The Relationship Between Knowledge Production and Google in Framing and Reframing AI Imaginary. A Comparative Algorithmic Audit between the US and Italy

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Abstract: This study offers an analysis and comparison of search results from Google concerning the topic of Artificial Intelligence (AI) in two geographically and politically different contexts: the United States and Italy. As new AI systems, tools, and solutions are developed and implemented in each sector of human life on a global scale, certain imaginaries of AI are emerging. These imaginaries constitute the ground for the public understanding, support, and disapproval of certain AI technologies and regulations. As citizens turn into users, Google remains the dominant gatekeeper of information, thus becoming an influential actor in sharping AI imaginaries. The following analysis is a response to this criticism of Google's search results, considering Google as an essential producer and certifier of AI imaginaries for general public. The comparison of search queries conducted in this analysis shows that the sources which Google presents in its search results add to different types of AI imaginaries, consequently influencing public opinion in different, often asymmetrical, ways.

Keywords: Digital Knowledge Production, AI Imaginaries, Google Critique, Algorithmic Auditing

Introduction

Artificial Intelligence (AI) is creeping into every aspect of human life. While it does not materialize as a superhuman Artificial General Intelligence that takes control over humanity, AI systems regulate, organize, and influence policies, economy, law enforcement, job market, immigration, and human intimacy. In a techno-deterministic spirit, AI is presented as an inevitable technological future. With the recent upheaval caused by the release of Generative AI models such as DALLE-2 and ChatGPT, AI became a major issue of public concern. How does the public understand AI? A notion of "sociotechnical imaginary" is useful here. In Sheila Jasanoff (2015) definition, sociotechnical imaginary serves as a framework to understand the fears, hopes, and believes held by a community such large as society or nation (Jasanoff, 2015, p. 321). Jasanoff argues that by

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investigating what sociotechnical imaginaries are held by a given group or community, one can understand the "futures to be shunned and avoided" (Jasanoff, 2015, p. 22) but also the futures that are hoped for. Therefore, imaginaries allow certain actors, especially on governmental and corporate levels, to accordingly influence and respond to what are "the right" scales and types of action to take (Jasanoff, 2015, p. 23). It has been further noted that the public understanding and awareness of AI is a pivotal element for how "AI is deployed, developed and regulated" (Cave and Dihal, 2019, 331). Yet sociotechnical imaginary should not be considered a monolithic and stable entity to be excavated, but rather a set of dynamic, entangled, and sometimes contrary imaginaries that are simultaneously at play when we study them (Mager and Katzenbach, 2021, p. 226l; Mager 2017: 256).

Search engine results, such as Google results page, are governed by "*public relevance algorithms*, [which] are-- by the very same mathematical procedures--producing and certifying knowledge" (Gillespie, 2014, p. 168). For example, the 'AI' images which appear in search engine image tab, driven by a certain economic and algorithmic logic, have an impact in reinforcing certain imaginaries of AI image, which Romele (2022, p. 3) pointed out in his study of Getty Images stock images of 'artificial intelligence.' By considering search results as knowledge artifacts – digital entities of particular context, organized by specific algorithmic logic – we can examine expressions of specific sociotechnical imaginary which can emerge as much from policy documents (Burri, 2015, p. 234) as from search results.

While there have been reports of Google showing biases over sensitive or controversial queries (e.g. Sweeney, 2013; Bogers & Loes, et al, 2020; Houli, et al. 2021; Solon & Levin, 2016), the following comparative analysis focuses on a seemingly 'neutral' keywords, which do not carry a direct political or social weight. The analyzed search results come from queries "AI" and "artificial intelligence" in the US and Italy (in Italian, "IA" and "intelligenza artificiale," respectively). This analysis asks what are the AI imaginaries that Google shows in the search results, and whether they are coherent across two analyzed geographical locations.

