

TOWARDS A HUMAN-CENTRIC INTERNET: CHALLENGES AND SOLUTIONS

MAPPING KEY TECH AND POLICY TOPICS WITH TEXT-MINING

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EXECUTIVE SUMMARY

The main goal of this report is to introduce an online tool that facilitates the exploration of key technology challenges and related policy issues. Based on a text-mining methodology, we have examined and identified the specific topics discussed in a wide range of written media shared on social media platforms.

We focused on six general umbrella topics:

- Environment, Sustainability & Resilience**
- Decentralising Power & Building Alternatives**
- Public Space & Sociality**
- Privacy, Identity & Data Governance**
- Trustworthy Information Flows,
Cybersecurity & Democracy**
- Access, Inclusion & Justice**

For each wide topic, interactive maps present clusters of articles covering related issues, enabling the discovery of problems, opinions and recommendations for solutions. With expert analysis, we have tagged and named these clusters on the map, supporting further analyses by the users.

In order to showcase the potential of the tool, we have prepared a deep dive for the umbrella topic *Access, Inclusion & Justice*.

The reports provides insights on the challenges and solutions related to:

- Open Internet (access to the Internet, control over infrastructure, censorship and content moderation)**
 - Inclusive Tech (gender and racial equality, inclusive education, legal tech)**
 - Ethical Tech (algorithmic bias, military and surveillance application of AI, gig economy)**
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INTRODUCTION

The systematic and unbiased exploration of news, opinion pieces and discussions on selected topics has become a crucial challenge in the age of the “infodemic”. It is increasingly difficult to burst the filter bubble and gain insights on social issues from a wider set of perspectives. However, to tackle global challenges, we cannot afford to drop any good ideas, therefore it is crucial to include voices from a wide spectrum of cultures and social groups.

In academia, there is a long tradition for systematic literature reviews. Such works summarise the insights from scientific articles meeting certain criteria, e.g. the quality of the journal and the keywords of the article. This approach, while not being possible to implement without modifications, provides numerous best practices for a systematic way of knowledge organisation. One key feature is reproducibility: with the same criteria, the review can be repeated by other researchers. The other useful characteristic is the lack of subjective evaluation of sources: once the criteria for the works included in the review are set, there is no way to exclude authors or journals from the dataset.

For this work, we set the following goals:

- To publish a tool for researchers and policy-makers to gain insights on crucial tech issues
- To find a reproducible method to collect a wide range of relevant opinions on tech and policy
- To prepare a methodology for organizing, transforming and analysing text articles
- To demonstrate the methodology and tool via a pilot study

In our previous analyses, we used a set of predefined sources to analyse patterns and find emerging topics in the world of technology.¹ While this approach has enabled us to observe changes in the tech debate over time, the spectrum of policy suggestions and ideas were limited by the restrictions on the number of publishers. In this work, we adjust our approach to data collection: instead of collecting news articles from a list of portals, we collect articles shared on various social media platforms. Therefore, the dataset contains not only news snippets from mainstream Western media, but also blog posts and opinion pieces from different corners of the world. Posts matching certain criteria were collected from three social media platforms: Twitter, Reddit and Hacker News. The main attributes to find relevant posts included a limitation

on content – whether the post included various keywords and links to online articles, time - posts published between January 2018 and March 2021 and language – posts in English. Following the collection of millions of posts, more than 110 thousand unique articles were included in the analysis.

We collected online articles for six wide umbrella topics that are in the focus of the NGI Forward project. The topics are the following:

- Environment, Sustainability & Resilience
- Decentralising Power & Building Alternatives
- Public Space & Sociality
- Privacy, Identity & Data Governance
- Trustworthy Information Flows, Cybersecurity & Democracy
- Access, Inclusion & Justice

Besides modifying the approach to data collection, we also revised our methodology to map articles and discover the discussed topics. Our main aim is to provide a robust tool that visually presents the key topics of tech discussions, facilitating the exploration of specific and narrow areas.

To achieve this, we developed a methodology that identifies documents covering the same tech, policy and social issues, enabling further quantitative (the analysis of keywords) and qualitative analysis (examining the discussed ideas). Our dataset contains thousands of unlabelled text data: prior to the analysis, only the general keywords of articles were known, such as privacy or climate crisis. However, our main ambition is to unravel the specific issues and challenges discussed within these wide areas. There are various NLP (Natural Language Processing) methods that can be used for analysing such datasets:

- Generative statistical models that learn topic dictionaries and assign topics to the documents (e.g. Latent Dirichlet Allocation)
- Models based on word embeddings that represent words as vectors and learn the relationships between them (e.g. Doc2vec)
- Dimensionality reduction techniques that transform the high-dimensional text data to a low-dimensional representation (e.g. t-SNE)

¹ See: <https://fwd.delabapps.eu>

To find the optimal method, we have experimented with all three approaches using a reference dataset that enables the measurement of their accuracy. Based on this study, the t-distributed Stochastic Neighbor Embedding (t-SNE) was chosen as the main method for the grouping of articles. With t-SNE, the articles can be visually represented in a 2D space, where articles covering the same issue will be neighbours. Therefore, intuitive maps can be prepared that present the articles in separate small groups.

For each of the six umbrella topics, a separate map was prepared, available at <https://ngitopics.delabapps.eu/>. The maps present all articles, enabling users to discover both the narrow and the broad themes of discussions. In order to facilitate the use of the maps, we have annotated and tagged the groups of articles. The maps are interactive: the users can explore the titles and open the articles, as well as view the characteristic terms of topics.

To demonstrate the potential of the tool, we have prepared a deep dive for the umbrella topic of *Access, Inclusion & Justice*. This area is concerned with the human rights dimension of tech, such as discrimination, inclusivity, equality and free access to information. Using the relevant map, key insights were

summarised for three issues: Open Internet, Inclusive Tech and Ethical Tech. Based on relevant reports, blog posts and opinion pieces, the most important challenges are described, along with policy and tech solutions. The analysis summarises exciting ideas on many challenges, including algorithmic bias, lack of diversity in tech or the splintering of the Internet.

In order to keep this report concise, we focus on the presentation of the interactive tool and results. The detailed introduction to the methods and measurement of their accuracies can be found in the supplementary methodology report.²

How to read this work:

- If you are interested in the interactive maps and results, jump to the Results section
- If you would like to read the case study and insights on Access, Inclusion & Justice umbrella topic, head to the relevant section
- If you are interested in data science and NLP, read the next sections on the methodologies and datasets, and the supplementary methodology paper.

² <http://ngitopics.delabapps.eu/methodology.pdf>



METHODOLOGY AND DATASET

METHODOLOGY

In this section, we provide a brief introduction to the methodology used in this report. The more detailed elaboration of methods is provided in the supplementary methodology paper.

Our main goal is the identification of narrow topics discussed online within each of the six wide umbrella topics. These specific topics are unknown, as our datasets contain thousands of documents without additional information, such as topic labels. One way to solve this problem is by reading all articles and assigning the topics manually. However, in the case of a large number of articles a human cannot perform this task well: not only is reading speed limited to a few hundred words per minute, but also our memory is imperfect.

Therefore, we turn to various text-mining techniques that can be used to find topics in thousands of articles. These methods group articles based on their semantic similarity, helping to explore the covered issues. Each method has a different approach, and provides different additional analyses.

First, we experimented with Latent Dirichlet Allocation (LDA) and Pachinko Allocation (PA), topic models assuming that topics can be represented as mixtures of words, and documents – as combinations of topics. The advantage of this method is the clear interpretation of results: the algorithm provides the probabilities of topics that are present in the documents, along with the characteristic keywords that form the topics. Prior examples for the results prepared with LDA are available at our website.³

We also considered dimensionality reduction techniques that can be used to represent text data in as little as two dimensions. Our focus has been the t-distributed Stochastic Neighbor Embedding (t-SNE), which has grown to be one of the most often used unsupervised learning techniques. With t-SNE, articles can be visualised on a map, with articles covering similar subjects being placed close to each other in the two-dimensional space. The opportunity to organise articles in an interactive way is a major advantage of this method.

Finally, we also experimented with word embedding models that assign a multi-dimensional vector to each word. Such models can also take into account information on paragraphs or documents, using document vectors. The advantage of this approach is that further analyses can be prepared based on the word vectors, such as arithmetic operations: a well-known example is *king + woman - man = queen*. Additionally, the similarity of vectors can be calculated using the cosine function, enabling the analysis of related terms.

In order to ascertain what the optimal method is, we need ground truth: the desired classification outcome. We have no valuable ground truth regarding the topics in our datasets, as classification schemes vary between websites. Therefore, we used a reference dataset to measure the accuracy of each method. The *Reuters* dataset⁴ contains not only articles, but also the categories and labels for each article. Its properties resemble our datasets: it has multiple topics of unequal size, contains technical terms, and it is not too sensitive to cleaning methods or prone to volatile results.

Following the experiment that is presented in detail in the methodological supplement, we chose the t-distributed Stochastic Neighbor Embedding (t-SNE) as the main method for the grouping of articles. While the results confirmed that there is no single state-of-the-art method which outperforms all other methods across all metrics, the methodology based on t-SNE has proven to be robust and consistent.

DATA COLLECTION

The NGI Forward project has identified 6 umbrella topics related to the social challenges of internet technologies in a brainstorming session conducted in February 2021. The aim of the exercise was to map all critical NGI areas and find a shared understanding of the NGI field based on the consortium's previous works.

Table 1 provides an overview of the umbrella topics, along with the keywords used for the collection of data. The selection of keywords were informed by the workshop and previous results of the project.

³ <https://fwd.delabapps.eu>

⁴ <https://kdd.ics.uci.edu/databases/reuters21578/reuters21578.html>

We have selected Twitter, Reddit and Hacker News as our data sources. In the selection process we have considered the following criteria:

- Tech-oriented user base
- Diverse audience (Twitter mostly representing tech mainstream, while Reddit's and Hacker News' userbase is tech-savvy)
- Data availability (API or BigQuery storage)

In the first step, we have collected posts containing selected keywords and links to media articles. In this process we have utilized - the official Twitter API,⁵ Reddit's Pushshift API⁶ and Hacker News BigQuery database.⁷ In the case of Twitter, the sample sizes required reduction for further analysis. Therefore, to focus on the most influential content, posts that were retweeted less than three times were dropped from the analysis. Next, we have extracted article text and metadata with the use of the Python package Newspaper3k.⁸ For some major sites, when the procedure was not successful, we have retrieved the data using custom Selenium web scrapers.⁹ Additionally, we have checked URL redirections in a case of shortened links provided by bit.ly, lnkd.in, buff.ly and guided Newspaper3k to the original article links. In the case of Twitter, articles shorter than 1000 characters were deleted from the sample - these usually indicated issues with text extraction, such as paid content.

(See Table 1 Umbrella topics and keywords used for article extraction)

In some cases, we have used multiple versions of a keyword, taking into account different spellings and parts of speech e.g. "sustainable", "sustainability" or "decentralisation", "decentralisation", "decentralised". For Twitter and Reddit, we have added a requirement - along with our keywords the articles had to include the words: "online", "tech" or "technology" in certain instances (example query: "technology + democracy"). This procedure was introduced in order to filter out articles beyond the scope of our study.

Table 1 Umbrella topics and keywords used for article extraction.

Umbrella topic	Keywords
Environment, Sustainability and Resilience	climate crisis global warming right to repair climate change sustainability
Decentralising Power and Building Alternatives	open-source blockchain competition decentralization
Public Space and Sociality	public space smart city offline
Privacy, Identity, and Data Governance	online privacy data privacy data governance personal data digital id e-id encryption anonymity
Trustworthy Information Flows, Cybersecurity and Democracy	fake news filter bubble democracy cybersecurity censorship
Access, Inclusion and Justice	discrimination justice ethical inclusive freedom human rights open internet equality

⁵ <https://developer.twitter.com/en/docs/twitter-api>

⁶ <https://github.com/pushshift/api>

⁷ <https://console.cloud.google.com/marketplace/product/y-combinator/hacker-news>

⁸ <https://newspaper.readthedocs.io/en/latest/>

⁹ Sites scraped with Selenium: [bbc.com](https://www.bbc.com), [bbc.com](https://www.bbc.com), [forbes.com](https://www.forbes.com), [link.medium.com](https://www.link.medium.com), [nytimes.com](https://www.nytimes.com), [cnn.it](https://www.cnn.it).

title	link	date	text	domain	length
China's 'Sharp Eyes' Program Aims to Surveil 1...	https://onezero.medium.com/chinas-sharp-eyes-p...	2021-03-02 16:41:34.950000+00:00	China's 'Sharp Eyes' Program Aims to Surveil 1...	onezero.medium.com	10030.0
erfront oronto resets ns for ayside s...	https://www.theglobeandmail.com/canada/toronto...	2021-03-10 07:00:00-05:00	Open this photo in gallery Drawings of a conce...	www.theglobeandmail.com	5213.0
Op-ed: Tech, class, icism, and demic rea...	https://www.archpaper.com/2021/02/op-ed-tech-c...	2021-02-24 17:37:20+00:00	It didn't take long for the coronavirus pandem...	www.archpaper.com	8928.0

Fig. 1 Snapshot of the final dataset.

SOURCES

Twitter with 87944 articles is by far our largest source, preceding Reddit (16090) and Hacker News (7105).

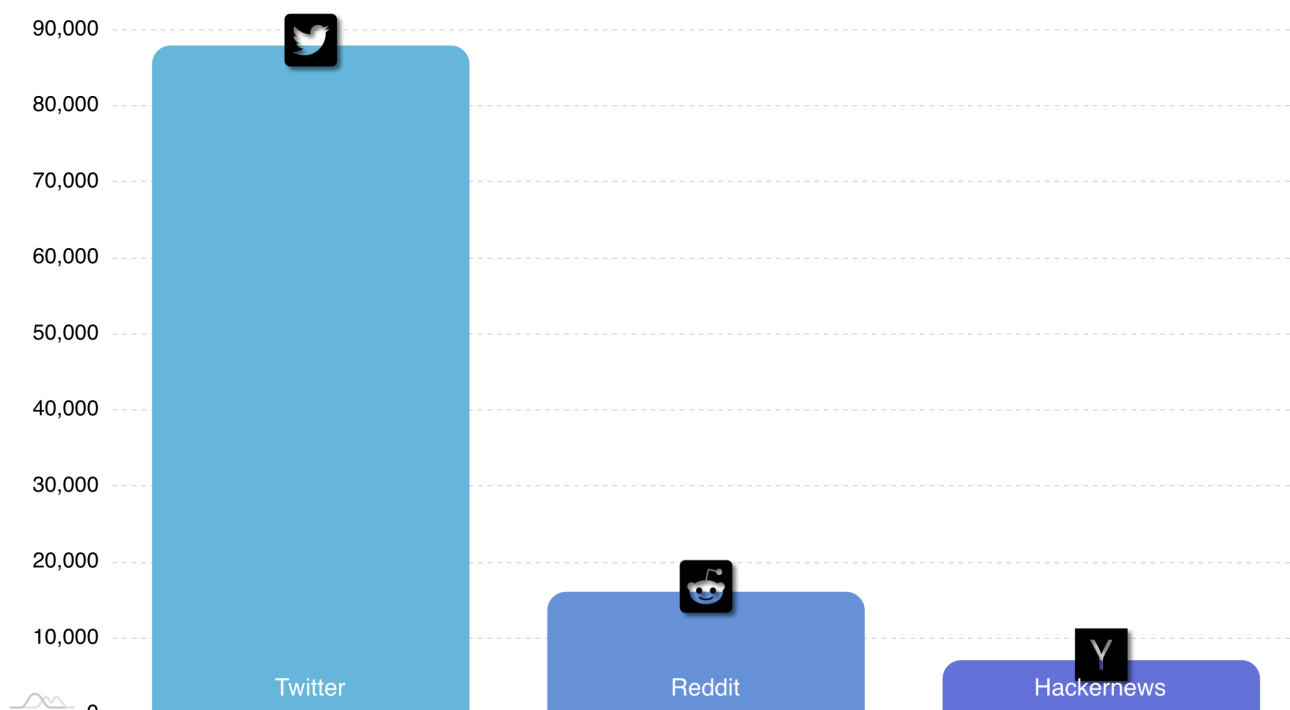


Fig. 2 Number of articles retrieved per source.

