



ViT



Digital
Future Society

DataViz for Society

2022 Dossier Conference



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Contents

Introduction	4
Visualising science for the public	5
Visualising the news	7
Collaborative visualisation and new visualisation techniques	9
Visualisation to unlock Open Data	10
Rapid-fire talks	11
The two Catalonias	11
Decision Support Tool to predict renewable energy supply for the forthcoming weeks and months	11
Air quality data visualization via mobile apps	12
Top Rosies Talent	12
Inspirational Talk: Coming Home – Ideas of the third kind with the Geniverse AI revolution and the age of the super subconscious	13
Use Cases	14
Digital divides in the city of Hospitalet de Llobregat	14
Visual Trust: reliability, accountability and forgery in scientific, religious and social images	14
DisTrack: tracking disinformation in social media	14
Atlas project	15
UN Environment Programme: Pollution Action Note – Data you need to know	15
Workshops	16
Observable HQ for data science	16
Tools, platforms, and techniques to visualise Earth Observation datasets	16

Friday, December 2nd
Palau Macaya
Saturday, December 3rd
Pier 01 - MWCatal

DataViz for Society



Introduction

Technology, through the collection and processing of increasingly huge amounts of data offers the ability to understand in greater detail the complexity of the world and the people and societies that live within it. This presents incredible opportunities not just for observing and monitoring but also acting toward the development of fairer and more equal societies and responding to the major challenges the world faces today. However, complexity presents its own unique challenges that can marginalise and exclude many from the important stories it can tell.

This is where data visualisation comes in. As this report on the DataViz for Society Conference hosted in Barcelona by Digital Future Society and the ViT (Visualization for Transparency) Foundation will show, data is becoming a key tool for focusing and directing social, cultural and technological initiatives that can benefit from having data and increasingly complex datasets inform their decision-making and governance processes. The report will first explore the topics covered in the three main panels on using data visualisation to communicate science with the public and to tell the news and will also look at exciting data visualisation that are furthering collaboration in the field. Following on from there, the report will then explore the shorter keynote speeches, rapid-fire talks, use-case scenarios, and interactive workshops that also contributed to the Conference.

There is a beauty to data visualisation too as it sits at a crossroads between art, science, reporting and storytelling. Although this report will explore data visualisation's role in communicating science and scientific advances to the public, reporting on the most important news stories of the day, facilitating collaboration on the most complex tasks and more, a key theme runs throughout the whole report, emotion and engagement. Data visualisation should engage the people who need to understand the data it presents, and, in most cases, the most successful visualisations do this by invoking an emotional response. This very nature of data visualisation then poses it as a vital tool for properly understanding and directing the new and exciting technologies that can help build fairer and more equitable futures by linking the work they do to the hearts and minds of all of us.

Finally, before moving on to discuss the key learnings from each of the DataViz for Society panels and sessions, it is important to note that this conference marks the first of what will become an annual event and Digital Future Society and the ViT Foundation very much look forward to seeing you at the next edition of DataViz for Society conference.



Visualising science for the public

Moderator: [Mercè Crosas](#), Data Researcher and Technologist, Generalitat de Catalunya and Harvard University

- [Alyssa Goodman](#), Robert Wheeler Willson Professor of Applied Astronomy, Harvard University
- [Arvind Satyanarayan](#), Assistant Professor of Computer Science, MIT (Massachusetts Institute of Technology) and Group Leader, MIT Computer Science and Artificial Intelligence Laboratory (CSAIL)
- [Diana Urquiza](#), Product Designer, Barcelona Supercomputing Center

Visualisation can help explore data, explain science, and engage citizens. In doing so it transforms the reach of data and revolutionises transparency and accountability. Successfully using data visualisation as a tool for communicating science with the public, however, raises a series of technical questions and in the post-Covid-19 context also comes loaded with several societal issues that need to be taken into account.

Using visualisation to help explain science sits on a conceptual plain that needs to be deconstructed. Science, by its nature, is a vast and complex subject and there are many ways of communicating interpretations and explanations of it. There are questions then, that can help guide the process of breaking down something conceptual into a meaningful visualisation that will connect with its intended audience. For example, as Diana Urquiza noted, climate data is a huge challenge for journalists, so it is important to engage with them to better understand the challenges they face in this regard. In fact, defining the audience is one of the ten key questions as outlined by Alyssa Goodman.¹ Other questions to ask when creating visualisation relates to the context and scale of

¹ See: [Ten questions to ask when creating a visualization](#)



the data and how to visualise it, is the goal to explain or explore data or idea, what modes will be used to display the visualisation and more.