Conceptual Framework

To explore sociotechnical imaginaries of AI is thus to turn to common sources of knowledge production and analyze those involved in the structuring of these imaginaries. As Burri (2015, p. 234) already pointed out, Jasanoff, already in her text on imaginaries from 2005, highlighted the relationship that imaginary and technology play at performing, organizing, and controlling "ways of knowing the world" (Burri, 2015, p. 234). I also would like to point our attention to the argument put forward by Emma Garzonio in her recent chapter publication "Performative Intermediaries Versus Digital Regulation. A Multidisciplinary Analysis of the Power of Algorithms." Garzonio, partially inspired by the work of Geoffrey Bowker (2006:12–14), argues that "[a]s information technology has converged with the nature and production of scientific knowledge, we assist the social and political process of creating an explicit, indexical memory of what is known, the making of 'memory infrastructures'" by "database[ing] the world" (Garzonio, 2022, p. 159). With the ongoing digitalization of everything, users turn to algorithms as principle means of storing, sorting, and sharing. Yet by navigating

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though all digitalized information with algorithmic logic as our navigator, we are faced with very "specific implications" on knowledge production, Garzonio (2022, p. 160) argues. She adds that one such implication is the 'relevancy' principal that steers most data-driven algorithmic systems of search. One very tangible example of the relevancy principal and its implications on knowledge is the search engine results.

The "knowledge" that co-shapes AI imaginaries comes in a significant degree from search engines, mostly from Google which maintains 92.47 percent of the market share worldwide (Statista, 2022). Google is thus a "gatekeeper;" Google does not only provide information online but also orients and controls the information flow, allowing some types of content to surface, while drowning others (Jürgens & Stark, 2017; Latzer et al., 2016). "Our mission is to organize the world's information and make it universally accessible and useful" (Google, 2022), Google claims on its "About" page. Yet each selection of Google search results that appears on users' screens "represents a particular knowledge logic" (Gillespie, 2014, p. 168), which is based on unclear algorithmic criteria of the most 'relevant' information for the users.

In other to examine the knowledge (re)produced by Google Results and the derived sociotechnical imaginary of AI, in this paper I turn to digital methods. Digital methods, as explained by Rogers (2017, p. 15-16), are a toolkit of methods which are of the medium, taking into account the affordances of digital objects, from search results to social media platforms. The dependency on Google as the source of 'knowledge' sparked a vibrant research field dedicated to Google's information politics, especially in terms of the logic of hierarchies of 'relevance' in the way that Google situates search results (Rogers, 2022, 5).

One has to acknowledge the intrinsic limitation of such research, however. There are several obstacles in analyzing SERP results in an algorithmic auditing setting. The search results on Google are intrinsically unstable due to continuous readjustment of the recommending system for specific users (Gillespie, 2014, p. 178). Additionally, users tend to see different results due to the filter bubble effect without an awareness of the invisible editing of Google's recommendation and ranking algorithms (Rogers 2022, 12). It is often impossible to know how and why results change over time in Google (Umoja Noble, 2018, p. 4, p. 16), leading to the limitation of the research to be representative of singular capture of constantly shifting and changing search results.

Method

Following the research tradition of 'algorithmic auditing,' this analysis looks at the hierarchy and placement of sources in Google results. As Rogers phrases it, "for the social researcher, Google is of interest for its capacity to rank actors (websites) per social issue (keyword), thereby providing source hierarchies, and allowing for the study of dominant voice" (Rogers, 2017, p. 79). This study follows the academic inquiry into Google's logic of relevancy and the (lack of) preferences for certain types of sources or kinds of actors across different locations. Thus, the following analysis merges two research approaches to study Google, as discussed by Rogers: the

medium research and the social research.

The medium research, or 'preferred placement' critique, is focused on the degree to which a search engine shows preference for certain type of dominant website (Rogers, 2017, p. 77). The social research, or 'filter bubble' critique, are focused on the extent to which personalization – such as geolocation settings – impact the search results leading to more localized and personalized query outputs and severe niching (Rogers, 2017, p. 77). The examinations of results allows for a study of "social sorting" (Rogers, 2017, p. 77), where one can tract which actors are allowed by Google relevance algorithms to dominate the search and thus "drive the meaning of terms;" to quote from Rogers again, "the engine is considered as serving social epistemologies for any keyword (or social issue) through what is collectively queried and returned" (Rogers, 2017, p. 78).

The following study analyzes only the first page of SERP (Search Engine Research Pages), to reflect the actual behavior of users who rarely engage with results beyond the first page of SERP (Jansen & Spink, 2006; Rogers 2022, 9; 23; Steiner et al, 2022, p. 219). Given that most users click on top-ranked results (Steiner et al, 2022, p. 221; Pan et al., 2007), while more than 80 percent of users stop looking after first three results (Jasen & Spink, 2006), particular attention is given to the results which appear 'above the fold' of the webpage, and which results are pushed down 'below' the fold.

