Neurotechnology and Neurorights: an overview of European online news

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Executive Summary

The purpose of this document is to illustrate, using text mining techniques, **what topics related to neurotechnology are covered by European online media**. It intends to provide an overview of the most important news titles and reporting trends related to this topic. The sources of our analysis include a selection of the most important online media outlets in the 27 Member States.

This report summarises the findings of the analysis on data collected from **1 January 2020 until 24 October 2024.**

Key findings:

- **3,440 articles** discussed neurotechnology. Of these, **605 news items made a reference to neurorights and legislation**, addressing different laws or policies and calls for regulation.

- Media reporting was focused on **Elon Musk's company Neuralink** as it has made significant progress in developing brain implants. The most significant reporting peaks revolved around Neuralink implanting the first brain chip in human and receiving the authorisation to implant brain chips in humans by the U.S. Food and Drug Administration (FDA).

- Advancements in **brain implants and artificial intelligence** are being covered by the media, in particular their application and benefits in various neurological disorders. However, legal considerations around neurotechnologies received limited coverage (but slowly increasing) despite its significant ethical, regulatory and policy implications.

- The primary focus of online media was on compliance with safety regulations and ethical considerations, as reflected in the dominant emphasis on the value of *Safety* (53.8%) compared to *Policy* (10.7%) and *Political aspects* (7.5%). Key developments, such as the FDA's approval of Neuralink's human trials amidst ongoing ethical scrutiny by NGOs, underscore the challenges of balancing innovation with accountability. At international level, initiatives by the OECD, the EU and individual nations such as Chile and Spain, signal growing efforts to establish regulatory frameworks that prioritise transparency, human rights, and the safeguarding of mental integrity.

- The overall sentiment for news related to neurotechnologies and neurorights is **positive**, with 48.2% of the articles having a positive tone. There is little to no perceived threat of neurotechnology developments empowered by artificial intelligence. Elon Musk (72.6%) is the person most reported in articles, whereas the predominant values are *Universalism* (21.8%) and *Security* (20.3%).

- The main reporting countries in the EU are Spain, which hosts the National Neurotechnology Centre (Spain Neurotech), and France.

Introduction

This science media intelligence report is part of the joint publication series of the European Science-Media Hub (ESMH) and the JRC Text and Data Mining Unit that cover a wider range of scientific topics relevant to the work of the European Parliament's Panel for the Future of Science and Technology (STOA). In this report, the focus was on **neurotechnologies.**

In a time of unprecedented technological growth, we are witnessing the rapid convergence of cutting-edge scientific fields such as Artificial Intelligence (AI) and neurotechnology. This multidisciplinary blend is not only expanding the horizons of *brain science and neural engineering* but also offering innovative means **to record and potentially modify human neuronal activity**. The implications of these advancements are profound, as they hold the promise of ground-breaking *treatments for neurological disorders* and enhancements of cognitive capabilities, while raising concerns about surveillance, subliminal manipulation of preferences, and the collection of brain and mental information. The UNESCO report *Unveiling the Neurotechnology Landscape* even warns of the severe implications for human identity, autonomy, privacy, behaviours, and well-being – all part of what makes us human.[1]

Alongside the promise, this convergence raises **ethical, legal, and social questions** that must be addressed with urgency. The power to access and influence the most intimate workings of the human brain evokes scenarios once confined to the realm of science fiction: surveillance that transcends physical space to encroach upon our innermost thoughts, surreptitious manipulation of our preferences and behaviours at a neural level, and the collection and potential exploitation of personal brain and mental information. These issues underscore the fundamental need to protect the rights and privacy of individuals in the face of such powerful technologies.

As a response to these concerns, the new concept of neurorights has emerged. **Neurorights** could be defined as ethical, legal, social or natural principles of freedom or entitlement related to a person's cerebral and mental domain.[2] These rights are envisioned to complement the ethical and legal frameworks laid out within the human rights charter and confront the challenges posed by neurotechnological advancements. Neurorights aim to ensure that the progression of neurotechnology occurs in line with the values of freedom, consent, and personal autonomy.

There are growing efforts for neurotechnology governance from governmental, intergovernmental, and non-governmental institutions. The European Institutions recognise the severity and immediacy of these issues and therefore aim to play a proactive role in the global dialogue on neurotechnology governance. The European Commission's interest in this domain is driven by the need to balance innovation with the protection of fundamental rights, to maintain public trust in science, and to prevent potential abuses that could arise from unchecked development and application of these technologies.

Despite the significant advancements in neuroscience over the last years, and the high reputation that this field of science enjoys, there remains a considerable risk of perpetuating 'neuromyths' and 'neuroenchantment'— the uncritical acceptance of overhyped claims about the capabilities and

[1] Hain, D. S., Jurowetzki, R., Squicciarini, M., & Xu, L. (2023), *Unveiling the neurotechnology landscape: scientific advancements innovations and major trends*, UNESCO: United Nations Educational, Scientific and Cultural Organisation.

[2] Ienca, Marcello. (2021). COMMON HUMAN RIGHTS CHALLENGES RAISED BY DIFFERENT APPLICATIONS OF NEUROTECHNOLOGIES IN THE BIOMEDICAL FIELD.

applications of neurotechnology, as a recent STOA study shows[3]. These myths can distort public understanding and expectations, potentially leading to the misallocation of resources and the erosion of trust in legitimate scientific research.

Therefore, **it is important to monitor and promote transparent communication on the limitations and risks of neurotechnologies**.

The purpose of this report is to **monitor how the European media has covered neurotechnologies** so far. This report illustrates the reporting trends and peaks, the main topics and events that stood out in the media, and the highlights in different EU Member States.

The analysis was performed on online articles published by European online media between **1 January 2020 and 24 October 2024**. To identify the most relevant topics, an automated topic-clustering algorithm was used to unveil the main events and narratives appearing in the media. The data was collected by the Europe Media Monitor (EMM) on a selection of the most important online media sources in the 27 EU Member States, including 581 media outlets from all Member States.[4]

For a detailed description of the methodology and applied technology, please refer to the Annexes.

[3] Maia de Oliveira Wood, G., Berger, L., et al. (2024). THE PROTECTION OF MENTAL PRIVACY IN THE AREA OF NEUROSCIENCE: SOCIETAL, LEGAL AND ETHICAL CHALLENGES.

[4] The number of sources was weighted based on the countries' population.

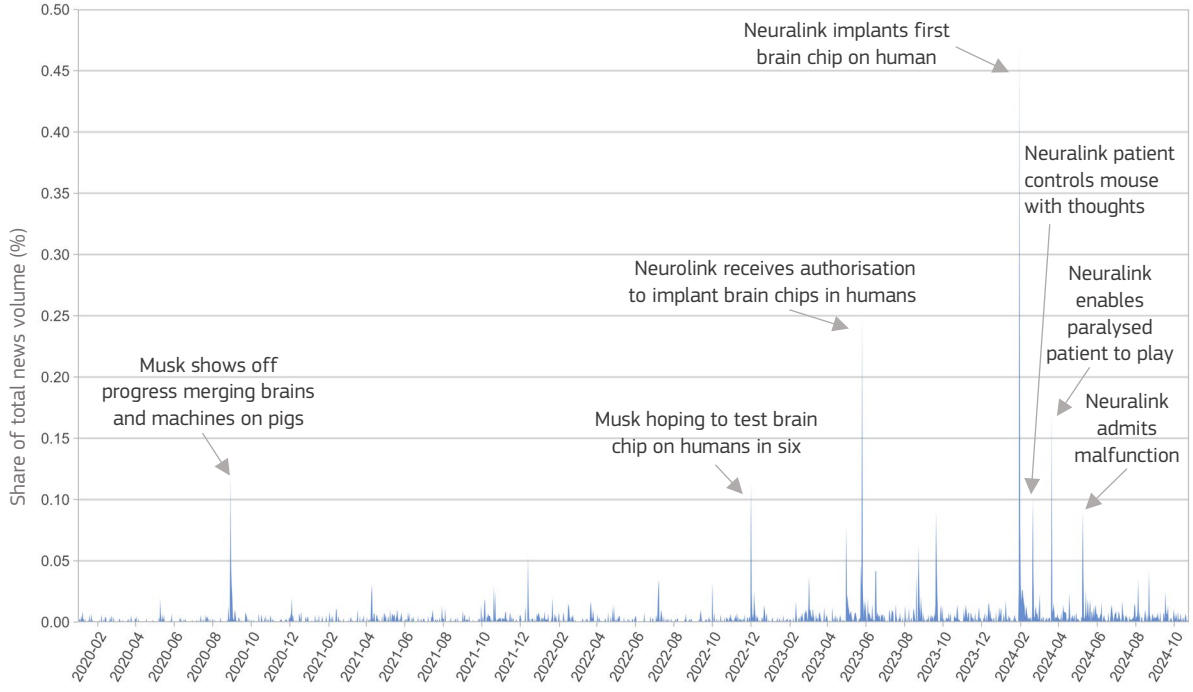
1. Reporting trends and peaks

This section provides an overview of the media reporting volume on neurotechnnology. **3,440 articles discussed neurotechnology** focussing on different aspects and events (for an overview of the most discussed topics, see section 2). **605 news items made a reference to neurorights and legislation**, addressing different laws or policies to the call for regulation.

Figure 1 displays the full dataset containing 3,440 articles that discussed **neurotechnology and its development, its convergence with Artificial Intelligence and its legal considerations**. The chart presents the total number of articles published daily that contain the keywords related to the concept of "neurotechnology" (see Query 3 described in the Data selection of the Appendix).

The overall reporting has gradually increased over the past few years, with some outstanding peaks throughout the period of observation. This shows that the topic generates more media interest and finds more relevance in the public discourse than in the previous years. Nonetheless, the share of the global online media reporting on the topic remains small.

Figure 1 Share of volume on neurotechnology and neurorights in global media reporting



Source: *EMM "EE24campaign"* index. Period: 01-01-2020 to 24-10-2024. Daily share of news on neurotechnology and neurorights (Query 3) of global EU news reporting.

