett, one of the team members for this project, kept on collaboration with the Amsterdam University of Applied Sciences on climate related projects. He designed a podcast on Spotify that explores the potential and the risks of carbon taxation, and he's now currently working as a research fellow at the Visual Methodologies Collective on a project about imagining alternative climate futures with machine learning.

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(4.2) RIGHT BETWEEN OUR EARS

Keywords: Transparency, Digital methods, Climate advocates, TED

Time: Febr 2019 - Jun 2019

Related SDG's

Stakeholders

Partners: Climate Cleanup and Visual Methodologies Collective
Digital Transformation Designer and Project Lead: Carlo De Gaetano
Team: Li-Hsin Chang, Jessica Ciucci, Linda Sophie Nißlbeck, AJ Magee and Valentina Todorova

Challenge

How do we support climate change solutions with data-driven storytelling? How, where, and by whom are climate change solutions currently communicated?

Problem

The large majority of the academic world already agrees that climate change is real and that we need to rethink our systems completely in order to tackle it. However, policymakers worldwide have not yet found effective ways to implement meaningful changes. Moreover, the technical nature of climate science communication and the alarmism of mainstream media make it difficult to take hold of public opinion (Corner, 2018).

The impacts of climate change seem to be too distant from our daily lives (Born, 2019): the press repeats over and over the same cli-fi (climate fiction) scenarios, where coastlines are flooded by devastating storms and the doomsday clock takes out a different animal species each day. This can lead to what is called "apocalypse fatigue" (Suttie, 2018). In the face of these overwhelming messages, even well-intentioned people may start to avoid conversations around seeking solutions.

The design challenge that we tried to solve in this project was this: How do we support climate change solutions with data-driven storytelling? How, where, and by whom are climate change solutions currently communicated?

Output

Our project culminated in a data-driven digital platform that uncovers the common messages from the leading experts in the climate crisis: https://rightbetweenourears.com/

Figure 4.2.1
A screenshot from the homepage of the platform.
Illustration by Valentina Todorova.

Method

To address the communication issue outlined above our team looked to the leading experts in the climate crisis and used digital methods of research to create a unique and manually curated dataset of their common messages. The goal of creating this dataset, and making it accessible and explorable, is to inform and create awareness in the general public and guide people to take positive action.

At the right the protocol that leads to the creation of the dataset:

Step 1:

First, the team looked at TED.com, a peer-reviewed platform of experts speaking about "ideas worth spreading." The team compiled a list of the top 30 TED Talks by filtering the search results by:

a. Keyword "climate change"
b. Ranking "most viewed"
c. Date of creation after the 2015 Paris Agreement

Step 2:

The team cross-referenced the results with two more lists of notable experts, also curated from TED.com. The team refined a list of the top 30 TED Talks from Step 1, by filtering the search results by:

a. Keyword "Climate Cleanup"
b. Talks featuring the personalities curated by Apolitical.com's "Climate 100: The World's Most Influential People in Climate Policy"

The refined dataset included 22 TED talks from leaders present in both sets of talks from Steps 1 and 2.

Step 3:

The team developed a questionnaire to analyse the narratives and find relevant patterns. The questions included:

- How do they describe the current issue?
- What actions do we need to take to experience a positive change?
- What is the desired future they have in mind?
- What stories or metaphors are they using to convey their message effectively?

Each TED talk was reviewed by at least two members of the team that answered the questionnaire independently. Each answer was then cross-checked by all members reviewing the talk. When reviewers disagreed, a discussion ensued between the reviewers which culminated in consensus. If it was still not possible to reach an agreement on the answer, the talk had to be reviewed by all five members of the team and the different answers had to be dot-voted. The answer with most votes was retained.

Step 4:

The team organised the collected data in an openly accessible spreadsheet that summarises the messages into three broad categories: what do the experts say we should change in our way of *thinking*, *speaking* and *acting* in the climate crisis?

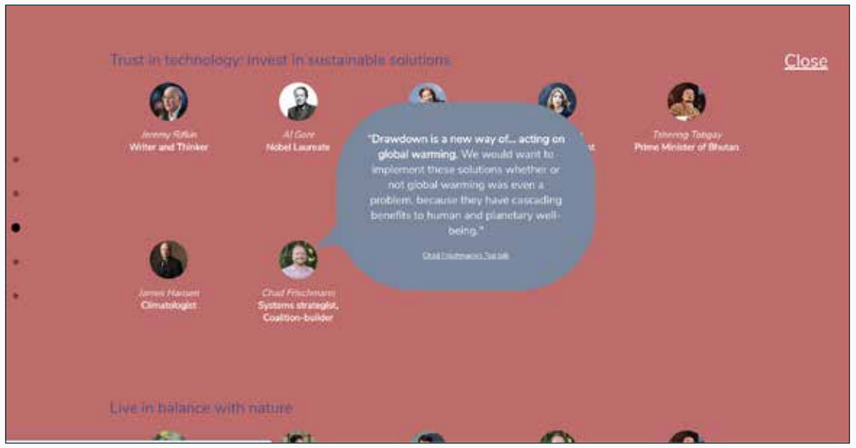

Figure 4.2.2
A screenshot from the exploration section of the platform. Users can read the quotes from the TED talks of each climate advocate, and access the full videos.

Results

Apart from the urgent need to reduce CO_2 emissions, the common messages from the leading experts in the climate crisis include: think optimistically, rethink our systems, dream of a better future, speak urgently, speak optimistically, communicate science effectively, have trust in technology, invest in sustainable solutions and live in balance with nature. But the question on how we might make these statements more actionable still holds. Here is the dataset about TED talks from 22 leaders in the climate crisis.

Discussion

Trying to understand the full scope of the climate crisis can be overwhelming, to say the least. After analysing speeches from a number of leading climate crisis experts, the research team was able to identify key patterns of advice that link their messages together. Although each expert has their own unique way of wording and framing their presentation of the issue, many of them are saying the same things about the current problem and the best possible solutions.

By creating an open platform that allows us to navigate these common messages, this project aims to build awareness in the public and guide people to take positive action. Users can develop a better understanding about the leading experts on the climate crisis by looking at their individual quotes and bios, which are linked to the original TED talk videos.

Finally, this project aims to help researchers on climate change communication by creating an open and accessible dataset and by sharing the methodology behind the data collection, curation, and visualisation.

Future Work

It would be interesting to use Natural Language Processing (NLP) to analyse the scripts of all the TED talk videos from climate advocates and design an interactive data visualisation to explore the topics that bring climate spokespeople together. Further work should be made to turn the website into a tool that people can use not only to inform themselves, but also help themselves to take action: for example, link every statement from climate experts to actual actions that people can take to apply that statement. For example, if an expert says "we should trust in climate science" we would then link to fundraising for climate science research. One of the former members of the team, Jessica Ciucci, took part as a research fellow of Visual Methodologies Collective in a spin off project about future climate narratives in indigenous literature and art.

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(4.3) SEE YOU ON THE STREET

Keywords: Climate movements, open database, digital archive, direct visualisation

Time: Sept 2019 - Febr 2020

Related SDG's

Stakeholders

Partners: Re-set (HvA), Visual Methodologies Collective (HvA)
Digital Transformation Designer and Project Lead: Carlo De Gaetano
Team: Robert Carr, Orestis Ioannidis and Manlio Massimetti

Challenge

How can we create open and accessible datasets to tell the story of the youth climate movements and function as interactive tools in support of climate action? How can we work towards a campaign lab where people can join the climate movement by creating their own data-driven and street-ready visions of better futures?

Problem

In recent years the impact of extreme weather events such as killer heat waves and massive wildfires struck like a dramatic echo of the countless warnings by scientists and NGOs. But together, in light of these climate emergencies, we have witnessed the rise of a new 'social life of climate change,' with youth movements such as Extinction Rebellion (XR) and Greta Thunberg's #FridaysForFuture (Nevett, 2019).

These new climate movements have been welcomed as the dawning of a new hopeful age of climate politics, combining digital activism with direct action and street protests. But what are the dynamics which make their narratives so attractive? How do we uncover the movement's vision of the future? And are these visions different from the ones supported by climate experts, or are they only presented with another tone of voice?

The aim of this project was to create a digital open archive that celebrates these new narratives and to design tools and practices that allow different audiences to explore the data, analyse the language and be inspired to join the movements from the screens and in the streets.

The design challenge that this projects addresses is this: How can we create open and accessible datasets to tell the story of the youth climate movements and function as interactive tools in support of climate action? How can we work towards a campaign lab where people can join the climate movement by creating their own data-driven and street-ready visions of better futures?

Figure 4.3.1
Students striking for climate action.

Output

The output of this project is a web-platform called See you on the Streets, a Digital Climate Parade. This platform celebrates the phenomena of taking to the streets to demand climate justice by combining digital and physical activism. The webspace takes visual content of recent instances of climate protests from Instagram and compiles them into one 'digital demonstration.'

Method

The platform is based on a dataset that contains images from climate demonstrations between the years 2015 and 2019. About 3,000 images were extracted from the Instagram official accounts of four main climate movements (Extinction Rebellion, Fridays for Future, Sunrise Movement, and Zero Hour) as well as from individuals who used the official hashtags of the movements within their post (#ExtinctionRebellion, #FridaysforFuture, #SunriseMovement, and #ThisIsZeroHour). The team collected the data from Instagram in November 2019, using the Instagram Scraper tool from the Digital Methods Initiative (DMI). This data set can be accessed at the following links: syoss Data.json, syots_data.csv

For each post, the following columns are included:

- Movement name;
- Hashtags present;
- Post url;
- Image url;
- Image itself;
- People (present or not);
- Timestamp;
- Date;
- Comments;
- Likes;
- Engagement rate calculated as (likes + comments) / followers;
- Caption.

The images range from August 2015 to November 2019. This is because the tool starts to scrape data from November and goes back in time until it reaches the limit of 3000 posts.

The second part of the dataset concerns unofficial communication; it includes all the images with over 100 likes that contain at least one of the hashtags from the official movement campaigns. While the first collection has just four different authors, the second part has an unlimited number of authors. The same columns as above are also present for this second part, however, engagement is calculated in absolute terms (likes + comments) rather than finding the rate per follower. This is done because many of the posts are from private accounts where follower count is not available. The images for the second part have a narrower date range, from October to November 2019.

Results

In the platform users can filter and sort images by movement, date, level of engagement, hashtag(s) used, and more. The main intention is to enable the exploration of the recent months of climate activism through images by giving individuals freedom in how to arrange the items on the platform to subsequently derive meaning. The platform is designed to allow the user to explore the data on different layers and aims to facilitate the discovery of different stories within the same dataset. The landing page shows a birds eye view of all the images, which celebrate the act of marching in the streets for climate justice. Users can toggle between the street view and the lab view, where they can dive deeper into the analysis of the topics derived from the post captions. Users are also able to click on individual images to see more details about the individual posts. The most evident result of this platform is a visual celebration of the growth of climate movements which poetically conveys the message that climate activism is not just a series of isolated events. You can see the platform in motion here.

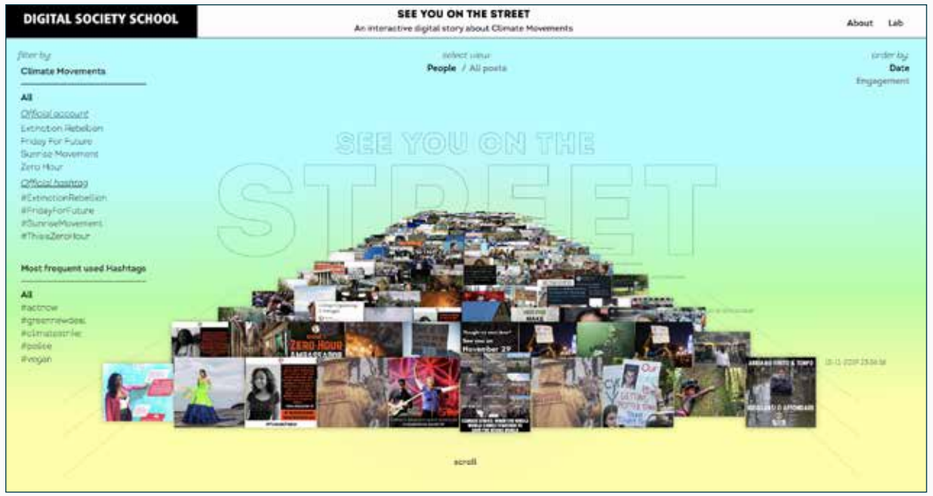

Figure 4.2.2
A screenshot from the landing page of the platform. Images are displayed from most to least recent in a bird-eye view.

In addition to a celebration of these movements, the impacts of the platform may include:

- Bridging the gap between digital and physical activism by creating a digital space where people could feel the street and find inspiration to join the next parade;
- Informing users about the most successful messages from climate movements by literally bringing forward the images that generated the most engagement online;
- Providing social researchers with an open dataset about climate activism with the tools needed to explore and analyse it;
- Increasing the sense of togetherness in individuals already affiliated with climate movements;
- Improving the general perception of activism and breaking down stereotypes about what it means to be a protester.

Discussion

The platform is designed to be used by researchers, journalists, and climate enthusiasts who are interested in exploring the recent environmental demonstrations. The multiple filters and sorting mechanisms are tools intended to give users the power to arrange the data in ways that suit their individual interest. The ability to combine filters gives users the freedom to create different stories from the data. Researchers could compare and contrast the visual communication of different movements, or see how image content is related to engagement metrics. Additionally, the platform enables users to study how official channels of communication differ from individual accounts, or how different hashtag campaigns influence the imagery produced. The time filter allows users to rearrange the dataset from the most recent to the oldest post, which could be key to facilitate the understanding of how these climate movements have been growing over time, and if and how their messages have been changing.

Essentially, this platform is a versatile space where researchers, climate enthusiasts, journalists and others can study the visual and textual communication of climate movements on social media. Even in its beta version, the web app shows potential for storytelling in support of climate action. Not only does it acknowledge and celebrate the growth of climate movements, but it also functions as an interactive archive of the most engaging messages of such movements.

Future Work

In the current version the web app is working with a dataset of around 3000 Instagram posts. One of the implementations that we discussed during the project was making this dataset live by tracking Instagram for specific hashtags and keywords and displaying the related posts in real time. This may be a difficult step to accomplish due to privacy regulations and the platform's API accessibility. By creating a campaign hashtag (#seeyouonthestreet), people would be invited to join the movements on the streets and be present also in the digital parade.

One further improvement to be made concerns the language analysis section: it should be redesigned to be more accessible to non-tech-savvy users. Journalists and researchers that want to analyse the language of climate movements should be supported by an easy-to-use interface and more clear instructions on how to read the data. This feature would be necessary to open up the platform to a broader audience. This could be fascinating for journalists who would use the unique features of the web app to write visual articles by re-using and combining images and texts from the dataset. Manlio Massimetti is keeping the project alive and he's looking for academic and commercial partners to make this prototype into a complete tool.

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(4.4) CLIMATE (MIS) INFORMATION

Keywords: Climate misinformation, YouTube, Recommendation algorithms, Fake news, Topic drift, Binge-watching.

Time: Sept 2020 - Jan 2021

Related SDGs

Stakeholders

Partners: Visual Methodologies Collective, Re-set
Digital Transformation Designer and Project Lead: Carlo De Gaetano
Team: Tian Breznik, Francesco Calvetti, Qianyu Feng and Karthika Kannan

Challenge

How can we empower people to overcome the pitfalls of YouTube recommendation algorithms to enable a more mindful binge-watching experience about climate information?

Problem

Science-based information about climate change and its solutions should be crucial for policy makers, but also for all the people who now have, or who will have, the power to decide who will be making political decisions in the near future. If finding a shared, understandable, and engaging way to communicate this information is the key to fill in the science-action gap, we should also pay attention to the growing phenomenon of climate misinformation. A recent report published by Avaaz focuses specifically on the impact of YouTube in the spread of disinformation and misinformation about climate change ("Why Is YouTube Broadcasting Climate Misinformation to Millions?," 2020).

One of the most relevant findings from the report is that "YouTube is driving millions of people to watch climate misinformation videos every day. These videos aren't just being uploaded to YouTube and organically seen by interested audiences. Instead, YouTube's recommendation algorithm is giving these videos free promotion and showing misinformation to millions who wouldn't have been exposed to it otherwise."

The design challenge that this project addresses is a question: how can we empower people to overcome the pitfalls of YouTube recommendation algorithms to enable a more mindful binge-watching experience about climate information?

Output

The output of this project is a platform that allows users to experience the topic drift [11] on YouTube and that raises awareness about the risks of recommendation algorithms. You can see the platform, called Project Climate Dreams here.

- Here is a link to the script we used to scrape YouTube: script to scrape Youtube. Script to visualise the network of recommended videos with D3.js
- D3 code to visualise the recommendation network:
  Without animation, fully debugged: https://observablehq.com/@emma-ba/youtube-recommendation-network-on-the-climate-crisis.
  With animation: https://observablehq.com/@tianbreznik/v2-youtube-recommendations-climate-crisis-work-in-progres
- R code to scrape data without user tracking, using Rvest only: https://github.com/fcalv/Climatedream/blob/master/Scrape/DSS_Youtube_Scrape_pure_Rvest.R
- R code to scrape data with user tracking, using Selenium: https://github.com/fcalv/Climatedream/blob/master/Scrape/DSS_Youtube_Scrape_V2.R
- R code to format the scraped data into .json data for the D3 visualisation (without animation):
  Without animation, fully debugged: https://github.com/fcalv/Climatedream/blob/master/Scrape/DSS_Youtube_Format_V2.R
  With animation: https://github.com/fcalv/Climatedream/blob/master/test%20Francesco/DSS_Youtube_Format_V2.R

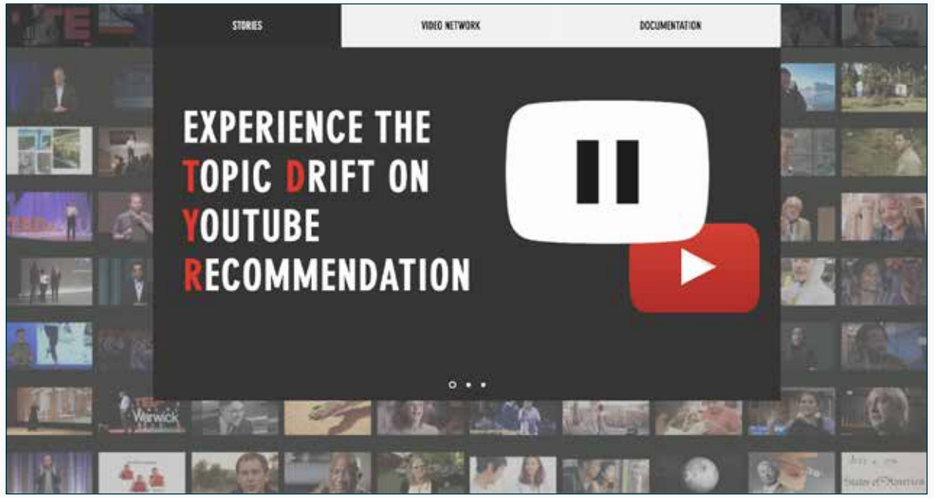

Figure 4.4.1
A screenshot of the platform.

Methods

Binge-watching as a research method

To investigate the hidden dynamics of the recommendation algorithm we started with the concept of binge-watching. First, we designed different lists of climate-related keywords based on the following:

- Google trends relating to “global warming”, “climate change” and dated 20/03/2019 -20/03/2020, in the United States;
- Video comments on misinformation videos taken from the Avaaz report “Why is YouTube Broadcasting Climate Misinformation to Millions?” with search query “global warming”;
- Text transcripts of TED talks relevant to climate change, which were selected from a playlist on the official TED website tagged with the topic “Climate change”.

We then built a binge-watching machine that uses the keywords as search queries on YouTube and automatically collects the recommended videos.

Data collection and curation

For each keyword list, the data was collected by simulating a YouTube session where a user watches the first recommended video for each query, and then continues to watch the recommended videos (the “up-next” videos). To scrape YouTube data we used Selenium and R. The data collected incorporates the search query, iteration, title, description, keywords, image, type, channel ID, duration, unlisted, regions, views, the date of the publication, the date on which the video was uploaded, genre, likes, and dislikes of all the videos watched or recommended in each session.

The data extracted from the scraping was cleaned by correcting the inaccuracies, the redundancies and the missing video data. Data was then prepared for topic modeling by gathering the texts from the titles, descriptions and tags for each video.

Topic modeling

We implemented bi-term topic modeling (BTM), an unsupervised machine learning technique, to extract topics from collections of documents (where each video is a document). This method explicitly models the co-occurrences of 2 terms to enhance the topic learning. The algorithm first performs speech tagging on the titles, descriptions, and tags of the videos. Then it extracts co-occurrences of nouns, adjectives, and verbs within a 3-word distance. Finally, it builds the topic model. The number of topics in each session point to the topic drift that occurs when a user searches for a topic, and is recommended through a network of different topics, which continues, recommendation after recommendation, and channel after channel.

Visual network analysis

The topics obtained from the model are highlighted in the video networks using D3.js. Users can interact with the networks to explore the different videos recommended in every session. Hovering on the nodes, it’s possible to highlight video details such as title, thumbnail, views and description. By following the threads of algorithmic recommendations, users can see where topic drift happens.

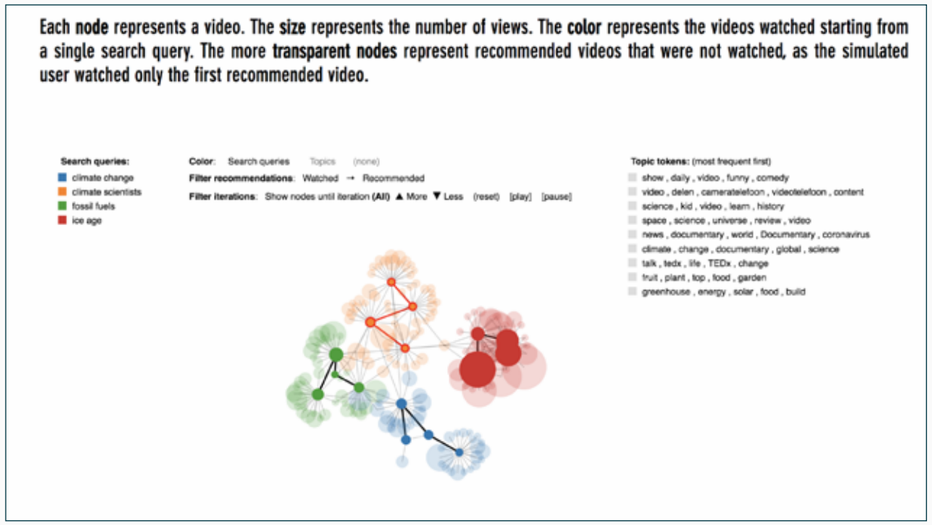

Figure 4.4.2
A screenshot from the video network section. Users can explore which videos are recommended by YouTube for different search queries. By hovering on a node, users can see detailed information about each video, and by clicking on it, they are redirected to the full video on YouTube. Nodes marked with a red border are included in the story section.

Data storytelling

To make the drift more evident, we made a qualitative analysis of the sessions and extracted the most evident and interesting examples. The selected chains of recommended videos are edited in short trailers of around 1 minute each, and showcased in a story section. Users can experience how easy it can be to drift from climate science to climate scepticism, or from documentaries to cartoons for kids.

Results

One of the main results of this project is the design of a method to automatically scrape YouTube's recommendations, by prompting a binge-watching machine with different sets of climate related keywords. Originally, we wanted to use this method to analyse the scraped data for climate misinformation, but we didn't have the time and the human resources to perform a fact checking routine as done by Avaaz. We focused instead on topic drift: when looking for climate content, is YouTube staying 'on topic,' or is the algorithm driving users away from it?

When querying "climate change" on YouTube, the recommendation algorithm drove us from documentaries describing the impact of a meat free diet to documentaries on quite diverse topics, such as 'how cash is becoming a thing of the past' and 'how the rich get richer, money in the world economy.' From a video that describes the impact of climate change on the bee population, we go to videos about bees in general, and their importance for the planet, to end with 'busy bees', a kid show. The query 'climate scientists' returns a speech from a Nobel awarded climate expert, which is followed by three videos from climate sceptics. Searching for climate change news on YouTube, we start with the impact of climate on the wildfires that devastated Siberia and Australia in 2019. The next recommended video talks about coal mines in Greece, and the next one about the use of Emojis in our everyday life.