In order to study Google search results from both social and medium perspectives, keyword design is a crucial step of the research methodology. The choice of the keyword(s) for a given query, aside from influencing the search results, is meant to reflect the contexts and actors who are most likely to be using them (Rogers, 2017, p. 81). Rogers talks about two most popular ways of differentiating keyword query types: unambiguous queries and ambiguous queries (Rogers, 2017, p. 87). This analysis focuses on the ambiguous query – 'AI' and 'artificial intelligence' – combined with a cross-geographical approach. Ambiguous queries allow one to track how Google as a search engine treats such an ambiguous query differently, by comparing and contrasting hierarchies of concerns which Google assembles while queried in different language and location (Rogers, 2017, p. 93).

In order to analyze accordingly what ordinary users would see, the search queries were adjusted to reflect what and how people would be searching for information on AI. Thus, no quotation marks were used in keyword design. As users mostly search in their native language, the queries in the context of Italy were conducted in Italian, and in English in the context of the US. Since users also tend to search with short and simple queries (Umoja Noble, 2018, p. 37), the four queries conducted were as follows:

US1: language English, region the US, query "AI"

US2: language English, region the US, query "artificial intelligence"

IT1: language Italian, region Italy, query "intelligenza artificiale"

IT2: language Italian, region Italy, query "IA"

In order to ensure quality of collected data, each of the queries were conducted using a clear Firefox browser (with no history of search or cookies), in incognito mode. To change geographical location a VPN was used,

setting the location to Italy and the US. The results for Italy were collected on November 1st, 2022, and the results for the US were collected on November 5th, 2022. The variables taken into account were: the search query, the hierarchy of credibility depending on the placement within SERP, and the source of information.

The study focuses primary on organic results, that is the search results which are not content curated within Google Features (the so called 'artifacts' such as Google properties sections which appear within SERP such as films, images, and top stories). However, results displayed within Google Features which were relevant for the study that is meant to replicate the user experience (Google's 'answers' and 'definitions' to suggested questions such as "What is AI"), were taken into consideration. Similarly, while results from Wikipedia tend to be placed within top results for many queries and can be thus understood as either "an authoritative source (for its persistent presence) and an engine artefact (for its uncannily persistent presence)" (Rogers, 2017, p. 80), for the scope of this research they were not removed from the dataset.

Results

Table 1 shows the list of sources counted from the top of each SERP of each query. The analysis of organic results accounted for their materiality, distinguishing between the form of source and the type of source. The fifth result the US1 query and US2 query, as well as the third results in both IT1 and IT2 queries (marked with * in the table), were a Google Feature of "people also ask;" under that feature, the following tab was present, linking to sources which were included in the table: "What is AI?" (US1); "What is artificial intelligence with example?" (US2); "Come funziona l'IA?" (IT1); "Cosa si intende Intelligenza Artificiale?" (IT2). In the seventh and eights result of US2 query (marked with ** in the table) Google Feature of "Things to know" included the following tab linked to sources which were included in the table: a) "Disadvantages: What are some disadvatages of artifical intellgeince" b) "Good or Bad: Artificial Intelligence good or bad."

Table 1. Results of sources for each query

Number of the result	US1	US2	IT1	IT2
1	aws.amazon.com	Business Adobe	Wikipedia	hpe.com
2	Wikipedia/google search	MIT online getsmarter	ia.italia.it	Wikipedia
3	Google AI	A Caltech CTME	*SAS	*europarl.europa.eu
4	Google AI	Dictionary - Oxford Languages	SAS	intelifenzaartificale.it
5	*Techgadget	*Techgaget	ansa.it	agendadigitale.eu
6	Wikipedia	Wikipedia	garzantilingustica.it	blog.osservvtori.net
7	OpenAI	**(a) Simplilearn	ia.int	ai4business.it
8	SAS	**(b) enago.com	coe.int	SAS
9	C3 AI	Investopedia		treccanti.it

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10	BiiltIn	Techgadet		Oracle
11	The White Hose	Oracle		
12		BiltIn		
13		Britannica		
14		IBM		
15		SAS		
16		aaai.org		