The **significant reporting peaks** standing out in the timeline relate to news about Neuralink's activities and achievements:

- In August 2020, Elon Musk's presentation of trials implementing brain chips into three pigs was picked up by the media, but it was also mentioned that the progress was rather slow.[5]
- In December 2022, media covered Elon Musk hoping to test brain chip on humans in six months.[6]
- In May 2023, Neuralink received authorisation to implant brain chips in humans by the U.S. Food and Drug Administration (FDA).[7]
- In January 2024, Neuralink claimed to have implanted the first brain chip on human.[8]
- In February 2024, media covered the results of Neuralink's brain chip implantations, highlighting that the patient could control a computer mouse with their thoughts.[9]
- In March 2024, the 'telepathy case' made the headlines, referring to the Neuralink brain chip enabling a paralysed patient to play chess.[10]

[5] https://www.bfmtv.com/tech/la-puce-connectee-d-elon-musk-implantee-dans-le-cerveau-d-un-cochon_AD-202008290014.html

[6] https://www.ilmessaggero.it/tecnologia/news/chip_nel_cervello_umano_musk_neuralink_cosa_e-7086962.html

[7] https://www.ilfoglio.it/tecnologia/2023/05/27/news/lo-sviluppo-dei-chip-cerebrali-di-musk-mostra-l-urgenza-di-una-regolamentazione-delle-nuove-tecnologie-5316462/

[8] https://www.lemonde.fr/pixels/article/2024/01/30/elon-musk-annonce-que-sa-start-up-neuralink-a-pose-son-premier-implant-cerebral-sur-un-patient_6213876_4408996.html

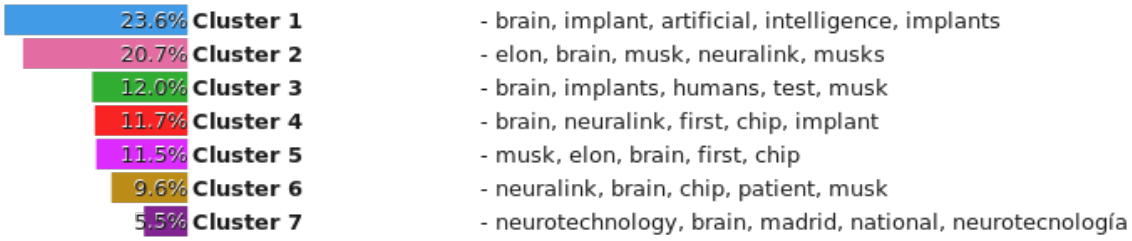
[9] https://forbes.n1info.hr/tech/strucnjaci-kritiziraju-muskov-neuralink-a-on-tvrdi-da-prvi-mozdani-implantat-odlicno-radi/

[10] https://www.ilpost.it/2024/03/21/neuralink-primo-video-paziente-gioca-scacchi/

2. Main reported topics

This section presents the main topics related to neurotechnology, and its convergence with artificial intelligence, covered by European online media. The topics have been identified by grouping the articles based on their titles' semantic similarity.[11] This technique allows to highlight debates on topics from various perspectives and to identify aspects that were relevant over a few weeks rather than peaking on specific dates only (and that might therefore not stand out as single peaks in the timeseries). The identified topics are displayed in Figure 2 from biggest to smallest volume of articles, offering a general overview of the topics' portrayal in the media.

Figure 2 Volume and most frequent keywords for TOP 7 reported topics on neurotechnology



Source: *EMM "EE24campaign"* index. Period: 01-01-2020 to 24-10-2024.
Note: Clustering was performed on headlines. Headlines not similar to any of the groups are not considered in the distribution across topics (Clustered: 2,551, Total: 3,167). Similarity also includes the similar length of titles and mentions of names.

The majority of media reporting refers to **Elon Musk's Neuralink** (clusters 2 to 6, representing in total 65.5% of the grouped news articles). The **media mainly reports on Neuralink advancing brain implant technology** (cluster 2) and making significant progress in developing brain implants. However, the company has faced criticism and controversy, including allegations of animal cruelty and concerns over the safety of its implants. Despite these challenges, Neuralink remains at the forefront of brain-computer interface technology, with Elon Musk aiming to revolutionise the field and ultimately achieve a symbiosis between humans and artificial intelligence.

The media paid particular attention to the following events:

- **Neuralink brain implants being approved for human trials** (cluster 3). Neuralink has been approved to test its brain implants on humans by U.S. Food and Drug Administration (FDA) in May 2023, with the goal of treating diseases and potentially enhancing human cognition. The company has already successfully implanted chips in animals, including pigs and monkeys. The company is recruiting volunteers for the clinical trial, which will involve implanting a chip in the brain to enable communication with computers. Musk hopes to start testing the brain implants, despite concerns from regulators and scientists about the safety and ethics of the technology. Neuralink's rival, Synchron, is also preparing to test its own brain implant technology on humans.
- **Neuralink reports having implanted a brain chip in a human** (cluster 6), allowing the patient to control a computer mouse with their thoughts. The company is working on developing a brain-machine interface that could potentially treat a wide range of medical conditions.

[11] 2,551 articles could be grouped to clusters based on semantic similarity (equal to 80.5% of the full dataset, represented by 3,167 single articles). The computed clusters provide a comprehensive overview of the main topics discussed in the neurotechnology.

- **Chile amending its constitution to include neurorights** and so protect its citizens' 'brain rights'.[12] Chile became the first country in the world to legislate on neurorights with the aim to safeguard the human mind from potential manipulation.
- **Neuralink claims leadership in brain chip industry** (cluster 4 and 5). The company had planned to perform more brain implants to improve its chips and procedure, but it faced criticism and controversy over its treatment of animals in testing and the potential risks of its technology. Neuralink remains a leading player in the field of neurotechnology and continues to push the boundaries of what is possible with brain-computer interfaces.

Beside the major focus on Neuralink's activities and achievements, the main standalone topic portrayed in the media (cluster 1; 23.6%) related to the **breakthrough in brain implants using AI.**

> Recent advancements in brain implants and AI have shown promising results in treating various neurological disorders, including paralysis, depression, and Parkinson's disease. These implants can read brain signals, enabling people to control devices with their thoughts and even regaining the ability to speak and walk. Additionally, AI-powered brain implants have been used to diagnose and treat conditions such as autism and obsessive-compulsive disorder. Researchers have also made progress in developing non-invasive brain-computer interfaces, which can decode thoughts and translate them into text or speech. Additionally, AI-powered systems have been designed to predict and prevent neurological disorders, such as epilepsy and depression. News items portrayed the potential of the innovations to revolutionise the treatment of neurological conditions and improve the lives of millions of people worldwide.

Another topic raised in the media refers to **EU and Spain investing in brain and neurotechnology research** as well as **the first law to regulate the use of neurotech** (cluster 7; 5.5%).

> The European Union and Spain were reported to have heavily invested in neurotechnology through the Neurotech National Centre established in Madrid. Partially leveraged by the Next Generation funds, the centre aims to become a world reference for the application of AI to neurotechnology, a field with numerous applications, especially in the area of health.
>
> Meanwhile, Chile has become the first country to pass a law protecting 'neurorights', i.e. the rights to personal identity, free will and mental privacy. This bill was reported to potentially serve as a foundation for future human rights legislation in other countries, as they confront emerging technologies applied to the mind and brain.

As several companies are developing new neurotechnology products, including brain-computer interfaces and neurostimulation devices, researchers are also warning of the risks associated with neurotechnology, including the potential for brain hacking and the impact on human rights.

Overall, **Musk's company Neuralink dominated the media landscape** regarding neurotech, as it has been driving the progress in the field. Advancements in brain implants equipped with AI were also reported, highlighting the application and benefits in various neurological disorders. It is noteworthy that the **legal consideration of neurotechnologies does not prominently emerge from the overall topics identified**.

[12] https://www.bcn.cl/leychile/navegar?idNorma=1166983

3. Reporting tonality for TOP 7 topics

In addition to the content analysis, algorithms were applied for sentiment classification as well as for detection of persons and human basic values (for details see the Methodology in Annex). Figure 3 presents the overall reporting tonality for the seven main clusters, based on this automated analysis.

The **predominant sentiment of the articles on neurotechnology is positive** (with a share of 48.2% positively classified news items compared to 8.4% negatively classified articles), i.e. the topic is introduced with positively connoted headlines to the reader, thus portrayed in a positive light.

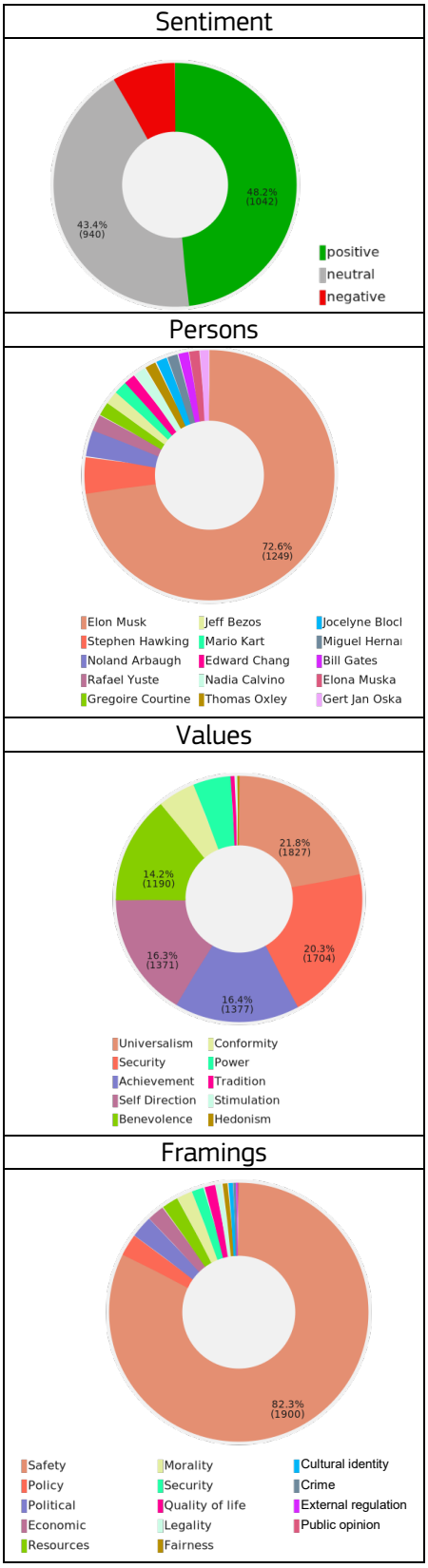
Elon Musk is by far the most mentioned person across all news groups, linked to the progress in the neurotechnology in general and especially driven by Neuralink. For cluster 7 individually, he only ranks in the second place after the renowned scientist **Rafael Yuste,** who was involved in the launch of the Neurotech National Centre in Spain.

Regarding **basic human values** which refer to desirable goals that motivate action, the expressions of ***UNIVERSALISM, SECURITY and SELF-DIRECTION* scored the highest**.

- The prominence of UNIVERSALISM (21.8%) as the top value implies that the reporting on neurotech conveys commitment to equality and justice, and the concern for the well-being of all.
- SECURITY, the next most prevalent value (20.3%), underscores that safety and health are addressed, with neurotechnologies portrayed as safe and secure in the media.
- The elevated score for SELFDIRECTION (16.3%) suggests that the discourse in the media highlights the big potential to increase the autonomy and freedom of patients using innovative neurotech solutions, allowing them to live a self-determined life.
- ACHIEVEMENT also ranks high as several milestones in the development of neurotechnologies have been conveyed to the public in the media.