Among the top domains we can find blog platforms (Medium, Github Pages), tech sections of popular news sites (NYTimes, The Guardian), mainstream tech magazines (Techcrunch, Arstechnica), as well as specialized tech sites like Spiked-online (focused on politics) or CPOmagazine (focused on privacy and cybersecurity). In Fig. 3 we present the top 15 domains. Our dataset is characterised by a long-tailed distribution, as the overall number of the unique domains is over 15 thousand. The abundance of sources enables us to include a variety of voices in the current tech debate, coming from authors with different backgrounds. Hoping to capture the unique perspective of authors outside the often overrepresented mainstream Western outlets, we did not restrict our sources to any specific part of the world or type of publishing. Therefore, our analysis covers articles published not only in e.g. Wired or Arstechnica, but also such domains as iafrikana.com, theafricareport.com, thehindu.com or thetaiwantimes.com.

In the following section we briefly describe three social media platforms we used for articles collection.

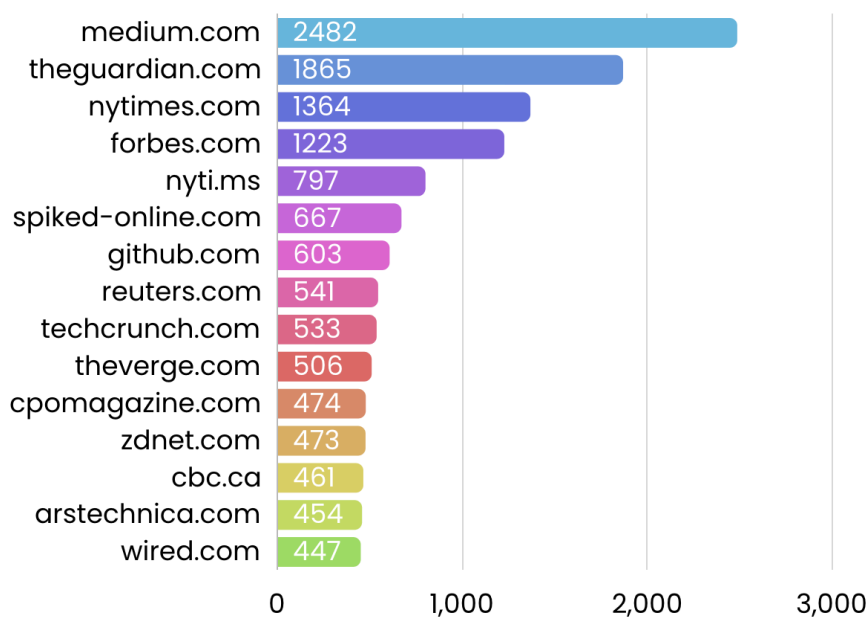


Fig. 3 Top 15 domains prevalent in our dataset.

1. Twitter

Twitter microblogging platform is one of the key places of the modern tech debate. According to Twitter’s own clustering analysis, conversation on the future of technology is among the fastest-evolving ones on the platform.¹⁰

NYTimes, Forbes and The Guardian are the most prevalent domains from Twitter in our analysis. However, we can also find a large number of blog posts (Medium) and more specialized articles (e.g. CPOMagazine) (see: Fig. 5).

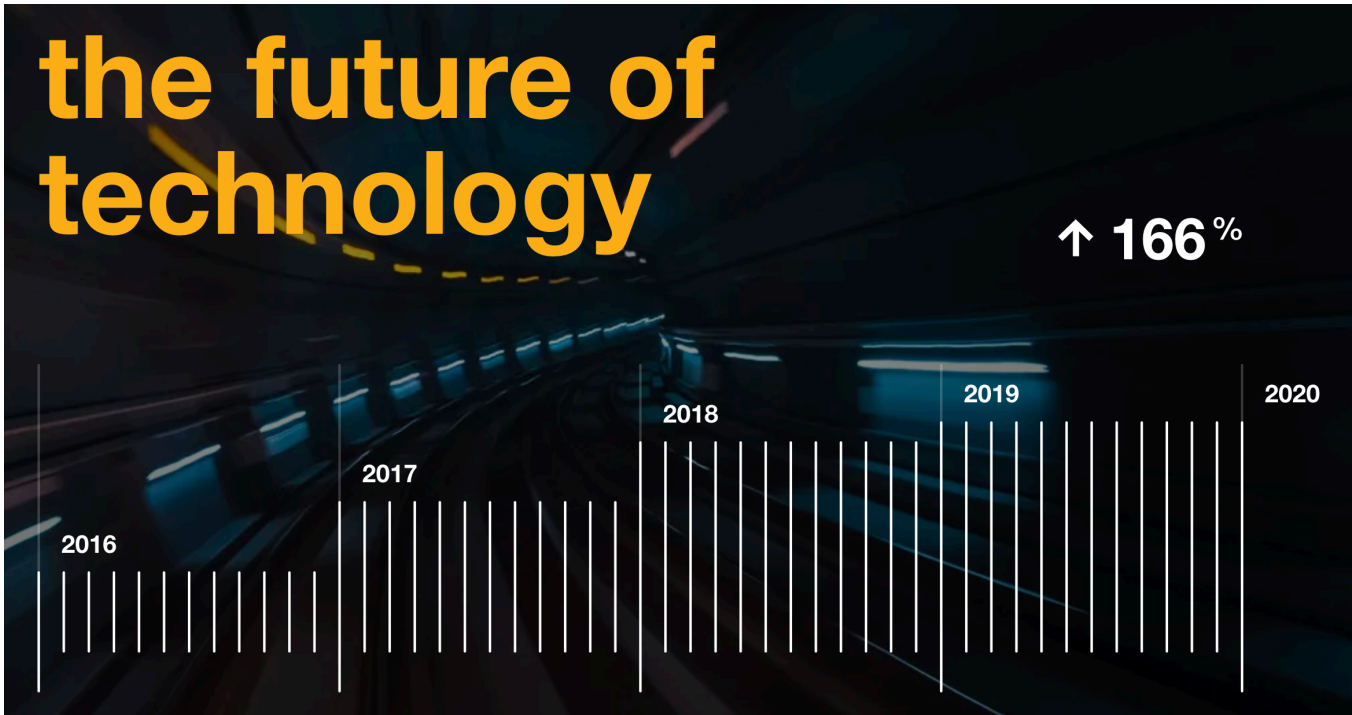


Fig. 4 Popularity of the future of technology discussions on Twitter. Source: Twitter, <https://marketing.twitter.com/en/culture-and-conversations#/tech-life>.

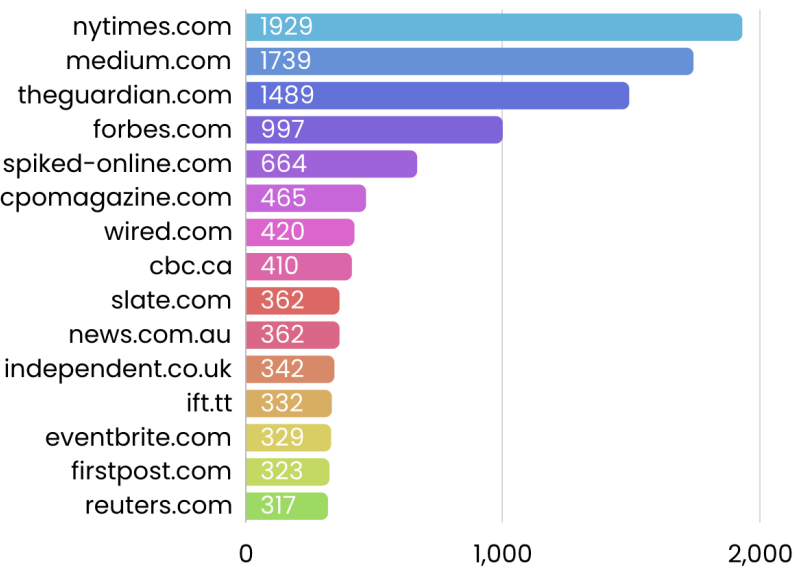


Fig. 5 Top 15 domains Twitter.

¹⁰ <https://marketing.twitter.com/en/culture-and-conversations#/>.

2. Reddit

Reddit is a social news aggregation and discussion website ranking among the top 20 most visited websites in the world.¹¹ The site's content is divided into categories or communities known as "subreddits", of which more than 130 thousand are active.¹²

The top article sources shared on Reddit are the ones that are also often mentioned on Twitter (e.g. Medium, Forbes, NYtimes). On the other hand, in Fig. 7 we can see sources outside the US-EU perspective (thehindu.com), as well as ones representing the nonprofit (eff.com) and scientific communities (sciencedaily.com).

Tech subreddit

About Community

The goal of /r/tech is to provide a space dedicated to the intelligent discussion of innovations and changes to technology in our ever changing world. We focus on high quality news articles about technology and informative and thought provoking self posts.

393k

Members


1.2k

Online

Created 25 sty 2008

Futurology subreddit

About Community

 r/Futurology

Welcome to r/Futurology, a subreddit devoted to the field of Future(s) Studies and speculation about the development of humanity, technology, and civilization.

15.5m

Members

1.9k

Online

Created 12 gru 2011

Technology subreddit

About Community

Subreddit dedicated to the news and discussions about the creation and use of technology and its surrounding issues.

10.8m

Members

5.9k

Online

Created 25 sty 2008

Privacy subreddit

About Community

The intersection of technology, privacy, and freedom in a digital world.

1.2m

Members

1.3k

Online

Created 21 mar 2008

Fig. 6 Example labels of Reddit's technological subreddits.
Source: Reddit.com.

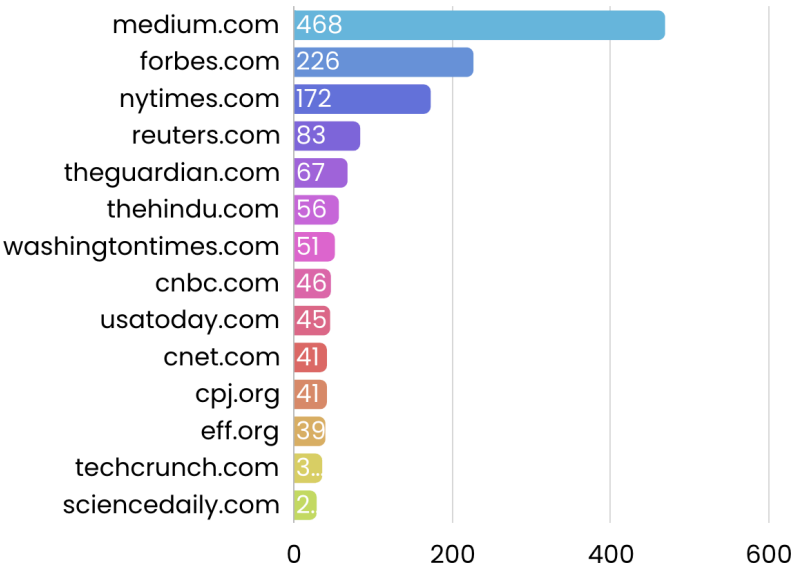



Fig. 7 Top 15 domains Reddit.

11 <https://www.alexa.com/topsites>
12 <https://en.wikipedia.org/wiki/Reddit>

3. Hacker News

Hacker News is a social news website attracting a technical audience. The word hacker in "Hacker News" is used in its original meaning and refers to the hacker culture which consists of people who enjoy fiddling with technology.¹³

The most frequently shared source on Hacker News, in the context of the six umbrella topics we have identified, is Github - a popular provider of Internet hosting for software development, also offering blog functionalities and wikis for software projects (see: Fig. 9).


Hacker News
[new](#) | [past](#) | [comments](#) | [ask](#) | [show](#) | [jobs](#) | [submit](#) | 2020-10-21

Stories from October 21, 2020

Go back a [day](#), [month](#), or [year](#). Go forward a [day](#) or [month](#).

- ▲ **Facebook Container for Firefox** (mozilla.org)
1457 points by sushicalculus 9 months ago | [hide](#) | 425 comments
- ▲ **PayPal to allow cryptocurrency buying, selling and shopping on its network** (reuters.com)
942 points by epaga 9 months ago | [hide](#) | 370 comments
- ▲ **Hands-Free Coding: How I develop software using dictation and eye-tracking** (joshwcomeau.com)
608 points by joshwcomeau 9 months ago | [hide](#) | 137 comments
- ▲ **Stable 1.2 Gigabit/s Internet achieved in moving train in Switzerland** (swisscom.ch)
420 points by richx 9 months ago | [hide](#) | 349 comments
- ▲ **The majority of Facebook's traffic now uses QUIC and HTTP/3** (fb.com)
414 points by mostdefinite1 9 months ago | [hide](#) | 139 comments
- ▲ **1Password for Linux beta** (1password.com)
413 points by FinnLeSueur 9 months ago | [hide](#) | 239 comments
- ▲ **United States vs. Google** (stratechery.com)
404 points by headalgorithm 9 months ago | [hide](#) | 335 comments
- ▲ **SQLite now allows multiple recursive SELECT statements in a single recursive CTE** (fossil-scm.org)
398 points by thunderbong 9 months ago | [hide](#) | 75 comments
- ▲ **Discipline Doesn't Scale** (sicpers.info)
320 points by ingve 9 months ago | [hide](#) | 169 comments
- ▲ **Study reveals restoration of retinal and visual function following gene therapy** (uci.edu)
217 points by gmay 9 months ago | [hide](#) | 45 comments

Fig. 8 Example of Hacker News front page submission list. Source: <https://news.ycombinator.com/news>.

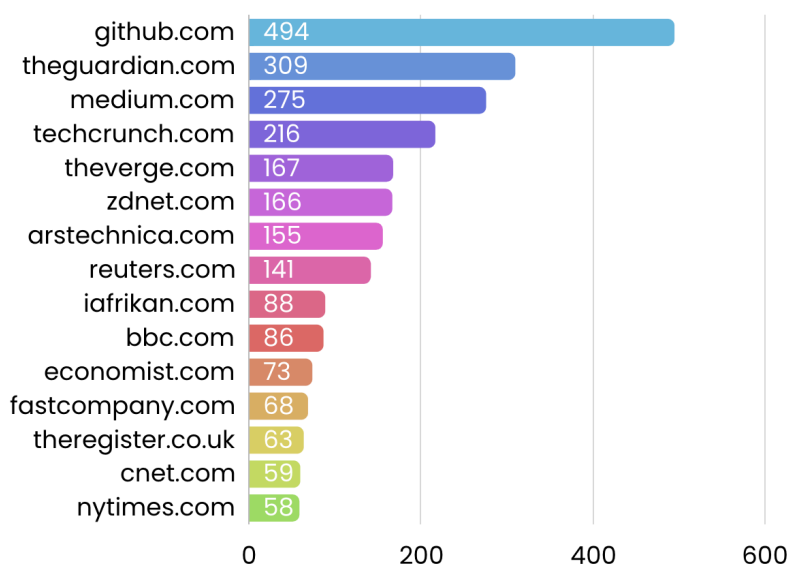


Fig. 9 Top 15 domains Hacker News.