These are some of the most emblematic examples of topic drift that we selected from the binge-watching sessions. In each of these cases the drift is different in nature: sometimes the algorithm stays on topic, but changes the target audience (from bees scientific documentary, to bees-themed kid show). In other cases the channel overcomes the topic, and we are prompted with a series of disparate documentaries from the same production. One of the examples shows a (dangerous) drift in scientific facts: we first see warnings from Michael Oppenheimer, who is among the world's foremost climate scientists, who claims that governments are not giving enough priority to solve climate change. The 'up next' videos are instead from climate sceptics, with titles like "Global warming: fact or fiction?" and "Climate Change Reconsidered."

Discussion

The first goal of this project was to investigate how people personally experience the influence of YouTube's recommendation algorithm in their information feed: when do people encounter climate misinformation, and how can we make people more aware of how this influence works. How can we expose the hidden dynamics of the algorithm?

The second goal was to make these experiences visible and show them back to the public. For example, we can tell users: this is what your two hours of binge-watching looks like. You started from a climate fiction trailer and you ended up in the conspiracy zone. How do you feel about it? What would you like to see instead?

This double intent was only partially addressed. We realized that spotting misinformation would have been a time-consuming task, especially considering that the final dataset consists of 1425 videos. Moreover, the team did not have the competence or bandwidth to fact-check information about climate change.

Nevertheless, the final prototype helps to understand the dynamics of YouTube's algorithm, specifically in its tendency to drive users away from their topics of interest. It's possible to experience the topic drift through the story section: different sequences of videos recommended by the algorithm are edited in short trailers, which make evident how the topic drifts from climate change to somewhere else.

In the video network section, the user is presented with the entire chain of recommended videos and can perform a distant reading of the different topics that emerge from a single watching section. Zooming in on the single nodes, one can also read into the more fine-grained details of each video. The combination of the video trailers and the exploratory network works best in raising awareness of what can happen if you let the algorithm drive you. But the question about how this may affect the user and what to do about it remains unanswered.

Future Work

The idea of binge-watching as a research method to study recommendation algorithms becomes powerful when combined with a solid analytical framework for the collected data, as well as a designed strategy on how to make the user experience the possible consequences of an information diet managed by the platform.

In the future, this project could contribute to the broader studies of YouTube as a radicalisation platform. The tool to automatically create datasets from simulated watching sessions, when used with the support of experts in climate science, could be a useful contribution in the research of how climate misinformation is promoted by the algorithm.

More work has to be done to involve the final user in this research, and to test if and how the topic drift has an impact on how YouTube users access healthy climate information.

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(4.5) MAKING CLIMATE VISIBLE

Keywords: Climate change communication, Digital methods, Visual methodologies, Cross-platform analysis, Data visualisation, Field guide.

Time: July 2018 - ongoing

Related SDG's

Stakeholders

Partners: Visual Methodologies Collective, Sheffield University
Research and Project Lead: Warren Pearce, Sabine Niederer,
Research and Design: Carlo De Gaetano

This work was done with the support of the Economic and Social Research Council Future Leaders Research programme, "Making Climate Social" project (ES/N002016/1)

The work that made this project possible was developed with the support of many participants during several summer and winter schools at the Digital Methods Initiative (UvA). Names of all contributors are mentioned in the printed report and in the four research posters, which were the output of this project.

Challenge

How climate change has become meaningful through digital platforms, outgrowing its scientific roots to become a 'social fact'?

Problem

Climate change is an issue that is often articulated through science. For instance, the hockey stick graph, the IPCC, and scientific consensus have become part of the familiar language of climate change communication. As scientific concern about climate change has increased, efforts have been made to improve climate science communication in an attempt to raise public awareness and support for climate policy. Yet these top-down, 'science-first' framing of climate change fall short in two ways. First, they assume that the aim of science communication should be to bring the public closer to scientific understanding of climate change (Boykoff, 2019). Second, they fail to take into account the transformative effect of social media, which has disrupted hierarchies of communication and diluted the power of established gatekeepers (Pearce et al., 2019). The failure of the 'science-first' approach has been used recently as evidence for the alleged rise of a 'post-truth' society, in which the testimony of experts such as climate scientists have been apparently rejected by politicians and the public alike (Jasanoff & Simmet, 2017).

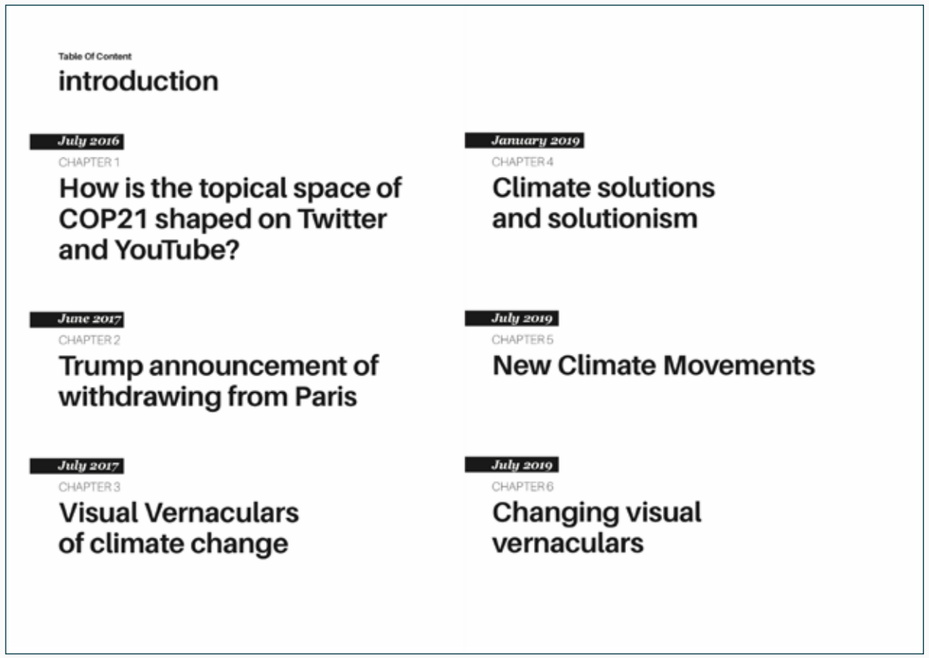
This project responds to these developments by investigating how climate change has become meaningful through digital platforms, outgrowing its scientific roots to become a 'social fact' (Pearce et al., 2019).

Output

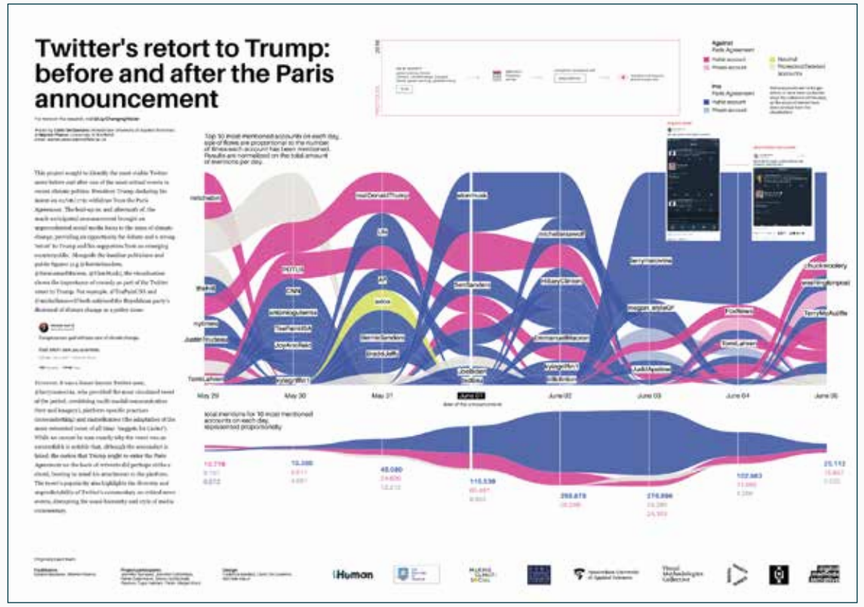
The output of this project was a printed report consisting of six studies on climate change online debate. Each chapter contains an introduction to the study, a designed research protocol and research findings. The latest version of the report can be found here.

This project also produced four research posters focusing on selected studies from the report. They are showcased at Sheffield University from October 2019.

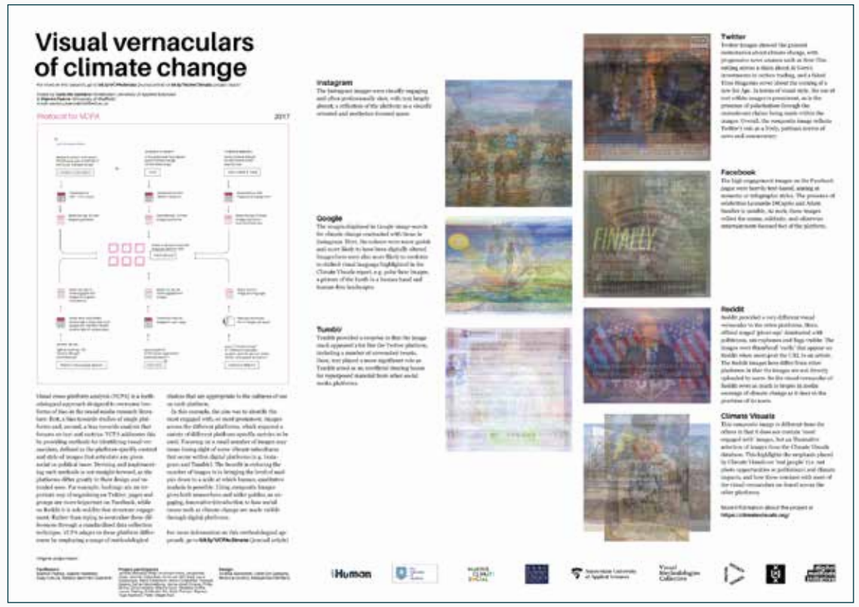
Figure 4.5.1
The cover page and index of the report (Illustrations and editorial design by Carlo De Gaetano)



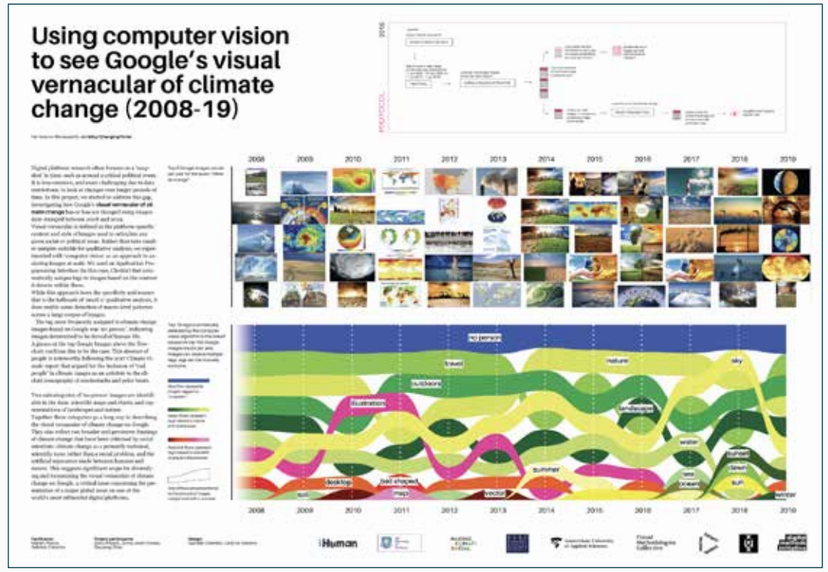
Poster 1: Twitter's retort to Trump: before and after the Paris announcement. Full size poster here



Poster 2: Visual Vernaculars of Climate Change. Full size poster here



Poster 3: Using computer vision to see Google's visual vernacular of climate change (2008-2019). Full size poster here



Poster 4: The visual vernaculars of climate change on Twitter (2016-2019). Full size poster here

Methods

The studies in this report were conducted using digital methods, which can be described as a series of practices used to undertake contemporary research by collecting data online. These generalized ways of performing online research include: building ranked source lists out of Google results in order to uncover the absence or presence of certain content; creating how-to's on performing single-platform and cross-platform analysis (with Twitter, Facebook, Instagram and others) for finding dominant voices and exploring different 'visual vernaculars;' creating procedures to spot the most engaging content on Instagram; and making inquiries into the formats that circulate well and into the groups animated by those formats (Rogers, 2019).

Twitter's retort to Trump: before and after the Paris announcement

This project sought to identify the most visible Twitter users before and after one of the most critical events in recent climate politics: President Trump declaring his intent to withdraw from the Paris Agreement, which occurred on June 1, 2017. We used the data from the global warming dataset on TCAT, a tool developed by the Digital Methods Initiative, which allows us to capture tweets containing certain words, hashtags, or usernames, which we can then filter and analyse in various ways.

The global warming dataset contains tweets with these keywords: 'climate,' 'climatechange,' 'drought,' 'flood,' 'global warming,' and 'globalwarming.' For this study we selected only tweets posted between May 29 and June 5, 2017, in the days just before and after Trump's declaration to withdraw from the Paris Agreement. From this subset, we extracted all the mentions (users that were mentioned in tweets) and their mention frequency per day. We then imported the data in Rawgraph [12] to visualise the top mentioned people per day with a bump chart.

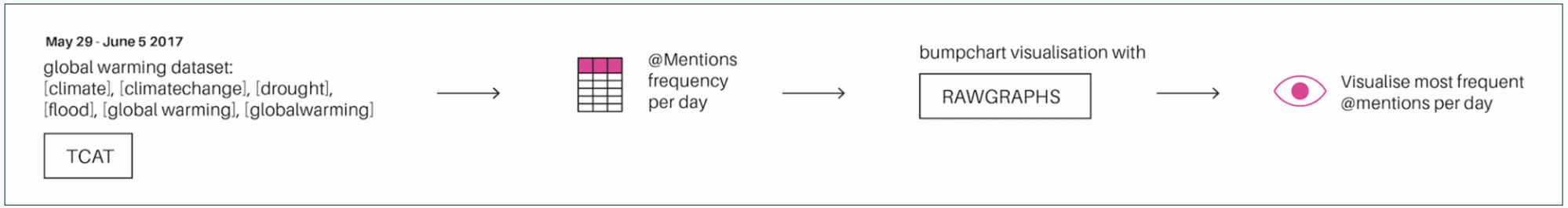


Figure 4.5.2
Design of the research protocol for the first poster.

Visual Vernaculars of Climate Change

Visual cross-platform analysis (VCPA) is a methodological approach designed to overcome two forms of bias in the social media research literature: first, the bias towards studies of single platforms and, second, the bias towards analysis that focuses on text and metrics. VCPA addresses these biases by providing methods for identifying visual vernaculars, defined as the platform-specific content and style of images that articulate any given social or political issue. Devising and implementing such methods is not straight forward, as the platforms differ greatly in their design and intended uses. For example, hashtags are an important way of organising content on Twitter, while pages and groups are more important on Facebook, and on Reddit it is subreddits that structure engagement. Rather than trying to neutralise these differences through a standardised data collection technique, VCPA adapts to these platform differences by employing a range of methodological choices that are appropriate to the cultures of use on each platform.

In this example, the aim was to identify the most engaged with, or most prominent, images across the different platforms, which required a variety of different platform-specific metrics to be used. Focusing on a few images may mean losing sight of some vibrant subcultures that occur within digital platforms (e.g. Instagram and Tumblr). The benefit to reducing the number of images is in bringing the level of analysis down to a scale at which human qualitative analysis is possible. Using composite images gives both researchers and wider public an engaging, innovative introduction to how social issues such as climate change are made visible through digital platforms.

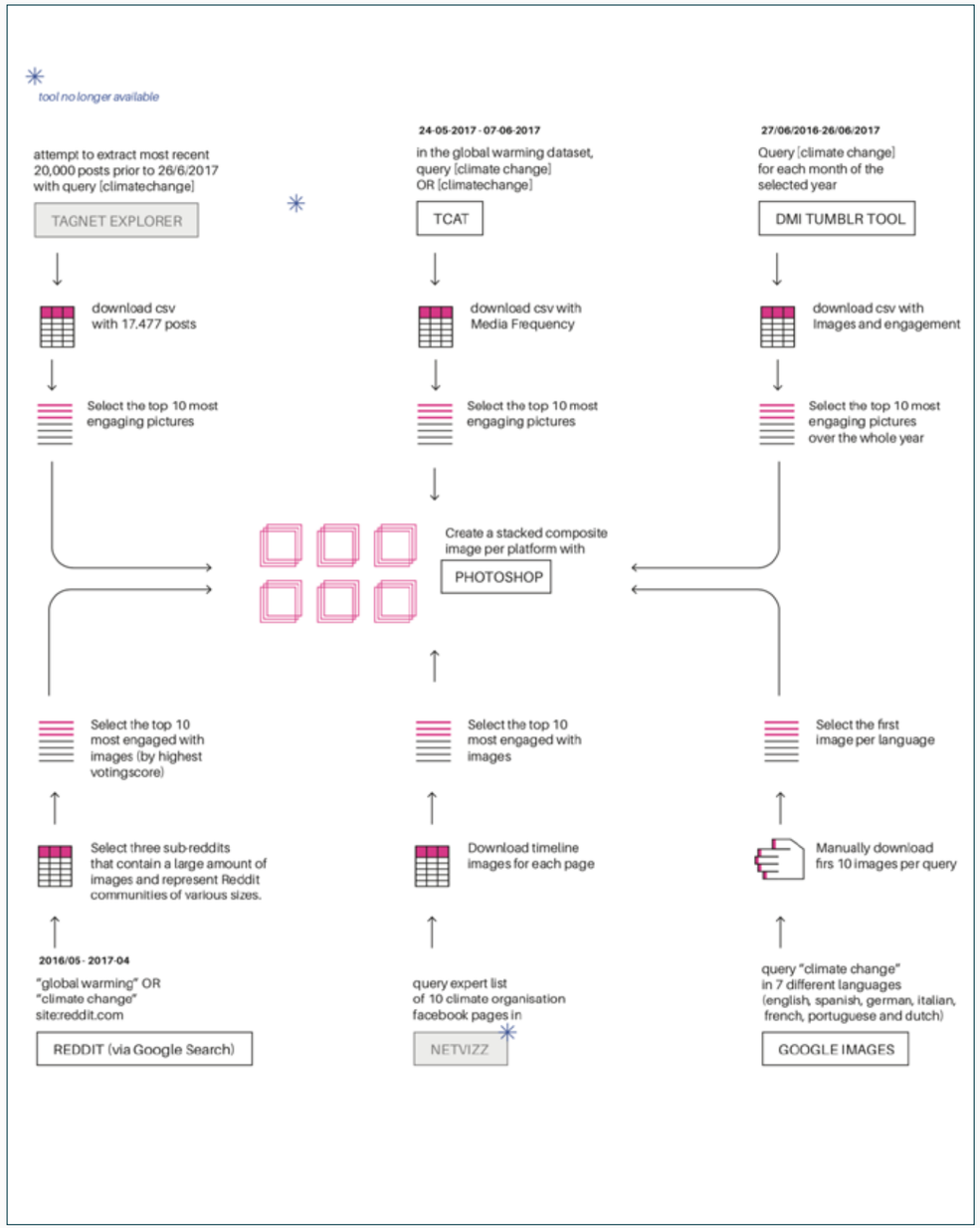
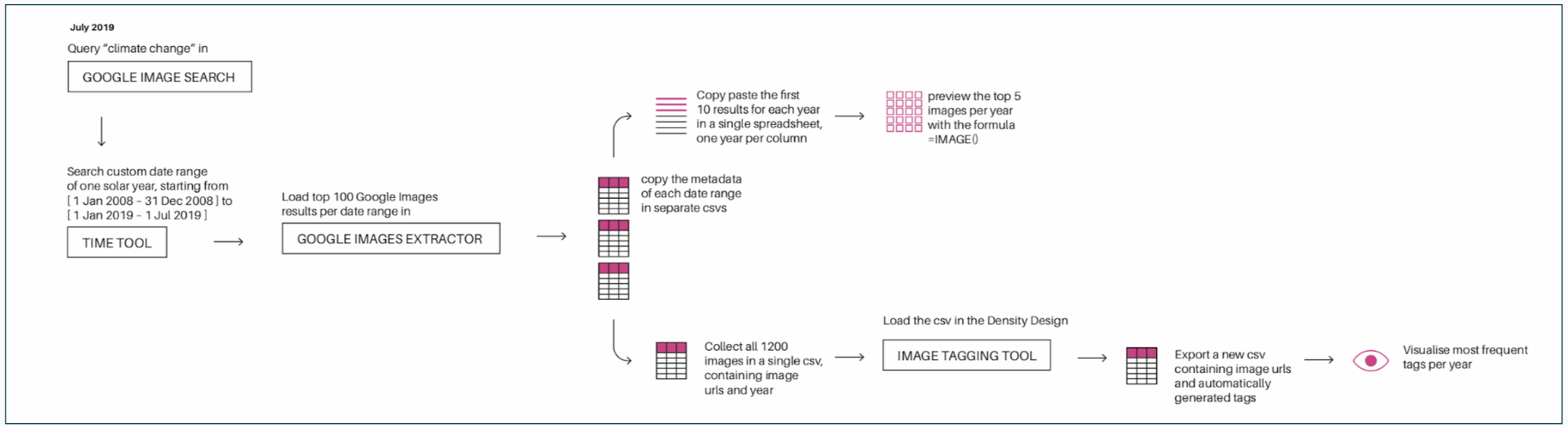


Figure 4.5.3
Design of the research protocol for the second poster.

Using computer vision to see Google's visual vernacular of climate change (2008-2019)

Digital platform research often focuses on a 'snapshot' in time, such as around a critical political event. It is less common, and more challenging due to data restrictions, to look at changes over longer periods of time. In this project, we started to address this gap, investigating how Google's visual vernacular of climate change has or has not changed using images date-stamped between 2008 and 2019. Visual vernacular is defined as the platform-specific content and style of images used to articulate any given social or political issue. Rather than take smaller samples suitable for qualitative analysis, we experimented with 'computer vision' as an approach to analysing images at scale. We used an application programming interface (in this case, Clarifai) that automatically assigns tags to images based on the content it detects within them. While this approach loses the specificity and nuance that is the hallmark of 'small n' qualitative analysis, it does enable some detection of macro-level patterns across a large corpus of images.

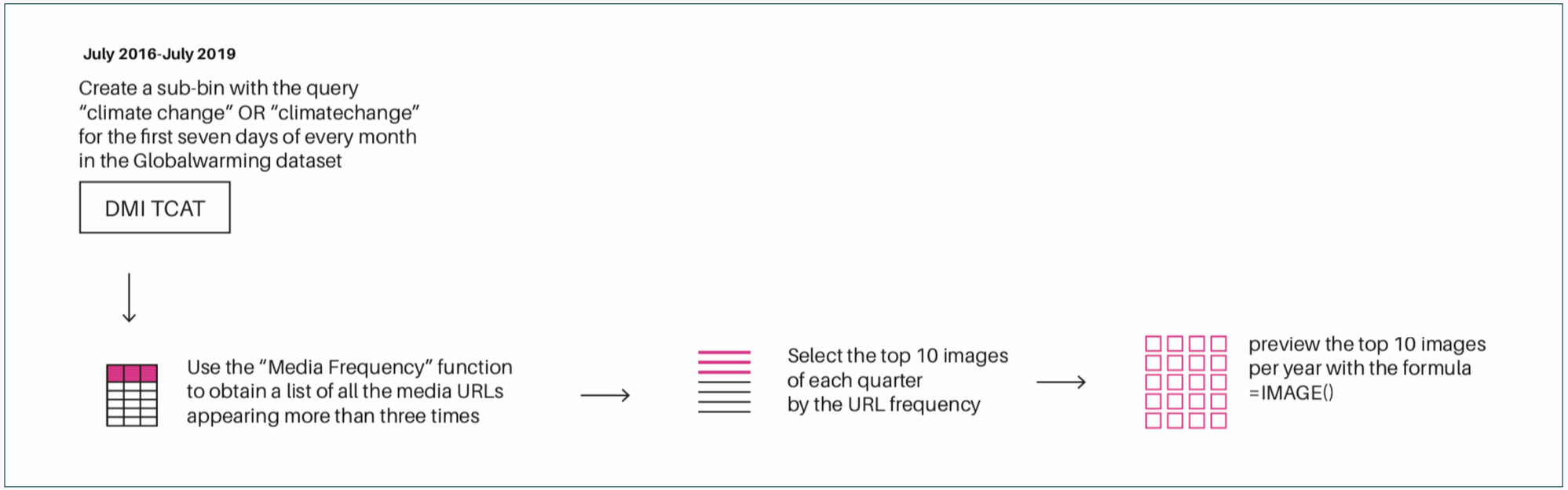
Figure 4.5.4
Design of the research protocol for poster 3.