Another important element to define when creating visualisations is the question of abstraction versus accuracy. For example, and tying back to the audience question, diagrams, as opposed to images, will better help explain what you are trying to visualise beyond those who are already familiar with the topic. Introducing categories into the abstraction of data can further help break down complicated structures and aid communication.

Arvind Satyanarayan pointed out that as with many of the different aspects, we associate with digital transformation, public perceptions of data visualisation have been revolutionised by the near-universal experience of the Covid-19 pandemic. Daily Covid charts and the 'flatten the curve' movement put data visualisation techniques front and centre in response efforts to one of the greatest health crises the world has ever faced together. Not only did this help improve and develop data literacy, but it also turned visualisations into social artefacts that people and communities could gather around, discuss, share, feel, and meme.

Unfortunately, however, just like with other aspects of digital transformation, this Covid-19-induced breakthrough point also clearly demonstrated that data visualisation is a double-edged sword. Some were able to impressively use visualised scientific data to spread scepticism and anti-science sentiment, often playing off the emotions triggered by the effects of the pandemic. Seemingly then, there is a need for the scientific community to recognise that not everybody

will see data the same way, with contextual and environmental factors also having an effect on interpretation meaning that good data visualisation on its own is not enough.

Visualising the news

Moderator: [Xaquín G.V.](#), Co-Founder, Visualization for Transparency (ViT) Foundation

- [Monica Ulmanu](#), Graphics Editor, The Washington Post
- [Rebecca Pazos](#), Data Visualisation Editor, SPH Media
- [Sara Chodosh](#), Graphics Editor, New York Times

In many ways, by offering improved transparency and accountability, data visualisation is a key tool in any modern and inclusive representative democracy. This assertion is borne out by the fact that journalists, also key pillars of democracy, are pushing the boundaries with data visualisation, telling human stories that are rich with data in new, exciting, and emotionally charged ways. Some of the biggest stories of our time such as climate change, women's rights, social marginalisation, ageing and ageing-related illness, among many others are wrapped so tightly in high levels of complexity that they are far too easy to ignore.

However, a new culture of visual journalism built on equality, transparent communication, diversity and cohesion, the sharing of knowledge and investment both in new hybrid skillsets and modern data analysis and graphical representation tools is pushing through this complexity to tell meaningful stories that can raise awareness, campaign for action, and ultimately change perceptions.





This new culture of visual journalism is broad and ripe for innovation. For example, it could mean modelling vast datasets to find a single data point out of 20,000 to build a visual narrative around or it may mean innovating new ways to tell a human story that will connect with the intended audience, as Monica Ulmanu did at The Washington Post.² Again, the audience is important here, as is making emotional connections with them. There are innovative new methods and practices for visualising stories to achieve this aim, with Rebecca Pazos's features on Living Inside and Outside with Dementia in Singapore for The Straits Times offering fine examples of what this new culture of visual journalism can achieve.³ These stories can have a powerful impact on individuals as well as the broader public. As Sara Chodosh noted, when raising awareness and campaigning, reaching a big audience is not as important as reaching the right audience. For example, as shown in stories on urban highways in the US⁴ and the Helms Amendment⁵ bringing data as parts of stories that really matter to activists or even policymakers in ways they could not have seen before can make a real impact.

A real challenge that still exists, however, is how to measure the impact that these new types of stories seek to have. Efforts can be made to track policy changes or changes in the public debate. However, a key pillar of successful data visualisation lies in a fundamental aspect of it, open data. Through open data, which again should mark a core tenet of inclusive decision-making and democratic governance, impact moves beyond a single visualisation and a single telling of its story. In this way, a visual story can shine a light on the data that wrote it and also form the basis of work to further advocate for its findings or the research that will guide the actions to be taken because of them. Here then, it is clear that beyond new tracking

²See: [2°C: Beyond the Limit](#)

³See: [Living inside with Dementia](#) and [Living outside with Dementia](#)

⁴See: [Mr. Biden, Tear Down This Highway](#)

⁵See: [Abortions Are Legal in Ethiopia. But Half of These Clinics Won't Provide Them](#)

⁶Matthew was unable to attend the event due to unforeseen circumstances.



techniques, conventional metrics such as views, shares, and comments can only go so far. Matthew was unable to attend the event due to unforeseen circumstances.