¹³ https://en.wikipedia.org/wiki/Hacker_News

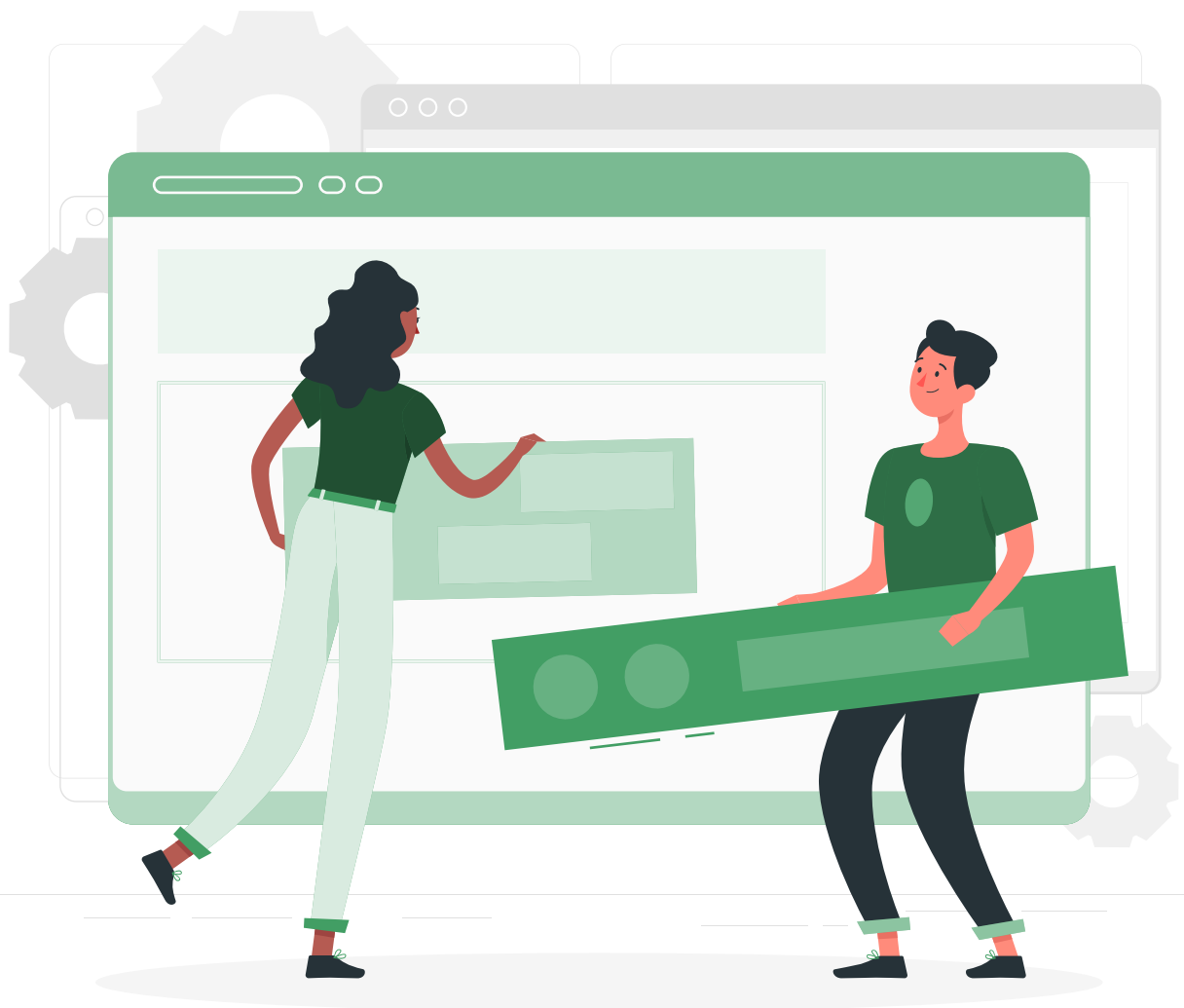
RESULTS

In this section we summarise the main clusters identified in the six umbrella topics. For each umbrella topic, a separate map was prepared. The maps present all articles posted on Twitter, Hacker News and Reddit featured in our dataset. The interactive versions of maps that enable the exploration of clusters and reading the articles are available online: <https://ngitopics.delabapps.eu/>.

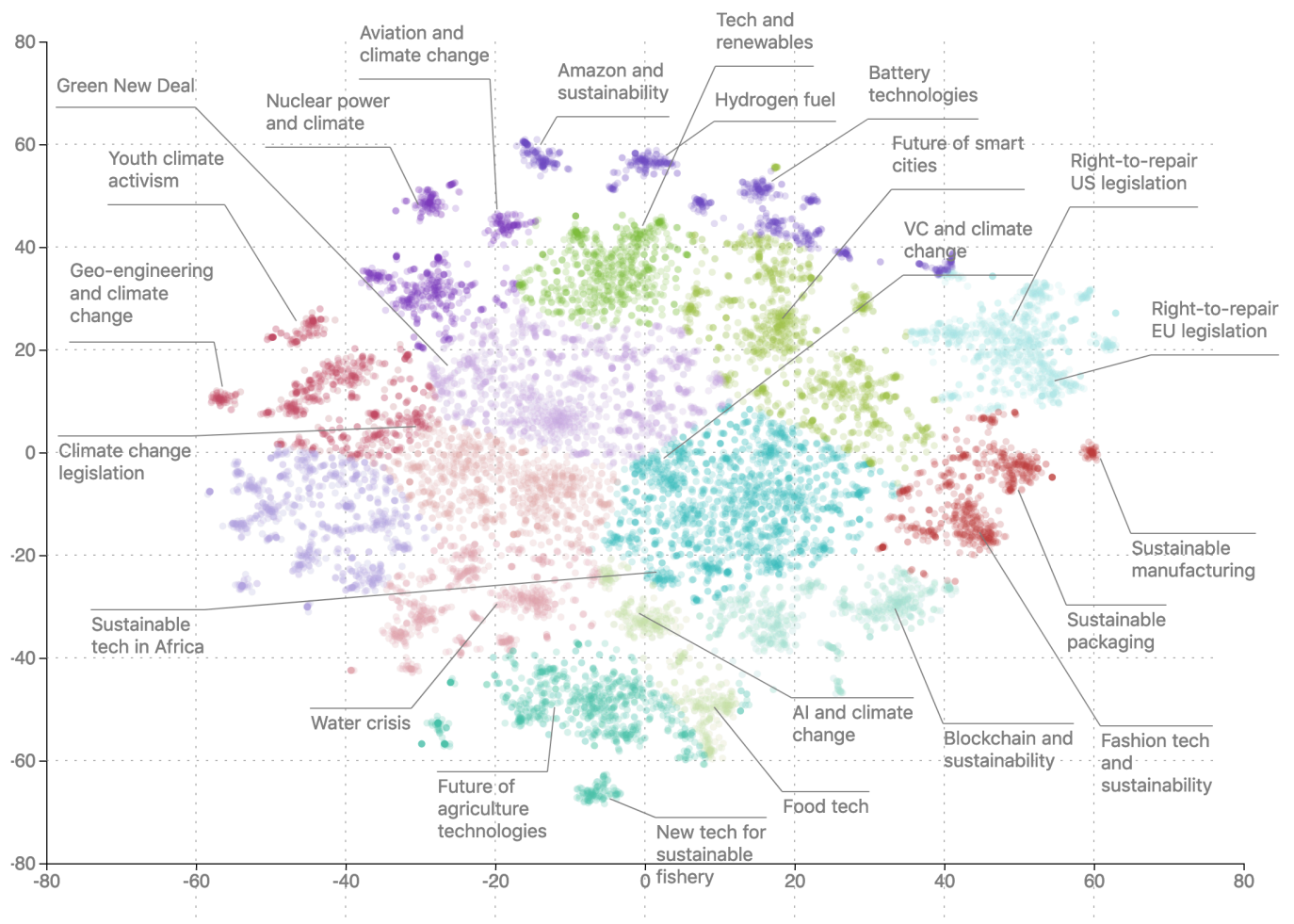
Each dot represents an article: articles close to each other on the map cover the same issue. Therefore, we could identify the narrow topics discussed in the small article groups. Using qualitative analysis, we have examined the text and titles of articles to select the most relevant clusters and assigned the tag descriptions. These topics are highlighted on the maps: the arrow is indicating the subject and the location of the article cluster.

The maps also contain various colours that signal the wide clusters of documents. These clusters were assigned with the use of a clustering algorithm (Gaussian mixtures), hence the colours highlight documents that belong together based on their location on the map. As the maps show, these wide clusters contain multiple small document clusters and narrow topics. Therefore, the colours provide further support in the exploration of the relationships between topics. In the case of the online tool, users can also view characteristic keywords for the identified wide clusters.

In the following sections, we provide a list of the narrow topics identified in each map. To facilitate further analysis, research questions are highlighted for each narrow topic. Readers are encouraged to explore interesting articles themselves using the online tool.



ENVIRONMENT, SUSTAINABILITY AND RESILIENCE



This umbrella topic is focused on the accelerating threat of climate change and its links with technological development. In particular, we analysed articles and discussions related to global warming, sustainability, and the right to repair.

Nuclear power and climate

What nuclear technologies can offer to address climate change? How can we tackle the problem of nuclear waste?

Aviation and climate change

The global scale and growth of aviation: what are the implications for climate change?

Amazon and sustainability

How does the online shopping giant deal with its carbon footprint (that rivals that of a small country)?

Tech and renewables

Can renewable technology help reduce energy costs? What are the challenges of energy storage?

Hydrogen fuel

Is hydrogen the energy solution of the future? How can it compete with battery technology in transportation?

Battery technologies

What are the advances in battery storage technology? Can innovative batteries drive the future of sustainability?

Future of smart cities

Does the tech sector hold the key to making cities liveable, efficient and sustainable? What can be the future of the smart city concept?

VC and climate change

What kind of investment instruments do sustainable startups need? Is the startup boom sustainable?

Right-to-repair US legislation

What is the fate of the right-to-repair electronics battle? What does the implementation process look like in different states? What is the reaction of the big tech companies?

Right-to-repair EU legislation

Will the European Green Deal fulfill the promise of “reusable, durable and repairable products”?

Sustainable manufacturing & packaging

How 3D printing and the use of digital technologies can lead to more sustainable manufacturing and packaging?

Fashion tech and sustainability

How technology can help in achieving sustainability in the fashion industry? What is the role of VR, 3D, blockchain and other solutions?

Blockchain and sustainability

Can blockchain technology be used to manage climate change? How is blockchain used for creating sustainable and transparent supply chains?

AI and climate change

How can AI help fight climate change? Discussion of various solutions from monitoring deforestation to designing low-carbon materials.

Food tech, Future of agriculture technologies & New tech for sustainable fishery

Can smart farming utilizing IoT systems lead to a more sustainable agriculture? What are the new tech paradigms in the food industry?

Water crisis

What are the AI initiatives in the field of water management? Can AI be used to address water scarcity?

Sustainable tech in Africa

What is the impact of digital transformation on Africa? How does the widespread use of mobile technologies change the nature of work on the continent?

Climate change legislation

What are the recent political efforts in the global fight against climate change? What can we expect after the upcoming COP26 (to be held at the end of 2021)?

Geo-engineering and climate change

Are geo-engineering and carbon capturing technologies effective in tackling climate change?

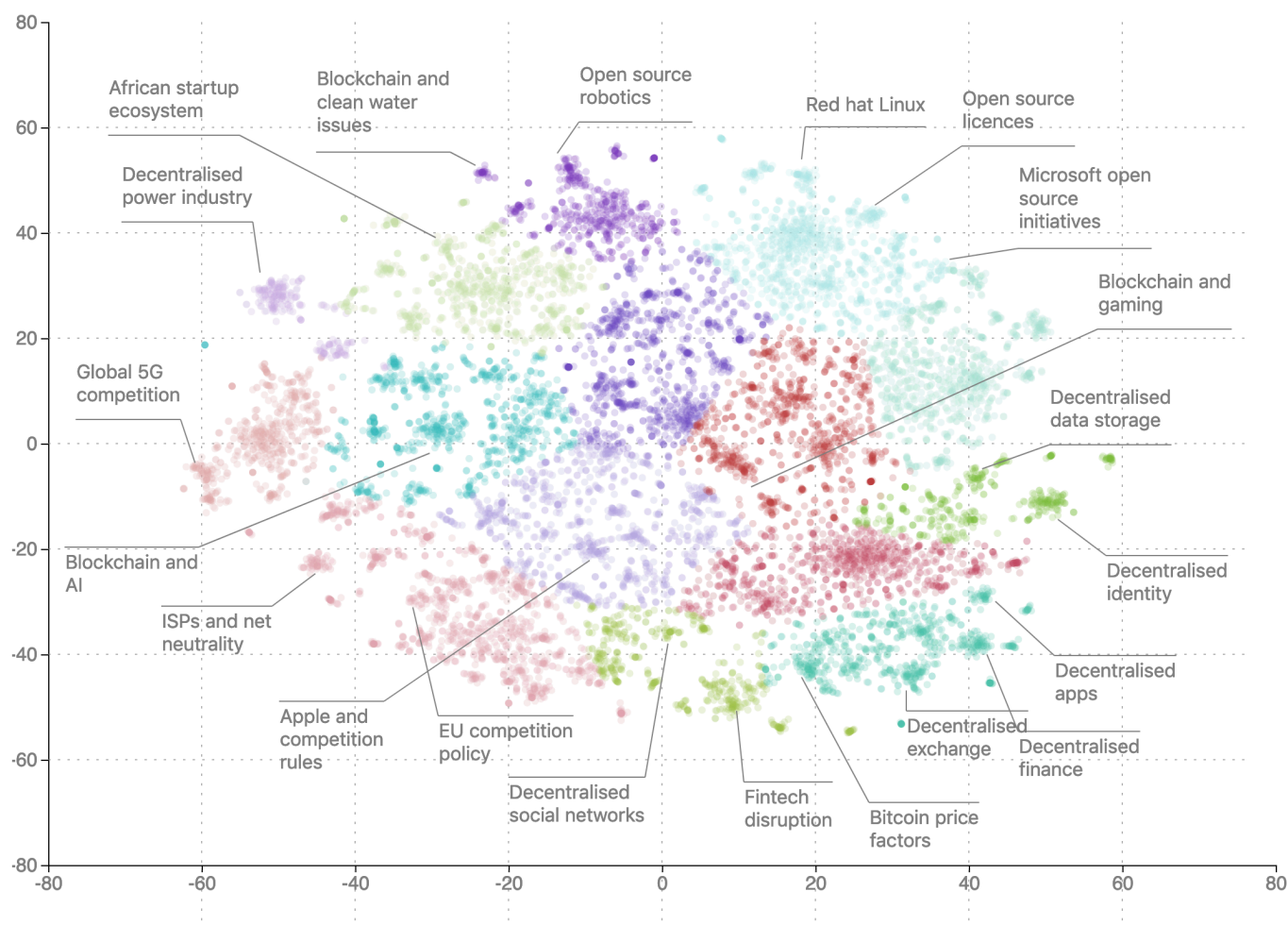
Youth climate activism

How does the young generation promote the fight against climate change?

Green New Deal

Could the fight with the climate crisis be a chance for transformative growth on scale with the industrial and information revolutions? What are the foundations of the US Green New Deal?

DECENTRALISING POWER AND BUILDING ALTERNATIVES



This umbrella topic revolves around infrastructure, decentralised and open source technologies, and their impact on market competition.

African startup ecosystem

What are the strengths and weaknesses of the African digital startup ecosystem?