The Visual Vernaculars of Climate Change on Twitter (2016-2019)

In this project, we investigated how the visual vernacular of climate change, defined as the platform-specific content and style of images used to articulate climate change, changed on Twitter between 2016-19. Due to the high number of tweets in the dataset, we focused on smaller time-specific samples of tweets as a manageable way to track change over time.

Figure 4.5.5
Design of the research protocol for poster 4.



Results

Twitter's retort to Trump: before and after the Paris announcement

The lead-up to, and aftermath of, the much-anticipated announcement brought on an unprecedented social media focus to the issue of climate change, providing an opportunity for debate and a strong 'retort' to Trump and his supporters from an emerging counter public. Alongside the familiar politicians and public figures (e.g @BernieSanders, @EmmanuelMacron, @ElonMusk), the visualisation shows the importance of comedy as part of the Twitter retort to Trump. For example, @TeaPainUSA and @michelleisawolf both satirised the Republican party's dismissal of climate change as a policy issue:

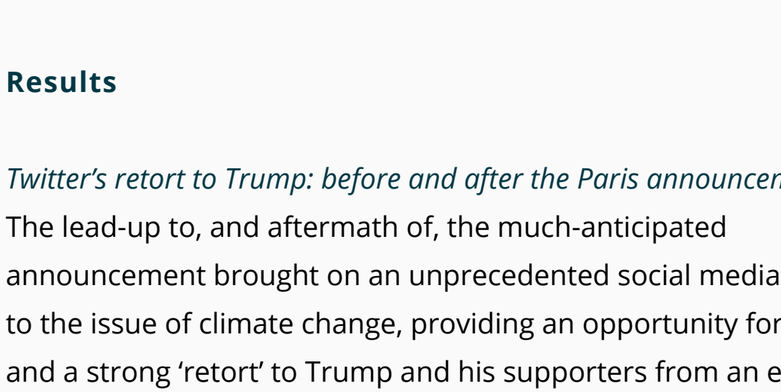


Figure 4.5.6
A tweet published by Michelle Wolf in response to climate scepticism.

However, it was a lesser-known Twitter user, @larrymatovina, who provided the most circulated tweet of the period, combining multimodal communication (text and imagery), platform-specific practices (screenshotting) and memefication (the adaptation of the most-retweeted tweet of all time: 'nuggets for Carter'). While we cannot be sure exactly why the tweet was so successful it is notable that, although the screenshot is faked, the notion that Trump might re-enter the Paris Agreement on the basis of retweets did perhaps strike a chord, bearing in mind his attachment to the platform. The tweet's popularity also highlights the diversity and unpredictability of Twitter's commentary on critical news events, disrupting the usual hierarchy and style of media commentary.

Visual Vernaculars of Climate Change

Composite image for Instagram

The Instagram images were visually engaging and often professionally shot, with text largely absent, a reflection of the platform as a visually oriented and aesthetics-focused space.

Composite image for Google

The images displayed in Google image search for climate change contrasted with those in Instagram. Here, the colours were more garish and more likely to have been digitally altered. Images here were also more likely to conform to clichéd visual language highlighted in the Climate Visuals report, e.g. polar bear images, a picture of the Earth in a human hand and human-free landscapes.

Composite image for Tumblr

Tumblr provided a surprise in that the image stack appeared a lot like the Twitter platform, including a number of screenshot tweets. Here, text played a more significant role as Tumblr acted as an unofficial clearing house for repurposed material from other social media platforms.

Composite image for Twitter

Twitter images showed the greatest contestation about climate change, with progressive news sources such as Now This cutting across a claim about Al Gore's investments in carbon trading, and a faked Time Magazine cover about the coming of a new Ice Age. In terms of visual style, the use of text within images is prominent, as is the presence of polarisation through the immoderate claims being made within the images. Overall, the composite image reflects Twitter's role as a lively, partisan source of news and commentary.

Composite image for Facebook

The high engagement images on the Facebook pages were heavily text-based, aiming at memetic or infographic styles. The presence of celebrities Leonardo DiCaprio and Adam Sandler is notable. As such, these images reflect the meme, celebrity, and otherwise entertainment-focused face of the platform.

Composite image for Reddit

Reddit provided a very different visual vernacular to the other platforms. Here, official staged 'photo ops' dominated with politicians, microphones and flags visible. The images were thumbnail 'cards' that appear on Reddit when users post the URL to an article. The Reddit images here differ from other platforms in that the images are not directly uploaded by users. So the visual vernacular of Reddit owes as much to tropes in media coverage of climate change as it does to the practices of its users.

Composite image for Climate Visuals

This composite image is different from the others in that it does not contain 'most engaged with' images, but an illustrative selection of images from the Climate Visuals database. This highlights the emphasis placed by Climate Visuals on 'real people' (i.e. not photo opportunities or politicians) and climate impacts, and how these contrast with most of the visual vernaculars we found across the other platforms.

Using computer vision to see Google's visual vernacular of climate change (2008-2019)

The tag most frequently assigned to climate change images found on Google was 'no person,' indicating images determined to be devoid of human life. A glance at the top Google Images above the flowchart confirms this to be the case. This absence of people is noteworthy following the 2017 Climate Visuals report that argued for the inclusion of 'real people' in climate images as an antidote to the clichéd iconography of smokestacks and polar bears.

Two subcategories of 'no person' images are identifiable in the data: scientific maps and charts, and representations of landscapes and nature. Together these categories go a long way to describing the visual vernacular of climate change on Google. They also reflect two broader and persistent framings of climate change that have been criticised by social scientists: climate change as a primarily technical, scientific issue rather than a social problem, and the artificial separation made between humans and nature. This suggests significant scope for diversifying and humanising the visual vernacular of climate change on Google, a critical issue concerning the presentation of a major global issue on one of the world's most influential digital platforms.

The visual vernaculars of climate change on Twitter (2016-2019)

We found that images contained people more often in climate change related images on Twitter than on other platforms, such as Instagram or Tumblr. In particular, politicians such as Donald Trump, Barack Obama and Elizabeth Warren, and public figures such as Leonardo DiCaprio and Bill Nye are prominent in the dataset. Alongside these humans, many images of animals are notable, such as whales, goats, penguins, cats as well as the icon of climate change, the polar bear. Infographics, screenshots and current affairs videos also feature widely from media sources such as Now This and Al Jazeera.

In terms of image style, humour is shown to be a persistent feature of Twitter's visual vernacular. For example, alongside images of Trump are images of Trump impersonators and memes that satirise Republican attitudes to climate science. Strikingly, humour is also central to the huge increase in total retweets in the second quarter of 2019, harnessing the increased public visibility of climate change achieved by Greta Thunberg and Extinction Rebellion. Increased concerns about climate change were expressed through platform-specific humour, notably the repurposing of the 'laughing guy' meme in which a man laughs hysterically "when somebody says they don't like me." While the original tweet was unrelated to climate change, the video was then re-used as the punchline to the following tweet:

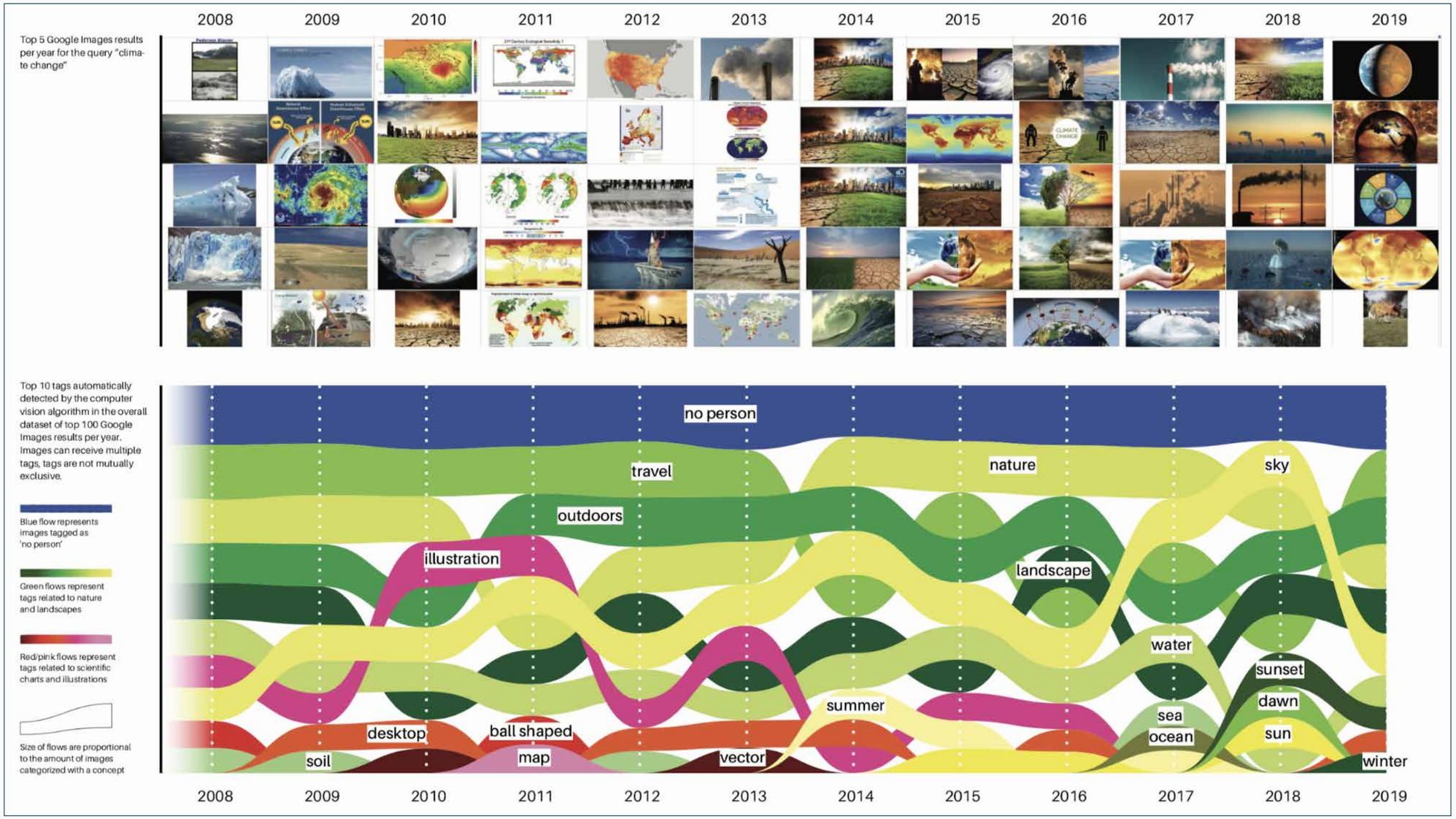


Figure 4.5.7
Data visualisation showing the top 5 Google images results per year for the query "climate change" and the top 10 tags automatically detected by the computer vision algorithm in the overall dataset.

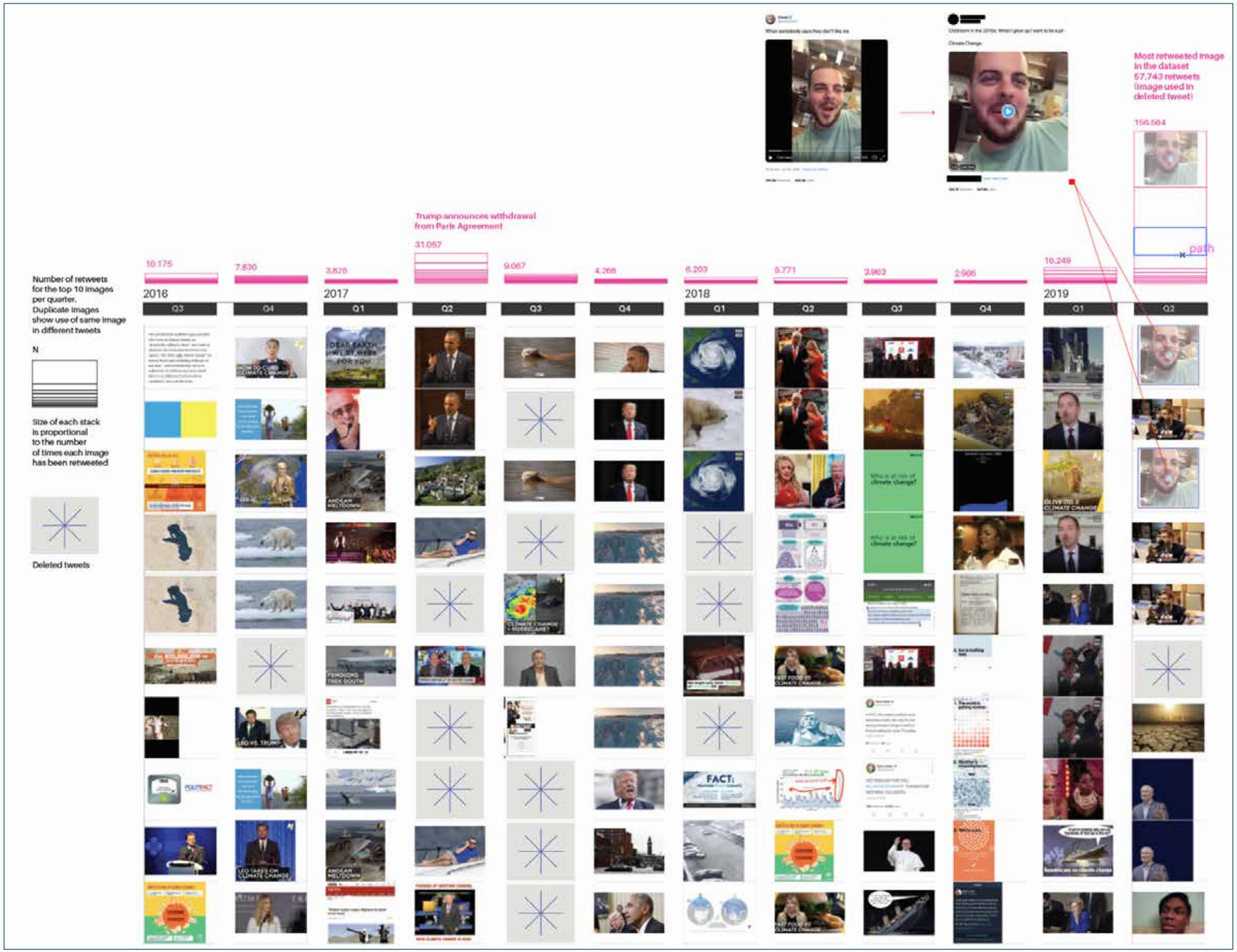


Figure 4.5.8
Data visualisation showing the number of retweets for the top 10 images per quarter. Duplicate images show use of the same image in different tweets.

Child born in the 2010s: When I grow up I want to be a pil-
Climate change: [laughs hysterically]

This new tweet combined two popular memes, the laughing guy video and the screenplay dialogue format, and was circulated almost as widely as the original tweet. The tweet's success emphasises the importance of humour and memefication on Twitter, as well as how ideas of extinction and emergency in climate change started to influence the platform vernacular in 2019.

Finally, a note on digital methods. The project highlights a challenge in Twitter research: that many of the most engaged-with images in the dataset were subsequently deleted. This raises the possibility that regular deletion or 'cleaning up' of one's social media profile is becoming more commonplace. So while tracking vernacular change over time is an important, emerging area of digital methods, such research has to confront the incomplete and unstable datasets that result from ephemeral platforms such as Twitter.

Discussion

These studies were conducted using digital methods of research, during data-sprints of one week that involved professionals and researchers with very different backgrounds and nationalities. The multidisciplinary nature of these sprint practices — where data scientists work together with new media scholars, developers, experts in environmental studies, artists and information designers — is a key factor to studying complex issues such as climate change. Diversity in the groups proved to be a strong asset which helped the group to avoid falling into silos, and it decreased the risks of assumptions and personal bias when reading the results.

We present these studies in the form of a field guide, following the line of the previously published work A Field Guide to "Fake News" and Other Information Disorders. In this format, the text is presented with a writing style that aims to be more accessible to a wider audience than the academic one. Each study is introduced by a step-by-step research protocol that is designed to facilitate the reproducibility of the research even by non-academics. The field guide format may not only make the research more approachable to the general public, but it is also a way to connect new media studies to a data journalism approach, which is a link that has been proven to be fruitful to developing and publishing other similar research [13] for broader, non-academic audiences.

By opening up the research processes that led to the data collection and visualisation, this report aims to be a resource not only for those who are interested in unraveling the climate change debate through social media data, but also serves for journalists and scholars who can reuse these tools and techniques for the study of different social issues.

Future Work

This collection of studies started in 2017 and it is still ongoing. The last chapter on youth climate movements will be developed during a data sprint in July 2020. We aim to have the report printed at Sheffield University in the fall 2020.

Looking to the future and at the reusability of the methods and tools used in this research, it's important to keep in mind that social media and online platforms in general tend to change rapidly. Not only in their source code, or in the way the platforms make their data more or less available to researchers, but also in how people make use of them. During the timeframe of the research (one year) some data collected have been already deleted on social media, and their original source is missing. These considerations reveal a question that is relevant not only for the future of this research, but also for utilizing digital methods in general: how can we design a field guide that helps to build the right research mindset, which goes beyond concrete instructions which may soon become obsolete?

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4.6 CLIMATE FUTURES: (MACHINE) LEARNING FROM CLI-FI

Keywords: Machine learning, Climate fiction, Climate future, Machine co-authoring.

Time: Oct 2019 - Ongoing

Related SDG's

Stakeholders

Partner: Visual Methodologies Collective, ARIAS

Research and Design: Carlo De Gaetano, Sabine Niederer and Andy Dockett

Challenge

How can we collaborate with artificial intelligence (AI) to shed light on, and contribute to, imaginary climate futures?

Problem

This climate future project was inspired by a number of previous studies on climate change communication. One of the recurring themes in these projects was the need to find new ways for people to imagine alternative, more positive futures, as a strategy to fight so-called 'apocalypse fatigue.'

When covering climate change, the media often feed us with doomsday images. We are also exposed by entertainment media: Hollywood often markets catastrophic scenarios — sudden ice ages, deadly tornadoes, and so on — where people are only faced with the terrible consequences of climate change. The climate change scientific debate tends to be mostly about competing predictions and models, each one darker than the next.

When you are surrounded by images and voices that claim the same thing over and over it becomes difficult to imagine something different. The idea of collaborating with machines was a strategy to detach ourselves from these strong narratives and to try to have a second, different opinion on our possible future in relation to climate change.

The problem our project aims to address is a question: how can we collaborate with artificial intelligence (AI) to shed light on, and contribute to, imaginary climate futures?

Outputs

The outputs of this project include:

- A project page with ARIAS: https://arias.amsterdam/making-climate-visible/;
- A podcast with human machine co-authored future climate stories: https://open.spotify.com/show/5hihOVSVV83lfqhQiJLXyV?si=_03kgGrySD-TyKz1PTcrOQ;
- A human-machine co-authored illustrated diary that illustrates snippets of daily life from a future highly impacted by climate change. https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/Ai-Generated-Climate-Fiction_draft.pdf;
- A dataset on cli-fi (climate fiction) movies: https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/Cli-fi-movie-trailers-and-climate-documentaries.xlsx
- Composite videos of cli-fi movie trailers that depict same climate scenarios: Download test video here;
- A dataset on climate art: https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/Climate-Art-Catalogue.xlsx;
- A map to help you get lost: an interactive conceptual network for the project: https://flamelinkz.firebaseapp.com/;
- Image dataset of cli-fi movie poster: https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/images.zip;
- An image-tag network that explores the content of this dataset with Google Vision API;
- StyleGANN model trained with cli-fi movie posters and book covers;
- Riso prints of the generated images to use in a postcard from the future online generator.

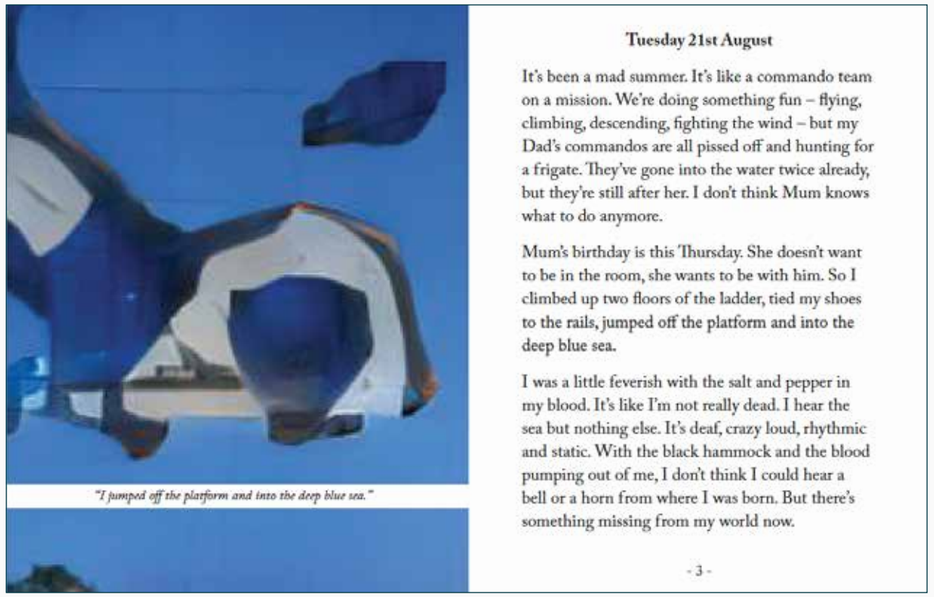

Figure 4.6.1
A sample page from the diary co-authored by humans and machines. On the right, a diary entry generated with the Open AI's GPT-2 345M language model. On the left, a synthetic image generated by the model AttnGAN: Fine-Grained Text to Image Generation with Attentional Generative Adversarial Networks, using a sentence from the text.

Figure 4.6.2
A still frame from the composite video generated with the trailers of climate fiction movies. In this example the plots involved mainly extreme weather events as a consequence of climate change.