Regarding the **framing**, which refers to the perspective under which an issue or a piece of news is presented, ***SAFETY* scored the highest**, underlining that articles are focused on the matter of safety and not on the legal or political considerations.

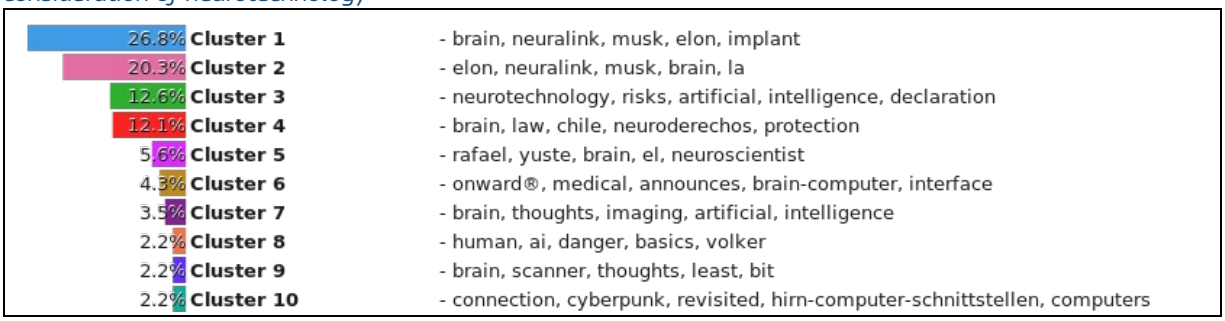
Figure 3 Reporting tonality for TOP7 clusters



4. Focus on neurorights and legal considerations related to neurotechnology

This section zooms in on the discussion about neurorights and the legal considerations of neurotechnology (see Query 2 in the Data selection of the Annex). The associated topics have been identified by grouping the articles based on their titles' semantic similarity, and are displayed from biggest to smallest volume of articles in Figure 4.

Figure 4 Volume and most frequent keywords for TOP10 reported topics on neurorights and legal consideration of neurotechnology



Source: *EMM "EE24campaign"* index. Period: 01-01-2020 to 24-10-2024.

Note: Clustering was performed on headlines. Headlines not similar to any of the groups are not considered in the distribution across topics (Clustered: 328, Total: 605). Similarity also includes the similar length of titles and mentions of names.

The legal aspects of neurotechnology receive minimal attention in the articles analysed. In most cases, legal considerations are only briefly mentioned, often relegated to the end of the article. Nevertheless, references to existing policies on testing and clinical trials, as well as compliance with national health regulations - such as those involving the U.S. FDA, are present. In particular, articles refer to **FDA's approval for Neuralink's human trials** for brain implants (cluster 1), and to the formal **complaint for alleged violation of the U.S. Animal Welfare Act** filed by the Physicians Committee for Responsible Medicine (PCRM).

In relation to legal considerations surrounding neurotechnology, online media reports tend to **focus more on compliance with safety regulations** than on policy issues. This emphasis is further supported by the analysis of framing techniques, which reveals that *SAFETY* (53.8%) accounts for a significantly higher proportion compared to *POLICY* (10.7%) and *POLITICAL* (7.5%).

The media did however cover the attempt by international organisations to develop a regulatory framework (cluster 3), including the OECD calling for international cooperation to develop guidelines and regulations for neurotechnology, and the EU considering to **adapt the General Data Protection Regulation (GDPR) to address specific challenges posed by neurotechnologies** (cluster 3). The media also extensively reported on Chile becoming the first country in the world to embed 'neurolaw', the right to mental integrity, into its constitution with the aim to safeguard the human mind from potential manipulation (Cluster 3, 10).

When it comes to neurorights and legal considerations of neurotechnology, Elon Musk is still the most reported person (50.2%), followed by the neuroscientist Rafael Yuste (15.4%) and the Chilean Senator Guido Girardi (5.4%), promotor of the first legislative initiative to regulate 'neuro-rights'. France (26.7%) and Spain (23.3%) are the two EU countries reporting the most on this specific topic, followed by Estonia, Germany and Italy (7.3% respectively).

When discussing neurorights and the legal implications of neurotechnology, the media focuses on the following events:

- The Physicians Committee for Responsible Medicine (PCRM), a U.S.-based non-profit organisation, lodged a formal complaint against Neuralink, accusing them of violating the U.S. Animal Welfare Act through invasive and lethal experiments on monkeys. The complaint alleges that Neuralink's brain implants experiments cause severe suffering to the animals tested on due to inadequate care and the highly invasive nature of the procedures, raising profound ethical and moral concerns about the treatment of animals and the conduct of the research.

- Neuralink is under investigation by the U.S. Department of Transportation for allegedly mishandling hazardous materials from brain implant tests on monkeys, posing a risk to public health. Additionally, four U.S. lawmakers have called on the Securities and Exchange Commission (SEC) to investigate potential securities fraud by Elon Musk. They allege that Musk may have misled investors regarding the safety of the brain implant being developed by his company (Cluster 2). The media coverage on these investigations and controversies gained particular traction in France, which appears as the main reporting country on this topic (63.8%, cluster 2).

- The meeting between Neuralink's CEO and Israeli Prime Minister Benjamin Netanyahu, during which several topics have been discussed including the potential of AI to revolutionise medicine and automation, but also the risks it poses to democracy.

- As part of the priorities of the National Strategy for Artificial Intelligence (ENIA),[13] Spain aims to develop research centres and gain international reputation in the field of neurotechnology. Similarly, the European Commission has approved a declaration which seeks to promote public and private investment in the domain while considering a regulatory framework to safeguard individuals' neurodata, including **potential adaptations to the General Data Protection Regulation (GDPR) to address the specific challenges posed by neurotechnologies.**

- The OECD has called for international cooperation to develop guidelines and regulations for neurotechnology, putting the emphasis on transparency, accountability and human rights.[14] In April 2024, it adopted the Neurotechnology Toolkit designed to facilitate policymakers in neurotechnology regulation.[15] Chile and the United States are also addressing the regulatory challenges of neurotechnology. Chile has been developing a national strategy that includes protecting individuals' neurodata and promoting investments in the field, while the U.S. state of Colorado has passed a law to safeguard the confidentiality of "neural data."

- Chile became the first country in the world to legislate on neurotechnologies and privacy of the mind (cluster 4 and 10). Its constitutional amendement[16] aims to protect individuals from potential abuses of neurotechnologies, including the unauthorised access to the human brain, such as reading or manipulating brain data. Other news reported the warning issued by the UN High Commissioner for Human Rights, Volker Türk, on the potential threats to human dignity. Speaking at a forum in Geneva commemorating the 75th anniversary of the Universal Declaration of Human Rights, Türk acknowledged the transformative potential of digital advancements but warned of the threats to humanity and individual rights posed by some innovative technologies, such as neurotechnologies.

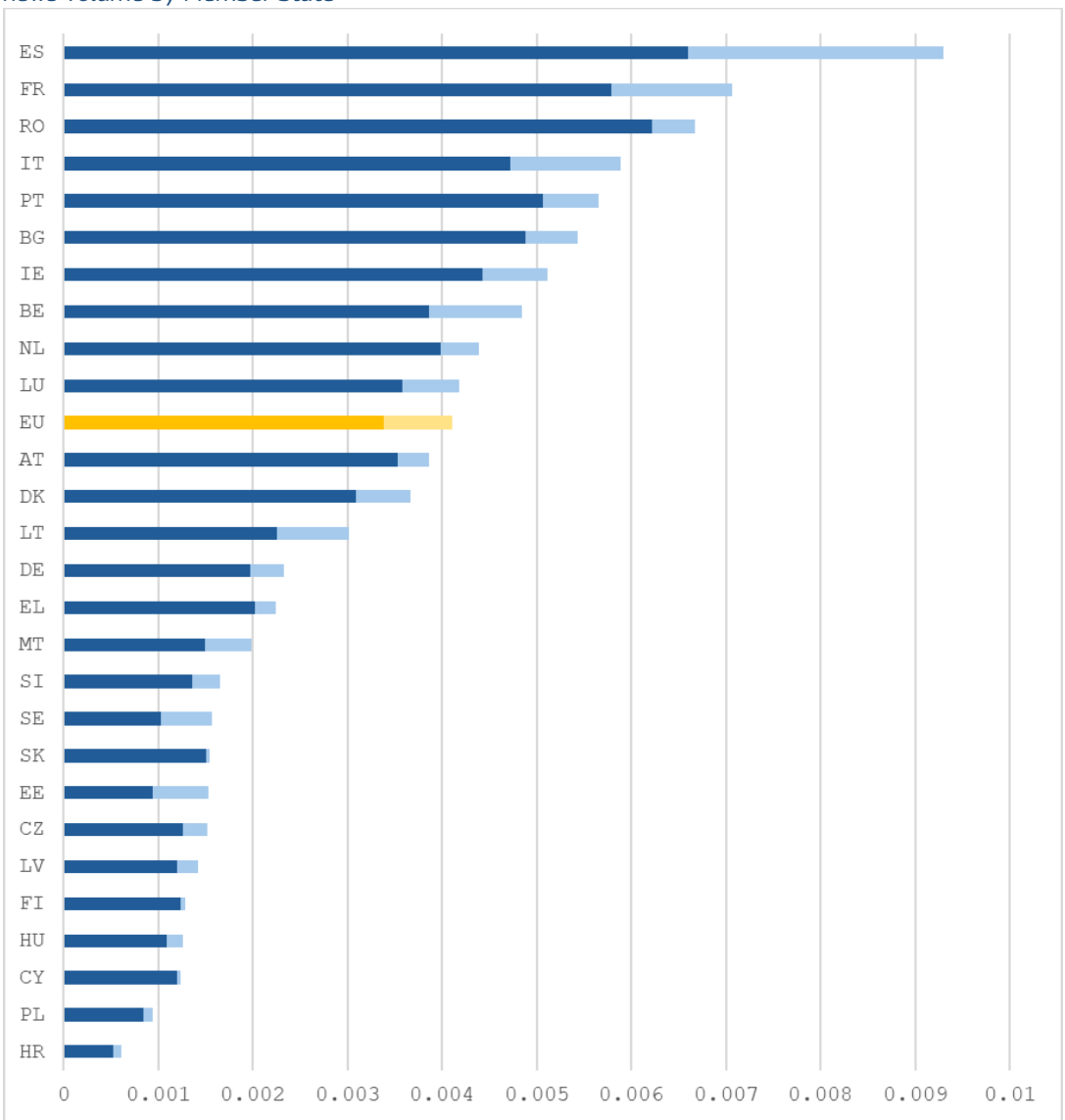
[13] https://www.lamoncloa.gob.es/lang/en/gobierno/news/Paginas/2022/20221222_spain-neurotech.aspx
[14] https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0457
[15] https://www.oecd.org/content/dam/oecd/en/topics/policy-sub-issues/emerging-technologies/neurotech-toolkit.pdf
[16] https://www.bcn.cl/leychile/navegar?idNorma=1166983

5. Country highlights

Figure 5 allows to compare the media attention to neurotechnology with the global reporting in the 27 EU Member States and the EU average. The highest share of media coverage was found in **Spanish media** with 0.009% of articles covering neurotechnology. For comparison, this means that less than 1 in 10,000 articles in the European online news dealt with neurotechnology. The second and third highest shares of neurotech-related news were identified in **French** and **Romanian media** (each 0.007%). Italian, Portuguese, Bulgarian and Irish news dedicated more than 0.005% of their general news reporting to the topic of neurotechnology.