Blockchain and clean water issues

Can blockchain help solve the global water shortage? Blockchain enthusiasts claim that centralized processes tend to be bogged down by transparency and security issues. Lack of trusted information often disincentivizes donors from continuing to contribute to these worthy causes. However, blockchain technologies and specialized utility tokens can be applied to support clean water initiatives.

Open source robotics

What are the latest developments in robotics? Examples of open source projects include applications in medicine, future of microrobotics and insights from DARPA competition.

Red hat Linux

What are the consequences of IBM acquiring Red Hat - the maker of open-source enterprise software for cloud computing?

Open source licenses

What is the future of open source development philosophy? What do the new types of open source licenses offer their users and how do open source initiatives fight the abuse from commercial firms?

Microsoft open source initiatives

What does migrating towards the open source model mean for the Redmond tech giant, Microsoft? What are the consequences of the 2018 acquisition of GitHub, the world's leading software development platform?

Blockchain and gaming

How is blockchain used in creating decentralised games, particularly in the massively multiplayer online (MMO) genre? Will blockchain help advance the gaming industry with decentralised asset exchange systems for collectibles and combating in-game frauds?

Decentralised data storage

Centralized cloud storage services put user data at risk - claim blockchain advocates. Will decentralised cloud storage prove to be a solution for protecting user privacy and data security?

Decentralised identity & apps

The idea behind a decentralised ID system is that no single person or entity controls the stored personal information. This means that users are empowered to have control over their own personal data. Is decentralisation a future for identity management?

Decentralised finance & exchange

The main idea behind decentralised finance (DeFi) is that software can act as a financial intermediary and that it is possible to take the key building blocks of the financial markets — activities like borrowing and lending, or trading and exchanging — and create software that runs online, independent of any institution. What will be the impact of DeFi on the financial system?

Bitcoin price factors

Bitcoin is the first and the most popular cryptocurrency. Its significant price volatility attracts a wide range of theories on the factors behind its valuation. What determines the price of Bitcoin and what will be its value in the long run?

Decentralised social networks

Do social networks need standards? Can decentralised systems solve crucial challenges, such as the spread of misinformation?

EU competition policy

How is the EU rebooting its competition laws for the requirements of the digital era? How is it going to level the playing field between new entrants, incumbents with a long history and Internet giants?

Apple and competition rules

Apple faced criticism from competitors and regulators because of its business practices over the years. Does Apple distort competition in the app market?

ISPs and net neutrality

Net neutrality is the principle that Internet service providers (ISPs) must treat all Internet communications equally, and not discriminate or charge differently based on user, content, website, platform, application, type of equipment, source address, destination address, or method of communication.¹⁴ What are the prospects for effectively regulating ISPs?

Blockchain and AI

The promise of decentralised AI is that it can ensure exchange of data between entities while keeping the sensitive data safe and local (e.g. between hospitals or autonomous cars). When could this promise be fulfilled at a large scale?

Global 5G competition

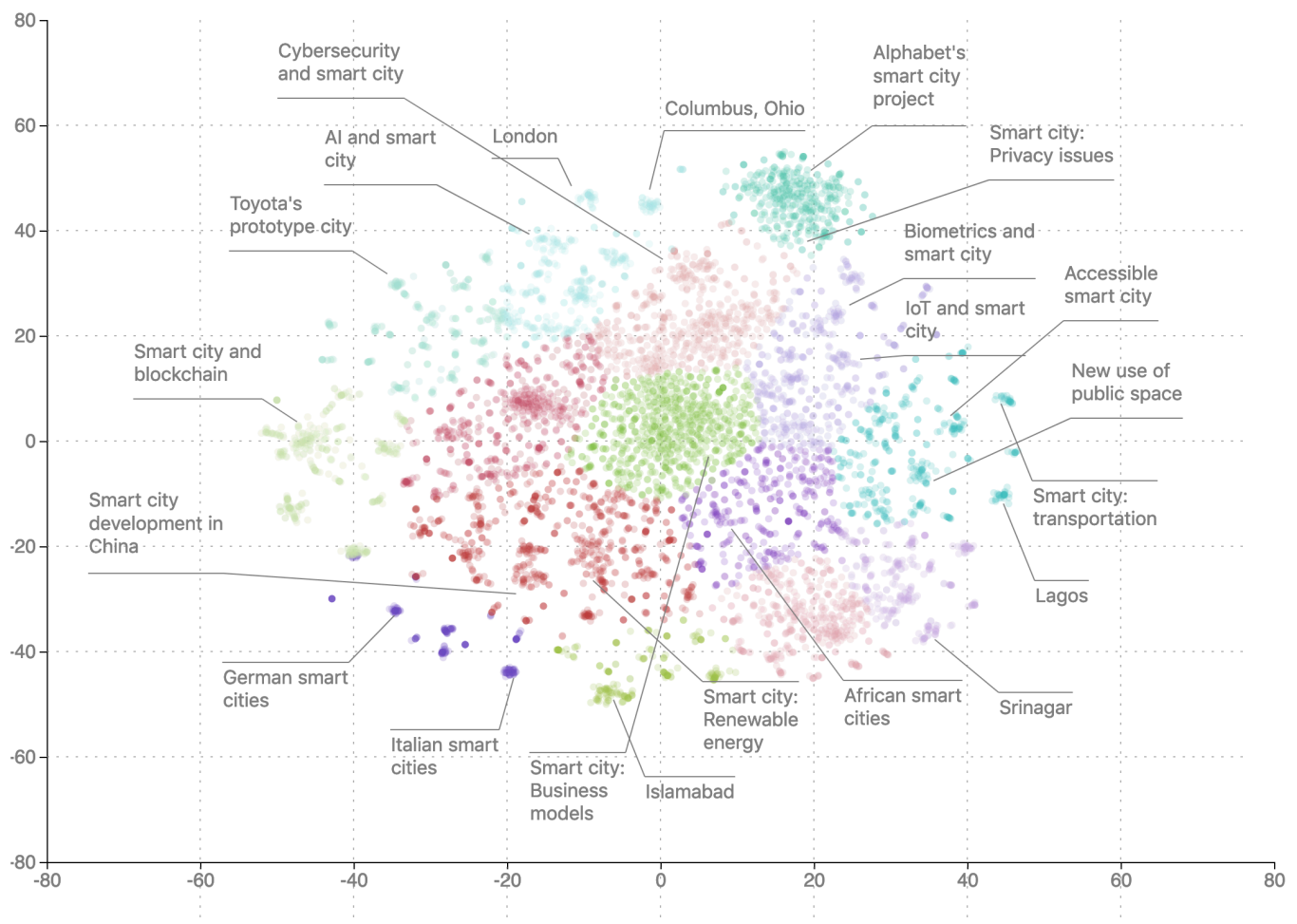
What are the stakes in the global race for 5G supremacy? The articles tell the story of a trade war, banning Huawei from supplying 5G infrastructure in various countries, US attempts to catch up with the Chinese 5G tech sector and the stance and place of the EU in this competition.

Decentralised power industry

Can blockchain effectively back the energy systems? How is the smart grid disrupting traditional energy markets?

¹⁴ Easley, R., Guo, H., Krämer, J., (2017), *From Net Neutrality to Data Neutrality*, *Information Systems Research* 29(2):253-272".

PUBLIC SPACE AND SOCIALITY



This umbrella topic is concerned with the technological transformation of the public space and its social consequences. It concentrates on the smart city concept, i.e. urban areas managed with the help of large streams of data and IoT systems. The collected articles describe different realizations of the smart city idea all around the world, as well as various challenges behind the technologies.

Toyota's prototype city

Toyota's Woven city is supposed to be a testing ground for the development of autonomous vehicles, robotics, smart-home systems, and other future tech in a real-world environment. What are the challenges involved and how has the pandemic affected the project?

AI and smart city

What is the role of AI in smart cities? How is AI used in smart cities for ensuring safe traffic management?

London

What is the story of technological innovations in London? How is the city promoting app-based services? What are the main challenges and plans for the future?

Columbus, Ohio

How the grant from the U.S. Department of Transportation helped transform Columbus into a smart city? Should smart city transformation be funded by national bodies?

Alphabet's smart city project

What are the ethical concerns related to smart city development on Toronto's waterfront? How has the COVID-19 pandemic impacted the plans of building a digital-first city in Toronto?

Smart city: Privacy issues and biometrics

Is the smart city concept a manifestation of surveillance capitalism? What are the privacy concerns related to ubiquitous data collection with the use of sensors?

IoT and smart city

What are the recent developments in IoT systems for smart cities management (devices such as connected sensors, lights, and meters to collect and analyze data)?

Accessible smart city

What technologies can be used for improving the accessibility of public spaces for inhabitants with disabilities?

New use of public space and transportation

Smart parking solutions, the rise of autonomous vehicles and alternative transportation modes pose questions on the use of public space. Are contemporary cities prepared for technological challenges?

Lagos

How did the plans of turning Lagos into a smart city receive a boost from major Chinese tech companies? Is it possible to transform a mega city into a smart city?

Srinagar

What are the efforts of Kashmir authorities to develop smart city solutions in the region?

Smart city: Renewable energy

Increased use of renewable energy is considered to be a prerequisite for sustainability, which is a core objective for smart city development. What are the recent developments in utilizing renewable energy in smart city solutions?

Italian smart cities

Italian cities rank far behind other regions in smart city rankings. Is Italy ready for smart city transformation?

German smart cities

German smart cities are heavily linked with the national technology ecosystem (mostly from the IoT area). What is the future ahead of German smart cities?

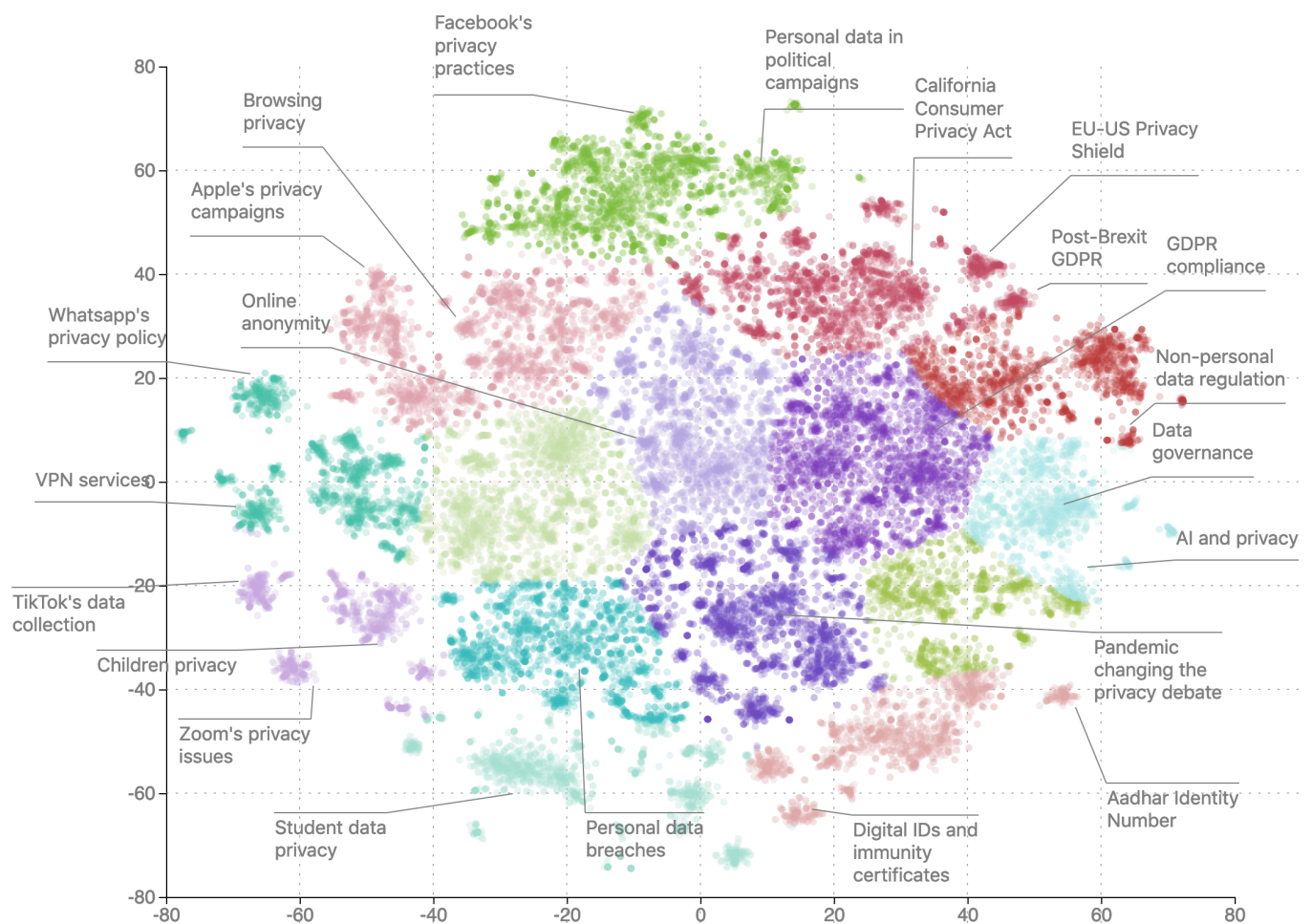
Smart city development in China

The Chinese model of smart city development based on massive surveillance is a growing concern of the international public opinion. China has submitted smart-city proposals to international standardization bodies. Are these proposals along with Chinese technology export a threat to democratic systems?

Smart city and blockchain

Can smart cities be run on blockchain? What are the available solutions across the world?

PRIVACY, IDENTITY & DATA GOVERNANCE



This umbrella topic deals with the conundrum of online privacy faced by the tech sector and regulators. It covers legislative efforts in the EU and US for improving privacy protection, various digital identity verification methods, security of online personal data and tensions between the comfort of online services provided by tech giants and user privacy.

Facebook's privacy practices

What is the value of privacy? The articles describe Facebook's repeated privacy lapses resulting in court penalties.

Personal data in political campaigns

Who influences our votes? How do they do it? What should be the code of practice for using online personal data in political campaigns?

California Consumer Privacy Act

California passed a landmark privacy protection act in 2018 despite the lobby of tech giants. How has it changed the US data privacy landscape? Is CCPA the US GDPR?

EU-US Privacy Shield

The EU-US Privacy Shield was a framework for regulating transatlantic exchanges of personal data for commercial purposes between the European Union and the United States.¹⁵ In 2020, the European Union Court of Justice invalidated the EU-US Privacy Shield in its decision in *Facebook Ireland v. Schrems*. The court determined that the Privacy Shield transfer mechanism does not comply with the GDPR. What was the purpose and history of the agreement?

Post-Brexit GDPR

What should the post-Brexit transfers of personal data look like? Will the UK meet the EU's strict data protection requirements?

GDPR compliance

What are the GDPR consequences for the business world? Does GDPR compliance equal security?

Non-personal data regulation

What are the obstacles to the free flow of non-personal data? Should companies and public administrations process non-personal data wherever they choose?

Data governance

What are the data governance best practices? Is data governance all about compliance or is it good for business? Examples from different countries and sectors.

AI and privacy

Most of the privacy-sensitive data analytics is driven nowadays by machine learning algorithms. How can we protect privacy in the AI-driven world?

Pandemic changing the privacy debate

Has the COVID-19 pandemic changed the way we look at our personal data? How should we treat sensitive medical records and track location data at times when it can be used for managing the worldwide crisis?

Aadhar Identity Number

Aadhaar is a 12-digit unique identity number that can be obtained voluntarily in India.¹⁶ Is Aadhaar related to data breaches and violations of privacy?

Digital IDs and immunity certificates

How digital IDs are used all around the world for issuing vaccination certificates? What are the privacy risks involved?