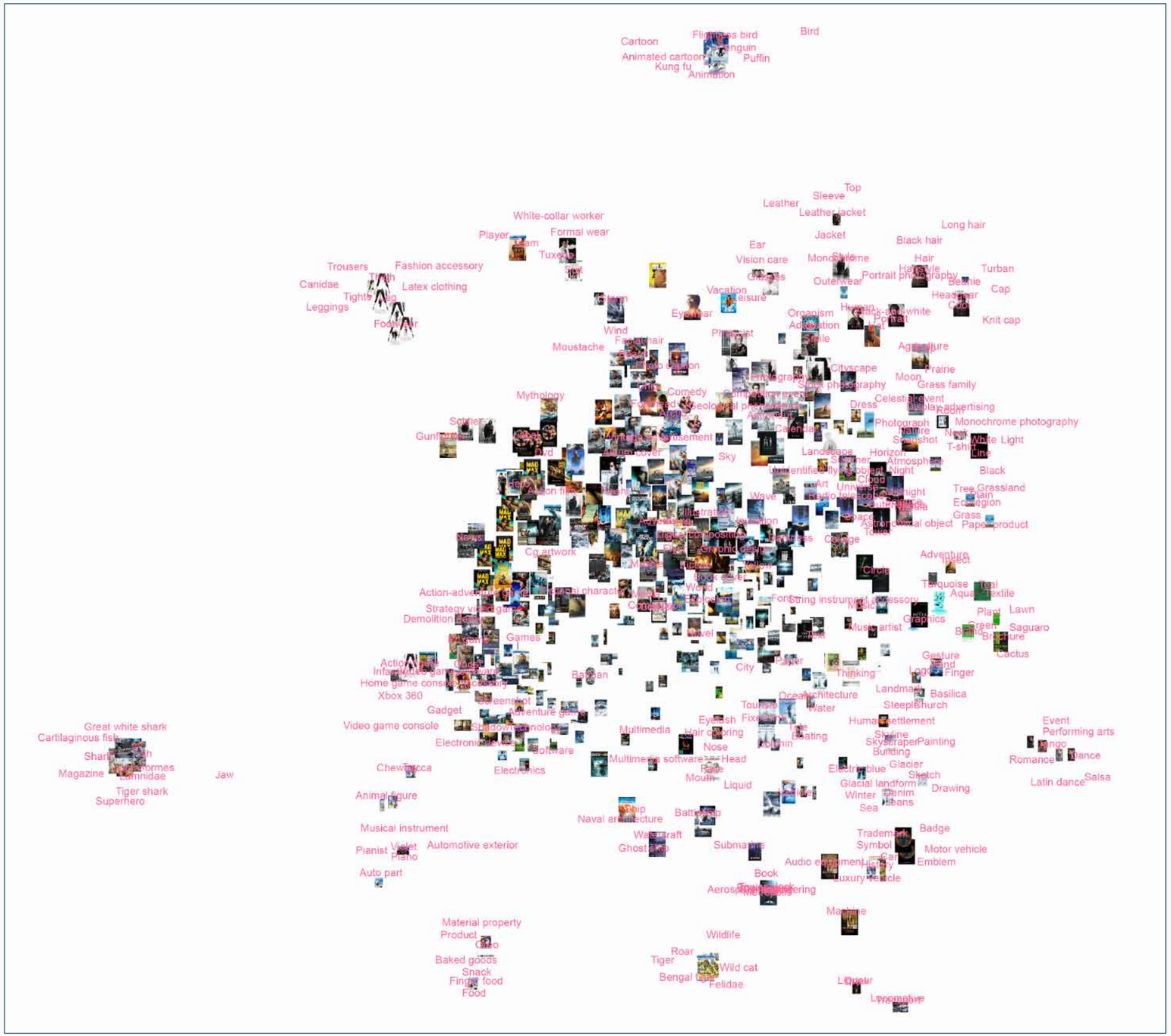

Figure 4.6.3
In this image-tag network (working version) we analysed cli-fi movie posters with the Google Vision API. Images are grouped together according to the similarity of the content detected by machine vision.

Figure 4.6.4
In this image-tag network (working version) we analysed cli-fi book covers with the Google Vision API. Images are grouped together according to the similarity of the content detected by machine vision.

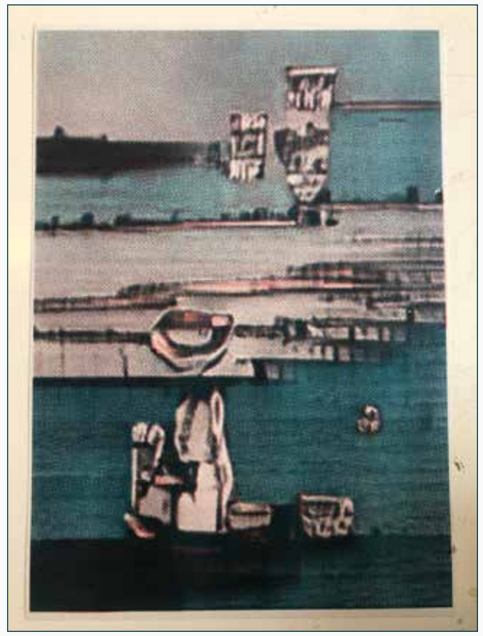

Figure 4.6.6
Sample of a riso print. The design started from a synthetic image generated by the text-to-image AttnGANN model.

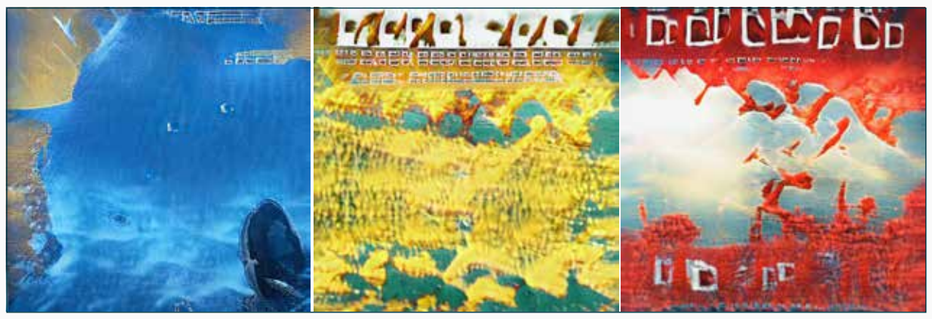

Figure 4.6.5
Three samples of images generated by the StyleGANN model trained on cli-fi movie posters and book covers.

Methods

In this project, AI functions as our co-author, who has (machine) learned about climate imaginaries (imaginary climate futures) on the basis of training sets of climate fiction literature, indigenous climate change stories, climate-themed visual arts, and Hollywood 'climate disaster' film trailers. We design queries to prompt the machine to create new climate imaginaries, in text and in visual form. Subsequently, we edit these machine-generated cli-fi narratives and translate them into short stories, podcasts, and artwork.

The following machines and algorithms have been used in the Climate Futures project to date:

- Tesla T4 (UUID: GPU-ef1d6b8c-7543-5969-4126-316eabeed5f9;
- Tesla K80 (UUID: GPU-c7194ecb-e0a8-c862-1d76-5c6e46847652);
- Open AI's GPT-2 345M language model;
- AttnGAN: Fine-Grained Text to Image Generation with Attentional Generative Adversarial Networks.

Below is the working research protocol for this project:

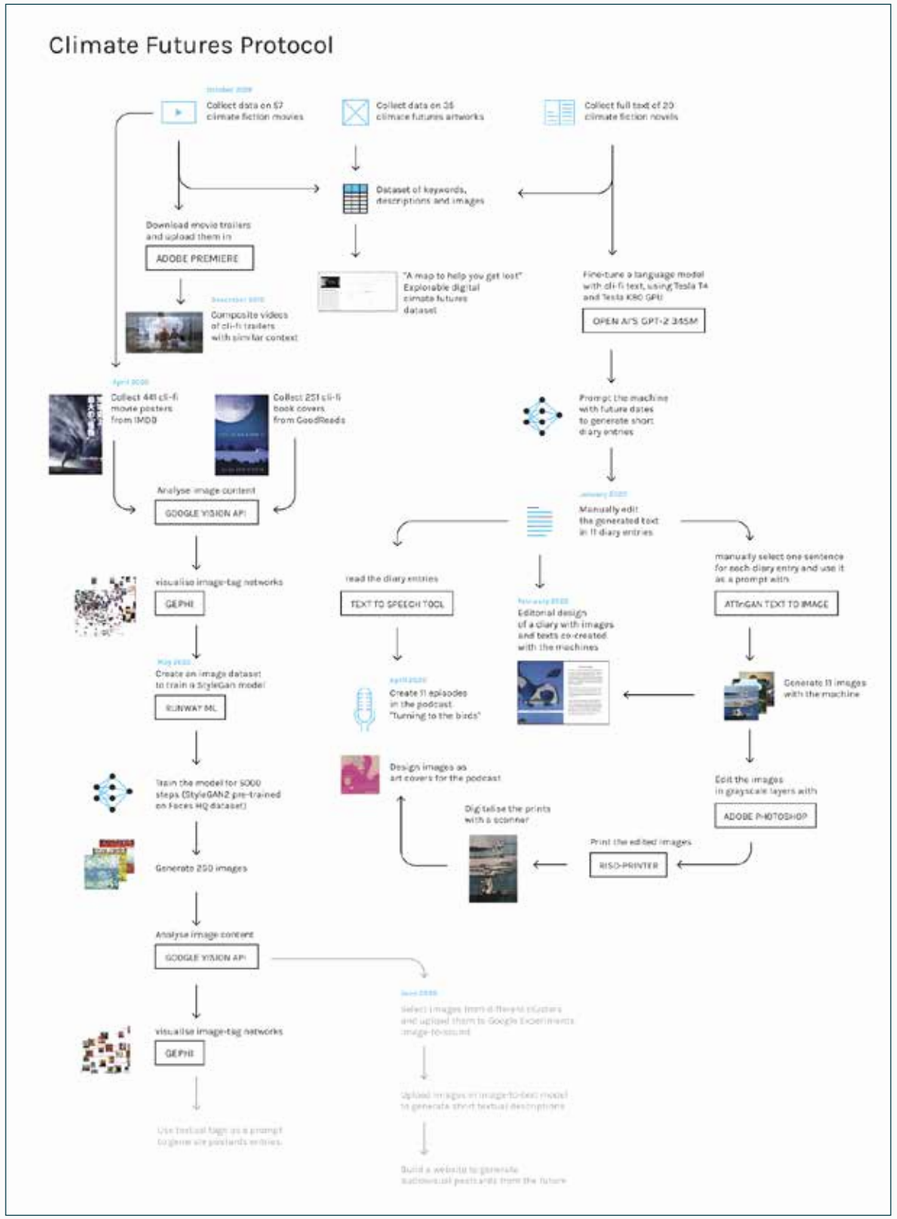

Figure 4.6.7
Design of the working research protocol of the whole project.

Results

The results of this pilot project were shown at several events, such as the ARIAS AI and Co-creation event of February 14th, 2020, at Gerrit Rietveld Academy, and published as a podcast on multiple platforms. The results were also submitted to various exhibitions worldwide, which have been moved up in time due to the corona pandemic.

Discussion

It is relevant to say that this is a series of experimental processes - for us this project is mainly a way of learning how to co-author with a machine, and to learn the limits of machine learning. One of the questions that we asked ourselves during the development of this project concerns how much the human touch comes into the making of this process.

Regarding the images that we designed with a text-to-image model, the human touch had mainly the role of selecting the most emblematic or evocative sentences from the diary entries. The images generated from these sentences were taken as they are, without any graphical intervention. Humans came again into play when we decided to print these images with a Riso printer: that cold feeling that usually these machine-generated images have become warmer in the printing process. It is still uncanny and dreamy, but with a more human layer to it.

This dynamic dialogue that we performed with the machines prompted a second question: how does the 'dreamstate' of machines become an important perspective in the making of this project?

The dreamstate is crucial because it is something that escapes our framing. To a certain degree It is free from our control, and that is why it adds an element of surprise and estrangement that can shake our existing views. This happens both with machine generated text and images: they are hard to pin down, but they are not a pointless fantasy. They have an element of realness that makes the futures they depict somehow plausible.

We envision using these new images and texts as speculative objects to engage different publics and dream alternative climate futures along with the machines. The potential of these co-authored texts and images could lie in the responses that they provoke in those who view them.

Future Work

We would like to wrap up this pilot by creating final output, documenting and publishing all materials - including the trained algorithms- and by laying the groundwork for a further collaboration within AUAS (e.g. with Re>set, Kate Raworth, CO-CB), with AHK, Rietveld/Sandberg (partners in ACIN and ARIAS), and external partners like Next Nature, Hortus Botanicus Amsterdam, Waag, Mediamatic, and Perdu.

As the planned live gathering (organised with ARIAS and Rietveld/ Sandberg) in preparation of a consortium has been moved to this coming Fall due to the coronavirus pandemic, we would like to proceed with the project formulation (and 'vraagarticulatie') by interviewing prospective partners about AI & machine learning in connection to arts, humanities, critical design practices, and climate storytelling.

The envisioned outcomes entail:

- A podcast of climate fiction with accompanying album art and card deck, each created with well-trained AI, edited by humans, riso printed in house at Makerslab;
- Publication of the research and training protocols, tools, and trained algorithms in Runway ML and/or GitHub / Google Colaboratory, and the documentation thereof;
- Publication of the output, and preparation of materials for exhibitions that have been postponed due to the coronavirus pandemic;
- A podcast interview (with the research team) and accompanying visual materials for Amsterdam University of Applied Sciences website and the new ARIAS platform;
- A series of interviews on AI and machine co-creation in art, design, and storytelling with potential research partners, the outcomes of which (in podcast and textual form) can be used in education and research, and will function as input for a larger grant proposal (RAAK Publiek in November or Pro in January).

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(5) PUBLIC RECREATIONAL SPACES

Public recreational spaces have always been an important part of our urban environments. Many forms of such public space remained relevant through ages. Stadiums for instance, such as the Johann Cruijff Arena, have been an important part of our societies since antiquity. The key functions of stadium remain the same (e.g., holding public events, as well as promoting a culture, history, or civilization, and facilitating societal bounding). However, within our modern digital era, new technologies and services can be provided to enhance the function of stadiums and the visitors experience during its visit. This is the motivation of our projects in this domain. Our projects were fuelled by the Spectacular Arena Experience (SAX) initiative, a consortium of public and private actors that seek to develop the next generation of stadium experiences. Hence, we addressed the following challenge: What future interactive technologies could be used to develop more inclusive communities in public spaces dedicated to recreation and cultural experiences?

We investigated this challenge in three projects that are dedicated to making digital technologies of force for enabling more diversity and inclusivity, hence reinforcing the social function of stadiums. We investigated in-situ installation with contents and games displayed through holograms (5.1), chatbot services that address the high-level customer values of diverse audiences such as families (5.2), and through a mobile app for guided tour that provide contents adapted to all audiences (e.g., including differently-abled audiences) as well as community building features (5.3).

(5.1) INSTALLATIONS FOR INCLUSIVE SOCIAL INTERACTIONS

Keywords: Hologram, social interaction, Digital art, Gaming, Inclusivity.

Time: Sept 2018 - Jan 2019

Related SDG's

Stakeholders

Partners: Johan Cruijff Arena, Amsterdam Innovation ArenA, Lectoraat Crossmedia

Digital Transformation Designer and Project Lead: Evelien Christiaanse

Team: Krassimira Rozendal, Nozomi Oka, Dikshant Agarwal, and Seiya Nishida

Challenge

How can Johan Cruijff Arena create a better fan experience with WOW moments, and incentives for visitors to remain at the stadium and share socially inclusive experiences?

Problem

The visitors of the Johan Cruijff Arena are as diverse as the Arena's programme: from football fans to music fans, and including all sorts of games, e-sports, cultural events, and community events. The crowds that gather at Arena events quickly leave once an event is finished, and it is a missed opportunity: the Arena offers large and attractive spaces (Figure 5.1.1) where visitors could enjoy more social moments, and where digital installations could develop inclusive social spaces for diverse communities to meet and share their experiences.

It is also a missed opportunity to improve the crowd management at the Arena. The events at the Arena typically gather between 35.000 to 68.000 visitors. Visitors' arrival may spread over time, but departures happen at the same time: right after events are finished. Massive flows of visitors accumulate in queues all along their way home: in staircases, gates, parking, roads, and public transports.

Hence, our design challenge is to create digital installations that encourage visitors to interact with each other, and stay longer to share socially inclusive experiences at the Arena. We thus investigated this question: How can Johan Cruijff Arena create a better fan experience with WOW moments, and incentives for visitors to remain at the stadium and share socially inclusive experiences?

Output

We designed and prototyped concepts of social games to be performed with interactive holograms. We used holographic pyramids for crowds to gather around. Such pyramids are relatively cheap to build. They basically require 4 panels of glass or plastic (or any transparent and reflective materials) and either large beamers or large screens to project the holograms. The production of the holographic content is also relatively simple. No 3D modelling is necessary. It requires only a single 2D image to be projected 4 times, on each 4 panels of the pyramid, with the same angle.

We developed small-scale prototypes of the pyramids (e.g., pyramids with edges from 10cm to 60cm) and developed data-driven games to be played by the Arena visitors. The holographic content is independent of the specific events at the Arena. Although the content concepts are generic, the content can be adapted to each event, e.g., with automated data collection to draw questions for quizzes.

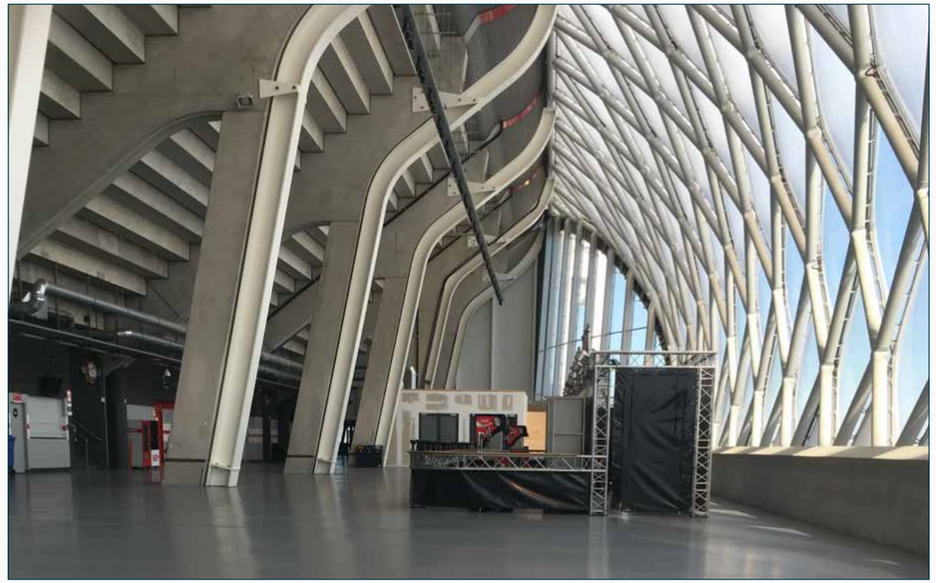
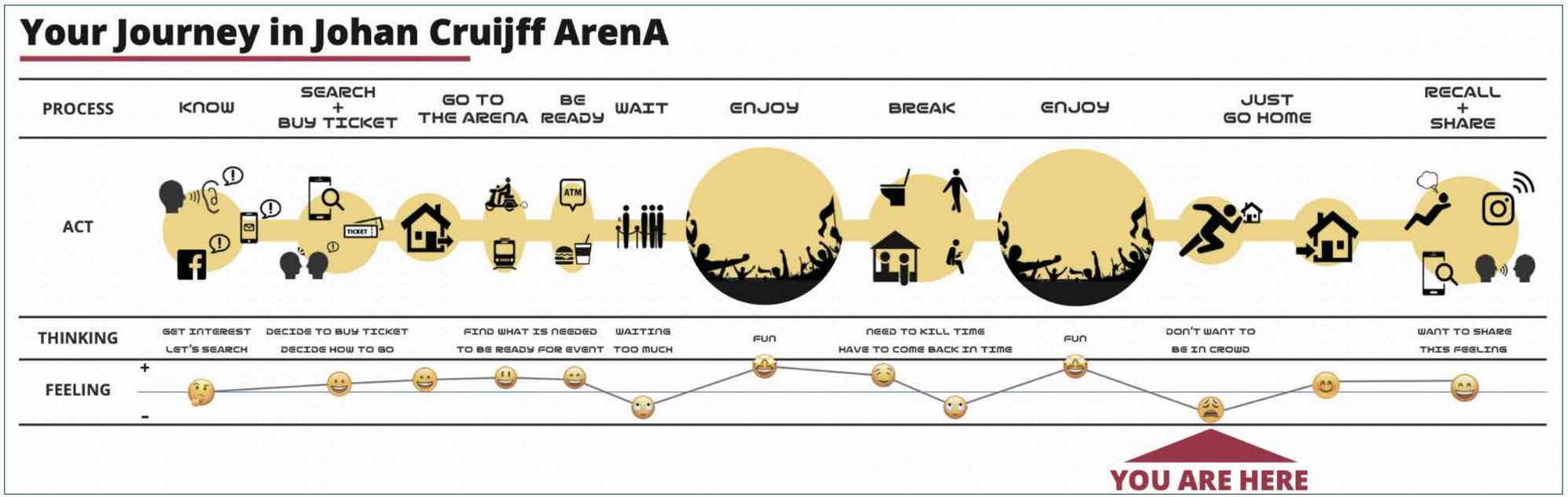


Figure 5.1.1.
Views of the stadium and of the large indoor space where digital installations can be created to encourage visitors to stay longer and share inclusive experiences.

Methods

We first conducted ten one-on-one interviews with visitors of the stadium, and drew a stakeholder map and a customer journey map (Figure 5.1.2). We then conducted desk research on the user experiences in stadia, malls, stations, airports, and other crowded public spaces. From the insights we collected, we decided to create a concept that is applicable to different types of events, and that can be used in a more universal way. Perhaps some contents of the installation can be adapted to specific events, but first we developed a generic concept.

Figure 5.1.2.
Customer Journey Map.



Results

Of the main insights of our one-on-one interviews with visitors was that visiting a stadium is a shared experience. Visitors often come with one person more. Groups of visitors follow certain paths and habits, and share common behaviours, emotions, and energy. From the feedback of visitors, we identified 5 focus points that can motivate visitors to stay longer in the Arena, and share more social contact and engagement (Figure 5.1.3).

From these focus points, we created concepts for transforming the indoor spaces in the Arena (Figure 5.1.4). Together with our partners, we selected a holographic installation as the most engaging concept (Figure 5.1.5). We designed concepts of games that can be played by groups of visitors standing at each side of a holographic pyramid. The modes of interactions included arm gestures, moving positions of individuals, and voice (e.g., which group says the louder or faster answers to quizzes).

The games we proposed included classic quizzes and karaoke, but with a data-driven and inclusivity-driven design. For instance, the songs of the karaoke, or the questions of the quizzes can be automatically drawn from the internet to match specific events (e.g., statistics about football players). Such content can include the biographies of celebrities who performed at the current or previous events (e.g., scraped from Wikipedia). The selection of biographic content can promote the diversity of performers and visitors. It can encourage more inclusive social interactions and group bonding at the Arena.

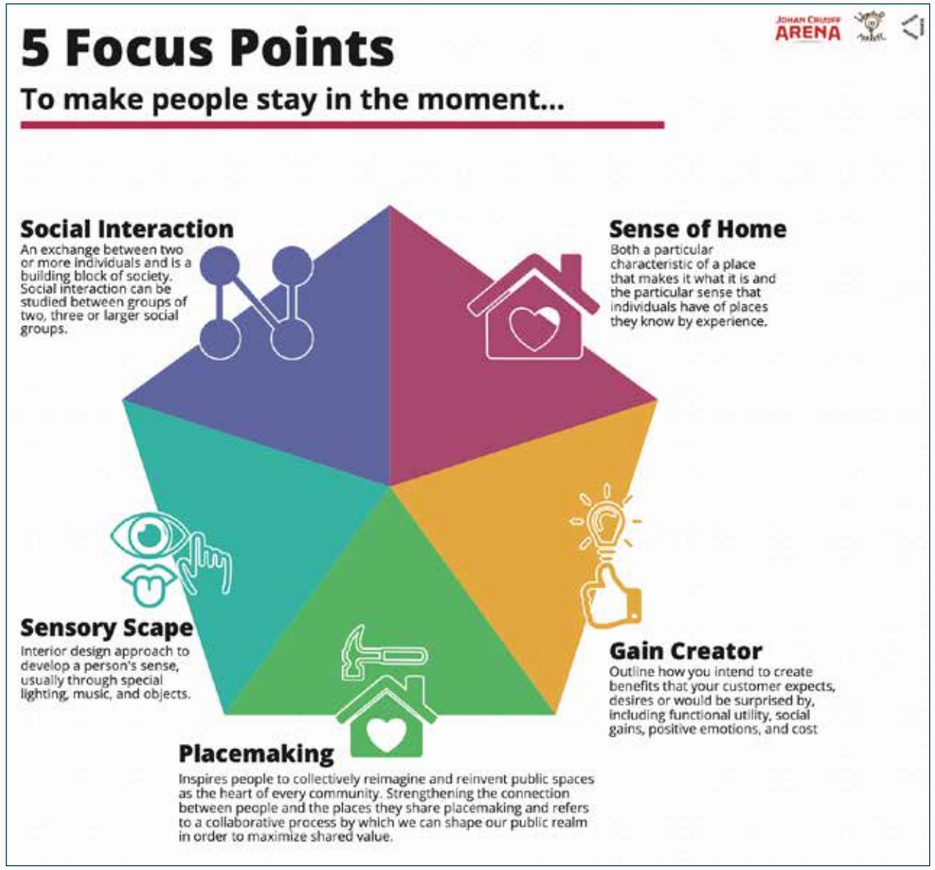


Figure 5.1.3.
Focus points to give visitors incentives to stay longer at the Arena.

Discussion

Holographic installations have the potential of creating WOW moments and more inclusive visitor experiences. With its content and interaction design, our concept makes use of digital tech for socially-aware entertainment. It addresses our partners' need for creating inclusive public spaces (SDG 11, Target 11.7) and giving incentives for crowds to stay longer at the Arena. However, issues remained with the hardware and content production, which can be addressed in future work.