The share of news specifically related to neurorights and the legal considerations of neurotechnology in online news was by far the highest within **Spanish media** (0.0027%), followed by **French media** (0.0012%). The next highest shares, still above the EU average, were identified in **Italy**, **Belgium** and **Lithuania**.

Figure 5 Share of reporting on neurotechnology in general compared to its legal considerations in the overall news volume by Member State



Bar chart displaying the share of news articles on neurotechnology in general in the overall online news by Member State. In addition, the light part of the bars represents the share of news on neurorights and the legal considerations related to neurotechnology. Source: *EMM "EE24campaign"* index. Period: 01-01-2020 to 24-10-2024.

Highlights in the main reporting countries in the EU

Spanish media

- The opening of the National Centre of Neurotechnology (*Spain Neurotech*) in Madrid.
- Scientists having developed brain-computer interfaces and AI-powered implants to help people with neurological disorders, improving the quality of life for millions.
- Elon Musk's company Neuralink being under scrutiny for its brain chip technology, with allegations of animal abuse and poor results. The rapid progress in neurotechnology has raised ethical concerns about human rights and the potential misuse of these technologies, sparking discussions about neurorights and the need for ethical guidelines. The Spanish government presented a Charter of Digital Rights[17] to guide future policies technology, ensuring the responsible development and use of these technologies.[18]

French media

- Brain implant technology showing promising results in restoring abilities in individuals with paralysis, brain trauma and other neurological conditions. However, concerns have been raised about the impact on privacy, personal autonomy, and animal welfare. Investigations are ongoing into Neuralink's alleged animal protection law violations.
- Chile adopting a law to regulate the use of neurotechnologies, and researchers calling for "neurorights" to protect individuals from potential risks.
- Companies such as Neuralink, Apple and Amazon making progress in developing brain implants and neurotechnologies, but also facing regulatory and safety challenges. A deepfake attack has resulted in a U.S.D 25 million loss, highlighting concerns about the risks related to neurotechnologies and unapproved devices.

Romanian media

- Recent advancements in brain implants showing promising results in treating various conditions, including paralysis, speech disabilities and depression, allowing individuals to regain control of their bodies, to communicate and experience improved emotional responses.

Italian media

- Advances in AI and neurotechnology raising concerns about risks to human freedom and the need for regulation. Researchers and experts warn about the potential for neurotechnology misuse, emphasising the need for strict regulation to protect human rights, brain data and individual freedoms.

Belgian media

- Elon Musk's Neuralink successfully implanting a brain chip in a tetraplegic patient, enabling him to play chess with his thoughts, but sparking concerns about animal testing and potential risks which prompting Chile to become the first country to enact "brain rights" legislation.

[17] https://administracionelectronica.gob.es/pae_Home/pae_Actualidad/pae_Noticias/Anio2021/Julio/Noticia-2021-07-15-El-Gobierno-de-Espana-adopta-Carta-Derechos-Digitales.html

[18] https://elpais.com/tecnologia/2021-07-14/el-gobierno-presenta-una-carta-de-derechos-digitales-para-guiar-las-futuras-politicas-tecnologicas.html

Conclusions

Despite a slight increase in the reporting trend over the past years, the topic “neurotechnology”, and in particular “neurorights”, is not widespread in the European online media. The potential and benefits for the healthcare industry are well portrayed, but concerns and risks associated to the technology are mentioned only in a small portion of the news items.

Neurotechnology is mostly presented in a positive light, as a great opportunity for people with different types of diseases to improve their quality of life. Although concerns are also addressed in news articles, these may not sufficiently raise awareness among readers about the potential risks of neurotechnology if used for purposes other than those reported. Additionally, the importance of regulation to mitigate such risks might not be effectively conveyed in the media.

Overall, the public discourse revolves around safety and security rather than political safeguards or ethical guidelines.

Elon Musk’s company, Neuralink, and its efforts in promoting its work, has been dominating the news landscape on neurotechnology. The main topics and peaks of news reporting revolve around the company and its achievements. Elon Musk was the most reported person in the field of neurotechnology and has become a household name.

The main countries reporting on neurotechnology in the EU are Spain and France. Spanish media in particular has been actively reporting on neurotechnologies due to the launch of the National Neurotechnology Centre in Madrid.

Legislative aspects

The legal landscape surrounding neurotechnologies, as reflected in the media coverage analysis, receives limited attention despite its increasing ethical, regulatory and policy implications. Online media primarily focuses on compliance with safety regulations and ethical issues.

Key developments include the U.S. FDA's approval of Neuralink's human trials and the associated ethical concerns, including the formal complaint for alleged violation of the U.S. Animal Welfare Act (filed by the Physicians Committee for Responsible Medicine) and the investigations led by the U.S. Department of Transportation for alleged mishandling of hazardous materials. These controversies underscore the challenge of balancing innovation with accountability and the humane treatment of test subjects.

At international level, efforts to establish regulatory frameworks are gaining traction. The OECD has called for global cooperation to create guidelines anchored in transparency, accountability and human rights, while the EU is exploring to adapt its **General Data Protection Regulation (GDPR)** to address neurotech-specific challenges. National initiatives, such as the Spain's National Centre for Neurotechnology, and Chile's groundbreaking law which embeds the right to mental integrity in the country’s constitution, demonstrate an increasing recognition of the need for comprehensive regulatory measures.

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Appendix

Data selection

Articles relevant for the analysis are selected by searching for a set of relevant keywords or keyword combinations that appear in the title, description or text of the article. Description refers to ca. the first 300 characters of the article, following the title. These keywords are translated into all EU24 languages. The keyword combinations have been selected carefully to include all important articles but to avoid irrelevant 'noise' in the news collection.

Query	Articles are included in the data set if they contain at least one keyword/expression of:	
Query 1 – Neurotechnology and AI	GROUP 1 – NEUROTECHNOLOGY SPECIFIC	In title or description
	OR	
	GROUP 2: ARTIFICIAL INTELLIGENCE AND GROUP 3: NEUROTECHNOLOGY BROAD	In title or text In title or text
Query 2 – Neurotech, rights and legislation	GROUP 4: NEURORIGHTS	In title or text
	OR	
	GROUP 3: NEUROTECHNOLOGY BROAD AND GROUP 5: RIGHTS AND LEGISLATION	In title or description In title or text
	OR	
	GROUP 3: NEUROTECHNOLOGY BROAD AND GROUP 5: RIGHTS AND LEGISLATION	In text In title or description
Query 3 – Neurotechnology TOTAL	**Query 1 – Neurotechnology and AI**	
	OR	
	Query 2 – Neurotech, rights and legislation	

GROUP 1: NEUROTECHNOLOGY SPECIFIC

"brain computer interfaces", "brain-computer-interface", "mind-computer interfaces", "brain-computer interface", "brain implant", "brain implants", "brain technology", "neuro implant", "neuro implants", "neurosensors", "neurotech", "neurotechnologies", "neurotechnology", "mind-computer interfaces", "brain-computer interface", "brain chips", "brain chip",

"мозъчен чип", "mozdni čip", "mozek čip", "hjerne-chip", "hersenchip", "aju kiip", "aivojen mikrosiru", "puce cérébrale", "gehirn-chip", "gehirnchip", "τσιπ εγκεφάλου", "agyi chip", "cip inchinne", "chip cerebrale", "smadzeņu čips", "smegenų čipas", "ċip tal-moħħ", "chip mózgu", "chip cerebral", "cip cerebral", "mozgový čip", "hjärnchip", "интерфейси ум-компютър", "интерфейс мозък-машина", "sučelja um-računalo", "sučelje mozak-stroj", "rozhraní mysl-počítač", "rozhraní mozek-stroj", "hjerne-computer interface", "grænseflader mellem sind og computer", "geest-computer interfaces", "hersenen-machine interface", "mõistus-arvuti liidesed", "aju-masina liides", "mieli-tietokone-rajapinnat", "aivo-kone-liitäntä", "interfaces esprit-ordinateur", "interface cerveau-machine", "Geist-Computer-Schnittstellen", "Gehirn-Computer-Schnittstelle", "διεπαφές νου-υπολογιστή", "διεπαφή εγκέφαλος-μηχανή", "elme-számítógép interfészek", "agy-gép interfész", "comhéadain intinne-ríomhaire", "comhéadan inchinn-meaisín", "interfacce mente-computer", "interfaccia cervello-macchina", "prāta-datora saskarnes", "smadzeņu-mašīnas saskarne", "protas-kompiuterio sąsajos", "smegenų-mašinos sąsaja", "interfaċċi moħħ-kompjuter", "interfaċċa moħħ-magna", "interfejsy umysł-komputer", "interfejs mózg-maszyna", "interfaces mente-computador", "interface cérebro-máquina", "interfețe minte-ordinator", "interfață creier-mașină", "rozhrania myseľ-počítač", "rozhranie mozog-stroj", "vmesniki um-računalnik", "vmesnik možgani-stroj", "gränssnitt mellan hjärna och dator", "gränssnitt mellan sinne och dator"OR "мозъчен чип", "интерфейси за мозъчен компютър", "мозъчен имплант", "мозъчни импланти", "мозъчна технология", "невронни импланти", "невросензори", "невротехнологии", "невротехнология", "mozkový čip", "rozhraní mozkových počítačů", "mozkový implantát", "mozkové implantáty", "technologie mozku", "neuroimplantáty", "neurosenzory", "neurotechnologie", "hjernechip", "grænseflader til hjernecomputere", "hjerneimplantat", "Hjerneimplantater",