Personal data breaches

Personal data is a highly valued type of data to compromise. In recent years, we observe a rise in personal data breaches, often utilizing new techniques. Articles describe stories of the most notorious attacks.

Students and children data privacy

What does privacy in pandemic-era education look like? Do students barter their personal data for "free" services?

Zoom's privacy issues

Before the COVID-19 pandemic, Zoom was barely known outside the enterprise IT world. During the pandemic its use became ubiquitous, despite its numerous privacy and security flaws. Have these issues been fixed?

TikTok's data collection

What are the risks related to the Chinese video sharing app TikTok? Is data privacy one of them?

VPN services & online anonymity

How can users protect their online privacy? One of the simplest and most popular solutions are virtual private networks. Articles describe how VPNs can improve online security and privacy.

Whatsapp's privacy policy

What is Whatsapp's monetization strategy? What data does it share with Facebook? The articles discuss concerns about the privacy policy of the popular messaging and VoIP app.

Apple's privacy campaigns

Apple has cultivated a reputation for its commitment to protecting users' privacy. How does this commitment look like in practice? What is the threat from the "data industrial complex" that CEO Tim Cook warned us in 2018?

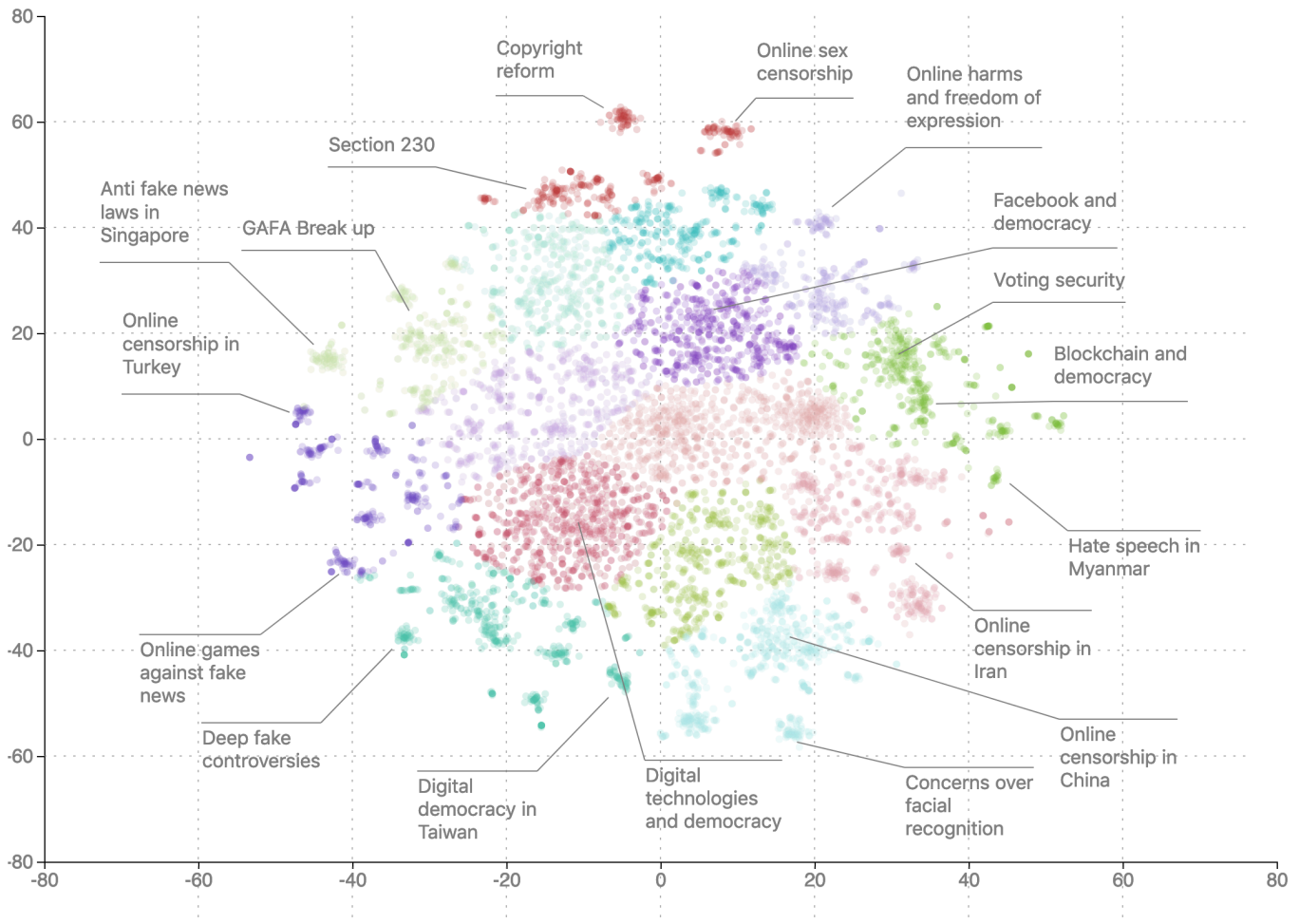
Browsing privacy

What are the privacy friendly alternatives to Google Search? Could they threaten the Silicon Valley giant? What functionalities do they offer their users?

¹⁵ https://ec.europa.eu/commission/presscorner/detail/en/IP_16_216

¹⁶ <https://uidai.gov.in/>

TRUSTWORTHY INFORMATION FLOWS, CYBERSECURITY AND DEMOCRACY



This umbrella topic pertains to the role trustworthy information plays in democratic societies. It gathers articles on challenges that disinformation, filter bubbles and censorship pose to the information flows. It discusses inter alia legal and technological attempts to fight the spread of fake news and covers systemic solutions proposing breaking tech giants in order to democratize the online sphere.

Anti fake news laws in Singapore

In 2019 Singapore's government proposed anti-fake news laws. However, according to critics, this law puts too much power in the hands of the Singaporean government, potentially threatening civil liberties. What are the concerns and consequences of the regulation for the civil society in Singapore?

GAFA break up

According to a growing number of critics, notably including US Sen. Elisabeth Warren, Big Tech has a profound negative impact on democracy. Is it time to break Big Tech up?

Section 230

Section 230 is a section of the US Communications Decency Act that provides immunity for website platforms from third-party content.¹⁷ Is it the most important law for online speech? What are the controversies related to this regulation and what direction will the section 230 reform take under Biden's presidency?

Copyright reform

The EU copyright reform faced a lot of public criticism: more than 5 million signatures made the petition against Article 13 the biggest in EU history. What is the role of regulators? What are the main standpoints on the issues?

Online sex censorship

How should online sexual content be regulated? The FOSTA-SESTA law aiming at tackling sex trafficking in the US brought controversies in this matter. Would it give way to online censorship? Will the situation of sex workers be less safe?

Online harms and freedom of expression

Should governmental bodies establish an independent regulator that can write a "code of practice" for social networks and internet companies, fining or blocking them if they fail to tackle "online harms"?

Facebook and democracy

Facebook was accused over the years of being too slow to recognise Russian interference in US and European elections, failing to police hate speech and stopping the spread of fake news. Does Facebook's monopoly power threaten democracy?

Voting security

The articles discuss the growing lack of confidence in election security across the world. They describe novel technological answers, such as upgrading the outdated electronic voting machines in the USA or using blockchain to track and tally election results in Sierra Leone. Can technology protect the voting process?

Hate speech in Myanmar

Institutionalized hate speech against minorities remains a major concern in Myanmar. Its root causes are complex and originate in both the historical and current political economic context.¹⁸ The articles discuss the role Facebook played during the tragic Rohingya crisis of 2017-2018 in spreading hate speech and deepening the chaos in the country. On the other hand, Facebook served as an organizational tool for the regime's opponents in 2021, leading to the platform's shutdown by the military. What should be the responsibility and code of conduct of a social network platform during such crises?

Online censorship in Iran

The government of Iran blocks many popular internet websites, preventing citizens from accessing

independently reported world news. It also blocks services like Google or Facebook, and tries to limit access to the main download page for the Tor Browser, which lets users circumvent such restrictions. How online censorship constrains anti-government protests in Iran?

Online censorship in China

China's internet censorship is claimed to be more comprehensive and sophisticated than in any other country in the world. How are Chinese internet services struggling with the increasing demands of the censorship apparatus and how are activists fighting the "Great Chinese Firewall"?

Concerns over facial recognition

The increasing use and efficiency of facial recognition divides the public opinion. On the one hand, it provides obvious benefits for consumer devices. On the other hand, it poses a threat to individual freedoms when used without consent in public space. What are the main approaches towards regulating facial recognition? How do trends in the Western world and China differ?

Digital technologies and democracy

What role do internet technologies play in the crisis of liberal democracy and the rise of populism? Are they only part of the problem or could they be part of the solution?

Digital democracy in Taiwan

What are the foundations of the Taiwanese g0v ("gov-zero") movement, one of the world's most active civic-tech communities? Does digital democracy lower the barriers to actively participate in the political process?

Deep fake controversies

Can deep fakes - synthetic media in which a person in an existing image or video is replaced with the likeness of someone else¹⁹ - be stopped? The articles discuss different tactics in the fight against misleading deep fakes.

Online games against fake news

Various non-standard efforts have been applied to tackle the spread of fake news. Are online games effective in helping people detect fake news?

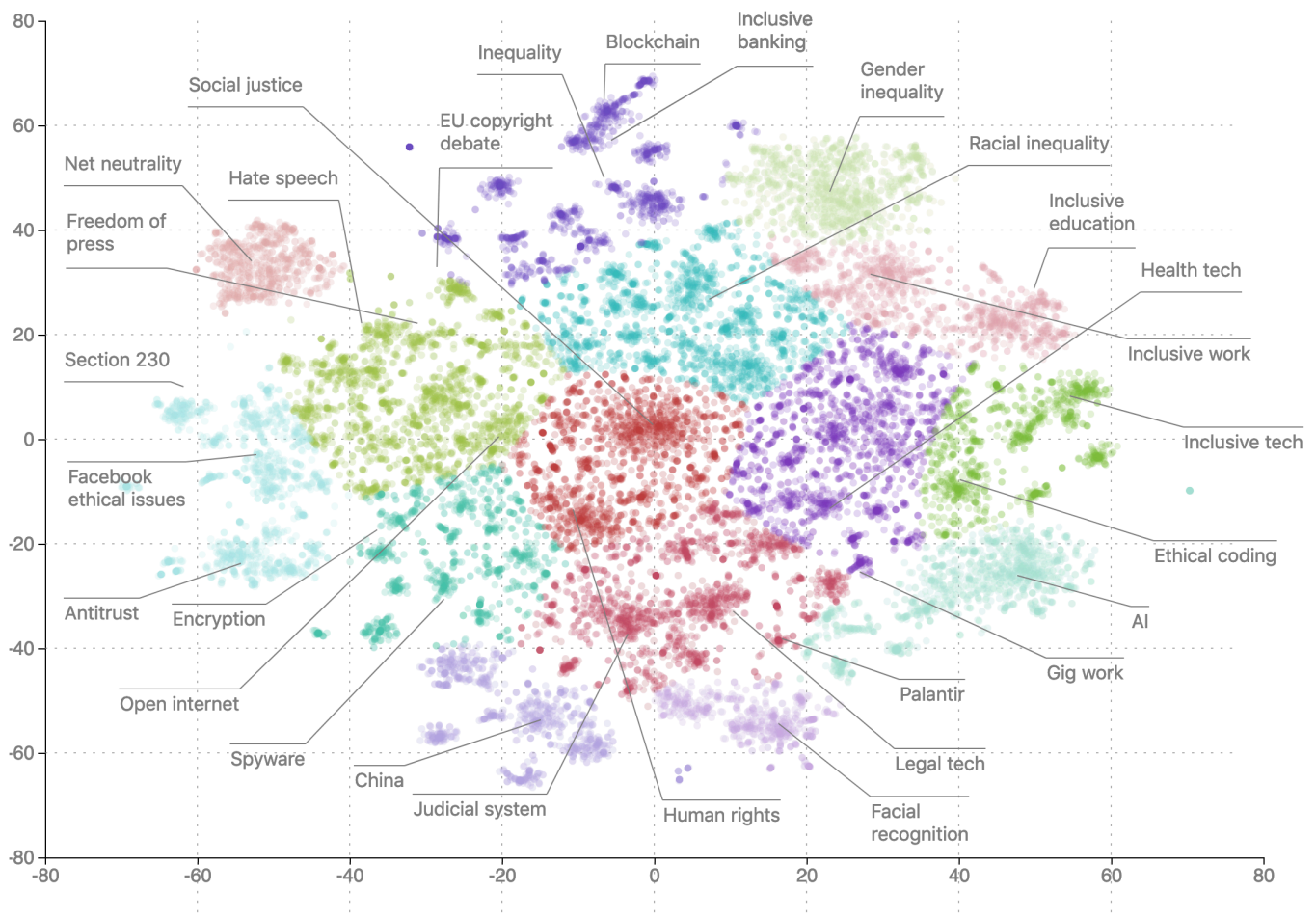
Online censorship in Turkey

For years, the Turkish government censored news, websites and platforms. What is the scale of this censorship and what are the consequences for the civil society in Turkey?

¹⁸ <https://hrp.law.harvard.edu/press-releases/myanmar-hate-speech-report/>

¹⁹ <https://en.wikipedia.org/wiki/Deepfake>

ACCESS, INCLUSION AND JUSTICE



This umbrella topic deals with such issues as access to the Internet, control over information and ICT infrastructure, principles of social justice in the tech industry and the Internet's ethical challenges.

Social justice

The articles provide a dive into stories concerning inequality, human rights, the gender gap or the Black Lives Matter movement. What is the role of the tech industry in the social justice movement?

EU copyright debate

The EU reform aiming at bringing the copyright rules in Europe up to date with the online world faced a lot of public criticism from internet activists and left-wing politicians. Should platforms be responsible for ensuring that content uploaded by users does not breach copyright?

Inequality

How can we address the contentious issue of growing economic inequalities? Should nation states introduce a global digital tax aimed at tech giants?

Blockchain

Blockchain can be used to provide essential services in developing countries, such as digital identities or financial transactions. Can blockchain become a major tool for development and social justice? Which are the examples showcasing the potential of blockchain?

Inclusive banking

How can fintech make banking more inclusive? What difference can real-time digital payments make in our daily lives?

Gender inequality

How big is the gender pay gap in the tech sector? Is gender equality improving? What can be done to foster equal opportunities for women?

Racial inequality

How diverse is tech? Which initiatives are fighting for racial equality? What measures can be implemented in the tech sector?

Inclusive education

How can technology improve the chances of disadvantaged students? What are the consequences of the pandemic on education?

Health tech

Can technology make healthcare systems more inclusive? What are the consequences of the digital transformation in medicine? Will the internet of medical things transform healthcare?

Inclusive work

How can technology support diversity in workplaces? How to build diverse work environments?

Inclusive tech

How technology makes the physical and digital world more accessible? Can technology create equality for the disabled?

Ethical coding

Should principles of ethics be followed in software development? What does ethics education in data science look like? Are there any ethical alternatives for big tech?

AI

What are the principles of ethical AI? What are the social implications of AI? Can AI be an “ally” for the human rights movement?

Gig work

Are platforms based on gig workers ethical? Are the rights of gig workers protected?

Palantir

What are the human rights concerns related to the surveillance analytics company Palantir? Should facial recognition be used to predict and surveil probable offenders?

Legal tech

Can technology displace lawyers? How can we use tech to bridge the gap in the access to justice?

Facial recognition

How should facial recognition be regulated to preserve freedom? What are the privacy fears stoked by facial recognition technology?

Human rights

What are the implications of tech for human rights? What is the impact of Covid-19 pandemic on the human rights agenda?

Judicial system

How is tech transforming the judicial systems worldwide? How to ensure access to justice for the whole society?