Future Work

Issues arise with the feasibility and costs of installing holographic pyramids in large, crowded spaces. First there is a need for sturdy materials, and safety checks for the equipment (e.g., the pyramid has edges, and can be damaged accidentally by visitors). Finally, the reflective properties of holographic pyramids function well in dark spaces, while events at the Arena may happen in daytime. Even with nighttime events, the indoor spaces need to be lit and not kept too dark. Hence, future work is required to identify the right materials for the pyramid's reflective panels, and for beamers or screens that can project lights with enough intensity.

Issues also arise with the content production. It requires a multidisciplinary team to design interactive holographic contents: graphic designer, motion designers, sensor experts, and developers. The contents can be generic and displayed at any event, or curated by the event organisers. However, adapting the content automatically may be difficult. For instance, we could use AI to draw the questions for a quiz from the Wikipedia page of the performers. However, AI errors may dull the game, and destroy user engagement. Other issues may arise with reusing videos from the event that visitors have attended, as these are subject to copyrights.

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(5.2) CHATBOT FOR INCLUSIVE FAN EXPERIENCE

Keywords: Chatbot, Fan care, Fan experience, Inclusivity, Family, Disability, Community, NLP, Sentiment analysis.

Time: Febr 2019 - June 2019

Related SDG's

Stakeholders

Partners: Johan Cruijff Arena, Amsterdam Innovation ArenA, AJAX, Lectoraat Crossmedia

Digital Transformation Designer and Project Lead: Evelien Christiaanse

Team: Steven Limandjaja, Gustavo Niño, Loredana Boghea, John Baaij and Emre Erim

Challenge

How can AI and digital technologies be used to address the diversity of football fans and their various needs, including practical needs and socio-cultural needs, throughout their customer journey? And how can we use chatbots to create more inclusive fan experiences?

Problem

Our challenge is to make use of digital technologies for creating fan experiences that support the diversity of AJAX fans who seek to attend matches at the Johan Cruijff ArenA. Prior to work from the Johan Cruijff Arena and its partners has pointed towards the opportunities of data science, artificial intelligence (AI) and interactive technologies such as chatbots. These technologies are particularly interesting for investigating the diverse profiles of AJAX fans, the diversity of their needs, and the means to address them. We thus focus on addressing two questions:

1) How can AI and digital technologies be used to address the diversity of football fans and their various needs, including practical needs and socio-cultural needs, throughout their customer journey?
2) How can we use chatbots to create more inclusive fan experiences?

Output

We delivered a chatbot that provides practical information and practical services (e.g., regarding the needs of disabled communities) and fosters inclusivity with games and socio-cultural information that promote diversity and equality. The chatbot addresses the complete user journey, with functionalities dedicated to the needs of fans before, during, and after the match at the Arena.

We also delivered an analysis of fan profiles (avoiding traditional demographics that are prone to biases), the human values they may develop as AJAX fans and as consumers, and how digital technologies can support the development of these human values.

Methods

We started by investigating the profiles of visitors, their specific needs (practical and socio-cultural), and the needs that remain unaddressed or yield negative experiences. To do this, we used NLP to analyse the emails received by the Ajax Fancare team, and the tweets mentioning the Ajax Fancare department (@AjaxFancare). While the former mostly include practical questions and complaints, the latter also include feedback on the positive aspects of the fan experience. We also considered the information webpages and Q&A that were most frequently visited on the websites of AJAX and the Arena.

We then reviewed the literature on fan care, inclusive design, and customer values. Taking into account insights from the literature and from our analysis of fan feedback, we drew personas that represent the diversity of visitors who attend the games. We decided to include families in our personas, because they provide a template for diversity: families include diverse members, with different abilities and practical needs (e.g., elderly, infants and strollers), and with different socio-cultural needs and interests (e.g., passionate about football, or less so but caring about the bonding effects of football matches).

We then matched the personas and their interests with the pyramid of customer values, as defined in Harvard Business Review (Figure 5.2.1). The pyramid provided guidance to identify how inclusivity increases the value of attending AJAX games for all customers, beyond the typical customers. The pyramid also provided guidance to design and prioritise the chatbot services that will have the highest values for customers.

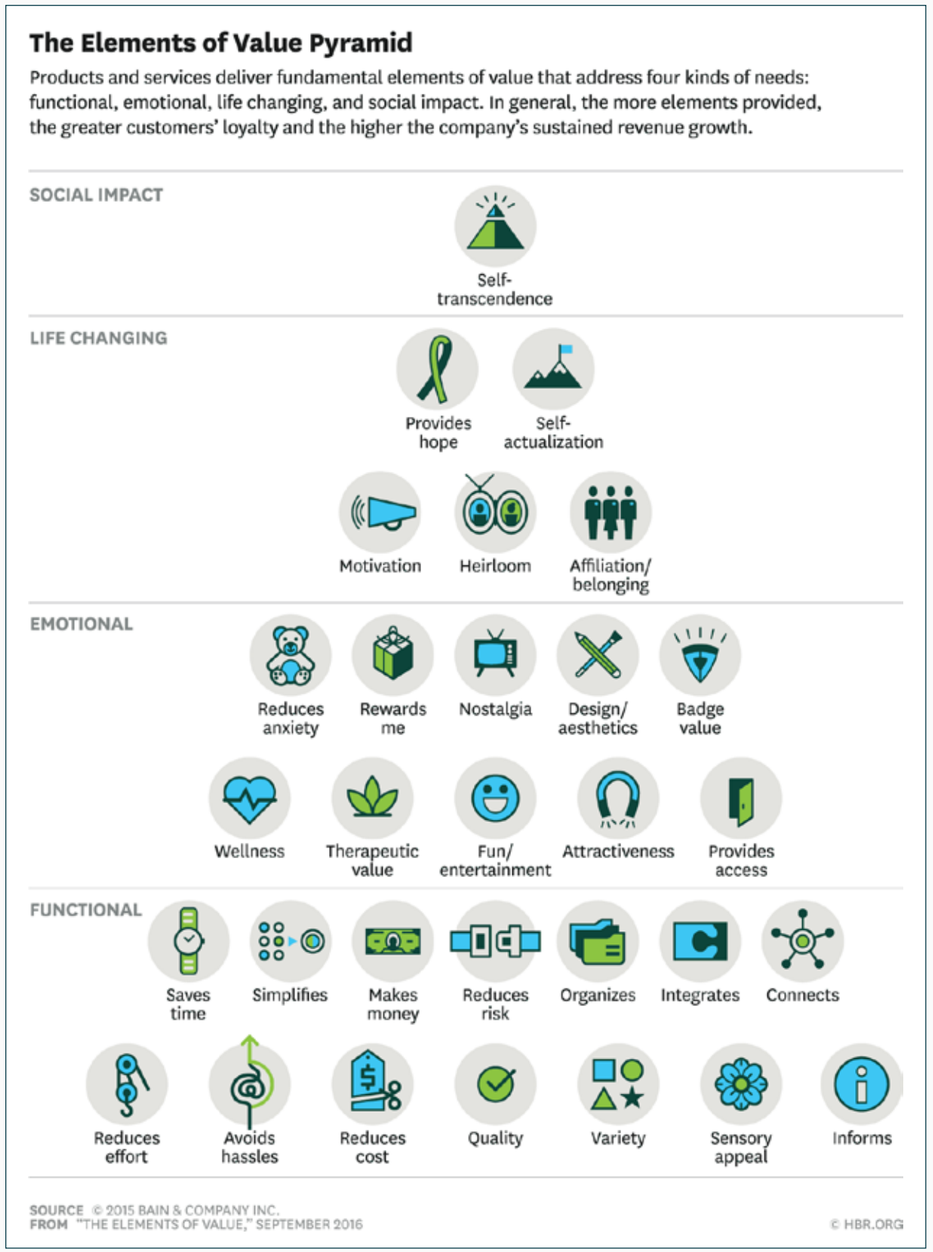

Figure 5.2.1.
Pyramid of Customer Values. It indicates the reasons why products or services raise interests by bringing low- to high-levels of material and emotional values.

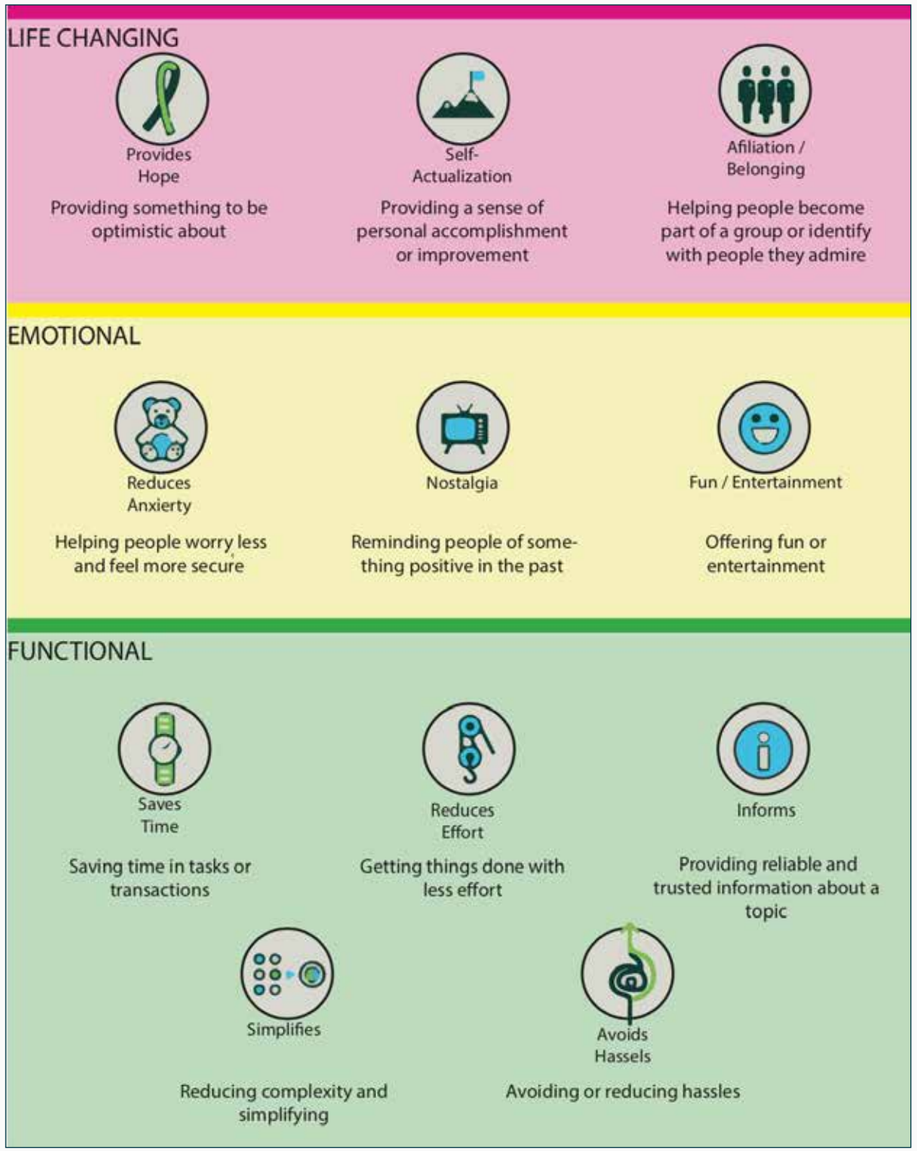

Figure 5.2.2.
Elements from the Pyramid of Customer Values that can be provided by chatbot-mediated services and community features.

Results

From our analysis of twitter data, fancare emails, and web logs, we identified topics of interest to AJAX fans and key information needs. We synthesised user profiles into and of the customer values that can be developed through chatbot-mediated services (Figure 5.2.2). Our analysis of these personas, topics, and values resulted in the design of services that can address user needs and foster inclusivity.

Information needs

The information needs of our audience are as diverse as their profiles and the experiences they seek. Practical information (e.g., access routes, indoor facilities) remain essential, especially for differently abled public who need to make sure their basic needs are manageable. Information on football teams and statistics are also very valuable to AJAX fans, as well as occasional supporters. Sharing statistics on teams and matches, and discussing interpretations and predictions, are good ice-breakers to build bounds between different visitors, whether or not they knew each other before. Among information that can foster discussions between fans, we can also think of adding quizzes and games, to play with your peers or with strangers. Finally the statistics and quizzes can include information on the profile of football players themselves. Players can be of different nationality, ethnicity, and culture, and therefore football team members are excellent examples to promote diversity and inclusion.

Personas

We chose our personas to be families. Families are interesting to investigate diversity because 1) families have diverse members of different ages, abilities (e.g., infant, elderly), personalities, interests, but also tensions (e.g., between generations) 2) adapting to the practical needs of differently family members also serve the needs of differently abled publics. For instance, designing access for baby-buggy or wheel-chairs is similar.

Customer values that chatbots can promote

We identified 11 low- to high-level customer values that chatbots can promote (Figure 5.2.2). To address these values, the chatbot requires basic practical services (e.g., booking tickets, planning routes, verifying accessibility and facilities) as well as services for entertainment and community building.

Chatbot services

The chatbot we develop allows users to access all practical information on AJAX and Arena website, in a seamless interface. Our system architecture connected the chatbot to the existing knowledge bases where this practical information is stored. The system was also connected to existing ticketing services (e.g., to manage reservation) as well as the systems to order food & beverage at the Arena.
The existing services were complemented with added features for navigating inside the Arena, to find the location of facilities (e.g., toilets for handicapped), once visitors are in the stadium.

The navigation service used the bluetooth sensors installed all over the Arena building, and provided simple & explicit guidance such as telling users “turn left now”. Finally, the chatbot provided services for games and community building (e.g., trivia games, karaoke). To adapt the chatbot to specific customer moods or experiences, we also added sentiment analysis features. When a users is particularly unhappy, the chatbot can address user’s anger itself, and adapt the language or services it proposes (e.g., to talk to a human instead of a bot).

Discussion

We collected 2 main insights from this project. First, football games are not only about football or entertainment. The visitors we interviewed did not always mention entertainment as their main motivators. Bonding with peers, reducing stress and learning were often equally or more important than entertainment. Hence the services provided by fancare teams should also address these high-level needs and values. Second, designing for inclusivity is not an overhead that will target a limited population, and thus have low return on investment. Designing for inclusivity is designing for various communities, and for the various members of communities. Basically, by targeting the non-mainstream visitors, we can include more members of the usual communities, and include new communities. Finally, designing for inclusivity is also designing for families, and families are assets for engaging customers in the long-term (e.g., a lifetime), for having long-term stable amounts of customers, and for engaging the new generation of customers (i.e., the youth).

Future Work

Future is required to investigate further the services that are of particular interest for chatbots. More community building features can be imagined. For instance, one community feature was found of particular interests for fans: having the ability to connect fans within the stadium with the fans outside the stadium (i.e., in front of their TV).

References

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(5.3) INCLUSIVE GUIDED TOUR

Keywords: Fan experience, Guided tour, Inclusivity, Diversity, Family, Intergenerational, Disability, Multimedia, Augmented reality.

Time: Sept 2019 - Jan 2020

Related **SDG's**

Stakeholders

Partner: Johan Cruijff ArenA Tours,
Amsterdam Innovation ArenA, Lectoraat Crossmedia
Stretcher: Jan Woering
Digital Transformation Designer and Project Lead: Slim Belkadi
Team: Anissa Cochran, Yujin Guo, Victoria Winstone and Dennis Juman

Challenge

How to ensure that the diverse visitors can all enjoy the guided tour of the Johan Cruijff Arena, and be provided with user experience and practical information that suit their culture, expectations, and abilities?

Problem

The guided tour at the Johan Cruijff Arena gathers 00K visitors every year, from all ages and nationalities. As a public venue for culture and entertainment, the Johan Cruijff Arena has a responsibility for making the guided tour inclusive of the diversity of people's culture and abilities (e.g., sensory impairments such as blindness).

How to ensure that the diverse visitors can all enjoy the guided tour of the Johan Cruijff Arena, and be provided with user experience and practical information that suit their culture, expectations, and abilities? This is the challenge that our team addressed, taking into consideration the full user journey: from buying the tickets and checking information about the tour, to coming back home with memories to share and remember.

Output

The project developed a mobile app prototype that includes a diversity of content and media, which address the diversity of our target groups. The project also produced an analysis of the customer journey and of the value creation for both the customer and the Johan Cruijff Arena.

Methods

For a preliminary study of the domain, we investigated the different target groups and features of the stadium tour by immersing our team within actual stadium tours and recording in-situ observations. At the end of the tour, semi-structured interviews were conducted with the visitors (who volunteered to help us without compensation). We also had regular interviews with the head of the stadium tour programme.

We explored further the diverse user experiences with a data-driven analysis of user feedback. Thereafter, we scraped the comments that visitors have left on the ticketing platforms and on Twitter (we retrieved tweets using a list of keywords and hashtags such as "Johan Cruijff stadium tour", "Ajax stadium tour" or #johancruijffarena). This social listening approach was completed with sentiment analysis (e.g., to detect negative and positive feedback) and with a manual review of the most positive and negative feedback.

From the social listening data and our in-situ observation of the tour, we investigated the type of visitors, their specific interests, and their specific difficulties. Personas of individual visitors and groups of visitors were co-created through several rounds of qualitative analysis of visitor's feedback and in-situ observations (e.g., qualitative coding).

To refine our personas and gain inspiration for our design process, we reviewed literature and prior work in several academic domains, guided by the lectoraat Crossmedia: fan experience, customer loyalty, gamification, and augmented reality for exploration and navigation. We then used an iterative approach to design an app to enhance the guided tours, in close collaboration with the head of the tour programme, and with regular user tests (e.g., unstructured interviews about tangible prototypes).

Results

We describe our results using the framework of the STOF model (Service - Technology - Organization - Finance) developed by Novay and Delft University of Technology. The STOF model follows a domain design approach where four aspects of business-oriented design interventions are considered: the Service domain (e.g., target groups, value propositions), the Technology domain (e.g., functionalities, implementation, deployment), the Organizational domain (e.g., actors, activities, resources), and the Financial domain (e.g., investments, costs, revenues). The latter could not be investigated within our relatively short project.

A. Service domain

This section describes our target group, the value and experience they may seek with the guided tours, and the services we designed for them.

Target group: Families

Our choice of target group aims to be inclusive of all visitors. We particularly focused on families because of the diversity of their members and needs. Interestingly, families with young children or elderly have special needs of the same sorts as visitors with disabilities, such as difficulties to move, hear, or see. Families also comprise diverse members, with different ages and interests, and thus different user experiences. Hence, focusing on families is an interesting approach to design user experiences that are inclusive and shareable and caters to the diversity of the visitors.

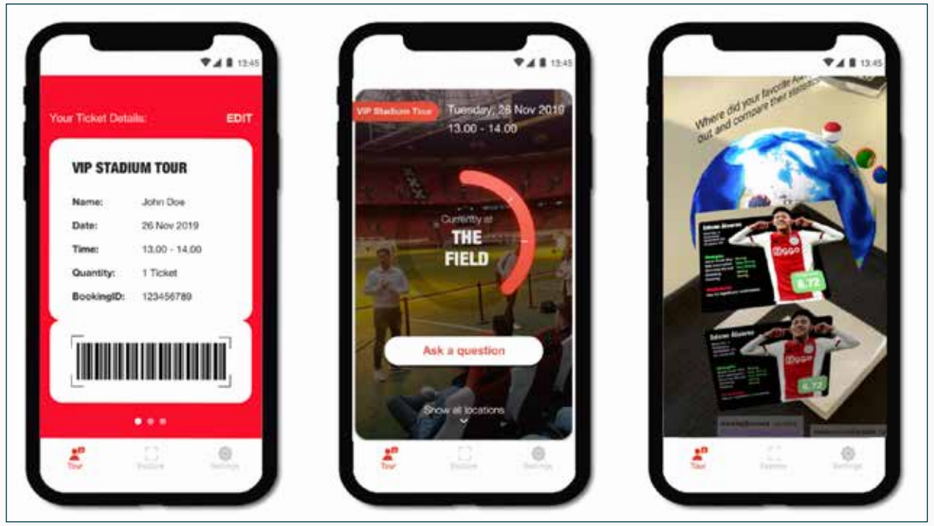


Figure 5.3.1.
Screenshot of the functionality for ticketing (left), feedback and orientation during the tour (middle), and AR content (right).

Services: Comprehensive and Integrated

Diverse visitors have diverse interests, needs, and expectations. These can range from finding their favorite contents within the tour to adjusting the media that best suit their needs (louder audio for elderlies, interactive media for tech enthusiasts, or live discussion with the guide), and to remember their favorite moments after the visit.

To address their needs, visitors will require diverse information and services along their journey. At the moment, the information and services are scattered on different platforms. And additional services to facilitate the user journey may be missing. Hence, we aimed at identifying, designing, and integrating essential services and information in a single application.

We chose to implement a mobile application, as the visitors would most probably have their mobile device at hand at all steps of their journey. The mobile application we designed offers comprehensive services that encompass the whole user journey: before, during, and after the tour.

Before the tour, the app offers a more integrated ticketing service, making it easier for visitors to book and manage their tickets. The app also provides easy access to practical information, such as transportation, parking, elevators, and other facilities. Such information may seem trivial or redundant, however, it is of great importance for families and visitors with special needs (wheelchair, baby buggy). Through our analysis of user comments on social media, we found several complaints and accounts of negative experiences due to lacking or elusive information on such facilities.

The app also lets visitors preview some content of the tour, to give visitors a better understanding of each type of tour offered by the Johan Cruijff Arena (e.g., VIP tour). Previews of the tours (without spoilers) are important for making the user experience more inclusive: it lets the diversity of user interests meet the diversity of the tours designed by the Johan Cruijff Arena.

During the tour, the app provides additional content about the tour, using different media (sound, image, video, text, augmented reality). Visitors can adapt the media, topics, and pace of their visits as they can play and replay the specific content they are interested in. Regardless of the chosen media, the topics of the content should also reflect the diversity of visitors. Although lots of visitors are interested in football, there are many other cultural aspects to explore: concerts and arts, other sports, architecture, and history of the site, history of Dutch sports, the life story of famous performers of the Arena (e.g., the diverse socio-cultural backgrounds of athletes and visiting artists).

The Augmented Reality (AR) content was designed by our team and created gamified interactions with the cultural heritage of the Johan Cruijff Arena (for example a replay of scenes and characters, such as goals or backstage atmosphere). Adding AR content is of interest for making the tour more inclusive, as AR experiences can be either personal or collective. AR lets visitors share similar experiences within their sphere (e.g., family or friends), or with other visitors. AR content gives a chance to increase social contacts among the visitors while respecting personal boundaries, as visitors can choose the distance at which they want to interact with the virtual content and with each other. Or to simply experience the AR content on their own.

The app also lets visitors relate to the content given by the tour guides live during the visit. Visitors can send live and anonymous feedback to the guides (e.g., requests to speak louder or more clearly, to give fewer or more details on a topic, or just to ask a question). The feedback functionalities help the tour guides adapt to the needs of diverse visitors, and alleviates the visitor's burden of making comments or complaints.

Both the multimedia content and the feedback features make the tours more inclusive, as visitors are given flexible and comprehensive

access to diverse contents that account for their sensory abilities and preferred forms of communication. The app also offers a map of the tour, and the Arena, where visitors can keep track of what they visited, what they can expect to visit next, and where are the facilities they may need (e.g., toilets, elevators).

After the tour, visitors are also guided through the facilities of the Arena. They are also offered services to preserve and retrieve their favorite memories from the visit (e.g., their favorite contents, pictures). Visitors are also allowed to give more detailed feedback on their visit, and to share their impressions with the Arena staff and other potential visitors. Visitors are offered to become ambassadors of the tour, by leaving their testimony and in-depth review of the stadium tour. To encourage visitors to give reviews, they can be rewarded with discounts, goodies, and profile pages as ambassadors.

This service would make visitors feel that their experience and opinion matters are important to the Arena, and the whole community of visitors. By giving all visitors the possibility to share their experience and opinion, we can make any visitors feel more integrated into the Arena community, and become part of the Arena experience. This way we can make room for and cater to the diversity of the visitors' profiles, tastes, and cultures.

B. Technology domain

This section describes the technologies required to enable the functionalities of the mobile application, and thus the new services described in (5.1).