"hjerneteknologi", "neuroimplantat", "neuroimplantater", "neurosensorer", "neuroteknologi", "Gehirnchip", "Gehirncomputerschnittstellen", "Gehirnimplantat", "Gehirnimplantate", "Gehirntechnologie", "Neuroimplantat", "Neuroimplantate", "Neurosensoren", "Neurotechnologien", "Neurotechnologie", "τσιπ εγκεφάλου", "διεπαφές υπολογιστών εγκεφάλου", "εμφύτευμα εγκεφάλου", "εμφυτεύματα εγκεφάλου", "τεχνολογία εγκεφάλου", "νευροεμφύτευμα", "νευροεμφυτεύματα", "νευροαισθητήρες", "νευροτεχνολογίες", "νευροτεχνολογία", "chip cerebral", "interfaces de ordenador del cerebro", "interfaces mente-ordenador", "interfaz cerebro-máquina", "implante cerebral", "implantes cerebrales", "tecnología del cerebro", "implante neurológico", "neuroimplantes", "neurosensores", "neurotecnologías", "neurotecnología", "ajukiip", "ajuarvuti liidesed", "ajuimplantaat", "ajuimplantaadid", "ajutehnoloogia", "neuroimplantaat", "neuroimplantaadid", "neurosensorid", "neurotehnoloogia", "aivosiru", "Aivojen tietokoneiden rajapinnat", "aivoimplantti", "aivoimplantit", "aivoteknologia", "neuroimplantti", "neuroimplantit", "neurosensorit", "neuroteknologiat", "neuroteknologia", "puce cérébrale", "Interfaces de l'ordinateur cérébral", "implant cérébral", "implants cérébraux", "technologie du cerveau", "implant neuro", "implants neuro", "neurocapteurs", "slis inchinne", "comhéadain ríomhaire inchinne", "ionchlannán inchinne", "ionchlannáin inchinne", "teicneolaíocht inchinne", "néar-ionchlannán", "néar-ionchlannáin", "néarbhraiteoirí", "néartheicneolaíochtaí", "néaraitheicneolaíocht", "čip za mozak", "sučelja moždanih računala", "implantat za mozak", "implantati za mozak", "tehnologija mozga", "neuro implantati", "neurosenzori", "neurotehnologije", "neurotehnologija", "agychip", "agyi számítógépes interfészek", "agyimplantátum", "agyimplantátumok", "agytechnológia", "neuroimplantátum", "idegimplantátumok", "neuroszenzorok", "neurotechnológiák", "neurotechnológia", "chip del cervello", "Interfacce cervello-computer", "impianto cerebrale", "impianti cerebrali", "tecnologia del cervello", "impianto neurologico", "impianti neurologici", "neurosensori", "neurotecnologie", "neurotecnologia", "smegenų lustas", "Smegenų ir kompiuterių sąsajos", "smegenų implantas", "Smegenų implantai", "smegenų technologija", "Neuro implantai", "neurosensoriai", "neurotechnologijos", "smadzeņu mikroshēma", "smadzeņu datoru saskarnes", "smadzeņu implants", "smadzeņu implanti", "smadzeņu tehnoloģija", "neiroimplants", "neiroimplanti", "neirosensori", "neirotehnoloģijas", "neirotehnoloģija", "ċippa tal-moħħ", "interfaċċji tal-kompjuter tal-moħħ", "impjant tal-moħħ", "impjanti tal-moħħ", "teknoloġija tal-moħħ", "impjant tan-newro", "impjanti tan-newro", "newrosensuri", "newroteknoloġiji", "newroteknoloġija", "hersenchip", "interfaces voor hersencomputers", "hersenimplantaat", "hersenimplantaten", "hersentechnologie", "neuro-implantaat", "neuro-implantaten", "neurosensoren", "neurotechnologieën", "chip mózgowy", "interfejsy mózg-komputer", "implant mózgu", "implanty mózgowe", "technologia mózgu", "implanty neurologiczne", "neurosensory", "neurotechnologia", "interfaces de computador do cérebro", "implantes cerebrais", "tecnologia cerebral", "neurossensores", "neurotecnologias", "cip pe creier", "interfețele creier-calculator", "implantul cerebral", "implanturi cerebrale", "tehnologia creierului", "implantul neuronal", "implanturi neuronale", "neurotehnologii", "neurotehnologie", "mozgový čip", "rozhrania pre mozgové počítače", "mozgový implantát", "mozgové implantáty", "technológia mozgu", "neurotechnológie", "možganski čip", "vmesniki za možganske računalnike", "možganski vsadek", "možganski vsadki", "možganska tehnologija", "nevro implantat", "nevro implantati", "nevrosenzorji", "nevrotehnologije", "nevrotehnologija", "hjärnchip", "Gränssnitt för hjärndatorer", "hjärnimplantat", "hjärnteknik", "neuroteknik"

GROUP 2: ARTIFICIAL INTELLIGENCE

"artificial intelligence",

"изкуствен интелект", "umělá inteligence", "kunstig intelligens", "Künstliche Intelligenz", "τεχνητή νοημοσύνη", "inteligencia artificial", "tehisintellekt", "tekoäly", "intelligence artificielle", "an intleacht shaorga", "umjetna inteligencija", "mesterséges intelligencia", "intelligenza artificiale", "dirbtinis intelektas", "mākslīgais intelekts", "intelliġenza artifiċjali", "kunstmatige intelligentie", "sztuczna inteligencja", "inteligência artificial", "inteligență artificială", "umelá inteligencia", "umetna inteligenca", "artificiell intelligens"))

GROUP 3: NEUROTECHNOLOGY BROAD

"brain computer interfaces", "brain-computer-interface", "mind-computer interfaces", "brain-computer interface", "brain implant", "brain implants", "brain technology", "neuro implant", "neuro implants", "neurosensors", "neurotech", "neurotechnologies", "neurotechnology", "brain chips", "brain chip", "brain imaging", "read the brain", "brain reading", "read the mind", "mind reading",

"чета мозъка", "четене на мозъка", "čitati mozak", "čitanje mozga", "číst mozek", "čtení mozku", "læse hjernen", "hjerne læsning", "de hersenen lezen", "hersenenlezen", "lugeda aju", "aju lugemine", "lukea aivot", "aivojen lukeminen", "lire le cerveau", "lecture du cerveau", " Gehirn lesen", "Gehirnlesen", "διαβάζω τον εγκέφαλο", "ανάγνωση εγκεφάλου", "az agy olvasása", "agyolvasás", "léamh an inchinn", "léamh inchinn", "leggere il cervello", "lettura del cervello", "lasīt smadzenes", "smadzeņu lasīšana", "skaityti smegenis", "smegenų skaitymas", "czytać mózg", "czytanie mózgu", "ler o cérebro", "leitura cerebral", "citi creierul", "citirea creierului", "čítať mozog", "čítanie mozgu", "brati možgane", "branje možganov", "leer el cerebro", "lectura del cerebro", "läsa hjärnan", "hjärnläsning", "чета мислите", "четене на мисли", "čitati misli", "čitanje misli", "číst myšlenky", "čtení myšlenek", "læse tankerne", "tanke læsning", "gedachten lezen", "gedachtenlezen", "lugeda mõtteid", "mõtete lugemine", "lukea ajatuksia", "ajatusten lukeminen", "lire dans les pensées", "lecture de pensée", "Gedanken lesen", "Gedankenlesen", "διαβάζω το μυαλό", "ανάγνωση σκέψεων", "gondolatolvasás", "léamh intinne", "léamh aigne", "leggere la mente", "lettura della mente", "lasīt domas", "domu lasīšana", "skaityti mintis", "minties skaitymas", "aqra l-moħħ", "qari tal-moħħ", "czytać myśli", "czytanie myśli", "ler a mente", "leitura de mente", "a citi gândurile", "citirea gândurilor", "čítať