Collaborative visualisation and new visualisation techniques

Moderator: [Anton Bardera](#), Professor of Informàtica, Matemàtica Aplicada i Estadística, Universitat de Girona y VIT Foundation

- [Christophe Hurter](#), Head of Interactive Data Visualisation team, Ecole Nationale de l'Aviation Civile (ENAC)
- [Matthew Brehmer](#), Senior Research Staff, Tableau Research6
- [Arzu Çöltekin](#), Professor, University of Applied Sciences & Arts Northwestern Switzerland

Innovative data visualisation can also facilitate advanced collaboration on even the most complex of modern tasks, such as safely tracking and managing the flight paths of thousands of flights a day. Further to facilitation, the cutting edge of data visualisation is moving into advanced forms of Human-Computer Interaction, incorporating elements of neuroscience and cognitive psychology into a multidisciplinary approach that makes improved data visualisations possible and that takes them into new extended versions of reality. However, as is often the case with cutting edge technologies, there are unknowns attached to extended realities and risks associated to the effects they may have on society. Furthermore, as increasing complexity inevitably leads to automation, explainability of outcomes becomes an issue too. Other interesting innovations in the field see technologies such as eye-tracking being able to push performance metrics beyond the standard engagement metrics outlined in the previous section.

As Christophe Hurter explained, the radar screen is a good example of using visualisations to link the digital and physical worlds in a highly collaborative and interactive manner. RenderLine is a new generation of data visualisation tool that records dynamic and static forms of air traffic and can efficiently visualise density, particularly over major hubs while also being able to highlight individual flight paths. This brings incredibly dense and complex datasets into simple visual trends, which can, for example, easily show and compare the difference between air traffic levels before and after the pandemic. However, automating the processing of increasingly huge datasets can lead to the black box effect regarding decision-making, when only the decision is known and not the rationale behind it. Here, important work is being done developing grey box solutions that also offer explanations regarding the rationale behind the decisions being made. This helps to bring acceptability of decisions as well as explainability.

In line with a running theme throughout this report, however, such high levels of complexity present new challenges themselves. Challenges, which new and innovative forms of extended reality may be able to address. As stated by Arzu Çöltekin, extended forms of reality can turn the world into a display and in doing so can connect with audiences in new and exciting ways. Incredibly, while strictly speaking, extended reality experiences may not be real, the psychological effects they have are, meaning the emotional connection with the data or the story being told in this way will resonate beyond the virtual or augmented reality where it is experienced into the real world where the data comes from. In this regard, extended reality devices have been described as the ultimate empathy machines as they literally allow users to have memorable experiences embodying the cognition of somebody else.

Finally, and to conclude, while new and innovative technologies such as eye tracking may not be able to measure the impact visualisations have on broader society, they do mark an evolution of the metrics mentioned in the previous section, at least as a tool for honing visualisations to increase their efficacy. Tracking the eye movements of a test subject will offer creators a way to measure how easy it is for users to interpret their visualisations.

Visualisation to unlock Open Data

Albert Cairo, Knight Chair in Visual Journalism, University of Miami

***“Adapt to your audience
[...] but then bring your audience to speed.”***

Visualisation alone is not enough to make data more accessible, transparent, easier to understand. Yes, literacy is high across a broader number of people than it has ever been before, but it visualisation creators must still endeavour to not just meet their audience at their level but then bring them up to speed with the rules of the visualisation they are looking at. There are few limits here either, there are no rules in data visualisation, there is only reason, and it is important to embrace fun and joy in order to make emotive connections with the audience, as perfectly illustrated by the climate change visual, Warming stripes,⁷ which made it to the cover of prominent magazines and newspapers and acted as a rallying cry during climate change protests.⁸ This is because, perhaps rather counterintuitively, as visualisation designers being “true to the data” is just an instrumental goal. The ultimate goal is to be true to the people who read the graphic and the people who are represented in the visualisations. Make their lives easier, better informed, and more joyful.

⁷See: [Warming Stripes](#)

⁸See: [Climate data makes front pages as strikes begin #ShowYourStripes](#)



Rapid-fire talks

The two Catalonias

- [Laura Aragó](#), MTVEC Alumni and Data Journalist, Master's Degree Visual Tools to Empower Citizens (MTVEC) and La Vanguardia
- [Ànnia Monreal](#), MTVEC Alumni and Senior Content Manager, MTVEC

When analysing data, it may seem difficult to spot trends that lend themselves to a compelling narrative. Particularly in cases when data is incomplete, useless and limited as it was with the two Catalonias project, which was analysing the Airbnb effect, which had been so clear in the city of Barcelona across the whole of Catalonia.⁹ At least it was until the data had been cleaned and correlated, which is when the idea of there being two Catalonias began to develop.¹⁰ The data showed distinct relationships between the coast and the interior of the country, there were distinct experiences of the Airbnb effect across different regions of the country. With stories being such a compelling part of visualisations, it is always important to look for the narratives that exist within the data.