The technologies required are well-known for most functionalities: integration of ticketing service, tour maps, retrieving pre- and post-visit content, and feedback systems. These services rely on classical web service and web interface technologies. The most innovative technologies required for our app are those used to produce and integrate Augmented Reality (AR) content.

To integrate AR content in the mobile app, ready-made rendering engines are available. Besides integrating AR content, to design the contents themselves, we need tools to design 3D objects and export them in the right format to the rendering engine. In our case, we used Unity for both the design and the rendering of AR content (Another option was to use Torch). To design more elaborate content, a panel of professional applications would be required (e.g., including the Adobe suite).

C. Organisation domain

This section describes the human organisation required to enable the new services described in (5.1), and the key roles of humans in this organisation.

Content designers are required to produce the AR content, as well as other multimedia content that the app includes. UX designers are required to refine the app over time, by integrating user feedback, and to give directions to the content designers. Community managers are required to review and respond to user feedback, given through our app or other social media. Data scientists are required to analyse user feedback at large scale (e.g., within the app

or other social media), and to analyse the user interactions with the app (e.g., which content has most views for which types of visitors, which functionalities are most used or have most usability issues). Finally, tour guides have an essential role in enabling the services of our app. As the app enables more types of interaction with the tour guides (e.g., ask a question through the app, ask the guide to speak louder or slower), the guides must become familiar with these new functionalities and learn how to respond to interactions mediated through the mobile app.

Discussion

The main insights we gathered about user experience and the requirements to improve user experiences are i) to provide an integrated experience where a single interface provides all practical information, tickets, the content of the tour, and feedback functionalities; ii) to provide more content that is not related to football (e.g., history of the site, architecture of the building, other cultural events); iii) provide more inclusive features for children, elderlies, and people with disabilities (e.g., audio content can render the backstage atmosphere, and remains accessible to blind visitors).

We also identified opportunities for increasing user engagement and supporting more inclusive communities: i) implement quizzes and games (before, during, and after the visit) where visitors can win discounts, goodies, or VIP visits; ii) set up a programme for visitors to become ambassadors of the tour, e.g., earning ambassador badges by leaving more detailed reviews and comments about the Arena; iii) advertise about other events on the same day as the tour visit; iii) implement better ways for the visitor to choose the type of tour (e.g., VIP tour) that best suits their interest (e.g., with a quiz to capture user interests, or a visualisation to show the differences between the types of tours).

Future Work

The mobile app we develop provides the basic framework to implement a comprehensive mobile app for the stadium tour. However, its multimedia content remained limited due to the short period of the project. Hence, future work is required to design and implement more relevant content, and to take into account the various interests and needs of diverse visitors. Future work is also required to investigate the usability of the app, and its feedback functionalities in particular. Comprehensive research has already been carried out on interaction design and usability issues for browsing contents, maps, and information about the tour. However, existing research is more limited on the topic of interaction design for giving live feedback to tour guides. Finally, future work must investigate how well diversity and community building can be supported by the app functionalities, by the multimedia content themselves, and by the interaction with AR content within a social group or between social groups.

References

- [1] De Vos, H., and T. Haaker. “The STOF method.” Mobile Service Innovation and Business Models. Springer, Berlin, Heidelberg, 2008. 115-136.

(6) EDUCATIONAL MATERIALS

Within the Data-Driven Transformation track one of our key goals is to cultivate data literacy to enable people to critically engage with data and data processing technologies. We want to translate relevant technical knowledge and academic research into terms that are understandable for everyone. We also want to develop a common knowledge about technology, and to let everyone engage in critical thinking and decision making. We particularly focus on bridging the gap between technology and design in order to foster design-thinking skills that integrate both technical and human aspects. We designed courses that are accessible to all ranges and domains of expertise, to enable lifelong learning for people from all backgrounds.

We find it very important to engage both current and future professionals, and therefore, we highly value our collaborations with a variety of education programs. The courses and educational materials we present in this chapter were developed in collaboration with a variety of institutions and experts, and for a variety of audiences.

Our courses cover four main topics:

- Data visualisation and exploration (6.1, 6.2, 6.4, 6.6, 6.10);
- Innovative methods for data collection (6.3, 6.5, 6.7, 6.13);
- Adaptive Mindset and design thinking (6.8);
- Key technical knowledge to understand and code data-driven systems (6.9, 6.10, 6.11, 6.12, 6.13, 6.14).

All are welcome to reuse these materials to further develop their literacy. You can find the materials here. If you use, alter, adapt, or extend our work, we would request that you please mention the Digital Society School. In addition, we are always interested in how our work can have an impact, so if you use our work and would like to share, please let us know at digitalsocietyschool@hva.nl. Of course, it would be nice if remixed, adapted and build upon our work, you mention Digital Society School, and even better, let us know digitalsocietyschool@hva.nl, so we can refer back to your work.

(6.1) INTRODUCTION TO DATA VISUALISATION

Description: In this lecture students will learn the basic principles of data visualisation. We will introduce Bertin's variables of graphic representation and show their use in the visualisation process of different kinds of data. We'll also discuss Tufte's design principles, which include clear labeling, the lie factor, and how to avoid chart junk. Students will also learn how to critique a data visualisation by asking meaningful questions about its purpose and composition.

Target audience: Students with no or little experience in data visualisation from a design perspective.

Duration: 2 hour presentation

Materials:

- *Semiology of Graphics (Excerpt), Jacques Bertin.* Excerpt containing explanations of visual variables and the dos and don'ts when using them to represent different kinds of data.
- *Beautiful Evidence (Excerpt), Edward Tufte* About seeing and showing, and on how empirical observations can turn into explanations and evidence presentations.
- *World Geographic Atlas, Herbert Bayer* A selection of pages from one of the most beautifully crafted atlas of the world.
- *Folder with presentation (pdf) and resources:* https://www.dropbox.com/sh/vgcf39v0bl6l1r9/AABQHu50LGyFkYKTes-iWH9-a?dl=0

(6.2) IMAGE SORTER AND CLARIFAI TUTORIAL

Description: This presentation is an exploration of a collection of images through their visual attributes. We will learn how to explore the collection through Image Sorter, an image browsing application. We will also learn how to analyse content using API systems like Google vision API or Clarifai. We will learn how to automatically tag images, and how to visualise the most recurring tags in your dataset.

Target audience: Designers, researchers and programmers interested in image analysis and computer vision.

Duration: 30 min presentation + 45 minutes exercise.

Materials:

- Folder with presentation (pdf) and materials https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/Clarifai-and-Image-sorter.zip

(6.3) CONVERSATIONAL OBJECTS

Description: In this presentation we introduce and approach two conversational objects and 'making' as research. Collection of resources and case studies to start a 'makersprint' with an open mind!

Target audience: Designers and programmers who want to experiment with the Makers Lab with the intention to create an object to explore an issue.

Duration: 45 minutes presentation + 15 min exercise

Materials:

- No materials needed apart from post its and markers for the check in
- Presentation link (pdf) https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/Conversational-Objects.pdf

(6.4) RAWGRAPH: FROM RESEARCH QUESTION TO DATA VISUALISATION

Description: In this hands-on tutorial, we will learn how to explore and test research questions with data visualisation techniques. Which types of visual models are useful for different types of questions, and which data goes with them.

Target audience: Researchers with little or no experience in data visualisation; Designers who want to experiment with datavis; People interested in using data visualisation for research.

Duration: 30 minutes presentation, 45 minutes exercise, 15 minutes reflection

Materials:

- Folder with presentation (pdf) and sample datasets https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/Visual-bootstrapping-with-Rawgraph.zip

(6.5) DATA CURATION WITH GOOGLE SPREADSHEET

Description: This simple tutorial demonstrates the basics of spreadsheet magic, such as how to import data in Google spreadsheet and how to sort and filter data in different ways. No experience needed!

Target audience: Students with no experience in managing data with spreadsheets.

Duration: 30 minutes walkthrough, 30 minutes exercise, and feedback

Materials:

- Sample Dataset, Google Account
- Folder with presentation (pdf) and sample dataset https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/Data-curation-with-Google-Spreadsheet.zip

(6.6) NETWORK VISUALISATION WITH GEPHI

Description: This presentation discusses when and why it is interesting to visualise networks, and how to do so by exploring the basics of Gephi (https://gephi.org), an open-source network analysis and visualisation software. We will learn how to format a dataset for Gephi, how to use different visual features and layout algorithms to visualise the dataset as a network, and the principles of reading and understanding network visualisations.

Target audience: Designers with an interest in data visualisation; Programmers who want to experiment with a data vis tool; Researchers that study social phenomena.

Duration: 30 minutes presentation + 45 minutes exercise

Materials:

- Sample Dataset, Download Gephi
- Folder with presentation, sample datasets and resources https://safe.dss.cloud/s/KXiGyGSKckQNPgP

(6.7) WEB SCRAPING TOOL MEDLEY

Description: The presentation includes an Introduction of tools and techniques used to scrape data from the web. Included in this overview are tutorials for tools such as: Google Search Engine, Google Images, Twitter, Instagram, YouTube, and Wikipedia.

Target audience: Researchers interested in utilising digital methods for research.

Duration: 1.5 hours presentation and experimenting with a variation of tools

Materials:

- Laptop with internet access
- Presentation link (pdf) https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/Web-scraping-tools-medley-1.pdf

(6.8) ADAPTABLE MINDSET MOOC

Description: This course will empower you to find your own way in this increasingly complex world. A world that is changing fast, with new technologies and new realities are arising every few months. Education struggles to keep up and businesses fail to adapt. In order to adapt to this ever-changing world, you need to develop your own mindset and tools to help yourself and others. Developing an adaptable mindset will allow you to embrace change and deal with it much more effectively in both your personal and professional life. In short, you will learn how to nurture an adaptable mindset in your personal and professional life.

Target audience: This course is virtually for anyone who wishes to create, or who desires to be surfing the wave of the new digital society rather than drowning under it. We invite all creators, makers, tinkerers, explorers, innovators, entrepreneurs, geeks, cool moms and dads, inspiration seekers and impact makers.

Duration: The video content is 3 and a half hours, don't worry it's all in small chunks and won't feel like school. You can stop whenever you want and continue whenever you want.

Materials:

- Laptop and the will to create an adaptable mindset
- Presentation link https://digitalsocietyschool.online/course?courseid=adaptable-mindset

(6.9) R AND VISUALIZATION FOR BEGINNERS

Description: This 2-day course is meant for very beginners to learn data visualisation and R. Participants can learn to handle datasets and make neat visualizations with just a few lines of code. After two days, they can inspect datasets, manipulate them, and plot nice graphs to show their results. The materials include two presentations (introduction to R and to visualization) and examples of R code, and exercises to work with datasets related to the green economy.

Target audience: Beginners in programming and visualisation.

Duration: 2 x 2 hours presentation,
example of R code, dataset, and exercise

Materials:

- Laptop with internet access
- Presentation and code https://github.com/DigitalSocietySchool/R_FirstContact

(6.10) SET OF LECTURES ON STATISTICS

Description: This set of lectures provides an introduction to key statistical methods in machine learning and econometrics. These lectures were taught at the Master Digital-Driven Business in the year 2019-20 and 2020-21. The topics include:

- Statistical tests and analysis of variance;
- Linear and polynomial regression;
- Multiple regression;
- Logistic regression and classification errors;
- Clustering;
- Bayes theorem.

Target audience: MA students in Business.

Duration: 4 weeks

Materials:

- Laptop
- Presentation link (pdf) https://digitalsocietyschool.org/set_lectures_statistics/

(6.11) SET OF LECTURES ON MACHINE LEARNING

Description: This set of lectures provides an introduction to key machine learning methods. These lectures were taught at the Master Digital-Driven Business in the year 2019-20 and 2020-21. The topics include:

- Introduction to machine learning and symbolic AI;
- Decision tree and regression tree;
- Random forest, bagging, boosting;
- Neural Networks;
- Classification;
- NLP.

Target audience: MA students in Business.

Duration: 3 weeks

Materials:

- Laptop
- Presentation link (pdf) https://digitalsocietyschool.org/wp/wp-content/uploads/2020/10/Set_Lectures_AI.zip

(6.12) VISUALISATION FOR DATA SCIENTIST

Description: This lecture introduces the basic steps to design visualisations, and to code them with R or D3. Finally, it gives an overview of key visualisation of interest for all sorts of data analysis tasks.

Target audience: PhD's students in Business

Duration: 1.5 hour

Materials:

- Laptop
- Presentation link (pdf) https://digitalsocietyschool.org/wp/wp-content/uploads/2020/10/Vis_for_Data_Scientists.zip

(6.13) COMPUTER VISION FOR IN-SITU TRASH MONITORING

Description: This two-week summer school called Map That Trash! was specifically developed for the École supérieure d'informatique, électronique, automatique (ESIEA), which is a French engineering school. During this course the following topics were addressed: how to make visualisations, how to use illustrator to make stylistic choices, specialised visualisations, clean and manipulate data, learn advanced methods to deal with classification errors, basics of artificial intelligence and basics of computer vision. The summer school assignment was about collecting data by taking images of garbage in the city of Amsterdam. The participants did this by biking around in the seven city districts of Amsterdam. While doing so, one's GPS coordinates will be mapped. At the end of the two weeks, for each city district an overview has been created of where garbage is a challenge to deal with for the city.

The following topics have been addressed: Design Method Toolkit + Design Thinking + Sustainable Development Goals; Cycling rules; Practical of use of AI; Introduction to AI; Introduction to computer vision and classifiers; Network visualisation with Gephi; How to make raw visualisation with Raw Graph; Visualising Methods for Digital Systems; Dealing with Clarifi and Google API's; R for beginners course and manual; Giving and Receiving Feedback.

Target audience: MA Students in Engineering.

Duration: 2 weeks alternating lecture and practice

(6.14) DATA DECOLONIALITY AND SPECULATIVE DESIGN

Description: How to decolonise the web and other stories.

Target Audience: Researchers, students or activists interested in data, decoloniality, speculative design or intersections

Duration: This seminar should take around 1.25 hours of lecture-style material, ideally supplemented with a one-hour speculative making exercise

Materials:

- Laptop and a critical lens for viewing data
- Presentation link https://digitalsocietyschool.org/wp/wp-content/uploads/2020/09/How-To-Decolonize-the-Web-and-other-stories.pdf

(7) TOOLS & METHODS

If you need to tighten a screw, you will most likely not use a hammer. Depending on the challenges you are facing, there are many interesting tools, methods, and approaches that can support you when designing and innovating your service or product.

One of the general methods Digital Society School developed is the Design Method Toolkit, which allows teams to quickly choose effective research methods for design processes. It is a collection of design and research methods, categorised to help you select, and time based to help you plan. Plan and execute your design research, ideation, experimentation, and creation within short iterations.

This chapter gives an overview of the tools and methods we developed over the last three years within the data driven transformation track. All tools and methods can be downloaded on our track legacy output page: https://digitalsocietyschool.org/data-driven-transformation/data-driven-transformation-output/.

(7.1) CARBON DATING

A speed dating tool to find possible relationships between climate change solutions and different stakeholders. The concept of 'carbon dating' takes inspiration from the real-life activity of 'speed dating'. This activity involves creating new potential relationships between those who haven't met before. The goal of this tool is to fall in love with the problem of climate change, by exploring the possible relationships between different stakeholders and methods of carbon sequestration. More information about how the tool has been used can be found in chapter (4.1) Climate change solutions.

(7.2) RIGHT BETWEEN OUR EARS (WEBSITE)

To address a certain communication issue, digital methods of research have been used to create a unique and manually curated dataset of common messages. In this project the goal of creating this dataset, and making it accessible and explorable, is to inform and create awareness in the general public, and to guide people to take positive action. A protocol has been created to lead to the creation of the dataset. You can find the full protocol written out here in the chapter (4.2) Right between our ears.

(7.3) DONOMETER

The Donometer is a decision-making tool designed to make climate change (in this specific case climate change, but it could be any change) more actionable by visualising the impact of choices which helps users find better solutions. See the links to the folder with code and the video tutorial to learn more about how the Donometer could be used. More information about the Donometer tool can also be found in chapter (4.1) Climate change solutions.

(7.4) DECARBONATOR

The Decarbonator is a real-time stakeholder mapping tool which can be used to discover which sectors of society are actively addressing a topic. In this case, we focus on the sectors of climate change. Here you can find the printed file for the board and the lasercut files to reconstruct the Decarbonator. For more information about the Decarbonator please see chapter (4.1) Climate change solutions.

(7.5) INTERACTIVE VISUALISATION GGD

This interactive visualisation prompts users to explore new connections between datasets by interjecting datasets from different sources. It serves to fix the rupture between environmental data and public health monitor data, without forcing correlations. For more information about the interactive visualisation please have a look at chapter (3.2) Participatory Ecosystem for Public Health.

(7.6) SEE YOU ON THE STREET

This tool is developed in the form of a web-platform. It is a platform that celebrates the phenomena of taking to the streets to demand climate justice by combining digital and physical activism. The webspace takes visual content from recent instances of climate protests on Instagram and compiles them into one 'digital demonstration.' The platform is based on a dataset that contains images from climate demonstrations between the years 2015 and 2019. Images were extracted from the Instagram official accounts of four main climate movements (Extinction Rebellion, Fridays for Future, Sunrise Movement, and Zero Hour) as well as from individuals who used the official hashtags of the movements within their post. The team collected the data from Instagram in November 2019, using the Instagram Scraper tool from the DMI. The platform can be accessed here. For more information see chapter (4.3) See you on the street.

(7.7) BOOKLET WITH DIGITAL AND VISUAL METHODS USED TO STUDY CLIMATE DEBATE

The booklet consists of six studies on climate change online debate. Each chapter contains an introduction to the study, a designed research protocol, and research findings. The studies in this report use digital methods to perform online research. These methods include: instructions to build ranked source lists over time by using Google Images results for the query "climate change"; how-to's on performing single-platform and cross-platform analysis with Twitter, Facebook, Instagram and others, for finding dominant voices and explore different 'visual vernaculars' of climate change; procedures that can be used to spot the most engaging content on Instagram and Twitter; and methods used for analysing climate movements imagery with computer vision. For more information see chapter (4.5) Making Climate Visible.

(7.8) CLIMATE FUTURE PROTOCOL

In this project, artificial intelligence (AI) functions as our co-author, who has (machine) learned about climate imaginaries on the basis of training sets which contain examples of climate fiction literature, indigenous climate change stories, climate-themed visual arts, and Hollywood 'climate disaster' film trailers. In this protocol, several queries have been designed, including queries used to prompt the machine to create new climate imaginaries, in text and in visual form. These machine-generated 'cli-fi' narratives have been edited and thereafter translated into short stories, podcasts, and artwork. The following machines and algorithms have been used in the Climate Futures project to date:

- Tesla T4 (UUID: GPU-ef1d6b8c-7543-5969-4126-316eabeed5f9);
- Tesla K80 (UUID: GPU-c7194ecb-e0a8-c862-1d76-5c6e46847652);
- Open AI's GPT-2 345M language model;
- AttnGAN: Fine-Grained Text to Image Generation with Attentional Generative Adversarial Networks.

The working research protocol, as well as more information on the project itself, can be found in chapter (4.6) Climate Features: (Machine) Learning from Cl-Fi.

(7.9) BOTOPOLY

Botoploy is a game developed to explore the potential of chatbots and their ethical and technical challenges, to, in the end, foster public engagement. The game runs on a simple concept similar to Monopoly. Players impersonate a chatbot and must navigate the game to have meaningful interactions with online abusers. The first player who collects all the conversational cards wins. However, to collect the cards, players must face multiple ethical and technical challenges, feats, and dilemmas. More information about Botopoly can be found in paragraph (3.3) Anti-Harassment Chatbots.

(7.10) CURATING DATASETS (GGD)

The interactive D3 visualisation uses glyphs to show multiple dataset characteristics (also called metadata), and includes functionalities to filter data, view datasets details, and edit the datasets and their characteristics (i.e. for long-term curation). The visualisation tool is accessible only to GGD employees, but a public tool with fictitious datasets is available here. For more information see chapter (3.5) GGD Monitor.

(7.11) VR TOOL FOR DATA COLLECTION

A VR installation was created to physicalise publicly monitored health data, and to bring it closer to the public which it serves. Users can interact with a physical installation that shows a map of Amsterdam with a QR code to access the VR content. By scanning each district with its phones, users are provided with VR content (a data visualisation) that can give insights into the public health challenges their city faces. The results are then sent back to the website for policymakers to use as part of a neighborhood monitor, or for GGD professionals to use in a curated report. For more information also see chapter (3.2) Participatory Ecosystem for Public Health.

(7.12) TREE VISUALISATION TNO

We designed an interactive visualisation that uses the metaphor of a tree to show a user's health status, good and bad habits, and risks of non-communicable disease (predicted by a Bayesian Network developed by TNO). The visualisation highlights the most influential habits which, if changed, would most increase the health of the user. Users are also provided with recommendations about changing their habits, and more information on what the habit entails. The tool is available here. For more information also see chapter (3.4) Habit for Health.

8. TALKS, QUOTES & EVENTS

Throughout all our activities, we thrive on engaging with diverse audiences to discuss digital transformation with data-driven technologies. It is important to share knowledge and inspiration by participating in events for a diversity of public. So far we have presented our projects (Chapters 3-5), discussed key societal and technological issues, and shared our expertise.

In this chapter, we compile the multimedia materials, such as posters and videos, that we presented at public and academic events.
The topics we covered range from:

- Climate change, social media, and the (visual) language of activists see (8.1) - (8.8);
- Concrete investigations of technical features and their implications in society see (8.9) - (8.12);
- Transparent and fair AI see (8.13) - (8.15);
- Inspiration for designing and researching the digital transformation see (8.16) - (8.19).

We hope that these talks and materials will inspire you.

(8.1) HASHTAGS AND THEIR VISUAL LANGUAGE AS REACTIONS TO EVENTS

July 2-6, 2018 - Digital Methods Initiative, Summer school 2018 (week 1)

The digital realm is a unique space for emotional discourse. Often times emotions are socially shared through visual communicative practices. Like many other (social) platforms, Twitter is a place where images incorporate original photographs, edited and re-worked images, and otherwise (re)appropriated visuals. Focused on communication regarding the Syrian war, in this sprint we focused on the following main questions:

Main research questions

- How is remembering and forgetting (distant) suffering 'happening' visually and affectively on Twitter and Facebook?
- What emotions occur with remembering and forgetting on Twitter and Facebook?
- Is visual effect on FB and Twitter different in terms of the emotions that visuals communicate, and in terms of longevity of concern?

Presentation: Final presentation,
to know more, look at the wiki page of the project

Team members: Marloes Geboers (facilitator), Andra Irina Cristina Ene, Benjamin Philip Blackwell, Carlo De Gaetano, Chad Van De Wiele, Chiara Piva, Katrine Meldgaard Kjaer, Nermin Elsherif, Petra Audyova, Tayfun Kasapoğlu

(8.2) RADICALIZATION THROUGH WELLBEING

July 9-13, 2018 - Digital Methods Initiative, Summer school 2018 (week 2)

The terms 'fake health news' and 'health misinformation' both describe the circulation of false or unsubstantiated claims about health. Specifically, on Facebook, one finds a plethora of 'miracle cures for cancer,' 'detox juices,' conspiracy theories about vaccines, and alternative treatments that promise to cure life-threatening illness with certain foods and oils. As a point of departure for this sprint we take the website, Facebook page, and Twitter account of NaturalNews.com. Around 'Natural News' is an ecosystem of websites, search engines and chat rooms, including over 50 websites with topics covering alternative medicine, fear of medicine and science, anti-left and pro-freedom hype, and doomsday prep advice. We ask, do different platforms tell different stories and if we look at them together can we see a joint agenda?

Main research questions

- How are narratives about trust and mistrust in medicine constructed?
- Which type of claims circulate best?

Presentation: Final presentation,
to know more, look at the wiki page of the project

Team members: Christina Meyenburg, Dall Christensen, Shefali Bharati, Anna Couturier, Tim Groot, Taylor Geiger, María Fernanda Ibañez Duarte, Natalia Sanchez, Michael, Carlo De Gaetano, and Federica Bardelli.