The forms of sources were categorized based on the following criteria: ad – advertisements or sponsored content; Google feature – any Google feature (*images*), including search results which link back to Google as a corporation (Google AI); and search results – organic search results in SERP (see Fig. 1 and Fig. 2).
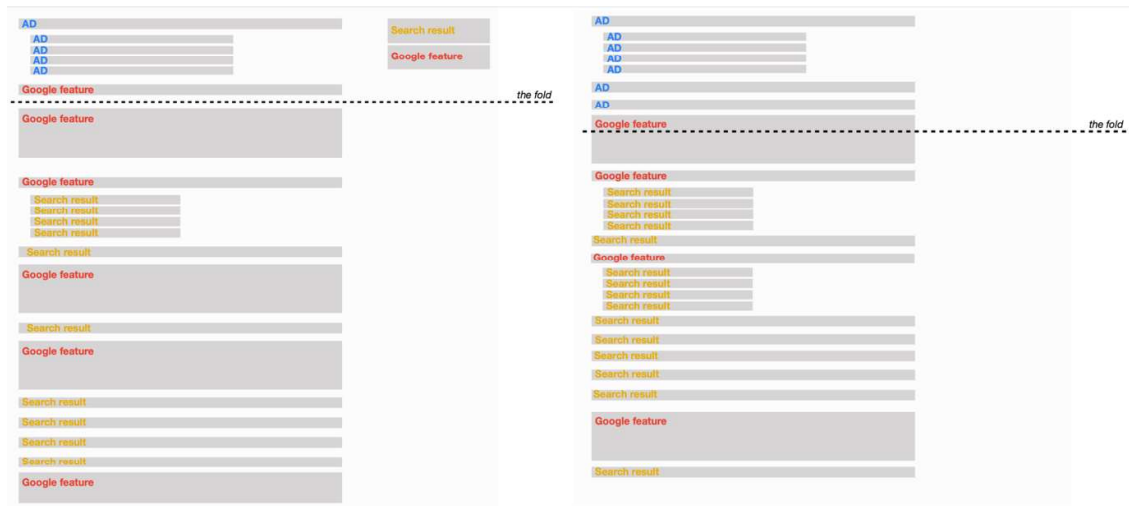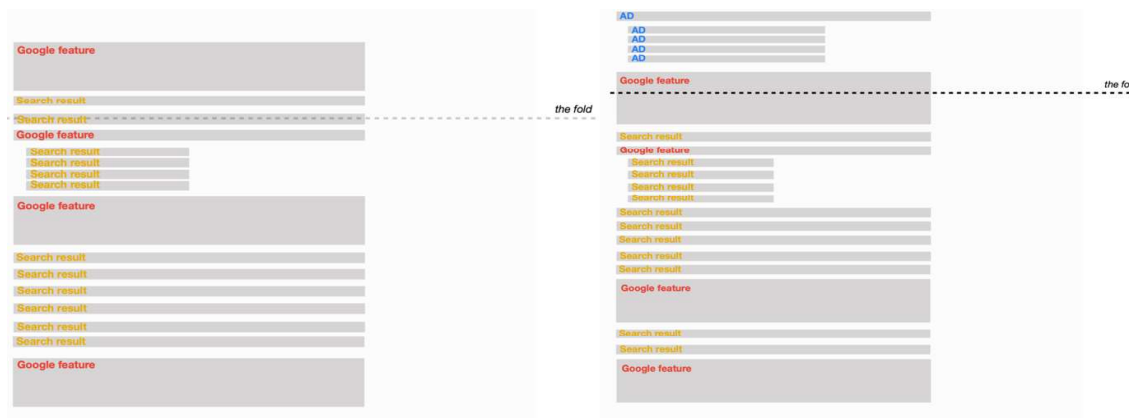

Figure 1. Results of US1 (left) and US2 (right)

Figure 2. Results of IT1 (left) and IT2 (right)