myšlienky", "čítanie myšlienok", "brati misli", "branje misli", "leer la mente", "lectura de la mente", "läsa tankar", "tankeläsning" , "мозъчна визуализация", "slikanje mozga", "mozek zobrazování", "hjernebilleddannelse", "hersenbeeldvorming", "aju pildistamine", "aivokuvantaminen", "imagerie cérébrale", "Gehirnbildgebung", "εικόνα εγκεφάλου", "agyi képalkotás", "íomháú inchinne", "imaging cerebrale", "smadzeņu attēlveidošana", "smegenų vaizdavimas", "immaġini tal-moħħ", "obrazowanie mózgu", "imagem cerebral", "imagistica creierului", "mozgové zobrazovanie", "slikanje možganov", "imagen cerebral", "hjärnbildning", "мозъчен чип", "mozdni čip", "mozek čip", "hjerne-chip", "hersenchip", "aju kiip", "aivojen mikrosiru", "puce cérébrale", "gehirn-chip", "gehirnchip", "τσιπ εγκεφάλου", "agyi chip", "cip inchinne", "chip cerebrale", "smadzeņu čips", "smegenų čipas", "ċip tal-moħħ", "chip mózgu", "chip cerebral", "cip cerebral", "mozgový čip", "hjärnchip", "интерфейси ум-компютър", "интерфейс мозък-машина", "sučelja um-računalo", "sučelje mozak-stroj", "rozhraní mysl-počítač", "rozhraní mozek-stroj", "hjerne-computer interface", "grænseflader mellem sind og computer", "geest-computer interfaces", "hersenen-machine interface", "mõistus-arvuti liidesed", "aju-masina liides", "mieli-tietokone-rajapinnat", "aivo-kone-liitäntä", "interfaces esprit-ordinateur", "interface cerveau-machine", "Geist-Computer-Schnittstellen", "Gehirn-Computer-Schnittstelle", "διεπαφές νου-υπολογιστή", "διεπαφή εγκέφαλος-μηχανή", "elme-számítógép interfészek", "agy-gép interfész", "comhéadain intinne-ríomhaire", "comhéadan inchinn-meaisín", "interfacce mente-computer", "interfaccia cervello-macchina", "prāta-datora saskarnes", "smadzeņu-mašīnas saskarne", "protas-kompiuterio sąsajos", "smegenų-mašinos sąsaja", "interfaċċi moħħ-kompjuter", "interfaċċa moħħ-magna", "interfejsy umysł-komputer", "interfejs mózg-maszyna", "interfaces mente-computador", "interface cérebro-máquina", "interfețe minte-ordinator", "interfață creier-mașină", "rozhrania myseľ-počítač", "rozhranie mozog-stroj", "vmesniki um-računalnik", "vmesnik možgani-stroj", "gränssnitt mellan hjärna och dator", "gränssnitt mellan sinne och dator"OR "мозъчен чип", "интерфейси за мозъчен компютър", "мозъчен имплант", "мозъчни импланти", "мозъчна технология", "невронни импланти", "невросензори", "невротехнологии", "невротехнология", "mozkový čip", "rozhraní mozkových počítačů", "mozkový implantát", "mozkové implantáty", "technologie mozku", "neuroimplantáty", "neurosenzory", "neurotechnologie", "hjernechip", "grænseflader til hjernecomputere", "hjerneimplantat", "Hjerneimplantater", "hjerneteknologi", "neuroimplantat", "neuroimplantater", "neurosensorer", "neuroteknologi", "Gehirnchip", "Gehirncomputerschnittstellen", "Gehirnimplantat", "Gehirnimplantate", "Gehirntechnologie", "Neuroimplantat", "Neuroimplantate", "Neurosensoren", "Neurotechnologien", "Neurotechnologie", "τσιπ εγκεφάλου", "διεπαφές υπολογιστών εγκεφάλου", "εμφύτευμα εγκεφάλου", "εμφυτεύματα εγκεφάλου", "τεχνολογία εγκεφάλου", "νευροεμφύτευμα", "νευροεμφυτεύματα", "νευροαισθητήρες", "νευροτεχνολογίες", "νευροτεχνολογία", "chip cerebral", "interfaces de ordenador del cerebro", "interfaces mente-ordenador", "interfaz cerebro-máquina", "implante cerebral", "implantes cerebrales", "tecnología del cerebro", "implante neurológico", "neuroimplantes", "neurosensores", "neurotecnologías", "neurotecnología", "ajukiip", "ajuarvuti liidesed", "ajuimplantaat", "ajuimplantaadid", "ajutehnoloogia", "neuroimplantaat", "neuroimplantaadid", "neurosensorid", "neurotehnoloogia", "aivosiru", "Aivojen tietokoneiden rajapinnat", "aivoimplantti", "aivoimplantit", "aivoteknologia", "neuroimplantti", "neuroimplantit", "neurosensorit", "neuroteknologiat", "neuroteknologia", "puce cérébrale", "Interfaces de l'ordinateur cérébral", "implant cérébral", "implants cérébraux", "technologie du cerveau", "implant neuro", "implants neuro", "neurocapteurs", "slis inchinne", "comhéadain ríomhaire inchinne", "ionchlannán inchinne", "ionchlannáin inchinne", "teicneolaíocht inchinne", "néar-ionchlannán", "néar-ionchlannáin", "néarbhraiteoirí", "néartheicneolaíochtaí", "néaraitheicneolaíocht", "čip za mozak", "sučelja moždanih računala", "implantat za mozak", "implantati za mozak", "tehnologija mozga", "neuro implantati", "neurosenzori", "neurotehnologije", "neurotehnologija", "agychip", "agyi számítógépes interfészek", "agyimplantátum", "agyimplantátumok", "agytechnológia", "neuroimplantátum", "idegimplantátumok", "neuroszenzorok", "neurotechnológiák", "neurotechnológia", "chip del cervello", "Interfacce cervello-computer", "impianto cerebrale", "impianti cerebrali", "tecnologia del cervello", "impianto neurologico", "impianti neurologici", "neurosensori", "neurotecnologie", "neurotecnologia", "smegenų lustas", "Smegenų ir kompiuterių sąsajos", "smegenų implantas", "Smegenų implantai", "smegenų technologija", "Neuro implantai", "neurosensoriai", "neurotechnologijos", "smadzeņu mikroshēma", "smadzeņu datoru saskarnes", "smadzeņu implants", "smadzeņu implanti", "smadzeņu tehnoloģija", "neiroimplants", "neiroimplanti", "neirosensori", "neirotehnoloģijas", "neirotehnoloģija", "ċippa tal-moħħ", "interfaċċji tal-kompjuter tal-moħħ", "impjant tal-moħħ", "impjanti tal-moħħ", "teknoloġija tal-moħħ", "impjant tan-newro", "impjanti tan-newro", "newrosensuri", "newroteknoloġiji", "newroteknoloġija", "hersenchip", "interfaces voor hersencomputers", "hersenimplantaat", "hersenimplantaten", "hersentechnologie", "neuro-implantaat", "neuro-implantaten", "neurosensoren", "neurotechnologieën", "chip mózgowy", "interfejsy mózg-komputer", "implant mózgu", "implanty mózgowe", "technologia mózgu", "implanty neurologiczne", "neurosensory", "neurotechnologia", "interfaces de computador do cérebro", "implantes cerebrais", "tecnologia cerebral", "neurossensores", "neurotecnologias", "cip pe creier", "interfețele creier-calculator", "implantul cerebral", "implanturi cerebrale", "tehnologia creierului", "implantul neuronal", "implanturi neuronale", "neurotehnologii", "neurotehnologie", "mozgový čip", "rozhrania pre mozgové počítače", "mozgový implantát", "mozgové implantáty", "technológia mozgu", "neurotechnológie", "možganski čip", "vmesniki za možganske računalnike", "možganski vsadek", "možganski vsadki", "možganska tehnologija", "nevro implantat", "nevro implantati", "nevrosenzorji", "nevrotehnologije", "nevrotehnologija", "hjärnchip", "Gränssnitt för hjärndatorer", "hjärnimplantat", "hjärnteknik", "neuroteknik"

GROUP 4: NEURORIGHTS

neurorights", "neurocrime", "neuroethics", "neurophilosophy",
"невроправа", "невропрестъпление", "невроетика", "неврофилософия", "neuraprava", "neurokriminal", "neuroetika",

"neurofilozofija", "neuro práva", "neurokriminalita", "neuronrettigheder", "neurokriminalitet", "neuroetik", "neurofilosofi", "neurale rechten", "neurorechten", "neurocriminaliteit", "neuro-ethiek", "neurofilosofie", "neuroõigused", "neurokuritegevus", "neuroeetika", "neurofilosoofia", "neuro-oikeudet", "neurorikollisuus", "neuroetiikka", "neurofilosofia", "droits neuronaux", "neurocriminalité", "neuroéthique", "neurophilosophie", "Neurorechte", "Neurokriminalität", "Neuroethik", "νευρωνικά δικαιώματα", "νευρωνικό έγκλημα", "νευροηθική", "νευροφιλοσοφία", "neuronjogok", "neurobűnözés", "neurofilozófia", "cearta néareolaíocha", "coireacht néareolaíoch", "eitice néareolaíoch", "fealsúnacht néareolaíoch", "diritti neuronali", "neurocriminalità", "neuroetica", "neiro tiesības", "neiro noziegumi", "neiro ētika", "neiro filozofija", "neuroteisės", "neuro nusikalstamumas", "neurofilosofija", "drittijiet newroniċi", "kriminalità newronika", "etika newronika", "filosofija newronika", "prawa neuronowe", "neuroprzestępczość", "neuroetyka", "neurofilozofia", "direitos neuronais", "neurocriminalidade", "neuroética", "neurofilosofia", "drepturi neuronale", "neurocriminalitate", "neuroetică", "neurofilozofie", "nevronske pravice", "nevronski kriminal", "nevroetika", "nevrofilozofija", "derechos neuronales", "neurodelito", "neurocriminalidad", "neurofilosofía", "neurorättigheter", "neurobrott" "neurocrime", "neuroethics", "neurophilosophy", "невропрестъпност", "neuropráva", "neurorettigheder", "νευροέγκλημα", "νευροδικαιώματα", "neuroderechos", "neurofiilia", "néarchoireacht", "néar-eiticí", "néarafhealsúnacht", "néarchearta", "neuroprava", "neurojogok", "neurocrimine", "neurodiritti", "neuronusikaltimai", "neuroteisių", "neironoziedzība", "neiroētika", "neirofilozofija", "neirotiesības", "newrokriminalità", "newroetika", "newrofilosofija", "newrodrittijiet", "prawa neurologiczne", "neurodireitos", "neurocrimă", "drepturile neuronale", "neurozločin", "nevrokriminal", "nevropravice"

GROUP 5: RIGHTS AND LEGISLATION

"data privacy", "data protection law", "data security", "digital identity rights", "fundamental rights", "human dignity", "human rights", "information privacy", "intellectual property rights", "law", "laws", "legislation", "mental privacy", "policies", "policy", "privacy law", "privacy laws", "regulation", "regulations",