China

What are the dark sides of Chinese modernization? The great Chinese firewall and the story of sanctions on the Chinese tech sector.

Spyware

The articles provide an overview on WhatsApp security breaches, the use of Pegasus and other cybersecurity threats. How is spyware used for surveillance and attacks on members of civil society?

Open internet

What are the challenges related to access to the Internet, control over information and infrastructure? Is broadband a human right?

Encryption

Why do encryption policies matter? What are the links between encryption, human rights and justice?

Antitrust

The history and lessons from the major antitrust investigations. How should the excessive market power of big tech companies be regulated?

Facebook ethical issues

What are the ethical concerns with Facebook’s algorithms? How does Facebook manage hate speech?

Section 230

How should web freedom and accountability be reconciled? Experiences from the implementation of a section of the US Communications Decency Act providing immunity for website platforms from third-party content.

Freedom of press

Where is freedom of press and access to information endangered? Which tech solutions can support citizens and journalists?

Hate speech

What are the initiatives and regulations to reduce online hate speech? Can we find a balance between mitigating online harms and ensure freedom of expression?

Net neutrality

Do we need an Internet Bill of Rights? How are the net neutrality principles supposed to safeguard the open internet?

ACCESS, INCLUSION AND JUSTICE

In this section, we showcase the use of the tool for the umbrella topic: Access, Inclusion and Justice. This topic is motivated by the belief that the Internet should be culturally inclusive, representative and accessible to all. Moreover, technologies should be designed and used following principles of ethics. In short, online services should be open, inclusive and ethical.

In the previous section, we have highlighted the specific topics and questions discussed in the articles. Now, we explore the insights deeper for challenges that have a high policy relevance and are essential to ensure a human-centric technology ecosystem. Following the exploration of the small topics and wider clusters, we identified three key areas:

Open Internet:

Issues related to access to the Internet, control over infrastructure, censorship and content moderation. The examined articles are located in the Open Internet wide topic (green area on the left side of the map), most notably: Open internet, Freedom of press and Hate speech clusters.

Inclusive Tech:

Ensuring equal chances for all in tech and science. The analysed articles are located in the Gender inequality (light green cluster on the upper right), Racial inequality (turquoise cluster in the centre), Inclusive education (light red cluster on the right), Inclusive work (red cluster on the right) and Legal tech (red cluster down) wide topics.

Ethical Tech:

Mitigating biases and fighting harmful applications of technologies. Articles featured in the AI (light turquoise cluster on the right), Facial recognition (light purple cluster down) and Spywares (turquoise cluster on the left) wide topics, and in the Gig Work topic cluster.

For each of the three areas, we summarised the insights from the articles featured on the map. In certain instances, articles cited were also used in the analysis. First, the various challenges described in the articles are briefly elaborated. Then, we focus on solutions proposed in the collected articles, especially concrete regulatory ideas and existing technologies.

OPEN INTERNET: CHALLENGES

The decline of Internet freedom

According to Freedom House, global internet freedom has been declining for over 10 years. Governments increasingly control the online flow of information that include the censoring of content, blocking platforms, shutting down the Internet, restricting the anonymity of users, arresting or in more extreme cases – physically harming journalists and bloggers. Between 2016 and 2020, the greatest decline in Internet freedom was observed in Venezuela, Egypt, Philippines, Rwanda and Kyrgyzstan, while China ranked last for the 6th consecutive year among the analysed 65 countries.²⁰ However, the tightening of state control over the online space is not restricted to autocratic regimes, but happens in democracies as well.

Moreover, the COVID-19 pandemic has just fuelled this process. According to Freedom House, in 28 countries governments censored information related to the pandemic, such as health statistics. In at least 45 countries people were arrested due to social media posts on COVID-19. Other examples include the use of contact tracing or quarantine compliance apps for surveillance.²¹

Similarly to Freedom House, The Global Expression report prepared by UK-based internet rights advocacy group Article 19 also reported an all-time low in freedom of expression.²² The report enlists the main symptoms of rising digital authoritarianism: Internet shutdowns, content restrictions, weakening of encryption tools; increased surveillance; and banning secure messaging apps.

However, the decline of online freedoms is not only attributed to state authorities, but to big tech companies as well. According to various security researchers, Silicon Valley companies are increasingly complying with the requests of authoritarian regimes.²³ There are numerous examples for big tech to clearly pursue corporate interests over human rights issues, hiding behind the excuse “to comply with local laws”,²⁴ such as Zoom blocking the accounts of Chinese freedom activists.²⁵ This crucial responsibility of major companies invites a wide

²⁰ <https://freedomhouse.org/report/freedom-net/2020/pandemics-digital-shadow>

²¹ <https://www.technologyreview.com/2020/10/14/1010361/governments-are-using-the-pandemic-as-an-excuse-to-restrict-internet-freedom/>

²² <https://avn.com/business/articles/legal/online-freedom-of-expression-worst-in-a-decade-report-shows-858030.html#.XfFVIGWSvKk.twitter>

²³ <https://www.zdnet.com/article/internet-censorship-its-on-the-rise-and-silicon-valley-is-helping-it-happen/>

²⁴ <https://www.wired.com/story/opinion-dont-be-fooled-by-big-techs-anti-china-sideshow/>

²⁵ <https://www.axios.com/zoom-closes-chinese-user-account-tiananmen-square-f218fed1-69af-4bdd-aac4-7eaf67f34084.html>

debate on the role of big tech in respecting human rights.²⁶

Internet shutdowns

Different types of internet restrictions are differentiated, including shutdowns, throttling (slowing down the speed of the network) and blocking (hindering access to certain platforms and content). The most severe case is an internet shutdown when the entire network connectivity is disrupted. In order to do that, the government must have control over the infrastructure - either by being the telecommunication monopolist (case in Ethiopia) or by exerting pressure on internet service providers (ISPs). A United Nations joint declaration proclaimed that such network shutdowns “can never be justified under human rights law”.²⁷

A common motivation for shutting down the Internet is to prevent the use of social media tools during protests, as it happened in a number of African countries in 2019.²⁸ More nuanced situations are related to social unrest and the spread of fake news. A prime example is India, where internet shutdowns justified by communal tensions are relatively frequent.²⁹ However, such practices are widely debated by human rights advocate groups. As the Association of Progressive Communications (APC), an international network of civil society organisations argues, Internet shutdowns violate the freedom of peaceful association and assembly, as well as the right to protest. Moreover, the lack of connectivity can hinder medical services and assistance.³⁰ Such actions are unlawful, and cases by civil society organisations can be won in court even in authoritarian countries like Zimbabwe.³¹

Censorship

Similarly to Internet shutdowns, digital censorship and surveillance also violate human rights: the right to seek and receive news and express opinions. According to a report by the Committee to Protect Journalists (CPJ), the most censored countries include among others Saudi Arabia, China, Vietnam, Iran and Belarus. These regimes are blocking various websites, VPN services, foreign social media platforms

and messaging apps. Other practices include forcing companies to disclose user data, censoring of blogs and posts, usage of bots and trolls to spread misinformation and implementation of surveillance tools.³² Moreover, governments can also employ economic measures to hinder access to information, such as taxing the use of online services.³³

The increasing state control and censorship is often justified based on fighting fake news,³⁴ preventing cyber crimes³⁵ or tackling online harms.³⁶ Media freedom has been also negatively affected by the pandemic, with governments limiting access to information and misusing information laws.³⁷

Splinternet

The online borders built by authoritarian states further increase the fragmentation of the Internet. Even before censoring access to various services, the communication across countries and languages has been restricted. In different regions of the world, various quasi-monopoly services have emerged for social media and search engines: Google-Facebook (most of the world), Yandex and VK in Russia or Baidu – Teibo in China.³⁸

According to the latest Freedom House Report, the previously gradual splintering of the net has become an all-out race of cyber-sovereignty with governments imposing their own internet regulation. This comes useful to shut down the Internet during civil protests (e.g. Iran in 2019) or to curb freedom of speech and facilitate self-censoring (Hong Kong).

This process allowed authorities to further limit civil liberties and human rights. However, such practices are not restricted only to the most notorious regimes. Various actions of democratic countries also contribute to an increasing fragmentation. An example is banning Chinese apps in the US and India.

26 <https://2018unforumhr.sched.com/event/GZ6I/forum-debate-are-tech-companies-a-threat-to-human-rights>

27 <https://freedomhouse.org/article/explainer-when-internet-goes-down-what-who-and-why>

28 <https://freedomhouse.org/article/explainer-when-internet-goes-down-what-who-and-why>

29 <https://www.indiatimes.com/technology/news/india-s-internet-freedom-is-getting-worse-as-online-access-was-shut-down-69-times-in-2017-336943.html>

30 <https://www.apc.org/en/pubs/lebanon-apc-calls-internet-access-restrictions-be-lifted-and-human-rights-online-and-offline-be>

31 <https://mg.co.za/article/2019-02-01-00-internet-shutdowns-violate-human-rights/>

32 <https://cpj.org/reports/2019/09/10-most-censored-eritrea-north-korea-turkmenistan-journalist/>

33 <https://www.apc.org/node/34760>

34 <https://openinternet.global/news/ukraine-wants-fight-disinformation-introducing-de-facto-censorship>

35 <https://www.amnesty.org/en/latest/news/790/>

36 <https://www.bigissue.com/latest/technology/this-approach-to-tackling-online-harms-may-threaten-a-free-and-open-internet/>

37 <https://europeanjournalists.org/blog/2020/04/27/no-lockdown-for-press-freedom-misuse-of-the-corona-crisis-to-silence-journalism-in-europe/>

38 <https://www.zdnet.com/article/internet-censorship-its-on-the-rise-and-silicon-valley-is-helping-it-happen/>

OPEN INTERNET: SOLUTIONS

EU Internet Foreign Policy

The Global Public Policy Institute provided a policy paper in 2018 focusing on the European Internet Foreign Policy.³⁹ The authors outline the long-term trends in tech policies: while the US advocated a laissez-faire approach, China managed to create an almost absolute control of the internet. Moreover, China was successful in promoting and exporting this model to other autocratic countries as well. On the other hand, Europe opted for more active regulations than the US, with the aim of correcting market failures. According to the authors, the EU can take several steps to address the mounting challenges related to the splintering of the Internet.⁴⁰

First, the authors advocate that the EU should strengthen European credibility by promoting not only the values of the open internet, but also the values of the rule of law. A greater emphasis on the protection of citizen rights and freedom would be a clear distinction from authoritarian states that often also communicate the protection of citizens from online harms, justifying state control. Therefore, Europe should promote checks and balances in its internet policies.

Second, Europe should strengthen and build new coalitions. Europe could emphasize the negative economic effects of the Chinese information control model. What can seemingly function efficiently in China may not be feasible in countries with smaller markets, as restrictions of data flows hinder innovation. Therefore, Europe should increase cooperation with non-Western countries like India or Brazil that have a relatively free digital space. Moreover, Europe could hold technology corporations accountable for the human rights implications of their activities.

Third, Europe should focus on fragmentation and aim at increasing legal and technical interoperability. The authors recommend that Europe should guide national regulatory actions to prevent further fragmentation of the Internet. It could include the cross-border implications of national regulatory plans in the evaluation process of domestic legislation. Interoperability of online flows can be also addressed in free trade agreements, e.g. by including e-commerce.

Making big tech transparent

Sir Tim Berners-Lee, the inventor of the World Wide Web, launched a campaign to defend the open Internet in 2018.⁴¹ The Contract for the Web, the result of a multi-stakeholder consultation, proposed a set of principles and recommendations for governments, citizens and companies.⁴² A key set of recommendations aimed at making technology companies aware of the human rights implications of their actions. Adrian Lovett, the President of the Web Foundation, provided a witness at the International Grand Committee on Disinformation and Fake News in Dublin,⁴³ where he outlined several policy recommendations.

According to Lovett, a first step is to require human rights impact assessments and transparency reports from tech companies. Tech firms should disclose how they evaluated the human rights implications of their products, services and operations. For this, policy makers should develop a reporting framework and include the issues of misinformation, hate speech, political ads and electoral interference. Further recommendations include the strengthening of regulatory agencies and the ban on micro-targeting of political ads. Moreover, the Contract for the Web also advocates regulatory frameworks to prevent disruption of internet access by governments, the inclusion of diverse communities during the development of new products, the promotion of open-source technologies and open data practices, the further development of open Web standards and the empowering of local users to participate in open culture, science and knowledge.

Setting standards for Online Platforms

An opinion piece published by OpenGlobalRights, a platform for human rights discussions, called for establishing a consensus for the responsibilities of tech companies in content moderation.⁴⁴ As the author Richard Wingfield recognizes, tech platforms are incentivized for heavy censoring of their content to avoid fines and legal problems. However, this often has repercussions for human rights, as in the case of removing evidence of atrocities and war crimes, e.g. in the case of Rohingya Muslims in Myanmar. While there are steps in the right direction, such as a report by the United Nations on online content regulation,⁴⁵ the author calls for more action. First, country-level action plans should be implemented with the focus on

³⁹ https://www.gppi.net/media/Hohmann_Benner_2018_European_Internet_Foreign_Policy.pdf

⁴⁰ <https://www.cfr.org/blog/how-europe-can-promote-free-and-open-internet>

⁴¹ <https://www.firstpost.com/tech/news-analysis/tim-berners-lee-has-launched-fortheweb-campaign-to-defend-free-and-open-internet-5509921.html>

⁴² <https://contractfortheweb.org>

⁴³ <https://webfoundation.org/2019/11/adrian-lovett-calls-for-legislation-requiring-greater-transparency-from-tech-companies-at-the-international-grand-committee-on-disinformation-and-fake-news/>

⁴⁴ <https://www.openglobalrights.org/risks-and-responsibilities-of-content-moderation-in-online-platforms/>

⁴⁵ <https://www.ohchr.org/EN/Issues/FreedomOpinion/Pages/ContentRegulation.aspx>

supporting, and not penalizing online platforms. Such plans should be based on the UN Guiding Principles, a framework for business activities respecting human rights.⁴⁶ Second, following another white paper by Global Partners Digital,⁴⁷ the author recommends the creation of a multi-stakeholder body. Platforms, through appointing independent experts, could develop a set of standards for content moderation that would create more accountability and transparency. The multi-stakeholder body would be in charge of reviewing compliance with these standards. In case of failure, the platform would be provided with recommendations for improvement.