The types of sources were assigned to one of the following categories of source types: industry – any company and business-oriented enterprise which either sells software (e.g. Google AI), AI solutions (e.g. SAS), or offers high-level online courses in machine learning and AI (e.g. MIT); government - the governmental representatives (the White House), official institutions affiliated with the national government or EU parliament (Italian Agenda for Digitalization); dictionary – sources which provide definitions (Wikipedia, Britannica, Google's 'definition' was also considered as such); NGOs (any non-governmental organization, also non-for profit organizations such as ANSA); other (sources which did not qualify for any of the previous categories, such as websites with unclear ownership, e.g. intelifenzaartificiale.it) (see Fig. 3 and Fig. 4).
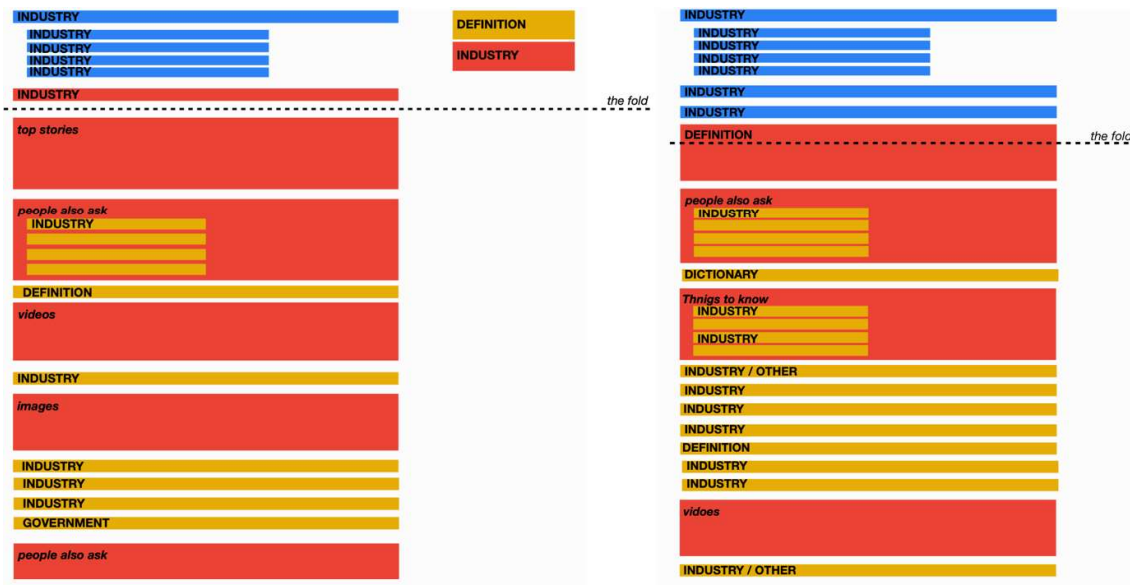

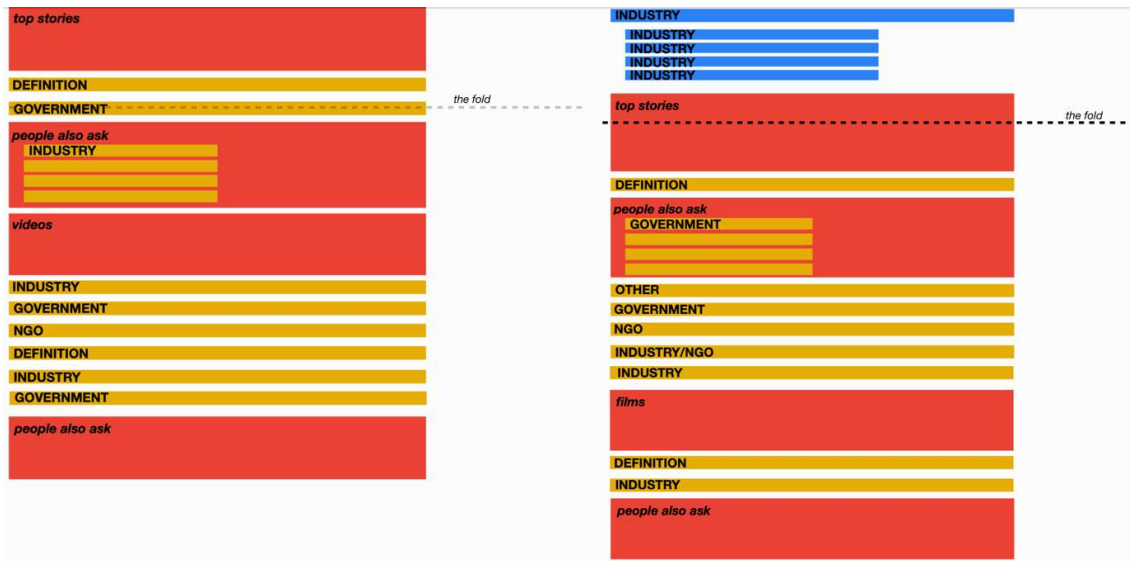Figure 3. Results of US1 (left) and US2 (right)

Figure 4. Results of IT1 (left) and IT2 (right)

There are several obstacles in analyzing SERP results in an algorithmic auditing setting. The search results on Google are intrinsically unstable due to continuous readjustment of the recommending system for specific users (Gillespie, 2014, p. 178). Additionally, users tend to see different results due to the filter bubble effect without an awareness of the invisible editing of Google's recommendation and ranking algorithms (Rogers 2022, 12). It is often impossible to know how and why results change over time in Google (Umoja Noble, 2018, p. 4, p. 16), leading to the limitation of the research to be representative of singular capture of constantly shifting and changing search results.