"поверителност на данните", "закон за защита на данните", "сигурност на данните", "права на цифрова самоличност", "основни права", "човешко достойнство", "права на човека", "поверителност на информацията", "права върху интелектуална собственост", "право", "закони", "законодателство", "неприкосновеността на личния живот", "политики", "политика", "закон за неприкосновеността на личния живот", "закони за защита на личните данни", "Регламент", "регламенти", "ochrana osobních údajů", "právní předpisy o ochraně údajů", "zabezpečení údajů", "práva na digitální identitu", "základní práva", "lidská důstojnost", "lidská práva", "práva duševního vlastnictví", "zákon", "zákony", "legislativa", "duševní soukromí", "politiky", "politika", "právo na ochranu soukromí", "právní předpisy o ochraně soukromí", "nařízení", "předpisy", "databeskyttelse", "databeskyttelseslovgivning", "datasikkerhed", "digitale identitetsrettigheder", "grundlæggende rettigheder", "menneskelig værdighed", "menneskerettigheder", "beskyttelse af personlige oplysninger", "intellektuelle ejendomsrettigheder", "lov", "lovene", "lovgivning", "mentalt privatliv", "politikker", "politik", "lov om privatlivets fred", "love om privatlivets fred", "regulering", "forordninger", "Datenschutz", "Datenschutzrecht", "Datensicherheit", "Rechte der digitalen Identität", "Grundrechte", "Menschenwürde", "Menschenrechte", "Rechte des geistigen Eigentums", "Recht", "Gesetze", "Rechtsvorschriften", "geistige Privatsphäre", "Richtlinien", "Politik", "Datenschutzgesetze", "Verordnung", "Verordnungen", "προστασία της ιδιωτικής ζωής των δεδομένων", "νομοθεσία για την προστασία των δεδομένων", "ασφάλεια δεδομένων", "δικαιώματα ψηφιακής ταυτότητας", "θεμελιώδη δικαιώματα", "ανθρώπινη αξιοπρέπεια", "ανθρώπινα δικαιώματα", "προστασία της ιδιωτικής ζωής των πληροφοριών", "δικαιώματα διανοητικής ιδιοκτησίας", "νόμος", "νόμοι", "νομοθεσία", "διανοητική προστασία της ιδιωτικής ζωής", "πολιτικές", "πολιτική", "νομοθεσία περί προστασίας της ιδιωτικής ζωής", "νόμοι για την προστασία της ιδιωτικής ζωής", "κανονισμός", "κανονισμοί", "privacidad de datos", "Ley de protección de datos", "seguridad de los datos", "derechos de identidad digital", "derechos fundamentales", "dignidad humana", "derechos humanos", "privacidad de la información", "derechos de propiedad intelectual", "derecho", "leyes", "legislación", "privacidad mental", "políticas", "política", "Ley de privacidad", "leyes de privacidad", "regulación", "reglamentos", "andmekaitse", "andmekaitseõigus", "andmeturve", "digiidentiteedi õigused", "põhiõigused", "inimväärikus", "inimõigused", "teabe privaatsus", "intellektuaalomandi õigused", "õigus", "seadused", "õigusakt", "vaimne privaatsus", "poliitika", "eraelu puutumatust käsitlev õigus", "eraelu puutumatust käsitlevad õigusaktid", "määrus", "määrused", "tietosuoja", "tietosuojalainsäädäntö", "tietoturva", "digitaalisen identiteetin oikeudet", "perusoikeudet", "ihmisarvo", "ihmisoikeudet", "teollis- ja tekijänoikeudet", "lainsäädäntö", "lait", "henkinen yksityisyys", "käytännöt", "politiikka", "yksityisyyden suojaa koskeva lainsäädäntö", "yksityisyyden suojaa koskevat lait", "asetus", "määräykset", "confidentialité des données", "loi sur la protection des données", "sécurité des données", "droits relatifs à l'identité numérique", "droits fondamentaux", "dignité humaine", "droits de l'homme", "Confidentialité de l'information", "droits de propriété intellectuelle", "loi", "lois", "législation", "vie privée mentale", "politiques", "politique", "Loi sur la protection de la vie privée", "lois sur la protection de la vie privée", "réglementation", "règlement", "príobháideachas sonraí", "an dlí maidir le cosaint sonraí", "slándáil sonraí", "cearta céannachta digití", "cearta bunúsacha", "dínit an duine", "cearta an duine", "príobháideachas faisnéise", "cearta maoine intleachtúla", "dlí", "dlíthe", "reachtaíocht", "príobháideacht mheabhrach", "beartais", "beartas", "dlí príobháideachais", "dlíthe príobháideachais", "rialáil", "rialacháin", "privatnost podataka", "Zakonodavstvo o zaštiti podataka", "sigurnost podataka", "prava na digitalni identitet", "temeljna prava", "ljudsko dostojanstvo", "ljudska prava", "privatnost informacija", "prava intelektualnog vlasništva", "zakon", "zakoni", "zakonodavstvo", "mentalna privatnost", "politike", "Zakon o zaštiti privatnosti", "zakoni o zaštiti privatnosti", "regulacija", "propisi", "adatvédelem", "adatvédelmi jog", "adatbiztonság", "digitális személyazonosító jogok", "alapvető jogok", "emberi méltóság",

"emberi jogok", "Adatvédelem", "szellemi tulajdonjogok", "törvény", "törvények", "jogszabályok", "mentális magánélet", "politikák", "adatvédelmi törvények", "rendelet", "rendeletek", "privacy dei dati", "legge sulla protezione dei dati", "sicurezza dei dati", "diritti di identità digitale", "diritti fondamentali", "dignità umana", "diritti umani", "privacy delle informazioni", "diritti di proprietà intellettuale", "leggi", "legislazione", "privacy mental", "politiche", "politica", "legge sulla privacy", "leggi sulla privacy", "regolamento", "regolamenti", "duomenų privatumas", "duomenų apsaugos teisės aktai", "duomenų saugumas", "skaitmeninės tapatybės teisės", "pagrindinės teisės", "žmogaus orumas", "žmogaus teisės", "informacijos privatumas", "intelektinės nuosavybės teisės", "teisė", "įstatymai", "psichinis privatumas", "privatumo teisė", "privatumo teisės aktai", "reguliavimas", "reglamentai", "datu privātums", "datu aizsardzības tiesību akti", "datu drošība", "digitālās identitātes tiesības", "pamattiesības", "cilvēka cieņa", "cilvēktiesības", "informācijas privātums", "intelektuālā īpašuma tiesības", "likums", "likumi", "likumdošana", "garīgais privātums", "politikas", "tiesību akti privātuma jomā", "privātuma tiesību akti", "regulējums", "Regulas", "il-privatezza tad-data", "liġi dwar il-protezzjoni tad-data", "sigurtà tad-data", "drittijiet tal-identità diġitali", "drittijiet fundamentali", "id-dinjità tal-bniedem", "id-drittijiet tal-bniedem", "privatezza tal-informazzjoni", "drittijiet ta' proprjetà intellettwali", "il-liġi", "il-liġijiet", "leġiżlazzjoni", "privatezza mentali", "il-politiki", "il-politika", "liġi dwar il-privatezza", "liġijiet dwar il-privatezza", "regolamentazzjoni", "ir-regolamenti", "privacy van gegevens", "Wetgeving inzake gegevensbescherming", "gegevensbeveiliging", "digitale-identiteitsrechten", "grondrechten", "menselijke waardigheid", "mensenrechten", "privacy van informatie", "intellectuele-eigendomsrechten", "wet", "wetten", "wetgeving", "mentale privacy", "beleid", "privacyrecht", "privacywetgeving", "verordening", "reglementen", "prywatność danych", "prawo ochrony danych", "bezpieczeństwo danych", "prawa do tożsamości cyfrowej", "prawa podstawowe", "godność człowieka", "prawa człowieka", "prywatność informacji", "prawa własności intelektualnej", "prawo", "prawa", "ustawodawstwo", "Prywatność psychiczna", "polityki", "polityka", "prawo ochrony prywatności", "przepisy dotyczące prywatności", "rozporządzenie", "regulacje", "privacidade dos dados", "legislação em matéria de proteção de dados", "segurança dos dados", "direitos de identidade digital", "direitos fundamentais", "dignidade humana", "direitos humanos", "privacidade da informação", "direitos de propriedade intelectual", "direito", "leis", "legislação", "privacidade mental", "direito da privacidade", "leis de privacidade", "regulamento", "regulamentos", "confidențialitatea datelor", "legislația privind protecția datelor", "securitatea datelor", "drepturile privind identitatea digitală", "drepturile fundamentale", "demnitatea umană", "drepturile omului", "confidențialitatea informațiilor", "drepturi de proprietate intelectuală", "Legea", "legi", "legislație", "intimitatea mentală", "politici", "dreptul la confidențialitate", "legile privind confidențialitatea", "regulamentul", "reglementări", "ochrana osobných údajov", "právne predpisy o ochrane údajov", "bezpečnosť údajov", "práva na digitálnu identitu", "základné práva", "ľudská dôstojnosť", "ľudské práva", "práva duševného vlastníctva", "právo", "legislatíva", "duševné súkromie", "zákon o ochrane súkromia", "zákony o ochrane súkromia", "regulácia", "predpisy", "zasebnost podatkov", "zakonodaja o varstvu podatkov", "varnost podatkov", "pravice do digitalne identitete", "temeljne pravice", "človekovo dostojanstvo", "človekove pravice", "informacijska zasebnost", "pravice intelektualne lastnine", "zakonodaja", "duševna zasebnost", "zakonodaja o zasebnosti", "zakoni o zasebnosti", "uredba", "predpisi", "datasekretess", "dataskyddslagstiftning", "datasäkerhet", "Rättigheter till digital identitet", "grundläggande rättigheter", "mänsklig värdighet", "mänskliga rättigheter", "informationssekretess", "immateriella rättigheter", "juridik", "lagar", "lagstiftning", "mental integritet", "integritetslagstiftning", "integritetslagar", "förordning", "föreskrifter"

Annex I – Methodology

This science media intelligence briefing is part of the series of joint publications of the European Science-Media Hub (ESMH) and the JRC Text and Data Mining Unit, covering topics relevant for specific policy domains, ranging from water scarcity, genetically modified organisms and new-genomic techniques to artificial intelligence in science communication as well as in healthcare. For further information please consults https://sciencemediahub.eu/science-media-intelligence-reports/.

Source and data selection

The manually curated list of **online media** outlets used for this report is composed of 581 EU27 online media sources monitored as index [pi_ee24campaign] by Europe Media Monitor (EMM). This sample of sources represents the most popular open news websites in each EU country in terms of visitors. The number of outlets per country was weighted based on the member states' population.

Articles relevant for the analysis are selected by searching for a set of relevant keywords or keyword combinations that appear in the title, description or text of the article. Description refers to ca. the first 300 characters of the article, following the title. These keywords are translated into all EU24 languages. The keyword combinations have been selected carefully to include all important articles but to avoid irrelevant 'noise' in the news collection.

Automated clustering

Clusters are computed by a community-based algorithm on the basis of the original language titles of the articles, using semantic similarity. Stopwords were not removed from the titles but are not shown in the keyword section. The model transforms sentences into language-independent vectors, suiting our need to compare articles coming from the various EU countries.

The minimum cluster size is set to 5 articles. The maximum cluster size is not fixed. Depending on the distribution of its neighbours (in terms of semantic similiarity), one document may belong to a cluster or not. In other words, not all articles can be clustered. Using this approach, the clusters found correspond to the main topics present in the dataset.

For more information see:
Stefanovitch, N.; Jacquet, G.; De Longueville, B. 2023. Graph and Embedding based Approach for Text Clustering: Topic Detection in a Large Multilingual Public Consultation. In Companion Proceedings of the ACM Web Conference 2023 (WWW '23 Companion). Association for Computing Machinery, New York, NY, USA, 694–700. https://doi.org/10.1145/3543873.3587627

Automated titles and summaries

To generate automated summaries for each cluster, we use Large Language Models (LLM). For this use case, the model – an instantiated LLama 3.1 70b – is treated like a news-digest AI which is capable of analysing a list of news articles and generating a high-level summary with a significant title. For each cluster, the translated headlines of the articles are provided as input, and a title and a summary are generated. If the cluster's size is bigger than 500 articles, 500 titles are chosen randomly. The LLama model allows to receive good quality output in combination with a very fast response time. A carefully crafted prompt is used so that the model is not too generic but instead always focused on the listed facts. The temperature of the model is set to "0" in order for it to not hallucinate.

Sentiment classifier

In our sentiment analysis, we utilise a state-of-the-art sentiment model, namely the XLM-RLnews-8 model, which is specifically designed for document-level sentiment analysis across multiple languages. Based on XLM-RoBERTa-Large, this model has been fine-tuned for sentiment analysis using the Unified Multilingual Sentiment Analysis Benchmark (UMSAB) dataset. The sentiment classes are computed on the English translation of the headlines.

To develop this model adapted to the news domain, we started with a multilingual news dataset extracted using the European Media Monitor (EMM) pipeline, which includes 20 000 news headlines and descriptions per language, totalling 24 official languages of the European Union.