Decision Support Tool to predict renewable energy supply for the forthcoming weeks and months

- [Albert Soret Miravet](#), Earth System Services Group Leader, Barcelona Supercomputing Center

While the weather forecast may be a familiar concept, the complexity involved in using a supercomputer to track climate variability understandably feels disconnected from the general public. Visualising data, however, and representing temperature anomalies can be powerful tool for connecting science with society and those tasked with planning and making decisions in its interest. To this end, the Earth System Services Group was able to develop a tool that communicates probability and two different forecast systems to with decisionmakers with limited levels of skill compared to the team's researchers. As well as searching for the narrative, it is also important to think about how to communicate it with the intended audience.

⁹See: The "Airbnb Effect" theory relates to hosts converting long-term rentals that could have been occupied by local residents and families into short-term rentals for visitors contributing to a decrease in the already limited supply of housing.

¹⁰See: <https://tfm-airbnb.vercel.app>



Air quality data visualization via mobile apps

- [Jaume Targa](#), Principal air quality and environmental consultant, 4sfera Innova

Europe has a lot of sensors measuring air quality right across the continent. On average, a single EU country captures 17,000 data points on air quality every day. Air quality experts are able to map and visualize this data, but as device trends limit the screen size available for air quality data visualization, increasing tech literacy and broader access to devices offer greater opportunity for more personalised notifications. These can offer increasingly simplified information, facilitating air quality communications that will be easily understood. It is critical to develop the user experience to ensure that the design facilitates effective utilisation.

Top Rosies Talent

- Karina Gilbert, Co-Founder, Women of COEINF (Col·legi Oficial d'Enginyeria Informàtica de Catalunya)

It is important to temper a report detailing the potential of a new and exciting technology with the message and warning that technology in itself is not a neutral actor but rather a tool wielded by those with their own ends. This means that active steps must be taken to use technology to break down the structural inequalities that exist in society, otherwise it will further reinforce them. An example of this is gender representation in tech fields such as AI, which can have detrimental effects on the development of new technologies and the effects they can have on society and citizens. Top Rosies Talent is working to promote the next generation of female AI talent by catching 20 women at the end of their bachelor studies in STEM and creating training content including gender perspective to open women's minds to the possibilities of AI.

Inspirational Talk: Coming Home – Ideas of the third kind with the Geniverse AI revolution and the age of the super subconscious

- [Javier Ideami](#), Co-Founder, The Geniverse

“Generative AI technology demystifies the human creative process; Metaphorically speaking, it provides us with a set of Iron Man suits that amplify our subconscious pots (our system 1 capabilities), in a win-win process which strengthens our creative muscles and accelerates our creative endeavours”

Building on Daniel Kahneman’s Thinking, Fast and Slow thesis, Javier Ideami sees the current trajectory of artificial intelligence development as being on a path to unlock the mysteries of the human mind. Kahneman identifies two systems of thinking, delineating between the rational and non-rational motivations or triggers relating to both system 1, which is fast, instinctive and emotional and system 2, which is slower, more deliberative and more logical. As artificial intelligence masters system 1 beyond human capabilities, able for example, to solve equations and create beautiful pieces of art in the blink of an eye we sit on the cusp of a superhuman consciousness that can map the intricacies that link system 1 to system 2 further boost and enhance the human creative processes.



Use Cases

Digital divides in the city of Hospitalet de Llobregat

- [Tanya Álvarez](#), Researcher, Digital Future Society
- [Miguel Villalobos](#), UI Engineer, ViT Foundation

New digital technologies offer unprecedented opportunities to overturn the structural inequalities that have historically marginalised many. However, they also offer very real risks further cementing those structural injustices into the fabric of society by placing access to rights, services, and the broader community behind digital gaps that align with them. However, these structural inequalities are based upon intersecting aspects of our identities, creating a complex web that can be difficult to relate to. The city of Hospitalet de Llobregat has visualised these interconnecting relationships and how they relate to the digital divides in the city, in the most ingenious of ways. Starting with gender and dividing out further aspects of a citizen's identity until they are represented with others who share the same characteristics, the city then visualises the citizen's group among the 941 other groups and is able to place them along the spectrum of meaningful connectivity to digital technologies.