The queries performed resulted in four captures of the first page of Google results, one webpage capture per each query. As illustrated in all figures, the number and types of results which occupy the space 'above the fold' differ in each of the captures, depending on the layout for specific query, in specific location and, and one might assume, specific time. In cases US1, US2, and IT4 sponsored content is shown first (above the fold), followed by Google Features and organic search results. Notably, due to the specific layout, the number of total results for Italian queries is lower than in the US queries (US1: 17; US2: 18; IT1:16; IT2: 17). The number of organic results and their hierarchy also differs across the pages analyzed, depending on the layout of the page (see in particular fig. 1 and fig. 2).

As illustrated in fig.1 and fig. 2, the content related to Google Features (not the organic search results) is similarly present in each case, both above and under the fold. A particular case of Google pushing forward its own content is visible in US1, where Google AI (a branch of Google) appears in two search results, both situated above the fold. It is also in the case of the US query (US2) that aside from the 'standard' Google Features such as *people also ask*, a unique Google Feature appears, titled "Things to know." Given the relevance of certain results within Google Features, some of them were considered while analyzing types of sources (see fig. 3 and fig. 4).

Despite the fact that the organic search results in Italy (IT1 and IT2) were fewer than in the US, the resonance of diversity of types of sources, particularly governmental ones, is particularly resounding (see fig. 3 and fig. 4). On the contrary, in the US context search results (US1 and US2), 'industry' sources prevail (see fig. 5).

Discussion

The fact that sponsored content takes the most prominent place in the results reflects that, first and foremost, Google is an example of an "advertising platform" (Srnicek, 2017, p. 49). Google is not an information company, but an advertisement company, biased towards its own properties and sponsored content (Rogers 2022, 26). As Umoja Noble phrased it, "Google creates advertising algorithms, not information algorithms" (2018, p. 38). Following this argument, one has to consider that the 'credibility' of information provided by Google's hierarchy of results can reflect advertising interests, or "an intersection of popular and commercial interests" (ibid., p. 36). Therefore, in each four cases analyzed, a significant presence of sources coming from
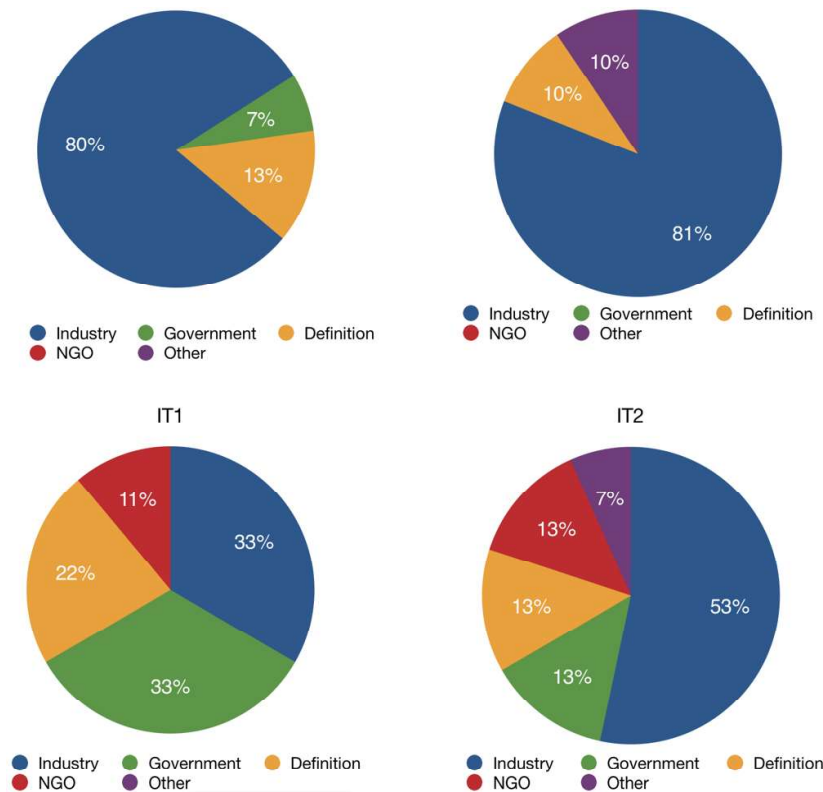
the 'industry' is not that surprising.