(8.3) CLIMATE CHANGE SOLUTIONS AND SOLUTIONISM

January 7-11, 2019 – Digital Methods Initiative - Winter school 2019

The realm of climate change solutions, which are resonating in the special report by the IPCC, in academia, and in the news media, seems to be suffering from the lack of a common language. Each term resonating in the realm has too many connotations. Many in the realm of climate change activism disagree about whether potential climate change solutions should be mentioned at all, as they may take away from the urgency to reduce emissions. The goals of this data sprint are to map an emerging chapter of the climate change debate, to study the visual (and textual) representation of climate change solutions across platforms, and to further develop appropriate visual forms for the representation of visual vernaculars per platform.

Main research question

- How and where are climate change solutions resonating online?

Presentation: Final Presentation, Pitch deck for the data sprint, to know more, look at the report of the project

Team members

Sabine Niederer, Warren Pearce and Carlo de Gaetano (Facilitators) Erika Grimes, Laura Briganti, Laura Boog, Ilona Bos, Frederieke Weel, Judith Eigeman, Katarina Schul, Emma Knight, Noémie Brion, Louise Dugas, Mathieu Soulabaille, Gary Mai , Eliza Connolly, Mathias Braad Petersen, Jedrzej Niklas, Xueyi Meng. (Participants)

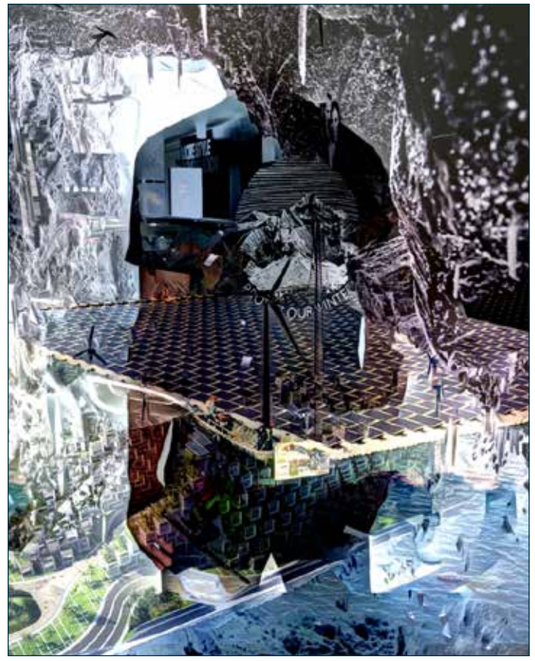


Figure 8.3.1
Composite images for the hashtags #renewableenergy (top) and #sustainablefashion (bottom)

(8.4) THE POLITICS OF SOCIAL MEDIA MANIPULATION

Data sprint: March 2019 | Book published in January 2020

Book edited by Richard Rogers and Sabine Niederer

Disinformation and so-called 'fake news' are contemporary phenomena with rich histories. Disinformation, or the willful introduction of false information for the purposes of causing harm, recalls infamous foreign interference operations in national media systems. In a series of empirical studies, using digital methods and data journalism, we inquire into the extent to which social media have enabled the penetration of foreign disinformation operations, the widespread publication and spread of dubious content, and the extreme commentators, with considerable followings, attacking mainstream media as fake.

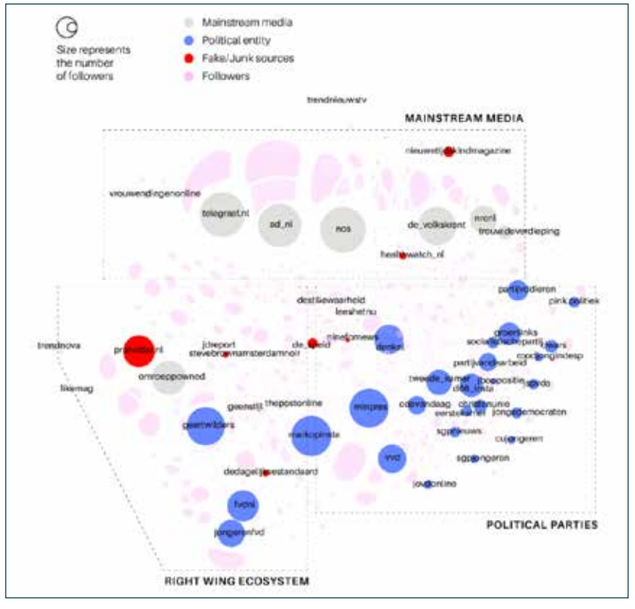


Figure 8.4.1
Visualisation showing follower ecologies of the Dutch Political space on Instagram. The more two accounts share the same followers, the closer they are in the map.

The presence of fakeness in the Dutch political Instagram: fake content, fake sources and fake followers

As few studies have described Instagram as fertile ground for the circulation of content with varying degrees of fakeness, particularly for the distribution of inflaming content in the form of memes, and also as a well-performing infrastructure for the artificial amplification of engagement. In this empirical research project, we devised three complementary approaches for the assessment of fakeness on Dutch political Instagram: fakeness with respect to the content shared on the platform, fakeness of the most relevant information sources within the space, and fakeness in the sense of inauthentic followers that may generate fake engagement.

Main Research Questions

- To what extent can the most liked content in a demarcated Dutch political space on Instagram be defined as fake or junk?
- To what extent do Dutch political entities share an audience with fake (or junk) news sources on Instagram?
- To what extent are efforts of artificial boosting (by means of fake followers) present around divisive topics on the Dutch Instagram?

Presentation:

Study presentation at the Digital Methods Winter School 2020,
Download the entire study here

Team Members

Gabriele Colombo, Carlo De Gaetano

(8.5) CLIMATE IMAGE SPACES AND THE NEW CLIMATE MOVEMENTS

July 1-5, 2019 - Digital Methods Initiative, Summer school 2019 (week 1)

Climate change communication is international, to a certain extent. By translating reports to other languages, there seems to be a mainstream and standardised visual language used to depict climate change. At the same time there are significant differences in preferred image types (e.g. photographs, maps, curves, pictograms, cartoons) and framings of climate change which might be specific to locations.

This data sprint is a combination of two different perspectives, one focusing on the online circulation of images returned by search engine queries for climate change, the other particularly on recent developments around the shifting language of climate change, the frame of "climate emergency", and the high-profile protests and school strikes in the last 12 months.

Figure 8.5.1
Image grid showing the top 10 Google images results per year for the query "climate change"

Main research questions

- How different climate frames have been visually represented by Google Image Search over the last 10 years? Is the visual story changing? Are the sources of top images changing over time?
- Can we find signs of climate human action/activism, and when?
- Is climate rebellion visuality present in Google search results? From when?

Presentation: Final Presentation,
To know more, look at the wiki page of the project

Team members

Katharina Christ. Gabriele Colombo, Carlo De Gaetano, Hanteng, Paul Heinicker, Zhao Jing, Janna Kienbaum, Bence Kollányi, Mangying Li, Mattia Lussana, Mace Ojala, Janna Joceli Omena, Asli Ozgen-Tuncer, Warren Pearce, Elena Pilipets, Nisha Rani, Frauke Rohden, Birgit Schneider, Ektor Theoulakis, Can Ture, Zilia Wang, Ziaoyang Zhao

(8.6) CHANGING CLIMATE VERNACULARS OVER TIME

July 8-12, 2019 - Digital Methods Initiative, Summer school 2019 (week 2)

The goal of this data sprint was to build a cross-platform dataset of visual climate communication for research, design, and campaigning purposes; to enable the analysis of differences in climate change related images in terms of type, content, and style.

Main research question

- How is climate change seen through platforms over time?

Presentation: Final presentation,
To know more, look at the wiki page of the project

Team members

Warren Pearce, Sabine Niederer, Carlo De Gaetano, Katharina Christ, Han-Teng Liao, Holly Foxton, Mathias Klang, Mathieu Jacomy, Soenke Lorenzen, Zijia Wang, Shenglan Qing.

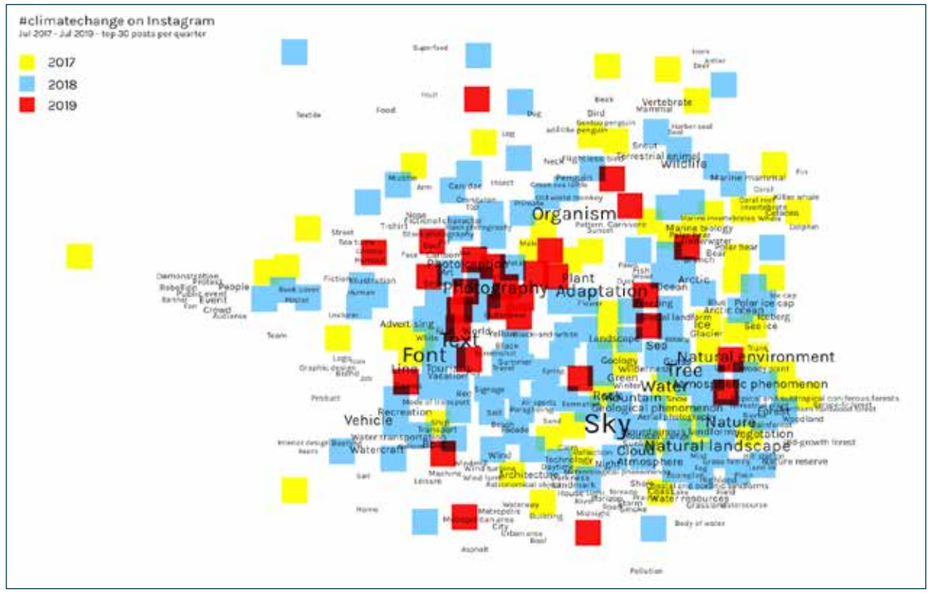


Figure 8.6.1
Image-tag network for the hashtag #climatechange on Instagram. Squares represent Instagram posts published with the hashtag. Colour represents the year of publication of each post. Posts are displayed in space according to how they are classified by the Google Vision API.

(8.7) FROM THE FRINGE TO THE MAINSTREAM: MAPPING EXTREME & EXCITABLE PHRASAL MEMES

Sept 15-20, 2019 - Summer School: Democracy In The Age Of Big Data & AI

The research on offer proposes to draw on computational linguistic methods to map local contexts of use of phrasal memes b/w the fringe (4chan) & the mainstream news media during the period of the 2016 US election. Taking as axiomatic that 4chan engages in extreme speech, this approach offers to compare and contrast extreme speech over time & across platforms.

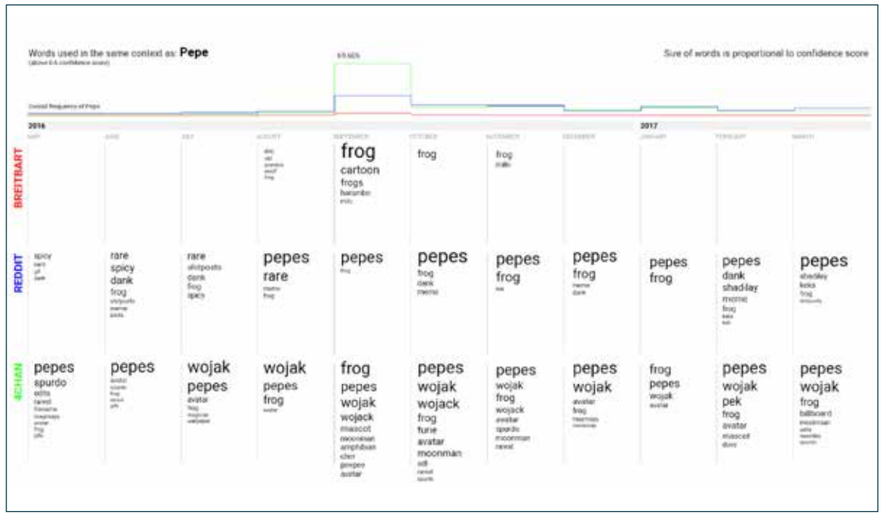


Figure 8.7.1
Visualisation showing words used in the same context as "Pepe" on Breitbart, Reddit and 4chan.

Main research question

- Dissemination & semantic similarity: How can we trace the provenance and varying use of excitable terms across Web communities?
- Us/them: can we identify how in/out-groups are constructed through excitable terms across Web communities?

Presentation: Final presentation,
To know more, look at the summer school page

Team members

Alexandre Leroux, Tim Kreutz, Carlo De Gaetano, Federica Bardelli, Gabriele Colombo, Anna Keuchenius, Sal Hagen, Marc Tuters, Stijn Peeters

(8.8) EVERYDAY ENCOUNTERS WITH THE IMPACTS OF CLIMATE CHANGE

October 10-12, 2019 - MORE WORLD BG's 20th Anniversary Conference

As climate change news travels the world, it is captured in local headlines and streamlined by news agencies. Disasters and crises spark Wikipedia entries and resonate in social media postings The coverage of typhoon Hagibis ranges from concerns about the scheduled Grand Prix Formula 1 in news outlets across Europe to the cancelled Rugby world cup and its effects on the Italian team.

In Japan, besides the expected cautionary articles and sharing of tips and tricks of how to prepare for this tremendous storm, we see small messages of relief, of looking forward to the time that can be spent with family while hiding out from the typhoon. The storytelling platform presented here is inspired by such local stories of the everyday encounters with the impact of climate change, through drought, flood, storms, air pollution, migration, etcetera.

Main research question

- How can we connect climate narratives with data?

Presentation: See final prototype here,
To know more, look at the conference page

Team members: Andreas Schneider, Anna Meïra Greunig, Cagri Taskin, Carlo De Gaetano, Eirini Malliaraki, Erdem Şentürk, Kavya Sukumar, Sabine Niederer, Yvonne Volkart, Zoran Pantelic

(8.9) BEAUTIFICATION APPS: A CROSS-COUNTRY ANALYSIS REGARDING FACE MODIFICATION FEATURES

January 13-17, 2020 - Digital Methods Initiative - Winter school 2020

"All I know, is everything is not as it's sold" is the very first sentence singer Nelly Furtado sings on her hit song 'Try'. Whereas this statement is applicable to many things, it can certainly be said about today's culture of digital images, since the majority of pictures shown in mass media are digitally edited. Whereas technologies concerning the editing of pictures used to be available for a small crowd only, for example for people working for magazines or in the world of advertisement, nowadays the general public has access to methods to easily alter their own appearance as well (Rajanala et al. 443). More specifically, today most individuals edit their pictures to show an ideal appearance of themselves before uploading these on social media platforms, whereas most altered images mirror Western beauty ideals.

Figure 8.9.1
Possible face modifications offered by apps within the Google Play Store of Brazil. Visualisation by Carlo De Gaetano and Gabriele Colombo.

Through examining the topic of beautification apps, this research aims to find out the differences and similarities offered concerning face modifications by answering the following research question: 'What are the differences and similarities of digital face modifications proposed by beautification apps in the Google Play Store of Brazil, India and the United States?'

Final Presentation

- Final presentation
- To know more, look at the wiki page of the project

Team members

Esther Weltevrede, Anne Helmond (Facilitators), Rimmert Sijtsma, Silke Mulder, Anne Schmitz, Arman Eslambolchi, Herbert Natta, Maria Valese, Sanne Kalf, Timo den Hartog, Shemayra Bastiaanse, Dania Awin, Gabriele Colombo, Jacopo Poletto, Carlo De Gaetano, Jack O'Carroll, James Sharp, Alla Rybina (Participants)

(8.10) CHATBOT AGAINST CYBER BULLIES

June 15, 2019 & May 21, 2020 - Two talks at ICML 2019 Workshop on AI for Social Good, and at the Global AI Community

Technologies to address online bullying are limited to detecting and hiding abusive messages, or provide a single automated reply. Conversational technologies are underused assets for addressing abusers. We propose to investigate the potential of conversational technologies for addressing abusers. We will outline directions for studying the effectiveness dialog strategies (e.g., to educate or deter abusers, or keep them busy with chatbots rather than their victims) and for initiating new research on chatbot-mediated mitigation of online abuse. We present our initial experiments and our research directions for investigating different dialog strategies (e.g., to educate or deter abusers, or keep them busy with chatbots rather than their victims). We also discuss fundamental issues with deploying chatbots for behavior manipulation on social media (e.g., failures and unintended consequences).

Materials:

- Paper: https://aiforsocialgood.github.io/icml2019/accepted/track2/pdfs/16_aisg_icml2019.pdf
- Poster: https://www.researchgate.net/publication/333895620_Poster
- Slides: https://www.researchgate.net/publication/333895425_Slides
- Video (starts at min. 5:30): https://slideslive.com/38917990/contributed-talks?ref=speaker-18247-latest
- Video: https://globalai.live/ai-talks-live/emma-beauxis/

Team members: Emma Beauxis-Aussalet

(8.11) YOUTUBE RECOMMENDATION, SOCIAL ENGINEERING AND CLIMATE CHANGE

December 13, 2019 & April 16, 2020 - Two talks at Search Engine Amsterdam, and at the Global AI Community

Recommender systems greatly impact the scope of information we are exposed to. For critical topics like the climate crisis, the filter bubbles of recommendation systems can shape our opinion and perhaps our future. Such recommendation systems are becoming instruments of social engineering, in ways we might control or not. We will present a project that investigates the filter bubbles that arise from Youtube recommendations on the topic of the climate crisis. We will discuss our methodology to trace Youtube recommendations for 3 user profiles: climate activists, climato-skeptics, and split-minded users. Such profiles would be created by initiating prior searches on pre-selected contents, and by controlling the tracking cookies of search engines. We will present our strategy for analysing and visualizing our results, and will invite the public to give feedback and criticism on our approach.

Materials from December 13, 2019

- Video: https://www.youtube.com/watch?v=yKXpyy1_9tw
- Slides: https://www.researchgate.net/publication/341179858_Filter_Bubbles_and_Echo_Chambers_in_Youtube_Recommendations_on_the_Climate_Crisis

Team members

Emma Beauxis-Aussalet and Carlo de Gaetano

(8.12) MAKING CLASSIFICATION ERROR & BIAS TRANSPARENT

September 26, 2019 & November 27, 2019 & December 14, 2019 Three talks at Amsterdam Data Science, at EGG 2019, and at the Global AI Community

To enable ethical and performant AI systems, we must scrutinise their errors and biases. All stakeholders should be able to assess the uncertainty of AI results: developers, managers, and end-users. At the moment, only technical experts are really able to assess AI errors and biases, because tools and methods are lacking for people with limited AI expertise. After comparing the information requirements of end-users and technical experts, we will discuss uncertainty metrics and visualizations that concern both audiences (i.e., stakeholders with extensive or limited AI expertise).

We discuss user studies that investigate how these tools and methods support (or not) the general public to 1) understand classification errors and biases, 2) choose and tune classifiers for their specific use case, and 3) interpret classification results with the correct confidence level. The insights we collected underly two shortcomings of existing practices. First, the end-user information requirements are not fully address by expert-oriented uncertainty assessments. Second, AI systems may not be tested sufficiently, e.g., with test sets that are too small, or not representative of the end-usage conditions in which classifiers are applied. In particular, the issue of error variance is largely underlooked but is crucial to identify classification biases and test set reliability. In conclusion, we present recent work

on comprehensive estimation of error variance, and simplified visualizations of the resulting classification uncertainty.

- Slides from EGG: https://www.researchgate.net/publication/337623427_Making_Classification_Bias_Transparent_Understandable_-_Presentation_at_EGG_Conference_2019
- Slides from ADS: https://www.researchgate.net/publication/336056915_Making_Classification_Uncertainty_Transparent_and_Understandable
- Video: https://www.youtube.com/watch?v=oAbqGOFy6po

(8.13) STATISTICS FOR ASSESSING CLASSIFICATION ERROR AND BIAS

October 25, 2018 & November 9, 2018

Two talks at BNAIC 2018, and IDA 2018

Measuring and identifying classification bias in practice requires methods developed in epidemiology and statistics, and must consider how class proportions and errors may vary (randomly or not). We present existing methods, and demonstrate their applicability to machine learning classifiers. We show that Fieller's theorem is applicable to drawn confidence intervals for estimates of classification errors in binary problems. Finally, we introduce novel methods to better estimate error random variance (Sample-to-Sample method), and to predict the variance of classification results (Ratio-to-TP and Maximum Determinant methods)

- Slides: https://www.researchgate.net/publication/328829181_Extended_Methods_to_Handle_Classification_Biases_-_Presentation_at_BNAIC_2018
- Original Paper: https://www.researchgate.net/publication/321483814_Extended_Methods_to_Handle_Classification_Biases

(8.14) VISUALISATION OF CLASSIFICATION ERRORS FOR NON-EXPERTS

September 12, 2018 - Talk at the European Conference on Cognitive Ergonomics (ECCE)

Classification errors are usually visualised using complex graphs and complex metrics. These visualisations requires intense efforts from non-experts (and sometimes experts). We present simplified visualisation that provide alternatives to confusion matrices, ROC curves and Precision-Recall curves. The visualisation provide more complete information and are easier to understand. We present our design and the qualitative results of our user study. The quantitative results are available in the journal version of the paper.

- Slides: https://www.researchgate.net/publication/327450214_Supporting_End-User_Understanding_of_Classification_Errors_Presentation_at_ECCE_2018
- Conference Paper: https://ir.cwi.nl/pub/27791/ECCE_Beauxis_VizClassificationErrors.pdf
- Journal Paper: https://ir.cwi.nl/pub/28813/JoIS_2019_Beauxis_Final.pdf

(8.15) XAI BY EXPLORING DATA FEATURES AND ALGORITHM BEHAVIORS

November 8, 2018 - Winning project of the XAI Hackathon organized by TNO and presented at BNAIC 2018

We designed a system that supports eXplainable AI (XAI) by letting users explore the specific features that have led an AI to make a specific classification. Users can also explore how these specific features would impact the end-results if different forms of AI were used.

- Slides: https://www.researchgate.net/publication/344493570_Winning_project_of_the_XAI_Hackathon_2018_organized_by_TNO_and_presented_at_BNAIC_2018

Team members

Emma Beauxis-Aussalet, Dan Xu, Abdelrahman Hassan, Aysenur Bilgin (guest), Ahmed Mohammed (guest)

(8.16) DECIDING FOR A PHD

February 20, 2020 - TECH020 summit by Amsterdam Data Science

What (not) to know before doing a PhD,
and deciding to do a career in academia or industry.

- Slides: https://www.researchgate.net/publication/344493655_Deciding_for_a_PhD_What_not_to_know_before_doing_a_PhD_and_deciding_to_do_a_career_in_academia_or_industry

Team members

Emma Beauxis-Aussalet

(8.17) MIC DROP: FUTUROLOGY

June 20, 2018 - Meetup #5 at Digital Society School

Jacintha Scheerder - Futurologist @We the Future

Mesmerized by the future Jacintha is (re)searching what tomorrow will bring. She's a frenetic future-thinker and -dreamer, fond of using different (scientific) foresight methods to bring the unthinkable and 'unknowns' a bit closer. During presentations and talks she likes to point out to think out-of-the-box without losing it out of sight.

(8.18) INTERVIEWS OF DIGITAL TRANSFORMATION DESIGNERS

June, 2020

Interviews of our own Digital Transformation designers and their perspective towards a future where data enables a positive transformation for society.

Abdelrahman Hassan: https://safe.dss.cloud/s/gbepwc2aSsEZPdT
Evelien Christiaanse: https://safe.dss.cloud/s/FEWzMyjDTZaRJS7

(8.19) ON DIGITAL IRONY, SINCERITY AND THE RHYTHM WHICH BINDS THE TWO

Keywords: Data literacy, Sonification, Digital irony, Network analysis, Rhythm analysis.