We further employed the UMSAB dataset for sentiment fine-tuning, which consists of eight datasets in eight languages, each annotated using three classes: negative, neutral, and positive. XLM-RLnews-8 achieved a macro F1 score of 0.704 on the UMSAB test set, proving its effectiveness in sentiment analysis tasks.

Additionally, the model has been evaluated in out-of-domain scenarios using the IMDb dataset and a silver dataset made of multilingual news headlines in original language and translated to English taken from EMM. On average, the model achieved a weighted F1 score of 0.765, demonstrating its robustness in sentiment analysis across different domains. The model exhibits high precision (0.86) and lower recall (0.77) for the detection of negative sentiment of English translation of headlines. This suggests that the model may miss some negative sentiments but is highly reliable in identifying the sentiment accurately. For positive texts, the model shows a high precision (0.80) and recall (0.71).

More details on the model development are available in:
Di Nuovo, E., Cartier, E., De Longueville, B. (2024). Meet XLM-RLnews-8: Not Just Another Sentiment Analysis Model. In Natural Language Processing and Information Systems, 28th International Conference on Applications of Natural Language to Information Systems, NLDB 2024, Turin, Italy, June 25–27, 2024, Proceedings (pp. 1). Springer Science and Business Media Deutschland GmbH.

Automated framing detection

Automated detection of framing dimensions constituted an extension of our analysis conducted in this report. This work was based on in-house machine learning classifiers that detect framing dimensions in the articles. The machine-learning algorithm trained on a multilingual corpus.

Framing refers to the perspective under which an issue or a piece of news is presented. We consider 14 frames: (1) *Economic, (2) Capacity and resources, (3) Morality, (4) Fairness and equality, (5) Legality, constitutionality and jurisprudence, (6) Policy prescription and evaluation, (7) Crime and punishment, (8) Security and defence, (9) Health and safety, (10) Quality of life, (11) Cultural identity, (12) Public opinion, (13) Political, (14) External regulation and reputation*.

For more information see the JRC Technical Report: News Categorization, Framing and Persuasion Techniques: Annotation Guidelines: https://knowledge4policy.ec.europa.eu/text-mining/news-categorization-framing-persuasion-techniques-annotation-guidelines_en

Named entities recognition

Names Entities Recognition has been done using the NEROne module which has been developed in the context of the Europe Media Monitoring project. For detailed information, see:
Guillaume Jacquet, Jakub Piskorski, and Sophie Chesney. 2019. Out-of-context fine-grained multi-word entity classification. In Proceedings of the 34th ACM/SIGAPP Symposium On Applied Computing (SAC 2019).

Understanding values

When referring to values in this report, we refer to the personal values model developed in social psychology research and validated in over 80 countries in over 200 samples (Schwartz 1992). These values are expressed as "guiding principles of life", such as security, freedom or equality. Research has shown that people everywhere appreciate these values to varying degrees.

The JRC flagship report "Values and Identities – A Policymaker's Guide" (Scharfbillig et al. 2021) has summarised the most important elements of values for understanding citizens' concerns and views. Here is an overview of the meaning of the values used in this study:

VALUES	INTERPRETATION
SELF-DIRECTION	Valuing independent thought and action—choosing, creating, exploring
STIMULATION	Valuing excitement, novelty and challenge in life
HEDONISM	Valuing pleasure or sensuous gratification for oneself
ACHIEVEMENT	Valuing personal success through demonstrating competence
POWER	Valuing social status and prestige, control or mastery over people and resources
SECURITY	Valuing safety, harmony, and stability of society, of relationships, and of own identity
CONFORMITY	Valuing restraint of actions likely to upset or harm others or violate norms and rules
TRADITION	Valuing respect, and acceptance of the customs that one's culture or religion provides
BENEVOLENCE	Valuing preserving and enhancing the welfare of others especially close ones
UNIVERSALISM	Valuing understanding, tolerance, and protection for the welfare of all people and for nature

For detailed information, see*:*

Schwartz SH. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. Adv Exp Soc Psychol. 1992;25(C):1-65. doi:10.1016/S0065-2601(08)60281-6

Scharfbillig, M., Smillie, L., Mair, D., Sienkiewicz, M., Keimer, J., Pinho Dos Santos, R., Vinagreiro Alves, H., Vecchione, E., Scheunemann L., Values and Identities - a policymaker's guide, EUR 30800 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-40965-6, doi:10.2760/349527, JRC126150.

Annex II – About the authors

Text and Data Mining Unit

The JRC.T.5 Text and Data Mining Unit of the European Commission specialises in Data Science for Policy, leveraging vast amounts of data and text to provide actionable insights. The unit delivers data, methods, services, and analysis to scientists and policymakers throughout the JRC and EU institutions.

As part of the Unit's activities, the "Political Intelligence" Team aims to inform and enhance policymaking by providing a comprehensive view of the main topics and entities dominating the media landscape relevant to specific policy domains, and assessing the associated tonality. To achieve this, the team aggregates and analyses various data sources, including news media, political speeches, public opinion, and existing and upcoming legislation. By applying cutting-edge text mining techniques, the team extracts valuable knowledge on key topics, sentiment, framing, and other aspects relevant to informing policymakers.

Please check https://knowledge4policy.ec.europa.eu/text-mining/topic/political-intelligence_en for more information on Political Intelligence.

European Science-Media Hub

The European Science-Media Hub (ESMH), operating under the political responsibility of the European Parliament Panel for the Future of Science and Technology (STOA), is a platform to promote networking, training and knowledge sharing between the European Parliament, the scientific community and the media.

The ESMH creates a network among policy-makers, scientists and media involving science, academia, educational and research entities, and professional associations of journalists and scientists. For journalists and media representatives, the ESMH organises training sessions and workshops on current technological developments, both as subjects of their reporting and as means of facilitating their work. Via media monitoring and media intelligence tools, the ESMH follows the most popular topics in the field of science and technology on different platforms including journals, newspapers and social media.

The ESMH makes information available to journalists, other media and citizens about new scientific developments, as well as about scientific topics that attract media attention, and promotes information based on evidence.

Check https://sciencemediahub.eu/ for more information, methodology and technology.

Europe Media Monitor

Europe Media Monitor (EMM) is a tool developed and maintained by the Text and Data Mining Unit of the Joint Research Centre (JRC) of the European Commission. The main purpose of EMM is to provide monitoring of a large set of online media, reducing the information flow to manageable proportions by clustering related news, categorising articles and applying Language Technology tools to derive further metadata, such as recognising and disambiguating entities in the text, extracting quotes by and about people, applying sentiment/tonality analysis and more.

A lot of EMM's functionalities are freely available. To **access the tool** that best fits your need, please **check** https://knowledge4policy.ec.europa.eu/text-mining/topic/europe-media-monitor-emm_en.

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EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex (eur-lex.europa.eu).

Open data from the EU

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

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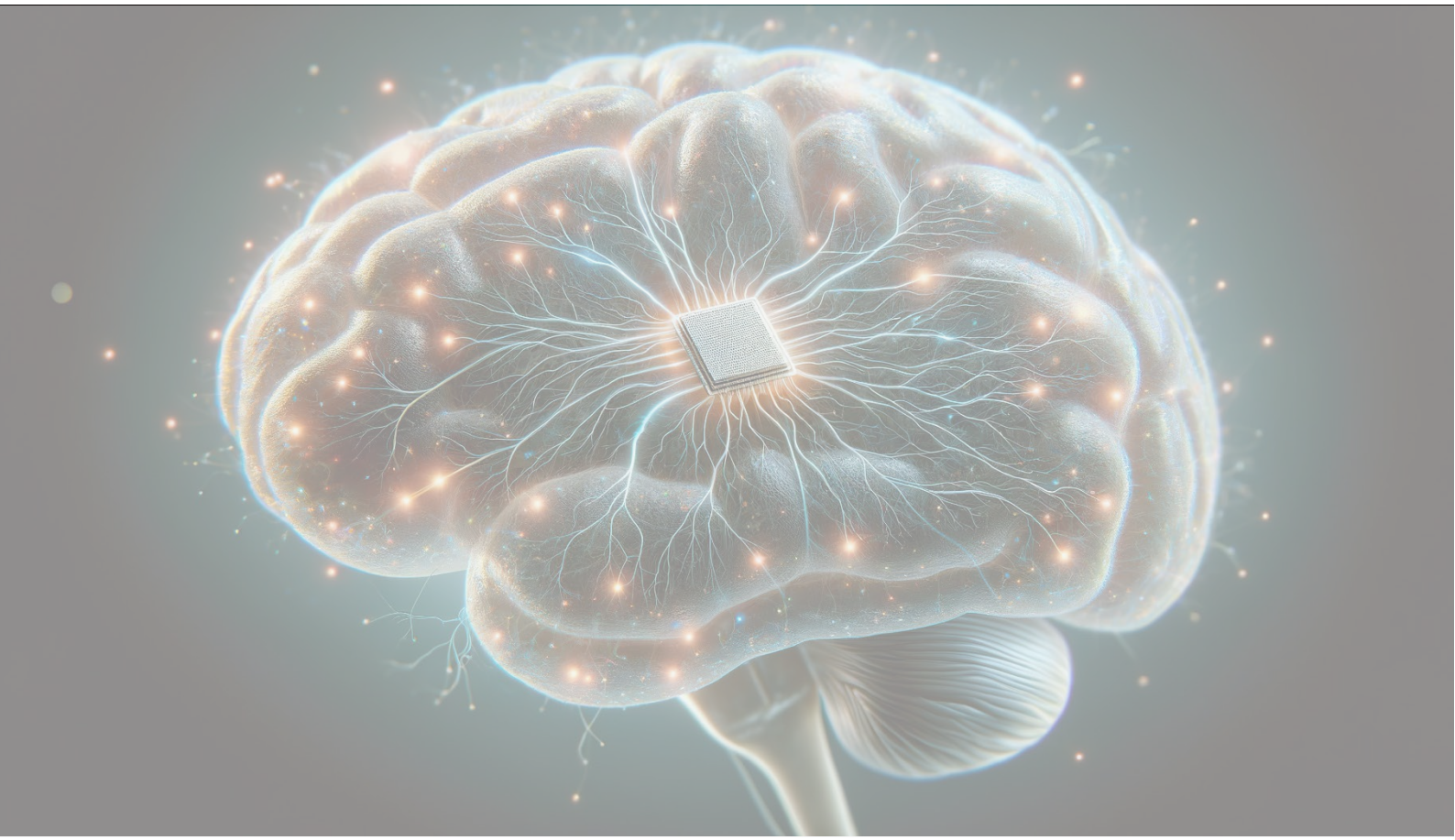

European Commission

European Parliament