Maintaining multi-stakeholder governance of the Internet

DNS – the Domain Name System – has been managed by ICANN (Internet Corporation for Assigned Names and Numbers), a US nonprofit corporation since the 1990s.⁴⁸ Until 2016, ICANN has been functioning in contract by the US administration. In 2016, this US oversight ended, and ICANN became the sole operator of DNS. This move has been widely praised by Internet infrastructure organizations like the I2Coalition.⁴⁹ The main advantage of the multi-stakeholder model of ICANN is that it facilitates global internet governance, instead of the further splintering of the Internet. In the absence of global governance, a likely outcome would be the existence of multiple protocols, hindering the free flow of information.⁵⁰ There are numerous supporters for a greater role of the US state in Internet governance, however, such a move may end up with more control for authoritarian states.⁵¹

Facilitating free access to information

There are also tools outside the realms of policy that can make the Internet more open. As an example, DW (Deutsche Welle) has been implementing censorship circumvention technologies that are built directly to apps and websites. With the use of such tech, DW content is also available in censoring countries as well.⁵² Popular options to securely communicate include the use of VPNs, end-to-end encrypted messaging apps and apps for encrypting documents.⁵³ Finally, mesh networks

enable communication within a neighbourhood even during internet shutdowns. Mesh networks avoid the intermediary service providers in the communication between devices, hence participants are directly connected to each other. Mesh networks are not only useful during protests in autocratic countries, but are also implemented by Internet activists in the West. As an example, volunteers maintain a wider mesh network in Oakland, demonstrating the viability of community-run Internet infrastructure.⁵⁴

INCLUSIVE TECH: CHALLENGES

Equal chances in education during COVID-19

The COVID-19 pandemic has created a huge challenge to maintain the same level of quality in education. Moving the courses online in higher education does not equal in-person classes: according to a study, students perform significantly worse in online courses, affecting future performance and raising the probability of dropping out. Moreover, switching to online affects most the lowest performing students.⁵⁵ Therefore, students with disadvantaged backgrounds are especially vulnerable to the adverse effects of the pandemic.⁵⁶ Online exams can be also discriminatory towards disadvantaged students with no access to space for work and with worse hardware.⁵⁷ Evaluating the work and knowledge of students has been difficult, however, the use of proctoring software that scan the faces and screens of students during exams to evaluate the risk of fraud has been especially problematic.⁵⁸ The challenge of the pandemic calls for a revision by academics of how universities can fulfill their mission, how they assess the work of students and how they provide access to academic resources. As an example, with the closure of libraries the importance of online materials further increased, along with the role of open science and open access publications.⁵⁹

46 <https://www.unglobalcompact.org/library/2>

47 <https://www.gp-digital.org/content-regulation-laws-threaten-our-freedom-of-expression-we-need-a-new-approach/>

48 <https://slate.com/technology/2020/09/tiktok-wechat-icann-dns-internet-freedom.html>

49 <https://www.i2coalition.com/i2coalition-supports-open-internet-and-multistakeholder-model-in-comments-to-ntia/>

50 <https://www.i2coalition.com/stopped-fragmentation-internet-celebrating-iana-stewardship-transition/>

51 <https://www.brookings.edu/blog/techtank/2018/02/07/u-s-government-should-not-reverse-course-on-internet-governance-transition/>

52 <https://www.dw.com/en/bypassing-censorship-with-the-dw-app/a-56029659>

53 <https://www.vice.com/en/article/dy8ekx/how-to-bypass-digital-dictatorship-during-the-myanmar-coup>

54 <https://oaklandnorth.net/2018/09/14/from-one-oakland-rooftop-to-the-next-volunteers-expand-free-open-internet-network/>

55 <https://www.brookings.edu/research/promises-and-pitfalls-of-online-education/>

56 https://www.theguardian.com/education/2020/may/04/if-universities-shift-online-we-risk-more-poorer-students-dropping-out?CMP=share_btn_tw

57 <https://www.ndtv.com/education/online-petition-rejects-discriminatory-online-examinations-during-lockdown-2214062>

58 <https://www.diggitmagazine.com/column/proctoring-exams-inequality>

59 <https://eve.gd/2020/08/18/rethinking-assessment-during-the-pandemic/>

Gender bias and lack of diversity in the tech sector

STEM fields have been largely dominated by white men, with strong gender bias and underrepresentation of minorities. According to PEW Research, less than a half of female STEM graduates pursue a field matching their degree.⁶⁰ Moreover, as reported by the World Economic Forum, women account for a third or less in areas like cloud computing, engineering or AI.⁶¹ Similarly, women hold less than 25% of tech roles in major tech companies: Apple, Intel, Google, Facebook, Microsoft and Twitter.⁶² Moreover, the pandemic has made it more difficult for women to pursue their careers, with limited availability of care services and school closures. Additionally, a study found that pay differentials between men and women remain even in the case of online work.⁶³ This is all the more surprising, as the study concludes that gender bias persists even in settings with flexible work arrangements.

Racial and ethnic minorities are also vastly underrepresented in tech companies, with little improvement in last years according to company diversity reports.⁶⁴ ⁶⁵ Moreover, there is a starkling gap in the share of black and Hispanic workers in tech jobs and supporting blue-collar roles.⁶⁶ ⁶⁷

Online violence and misinformation

In a survey prepared by Plan International in Australia, 65% of female respondents reported experiencing online violence, such as insulting language, embarrassment, body shaming and threats of sexual violence. These attacks are most common in major social media platforms and services, such as Facebook, Instagram, Whatsapp, Snapchat, Twitter and TikTok.⁶⁸

Online violence has been fuelled by disinformation campaigns across the world, amplifying discrimination not only in the West, but also in Asian and Latin American countries.⁶⁹

However, mitigating online harms by regulations is widely debated. As an example, the UK government has provided an Online Harms White Paper that set

out the plan to create a new regulatory framework. Among others, the plan assumes new duties for companies that share user generated content and the establishment of a new institution overseeing online safety.⁷⁰ While there seems to be a general consensus on the harmful effects of misinformation and hate speech, there have been strong opinions stating that the recommendations of the White Paper pose a threat to freedom of press and freedom of expression.⁷¹ ⁷² ⁷³

INCLUSIVE TECH: SOLUTIONS

Inclusive education

In order to make STEM education more inclusive and improve the retention of students from underrepresented communities, teaching methods should be modified. Mark Guzdial from the University of Michigan formulated three proposals to make computer science education more inclusive.⁷⁴ First, he advocates methods that help students with less computer CS backgrounds, such as Peer instruction. Second, grading should be based on reaching the learning objectives, providing the opportunity to receive the highest grades for all students. Third, instead of prosecuting plagiarism, more effort should be devoted to communication with students and encouraging collaboration.

During COVID-19, remote education is creating further challenges that can be mitigated via a student-centric approach.⁷⁵

Civic tech

Civic tech is a novel field connecting various stakeholders - policymakers, activists, tech companies and tech workers - with the aim of working on local problems together. An example of civic tech is Code For All, an international network of organisations facilitating democracy, gender equality and inclusion.⁷⁶ The network connects organisations and provides funding and expertise for collaborative projects. The projects managed by Code For All include a platform to make Freedom of Information requests, a platform

60 https://www.ft.com/content/d5d6035a-f63e-11e7-a4c9-bbdefa4f210b?utm_content=buffer7a292&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer

61 <https://www.dw.com/en/wef-coronavirus-has-reversed-progress-on-gender-equality/a-57048120>

62 <https://www.technologyreview.com/2020/09/05/1008187/racial-injustice-statements-tech-companies-racism-racecraft-opinion/>

63 <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0229383>

64 <https://www.ft.com/content/7ae052e3-fb0c-4b19-bd57-8b5eddddb9ed>

65 <https://riddl-tech.medium.com/from-the-streets-to-the-boardrooms-racial-equality-matters-5ca0d00434ea>

66 <https://medium.com/shaft/inequality-is-everywhere-in-tech-and-tech-is-ok-with-it-63673f7b0ec6>

67 <https://www.wpusa.org/files/reports/TechInvisibleWorkforce.pdf>

68 <https://www.theguardian.com/society/2020/oct/05/online-violence-against-women-flourishing-and-most-common-on-facebook-survey-finds>

69 <https://medium.com/advancing-justice-ajic/diversity-and-inclusion-in-anti-disinformation-work-302792ca45fe>

70 <https://www.gov.uk/government/consultations/online-harms-white-paper/online-harms-white-paper>

71 https://www.societyofeditors.org/soe_news/society-of-editors-responds-to-online-harms-white-paper/

72 <https://www.adamsmith.org/blog/our-online-freedom-is-under-attack>

73 https://sleeplessdystopian.com/politics/online-harms-white-paper-government-consultation-my-response?xg_source=twitter

74 <https://cacm.acm.org/blogs/blog-cacm/246550-3-proposals-to-change-how-we-teach-computing-in-order-to-reduce-inequality/fulltext>

75 <https://saah.org.za/2020/04/teaching-remotely-navigating-uncertainty-the-digital-divide-and-social-justice-in-health-professions-education/>

76 <https://www.devex.com/news/q-a-how-can-civi-tech-advance-gender-equality-99282>

for environmental open data and an app to report issues to local councils.⁷⁷

Increase the visibility of underrepresented groups in tech and science

To make tech and science more inclusive, it is important to provide greater visibility of positive examples that feature the work of underrepresented groups. There are numerous grassroots organisations worldwide like 500womenscientists or Ciencia Puerto Rico working on more inclusive STEM education, as well as projects that highlight the activities of change-makers.⁷⁸ By drawing attention to these projects, the negative narratives preventing young people from starting a career in STEM could be weakened. Other tools to break stereotypes include scholarships and mentorship programmes. There are also arguments in favour of positive discrimination in fields with large inequalities.⁷⁹

The underrepresentation of females is not only an issue in tech, but a general social challenge. A relevant project to draw attention to gender bias with positive narratives is provided by the Wikimedia Foundation in Sweden. In the “Equal Edit” campaign, history articles were amended to include the stories of major women figures.⁸⁰

The use of more inclusive language

A study⁸¹ found empirical support between cultural stereotypes embedded in language and gender imbalances in STEM fields. The authors examined how words co-occur with women compared to men across various languages, e.g. the words work, business or career. The authors suggest the results have implications not only in education, but also for research on gender bias in algorithms.⁸²

Similarly, men and women respond differently to the language of job advertisements. There are keywords that tend to deter women from applying to a role, such as “enforcement” or “fearless”. Therefore, tech companies should consider more inclusive language in job postings. Recruiters can also use software to analyse the language of posts and remove gender bias.^{83 84}

Legal Tech

Access to legal help and information is challenging for disadvantaged groups. Legal guidance and assistance portals can provide support with the use of various technologies, such as natural language processing, triage (“Automated interactions to help users determine the level of assistance they need”) and automated communication.⁸⁵ Legal tech apps can improve the accuracy of online searches for legal advice.⁸⁶ The legal tech scene is developing worldwide, including developing countries like Nigeria.⁸⁷ There are also examples for personal projects that made a wider impact, such as a chatbot to appeal for parking tickets in the UK.⁸⁸

ETHICAL TECH: CHALLENGES

Algorithmic bias

As algorithms function on the basis of data, they are prone to the “garbage in, garbage out” problem: the results from the model are as good as the dataset used to train the model.⁸⁹ A well known example for the importance of a diverse training data is related to screening job candidates: if the dataset is based on the hiring history of the company, the model will reproduce previous hiring practices that may include gender and racial bias.⁹⁰

Therefore, one may think a possible solution to avoid biases is to increase sample sizes and use as much data as possible. However, such an approach can also have fundamental flaws. As an example, search results are influenced by public preconceptions, further reinforcing biases that are present in the society.⁹¹ Moreover, large language models trained on enormous text data may also replicate historic biases and exclude the perspective of groups with less “linguistic footprint”. The discriminatory and unsustainable nature of such models has been described by Timnit Gebru, the co-lead of Google’s AI team, who has been forced out from the company.^{92 93}

Algorithmic biases have serious repercussions, as instead of reducing inequalities, technology seems

77 <https://codeforall.org/projects>

78 https://slate.com/technology/2018/04/being-a-woman-in-science-is-hard-but-were-actually-working-on-that.html?wpsrc=sh_all_dt_tw_ru

79 <https://blogs.scientificamerican.com/voices/women-in-cybersecurity-where-we-are-and-where-were-going/?amp>

80 <https://thenextweb.com/news/how-the-equal-edit-campaign-is-improving-gender-equality-in-swedish-history-on-wikipedia>

81 Lewis, M., Lupyan, G. Gender stereotypes are reflected in the distributional structure of 25 languages. *Nat Hum Behav* (2020). doi.org/10.1038/s41562-020-0918-6

82 <https://phys.org/news/2020-08-language-undermine-women-science-tech.html>

83 <https://www.shrm.org/ResourcesAndTools/hr-topics/technology/Pages/Do-Your-Words-Deter-Women.aspx>

84 https://www.ft.com/content/d5d6035a-f63e-11e7-a4c9-bbdefa4f210b?utm_content=buffer7a292&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer

85 https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2019/01/interactive-online-portals-offer-targeted-legal-resources-on-demand?utm_campaign=governing&utm_source=twitter&utm_medium=social&utm_content=ak_stateofjud

86 <https://www.suffolk.edu/news-features/news/2019/03/26/19/00/suffolk-legal-innovation-and-technology-lab-named-finalist-for-world-justice-challenge>

87 <https://www.thetechlawyered.com/womeninlegaltechnigeria/>

88 <https://www.digitaltrends.com/cool-tech/robot-lawyer-free-access-justice/>

89 <https://www.cfr.org/blog/gender-bias-inside-digital-revolution-digital-human-rights>

90 <https://www.forbes.com/sites/jasonbloomberg/2018/08/13/bias-is-ais-achilles-heel-heres-how-to-fix-it/?sh=7ae38a526e68>

91 <https://www.cfr.org/blog/gender-bias-inside-digital-revolution-digital-human-rights>

92 <https://www.technologyreview.com/2020/12/04/1013294/google-ai-ethics-research-paper-forced-out-timnit-gebru/>

93 <https://www.ifow.org/news-articles/timnit-gebru-google-and-institutional-discrimination-in-ai-lessons-learned-for-2021>

to strengthen them via feedback loops. The negative impact can be the unequal quality of online services, e.g. it has been significantly more difficult to find relevant health information for a black woman via search.⁹⁴ However, with the growing use of technology in public services, biases can have more serious repercussions as well. As an example, facial recognition systems tend to be less accurate in the case of people of colour. The worse accuracy is a serious risk with the growing use of surveillance technology and predictive policing systems in the criminal justice system.⁹⁵ Moreover, predictive tools are widely used to predict the probability of re-arrests, influencing the sentences. However, such tools lack transparency and are heavily based on environmental variables that are outside the control of the trialled person. As predictions are calculated from arrest data, these algorithms strengthen historic biases.⁹⁶ Similarly, the use of algorithms in healthcare can lead to tragic inequalities.⁹⁷

A recent example of the mounting problems of algorithmic decision making in Europe is the Dutch social benefits fraud scandal. The problem is two-fold: on the one hand, the models included discriminatory variables related to nationality. Second, the decisions to cut families from social care were made based on results of models, often with no human oversight and lack of critical assessment.⁹⁸

Military and surveillance application of AI

Various AI technologies, such as object recognition, were initially developed for business application. However, the technology to identify shopping items on websites can be also implemented to recognise targets by drones.⁹⁹ AI startups and tech giants alike are realising contracts for the military in the US, creating large tensions between corporate rules around ethics and financial interests. Ethical frameworks are open for interpretation: it can be argued that autonomous weapons save lives, as they are potentially more accurate, reducing collateral damage and civilian casualties.¹⁰⁰ However, there is a wide movement against the development of

autonomous weapons that make life-taking decisions with no oversight.¹⁰¹ Major tech companies, such as Google, faced also internal pressure from employees to stop collaborating in military projects like Maven.¹⁰²

Besides the military, police forces are also increasingly using AI tools. A related controversial area is predictive policing that has been sensitive to algorithmic bias.¹⁰³ However, with the quick increase of data, such as videos and pictures made by smartphones, the processing of digital evidence has become increasingly challenging for police forces. Technology can support crucial steps in investigations, such as unravelling social relations and identifying illegal activities in digital materials. On the other hand, the use of AI tools raises serious questions around transparency, reliability and privacy.¹⁰⁴

Spyware

Sophisticated tools are being developed by private companies that enable the extraction of personal data from smartphones. Among the most notorious spyware tools is Pegasus, a spyware developed by NSO group. Pegasus has been purchased by oppressive governments around the world and used to targets human rights activists and journalists.¹⁰⁵ As an example, 1400 individuals were spied on during a two-week period in May 2019.¹⁰⁶ According to Citizen Lab, a watchdog based at the University of Toronto, Pegasus has been activated on phones also in a number of EU countries, including France, UK, Poland and Latvia.¹⁰⁷