Stakeholders

Team members: Abdelrahman Hassan, Iskra Ramirez, Beatrice Gobbo and Daniel Leix-Palumbo
Digital Methods Researchers
UvA journalism and new media students

Problem

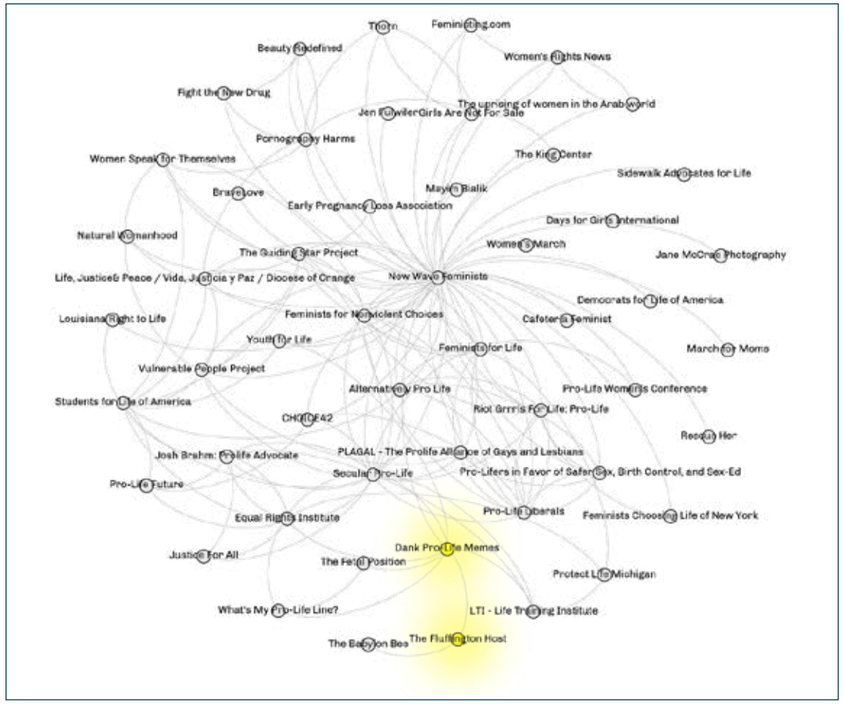
Amidst the rise of the far-right and subsequent post-truth narratives in 2016, there have been multiple accounts which amplified what we can call ' a crisis of irony'. The premise of the crisis is that factions of the far-right were 'weaponizing' irony to further their agendas. Amongst many things, this referred to incidents such as the radicalization of the online meme depicting a hate-filled right-leaning version of Pepe the Frog.

Irony is networked, relative and subject to cultural specificity. Seeing as cyberspace is also a space where rhythms contest, compete and reflect techno-cultural battles, and that irony is a multi-use cultural marker, how can we better expose the relationship between rhythm and irony? Amidst the rising use of weaponized irony in networked spaces, and Shintaro Miyziaki's idea of rhythm analysis, What can rhythm teach us about the way irony is used online?

We tried to answer this question by looking at pro-life online meme pages, to better understand what the performed irony of the 'meme' format can reveal about the sincerity behing the pro-life sentiment.This work was proposed as a project in the 2019 winter school session of the Digital Methods Initiative (DMI) held at the University of Amsterdam.

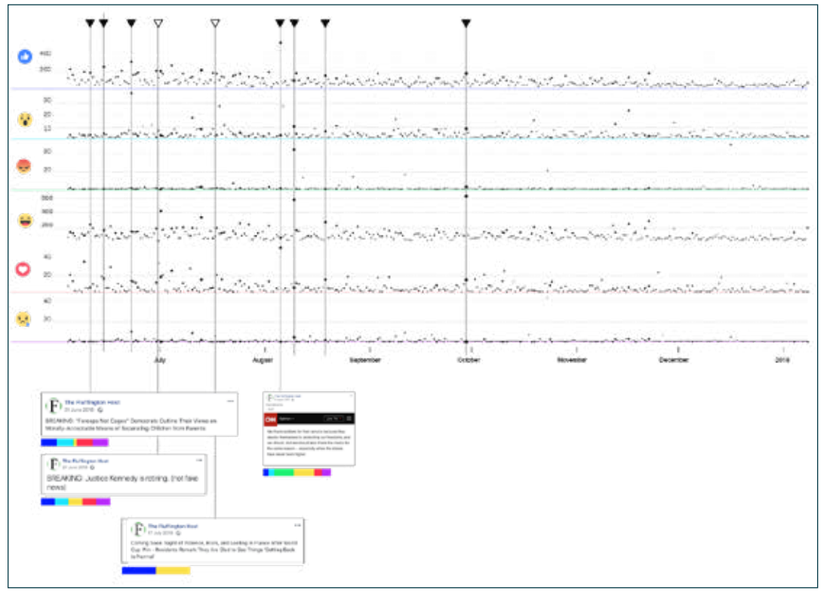
Output

- Habitat of interlinked pro-life meme pages.

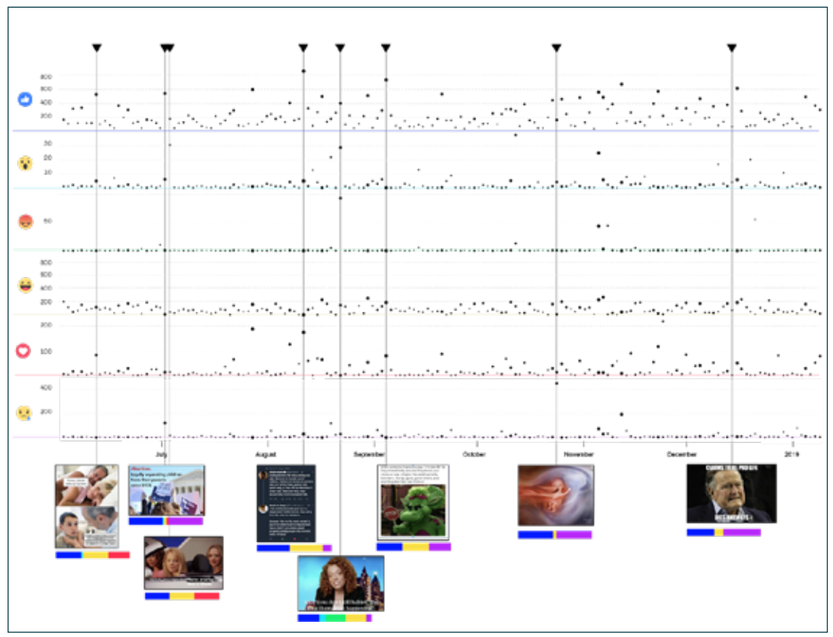


- Video of the sonified interactions of each page:
- “To make the rhythms accessible as a tool for a wider audience, an experiment was conducted to sonify and visualize the flow of interactions in each page. Every interaction was turned into a track, and the tracks were overlaid on top of each other to expose the rhythm of emotional interaction on the respective page. The results can be seen in the videos below”
- Dank Pro-life memes: https://vimeo.com/315465858
- Fluffington Host: https://vimeo.com/315466079

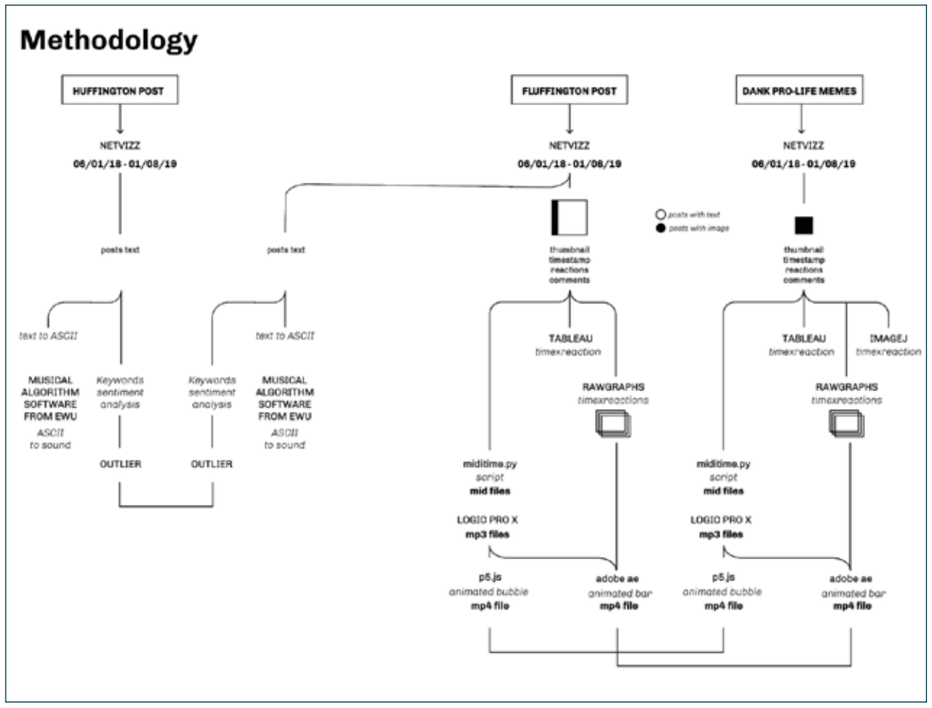
- Scatterplot and outliers of the Fluffington Host page



- Scatterplot and outliers of the Dank Life meme page



Methods



- DMI's netvizz was used to scrape data from the respective pages from 06/01/18 until 01/08/19;
- Content analysis: Since the Huffington Post page consisted of text-based posts, we were able to perform sentiment analysis to identify outliers in the text;
- Interaction analysis: we found it more fruitful to compare both pages' post interactions (likes and reactions);
- We then used TABLEAU, RAW GRAPHS and IMAGEJ to plot posts and reaction in relation to time on a scatter plot;
- We then used outlier analysis to determine outlier posts;

- A miditime.py script was used to convert the csv reaction data into sound data. Where each reaction was assigned a frequency;
- LOGIC PRO X was then used to refine the sound to produce the final video;
- p5.js was also used to visualize the rhythm of both bubbles. This was possible after converting the dates of each post to a timescale. The size of each bubble changes based on the amount of interaction each bubble gets.

Results

From the scatter plots, multiple candidates were identified as outliers that were, in essence, a disruption of rhythm. These were posts which either illicit too many reactions or too little reaction compared to the flow of reactions on the surrounding posts. Take for example the following post:

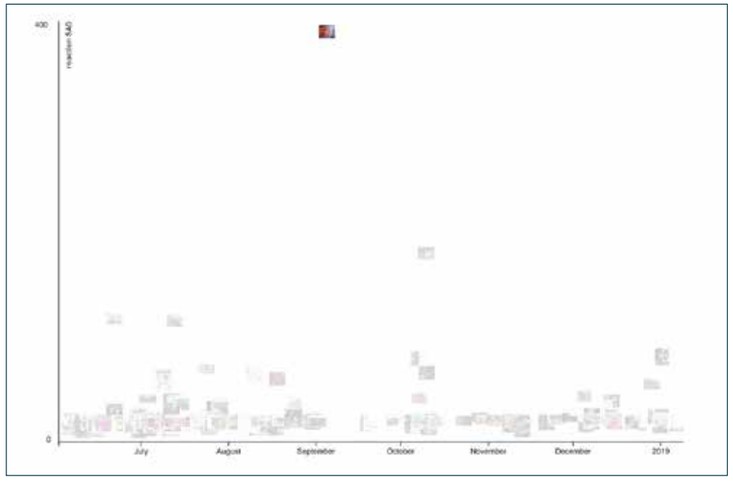
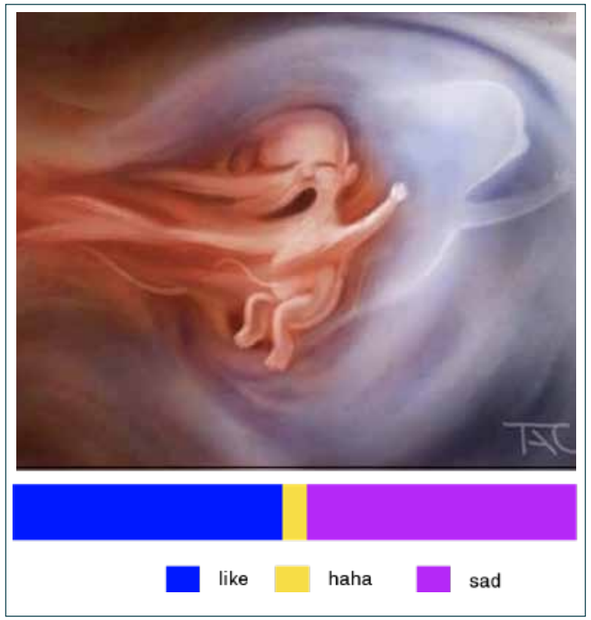


Figure 8.19.5
Outlier même



"Most of the time, I have a good time finding a terrible pro-choice argument, finding a quick way to refute it, and making a meme to mock its silliness. And other times... the reality of abortion really hits me"

This post by far is a clear disruption of rhythm as it solicited numerous sad reactions. This interestingly coincided with the sincere nature of the post, where the OP (original poster) of the meme posts a heartfelt reflection on his memetic practices and exposes the underlying cause of being pro-life. Similar patterns were found in the Fluffington Host page, where the rhythm was often disturbed by non-sarcastic comments annotated with "- staff" or "(not fake news)"

Outliers in the Fluffington Host Page

The Fluffington Host page has actually woven these distributions into its rhythm as if to cause what Lefebvre would've dubbed as a Eurhythmia or the constructive interaction between rhythms. The page would routinely publish staff annotated comments for the purpose of redirecting the irony whenever it was felt that the audience would lose touch. This demonstration of 'careful irony' is particularly helpful when understanding the weaponization of irony. Just as files are routed and rerouted by the different nodes in a network, online irony is also often disseminated by a conscious perpetrator, distilling the irony with sincerity as it navigates different modes of cultural understanding.

Discussion

Although the investigation was explorative, it provided valuable insight into the nature of irony and the uses of irony. It also set a precedent for a methodology for rhythm studies on social platforms. It also opens the floor for further explorations.

- How can we identify and study different Facebook-specific rhythms, beyond likes and reactions?
- How can we better define and study user-imposed rhythms (such as likes and shares) with algorithmic, platform induced rhythms (such as information sorting)?
- Can we repeat the same investigation across platforms?

This investigation is far from conclusive; it only brushes the surface of conceptualizing irony and networked humor. It provides insight on how irony can take shape on digital mediums, where its projection is the result of the interplay between human and machine. This work, as it stands, is the story of irony and sincerity as told by rhythm. It exposes one use of irony through a methodology which it hopes is transferable to other uses. Amidst claims of weaponization, this work still needs to directly address the question of power, how are power structures maintained by this ironic discourse. Even more importantly, how does irony shape the relationship between the oppressor and the oppressed?

CONCLUSION

Throughout each project, course, workshop, and event held in the duration of this track we have cultivated data literacy and design thinking. We bridged the gap between technology and design, all while fostering ethics, transparency and accountability. We did this by exploring tree domains, running 15 projects in collaboration together with 19 partners and 33 learners. We also created 16 online courses which are and still can be used as educational materials for both students and professionals. With these courses we have reached over 2000 students and professionals in more than 5 professional fields, ranging from Healthcare to IT. Within the academic field, we have been present at 6 international conferences (ICML, ECCE, IDA, BNAIC, EGG, More World BG).

We hope to encourage you to become a part of our broad and diverse community, made up of students, researchers, businesses, governments, and university staff; an ever-growing network of kindred spirits.

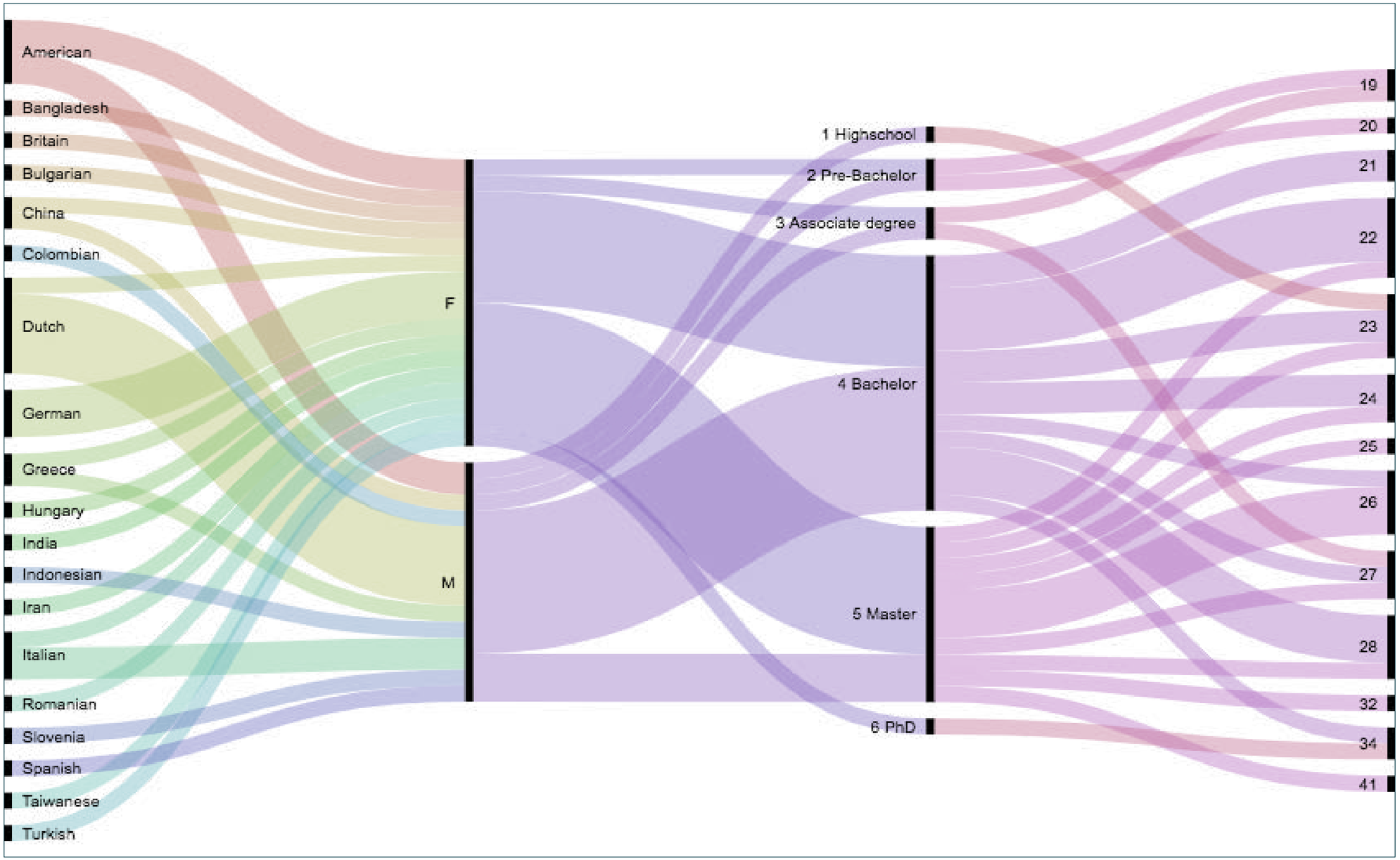


Figure 9.1
Overview of learners within the Data Driven Transformation track: gender, nationality, degree and age.

PARTNERS

re-set

VNH Vereniging van Nederlandse Hoofdpijncentra

delaware

Zilveren Kruis

EXMACHINA

AMSTERDAM INNOVATION ARENA

ARIAS Platform for Research through the Arts and Sciences

GGD Amsterdam

TNO

SAP

JOHAN CRUIJFF ARENA

Amsterdam University of Applied Sciences

Visual Methodologies Collective
www.visualmethodologies.org

AMBASSADORS

Robert Overweg

Robert uses design and technology to improve companies and to make people's lives better. In his life and profession he has had several roles: Design + Strategy at Vodafone; Liberty Global Keynote speaker at SXSW; MIT Next Artist at Centre Pompidou; and Media Biennial Seoul Writer: The Next Web Let's change something together.
Triple https://www.robertoverweg.com

Joot Plattel

Joost Plattel is a data-strategist who helps organisations and individuals develop and build strategies for data-related questions and opportunities. He creates experimental models, data visualisations, APIs and dashboards to solve problems and explore opportunities. The question I try to answer is: How do we use all the data generated every second? How do we turn it into information, to knowledge and finally wisdom? I'm often asked to give lectures and talks about data, experiments, ethics and difficult or weird questions to make people think. His interests include investigating how the data we generate every second is stored, and how we can turn that data into information, knowledge, and wisdom. Joost is often invited to give lectures and talks about data, experiments, ethics and difficult or weird subjects that make people think. https://jplattel.nl

Jacintha Scheerder

Mesmerized by the future Jacintha is (re)searching what tomorrow will bring. She's a phrenetic future-thinker and -dreamer, fond of using different scientific foresight methods to bring the unthinkable and 'unknowns' a bit closer. We the Future Netherlands

TEAM

Emma Beauxis-Aussalet
Senior Track Associate

Emma's background includes design, engineering, and research. Combining these can support great societal developments and Emma is delighted to develop their synergy at DSS. She loves gaining and sharing knowledge, having crazy ideas and exploring hidden corners. Her Ph.D. topic is classification uncertainty, where many hidden corners need more attention.

Slim Belkadi
Lecturer and Marketeer

Slim is an economist focusing on the marketing and branding aspect within organisations. He is interested in companies brand equities through customer engagement with the help of advanced technology. Slim is currently doing research on how companies' brand awareness and brand equity affect their financial performance. Alongside his research, he is also participating in a Traineeship at the HvA where he is exploring the different methods and techniques to transfer knowledge in the form of interactive dialogues.

Evelien Christiaanse
Digital Transformation Designer

Evelien is a geographer turned media researcher passionate about researching the relationship between people and technology. Her goal is to learn how to translate theory to practice together with a multidisciplinary team.

Carlo De Gaetano
Digital Transformation Designer

Carlo is an information designer focusing on data visualisation for social and cultural research. He is interested in visual content analysis, images as data and the mapping of social issues. Currently, he is doing research on how climate change is represented and discussed online by experimenting with different techniques to capture digital traces and visualise images in groups.

Abdelrahman Hassan
Digital Transformation Designer

Abdelrahman lives on the intersection between software, critical theory, data, and poetry. His interests include memetics, internet geographies, technical utopias/ dystopias and depictions of e-governance. His overarching goal is to bridge critical theory with digital practice and to limit accessibility gaps and hurdles to open access to knowledge.

Wouter Meys
Track Owner

Wouter is a track owner who is passionate about working on projects which aim to provide solutions for the societal problems of the future. By setting up and managing projects which combine research, industry, society, and (future) professionals. His goal is to develop and set up innovative projects that have a lasting impact on society within the field of system empowerment.

Margreet Riphagen
Track Owner

Within this program Margreet preps Digital Transformation Designers to have a local impact on global issues. She provides them with the right resources, tools, methods, and environment. In the Data Driven Transformation track, she wants to empower people to be at their best in this increasingly growing data driven society.

COLOPHON

Data-Driven Transformation Track Legacy presents the results of the three-year applied research, led by the Digital Society School in collaboration with many partners. https://digitalsocietyschool.org/data-driven-transformation/

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- Download all developed tools, methods and education materials: https://digitalsocietyschool.org/data-driven-transformation/data-driven-transformation-output/

Digital Society School (DSS) is a diverse group of designers, developers, and researchers shaping tomorrow's society through digital technology. DSS is based at Amsterdam University of Applied Sciences, and is part of the Faculty Digital Media and Creative Industries. http://digitalsocietyschool.org

The **Amsterdam University of Applied Sciences** (AUAS) has a total of 46,000 students across seven faculties and offers a total of 80 bachelor and master programmes. Its ambition is to train the professionals of tomorrow. Practical orientated research is an important component of its educational programmes. http://amsterdamuas.com

Research at AUAS always addresses real-life world problems from the professional field, and is conducted in close collaboration with both academics and professionals working within multiple disciplines.

The AUAS has 250 partner institutes across 50 different countries and contributes to various educational projects such as curriculum development, research projects, student/professor exchanges and work placements within an international working field.

We're not against printing. We're against wasting resources. Therefore, we decided to create an interactive pdf, and not a printed version of this publication.

Amsterdam University of Applied Sciences

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Let's stay in touch

ENDNOTES

1) https://sdgs.un.org/goals.
2) D3.js is a Javascript library used for documents based on data https://d3js.org/.
3) OpenStreetMap, https://www.openstreetmap.org/.
4) Hatebage.org is the world's largest structured repository of hate speech terms and phrases.
5) Perspective API uses machine learning models to score the perceived impact a comment might have on a conversation in terms of 'toxicity'.
6) Cloud AutoML is a suite of machine learning products that enables developers with limited machine learning expertise to train high-quality models specific to their business needs https://cloud.google.com/automl.
7) Imagination of Things is a creative studio that uses design, fiction, and technology to craft meaningful stories https://imaginationofthings.com/.
8) https://toolkits.dss.cloud/design/method-card/dot-voting/.
9) https://mouseflow.com/.
10) https://hopin.to/.
11) Term originated from Genie, Usenet and other electronic fora to describe the tendency of a thread to drift away from the original subject of discussion (and thus, from the Subject header of the originating message), or the results of that tendency.
12) https://rawgraphs.io
13) See for example: Rogers, R., and S. Niederer. "The Politics of Social Media Manipulation." (2019).

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