Visual Trust: reliability, accountability and forgery in scientific, religious and social images

- [Roger Canals Vilageliu](#), Universitat de Barcelona, Professor of Visual Anthropology

As fake images and misinformation continue to dominate our daily lives, it's easy to assume that people have lost trust in visual media. The Visual Trust project, by conducting experimental, empirical, and comparative research using audio-visual techniques, aims to investigate the notion of trust between different individuals through the prism of social, religious and scientific images. The project seeks to understand what aspects make us trust some images while recognising others as fake and even believing in others. Ultimately, among other aims, the Visual Trust project seeks to explore and establish how social scientists can make images that are trustworthy both for the scientific community and general public.

DisTrack: tracking disinformation in social media

- [Alejandro Martín](#), Associate Professor, Universidad Politécnica de Madrid

Following a call for proposals on how technology could be used to optimise fact-checking processes and help the fight against disinformation, created the winning solution, the AI+DA (Applied Intelligence and Data Analysis) research group of the Polytech University of Madrid created the winning solution, DisTrack. The tool is designed to monitor the spread of false claims on social media platforms such as Twitter. The tool is designed to analyze the entire cascade of the false claim, from its initial appearance on the social networking site to the final tweets published about the topic. The tool visualises the cascading nature of viral stories spreading across social media in a powerful way that immediately puts across the speed with which fake stories can spread as well as where they came from and all the accounts that amplify them.

Atlas project

- [Pere-Pau Vázquez](#),

The Atlas project is a collaborative effort that draws on expertise from across the Polytechnic University of Catalonia (UPC). With thousands of research papers published every year at the UPC, the project aims to create a “knowledge graph” of university research to help map and detect interdisciplinary and emerging areas or research, find relevant groups/authors in a given area, detect clusters of papers, detect keywords related to areas of research or clusters, and offer an overview of all UPC research. Atlas uses natural language processing to assess all UPC projects with machine learning algorithms then classifying the information. The breadth and depth of relevant information makes tracking the areas of confluence and clusters of research extremely difficult without the mapping tool the team has built. The information is displayed through a viewer that enables the user to filter information across various criteria.

UN Environment Programme: Pollution Action Note – Data you need to know

- [Xaquín G.V.](#) Co-Founder, Visualization for Transparency (ViT) Foundation

Air pollution is a major contributor to the global burden of disease, causing an estimated 7 million premature deaths each year. Data on the levels and sources of air pollution around the world, however, are broad and rich, and when you add in the types of causes, numbers of deaths, and government actions and responses it can feel overwhelming. The ViT Foundation, in collaboration with the United Nations Environment Programme (UNEP) has created a tool that brings together and visualises all this relevant data into visually stunning and interactive presentations that, alongside explanatory text explaining in greater detail what it is happening. The tool, utilising several types of visualisations including tilegrams, enables anybody who is interested in the subject from policymakers and researchers to concerned citizens explore aspects of the crisis easily selecting and highlighting broader topics such as impact or policy actions at the global level as well as more focused datapoints such as in-country realities. Furthermore, the ViT Foundation tool is working on making the tool open-source so that other researchers can use it to visualise other important subject matters too.



Workshops

Observable HQ for data science

Observable notebooks allow researchers to share and collaborate together compiling, analysing and presenting information in a manner that facilitates improved collaboration on data visualisation projects. The first part of this workshop explored Observable HQ, which is a powerful tool for collaborating and sharing data visualisations in this way. The second part looked at how to create visualisations using Plot Library, which has been created by the same team. Working with Observable HQ's observable notebook functionality, Plot Library allows users to easily create visualisations from their data libraries.

Tools, platforms, and techniques to visualise Earth Observation datasets

A powerful example of open-source data is those which are generated by satellites orbiting the earth and monitoring a plethora of variables from surface temperature to levels of moisture. Going way beyond Google Maps, this workshop explored the powerful tools, platforms and techniques such as EO browser and the Google Earth Engine API that are openly available for anybody to use to visualize this data to suite various research needs. The visually striking examples used here included tracking the effects of a forest fire in Catalonia and following the lava flows from the volcanic eruption on the Canary Islands in 2021. In essence, these datasets and tools for visualising the data give researchers the ability to travel back in time with powerful sensors for all manner of investigative work.



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