Gig Economy

Platform-based companies have gained significant market shares, especially in the transportation sector, such as taxi and delivery services. The rise of platforms in services has created a new form of employment: the “gig economy”. Individuals can provide services via the platform, with the promise of “being their own boss”. In practice, however, service providers are managed by algorithms that intervene in the behaviour of the workers at a very detailed level.¹⁰⁸ As an example, the Uber app decides whether the driver can use the app, which customers can the driver serve and what rate is

94 https://www.nyu.edu/about/news-publications/news/2019/november/charlton-mcilwain-on-black-software.html?utm_source=content&utm_medium=twitter&utm_campaign=nyunews_blacksoftware
95 https://www.axios.com/surveillance-people-color-race-ba857a69-d2b4-41f0-a8ce-a4a980af6e45.html?utm_source=twitter&utm_medium=social&utm_campaign=organic
96 <https://sociable.co/technology/predictive-ai-biased-tool-flawed-criminal-justice-system-brookings-institution-panel/>
97 <https://www.businessinsider.com/an-algorithm-treatment-to-white-patients-over-sicker-black-ones-2019-10?R=T>
98 <https://www.vice.com/en/article/jgq35d/how-a-discriminatory-algorithm-wrongly-accused-thousands-of-families-of-fraud>
99 <https://www.nytimes.com/2019/03/01/business/ethics-artificial-intelligence.html>
100 <https://www.nytimes.com/2019/03/01/business/ethics-artificial-intelligence.html>
101 <https://www.news18.com/news/tech/elon-musk-and-google-deepmind-signing-pledge-against-ai-weapons-is-a-step-towards-ethical-ai-1815939.html>
102 <https://gizmodo.com/google-employees-resign-in-protest-against-pentagon-con-1825729300>
103 <https://gizmodo.com/the-lapd-uses-palantir-tech-to-predict-and-surveil-prob-1825864026>
104 <https://www.theguardian.com/uk-news/2018/may/27/police-trial-ai-software-to-help-process-mobile-phone-evidence>
105 <https://www.theguardian.com/technology/2019/may/14/whatsapp-spyware-vulnerability-targeted-lawyer-says-attempt-was-desperate>
106 <https://scroll.in/latest/942218/nagpur-lawyer-notified-by-whatsapp-of-surveillance-says-bhima-koregaon-accused-were-also-targeted>
107 <https://www.fastcompany.com/90312043/cyberattack-firm-nsa-group-woos-new-investors-amid-human-rights-firestorm>
108 <https://slate.com/news-and-politics/2018/10/uber-lyft-uberland-algorithms.html>

charged.¹⁰⁹ However, the functioning of the algorithm is not transparent and service providers do not receive justification for the decisions made by the app. At the same time, gig workers are not employees of the platforms and do not receive social security and other worker rights and benefits.¹¹⁰ Moreover, workers lack direct help and conflict resolution, and depend on semi-automatic customer support systems, just as customers: in fact, they are treated as consumers of technology solutions by the app.¹¹¹

ETHICAL TECH: SOLUTIONS

Make AI models explainable

Various AI ethics guidelines adopted by organisations, public institutions and companies refer to the “Right of Explainability” - in the case of GDPR the “Right to be provided with meaningful information about the logic involved in the decision”.¹¹² Such information may refer to why a consumer was assigned to a specific segment by the algorithm or what kinds of counterfactuals exist, e.g. what would be the outcome in case of change in a specific variable. It is important to note that machine learning methods significantly vary in explainability: while some enable to examine variable weights and coefficients (e.g. logistic regressions, decision trees), others make such insights very challenging (e.g. neural networks). However, there has been promising progress in ML research in “model agnostic explainability frameworks” - these techniques correlate the model predictions to the training data and do not require knowledge about the specific models. A well-known example for such a framework is LIME - Local Interpretable Model-Agnostic Explanations,¹¹³ while for a commercial system Facebook’s “Why you’re seeing this Post”.¹¹⁴ There are also software solutions on the market to detect biases in AI processes, enabling companies to test their models and identify whether there are underlying factors influencing the decision of the algorithm.¹¹⁵ Besides LIME, another open-source solution to test biases in apps and websites is Themis that checks whether variables such as race or gender affect the results of such queries as a loan application.¹¹⁶

Understand biases in data

Bias in an algorithm can originate from various steps in the computation process: the training data, the labelling and annotation of data, and from the model itself. Therefore, the identification and treatment of bias should include all elements.

Biases from the training data can be related to historical bias (historical inequality), to representational bias (data not representative to the actual population) and to the measurement and aggregation bias (related to the selection and combination of features).¹¹⁸

Therefore, it should be evaluated whether the training data is uniformly distributed over the target population. Similarly, the annotation and transcription of data may be influenced by the cultural background and perspective of users, hence crowdsourcing such tasks over heterogeneous groups can decrease the bias in such datasets.¹¹⁹

Design tech products based on ethical frameworks

A key problem with major tech companies is the “move fast and break things” mentality. When releasing a new product without proper testing, technical debt is created - the cost of fixing bugs. Similarly, tech created without measures to eliminate bias, security and privacy issues leads to “ethical debt” following its deployment. Usually, fixing a software following its release is harder than during its development, and this is especially the case with ethical debt.¹²⁰ Therefore, ethics should be a feature in tech, and not an afterthought.¹²¹ Ethical frameworks should be established and used by companies, and best practices should be designed by people developing the products with effective oversight.¹²² Recommendations for governance focused on ethics include new company roles (“chief ethics officer”), transparent processes and the active management of biases.¹²³ There are also initiatives for establishing an ethics code for data scientists.¹²⁴ Another notable project by the University of Birmingham focused

109 https://www.publicbooks.org/gig-authoritarians/?utm_content=buffer89b17&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer

110 <https://www.nytimes.com/2020/05/05/technology/california-uber-lyft-lawsuit.html#click=https://t.co/aEjctcVv>

111 https://www.publicbooks.org/gig-authoritarians/?utm_content=buffer89b17&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer

112 <https://towardsdatascience.com/ethical-ai-its-implications-for-enterprise-ai-use-cases-and-governance-81602078f5db>

113 <http://www.csc.villanova.edu/~beck/csc8570/papers/ribeiro.pdf>

114 <https://homes.cs.washington.edu/~marcotcr/blog/lime/>

115 <https://towardsdatascience.com/ethical-ai-its-implications-for-enterprise-ai-use-cases-and-governance-81602078f5db>

116 <https://www.forbes.com/sites/charlestowersclark/2018/09/19/can-we-make-artificial-intelligence-accountable/?sh=7e6f0136364e>

117 <https://medium.com/very-thoughtful/combating-bias-in-tech-apps-platforms-code-and-a-justice-league-8fc0ea1c92a4>

118 <https://towardsdatascience.com/ethical-ai-its-implications-for-enterprise-ai-use-cases-and-governance-81602078f5db>

119 <https://insights.sap.com/can-ai-fix-the-racial-wealth-gap/?source=social-GLOBAL-SAPInsights-TWITTER-ThoughtLeadership-IT-AI-Viewpoints-Leadership+and+Strategy-spr-4316592-381&campaigncode=CRM-YD20-SOC-BRSOCPT>

120 <https://www.wired.com/story/opinion-ethical-tech-starts-with-addressing-ethical-debt/>

121 <https://openheroines.org/notes-on-implementing-ethical-tech-as-a-feature-not-an-afterthought-94c7c28f888e>

122 https://www.fastcompany.com/90308637/how-to-design-a-system-for-ethical-innovation-in-tech?partner=rss&utm_source=twitter.com&utm_medium=social&utm_campaign=rss+fastcompany&utm_content=rss

123 https://www.fastcompany.com/90308637/how-to-design-a-system-for-ethical-innovation-in-tech?partner=rss&utm_source=twitter.com&utm_medium=social&utm_campaign=rss+fastcompany&utm_content=rss

124 <https://www.wired.com/story/should-data-scientists-adhere-to-a-hippocratic-oath/>

on the translation of human rights into algorithmic systems design.¹²⁵

Make tech accountable

It can be argued that technology contains a social program based on optimisation problems and not on democratic debate. Moreover, society does not optimise for a set of predefined values, but individuals are committed to different values.¹²⁶ Therefore, technology, similarly to scientific research, should be the subject of impact assessment.^{127 128} Self-regulation and the adoption of ethical frameworks alone may not be enough to prevent harmful tech products.¹²⁹ The recommendations formed by the Women Leading in AI network include among others an industry level Fair AI certificate for companies, mandatory requirement for public sector organisations to inform citizens about the usage of algorithmic decision making and the establishment of an AI regulatory function to audit algorithms.¹³⁰

Support open-source tools

Parallel to making big tech more ethical, transparent open-source solutions should be also advocated. There are historic examples for citizen-based tech projects to circumvent mainstream communication channels, such as the Indymedia Center. Similarly, various cooperatives and non-profit organisations are committed to developing alternative tools.¹³¹ Therefore, with scaling and collaboration, viable alternatives to major tech services could be developed.¹³²

Empower gig workers

In recent years there has been a growing understanding that apps enabling gig work had a negative impact on labour standards and worker rights.¹³³ Regulatory pressure is increasing in many countries on platforms to classify their service providers as employees, instead of contractors.¹³⁴ On the other hand, calls for transparency about the apps and algorithms have remained problematic. As an example, apps do not want to reveal how the matchmaking algorithm works in order to preserve their competitive edge. However, platforms could be more open about the rating system towards the service providers and provide the reasons when the rating changes.¹³⁵

¹²⁵ <https://www.openglobalrights.org/when-law-meets-tech-moving-toward-rights-based-AI/>

¹²⁶ <https://www.cigionline.org/articles/adopting-new-technologies-we-must-define-common-good/>

¹²⁷ <https://www.cigionline.org/articles/adopting-new-technologies-we-must-define-common-good/>

¹²⁸ <https://medium.com/@progressivetech/beyond-covid-19-and-disaster-capitalism-why-we-need-sustainable-secure-left-tech-infrastructure-8a6d6c1e722f>

¹²⁹ <https://theintercept.com/2020/10/21/google-cbp-border-contract-anduril/>

¹³⁰ <https://womenleadinginai.org/report2019>

¹³¹ <https://medium.com/@progressivetech/beyond-covid-19-and-disaster-capitalism-why-we-need-sustainable-secure-left-tech-infrastructure-8a6d6c1e722f>

¹³² <https://www.aljazeera.com/opinions/2020/9/8/to-fight-data-colonialism-we-need-a-non-aligned-tech-movement/>

¹³³ https://slate.com/technology/2019/05/uber-strike-victory-drivers-network.html?link_id=8&can_id=296837f367fc5ae5c386dcb443cc6374&source=email-todays-headlines-jobs-with-justice-51419&email_referrer=email_546966&email_subject=todays-headlines-jobs-with-justice-51419

¹³⁴ <https://www.nytimes.com/2020/05/05/technology/california-uber-lyft-lawsuit.html#click=https://t.co/aEJctcVvR>

¹³⁵ <http://www.martijnarets.com/transparency-within-the-platform-economy-do-we-need-an-algorithm-accountant/?lang=en>

CONCLUSION

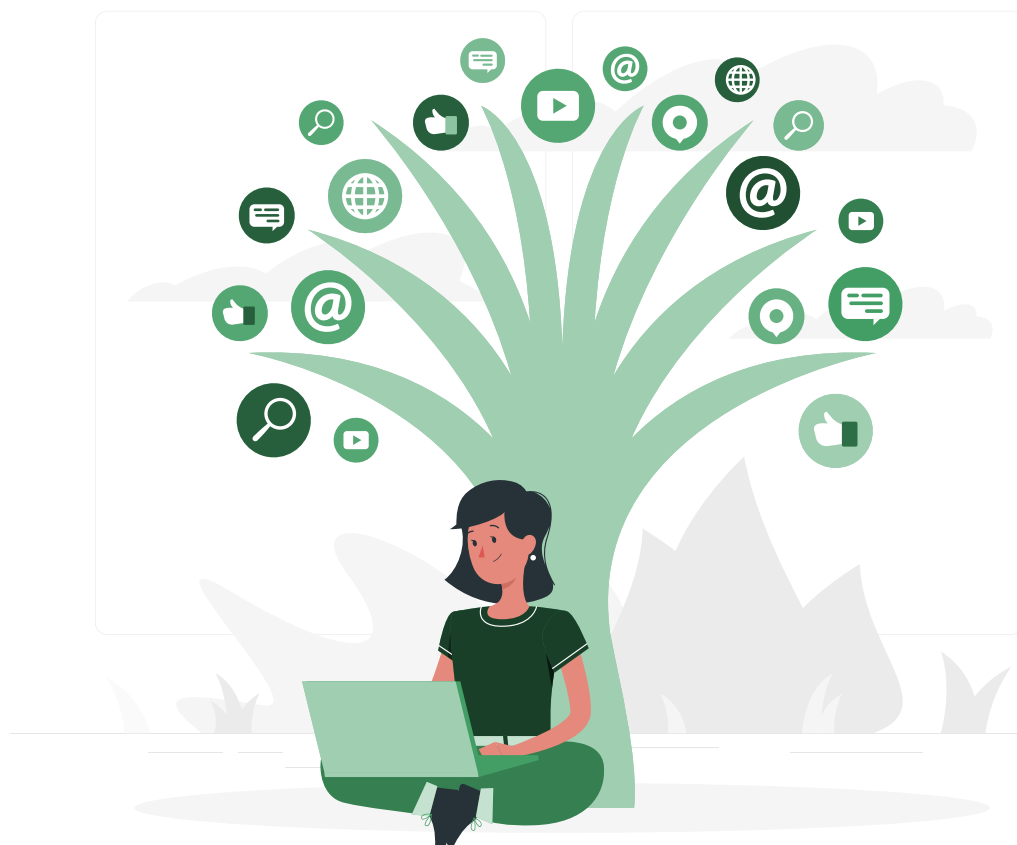
This report covered six umbrella topics of paramount importance for the future Internet, focusing on the relationship between technologies and social issues from various angles. The results highlighted the crucial role of the tech sector in social development: tech companies have a major, real-life impact on economic and social inequalities. Technology can be the solution for some of the greatest challenges ahead of mankind, but is also the source of various serious problems. The study also revealed the strong relationships between the topics: to achieve the goals discussed in Access, Inclusion and Justice, it is not enough to nurture new technologies (e.g. discussed in Decentralising Power & Building Alternatives), but also to implement adequate regulatory solutions (e.g. from Privacy, Identity & Data Governance). Therefore, policy and public institutions need to ensure that the tech ecosystem is evolving in a socially positive, sustainable way. The Internet of the future ought to be more open, inclusive, and ethical. Knowledge-driven policy can make it so.

This work contributed to the ongoing discussion on tech and policy three ways. First, a data collection method that enables the gathering of relevant opinions, articles, reports and blog posts in the evolving news landscape was introduced. Compared to our previous analyses, we radically increased the number of sources, widening the perspective of the study.

Second, a text-mining methodology was developed to systematically process and organise these writings. Using state-of-the-art methods, an optimal topic modelling algorithm was chosen. The methodology, combined with expert analysis, facilitated the identification of specific and narrow topics.

Third, an interactive tool was presented that facilitates further research and understanding of challenges and solutions discussed. The deep dive on Access, Inclusion and Justice highlighted the richness of information gathered with the tool and provided policy-makers with a number of solutions. The interactive visualisations enable the extension of the analysis to other areas as well.

Once again, we invite you to interactively explore the topics on our website <https://ngitopics.delabapps.eu>. To read all the details about the text-mining methodology, we encourage you to read the supplementary methodology paper <http://ngitopics.delabapps.eu/methodology.pdf>. Our previous results are available on <https://fwd.delabapps.eu/> and <https://covid.delabapps.eu/>.





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