Figure 5. Percentage of source types per query

While AI imaginaries have been influenced by myths perpetuated by science fiction (Bareis & Katzenbach, 2022, p. 857), this is hardly reflected in Google results. Yet if one assumes that contemporary myths are mostly generated by science and technology (Bory & Bory, 2015, p. 67), then the significant number of 'industry' sources, prominent in the US context, adds to the imaginary of AI being mystified, highly complex, and incomprehensible for laymen. 'Industry' sources also tend to reflect a rather overly optimistic approach to AI developments, shared by people in the field (Sartori & Bocca, 2022), focused on advantages and the unlimited potential that AI can unleash particularly for businesses. The high presence of 'industry' actors also reflects a more ideological phenomenon, that of global corporate presence – out of which, that of Google is the most prominent –in pushing utopian visions of digital technologies (Mager and Katzenbach, 2021, p. 227).

This analysis of Google search results on AI in the US and Italy has proven something quite different, namely that the type of sources and the form of sources differ significantly across borders. In fact, these differences reflect the political imaginaries of AI that the US and Italy (which tends to follow the general EU narrative) have been propagating for years. In their analysis of political approaches to AI imaginaries, Bareis & Katzenbach discovered that countries such as Germany and France tend to promote AI imagines "along ethical lines" focusing on "humanist ethos," security, and risk assessment (2022, p. 871-872). The US approach, as they

argue, is the contrary; both under Trump's and Biden's administration, AI is presented as a tool of "empowerment of the American worker, strengthening local industry, or fostering a deregulating free-market approach" which depends on "the competitive economic strength of a proud nation building" (ibid., p. 872-873). Hence, the global discourse of creating a nation- specific AI imaginary (ibid., p. 856), can be said to be reflected in the asymmetry between 'industry' actors and 'government' actors in the search results of Google.

Mager and Katzenbach point out that today, "the circulation of imaginaries is often not motivated and propagated by state actors and their interests, but by commercial actors' assumptions about technology that directly shape the design of their products" (2021, p. 227). In terms of constructing AI imaginaries worldwide, as noticed also recently by Bareis & Katzenbach, the primary actors are "business actors [who] feature much more often in AI reporting than other stakeholders" (Bareis & Katzenbach, 2022, p. 857). Google seems to be reflecting that trend. Avis argues that the imaginaries which surround the 4th Industrial Revolution, which is driven by AI development and implementation, consist of a range of tensions and contradictions across regions which are nonetheless united by the overarching dominance of the capital (Avis, 2018, p. 342). One wonders whether Google's search results reflect a greater shift between the US and EU AI imaginaries, thus perpetuating the political hegemony, or whether in both cases the most prominent actors (industry in the US, government and NGOs in EU/Italy) are using SEO, and, by constructing 'credible' websites, dominate in SERP.

"All knowledge is a condensed node in an agonistic power field," stated Donna Haraway (1988, p. 577), and all 'knowledge' of Google is no different. Ultimately, knowledge is related to power relations, and AI imaginaries are intrinsic to socio-political realms in which they emerge. As Umoja Noble argues, "we must ask when we find these kinds of results, Is this the best information? For whom? We must ask ourselves who the intended audience is for a variety of things we find" (2018, p. 5). The way Google and other algorithm-driven systems categorize and configure knowledge can influence users' perception – and, as we might add, their imaginaries – of the reality beyond the digital. As Garzonio (2022, p. 161). rightfully notices while referring to the Google results,

> a complex, automatic, profit-driven mechanism drew a line between what we could easily find and access and what was to remain silent. Again, this represents an exercise of power, both in terms of control over the availability and concrete accessibility of knowledge and in terms of influence on the meaning we subsequently construct over that same knowledge.

The search queries conducted in the US and Italy reveal that depending on geographic location, Google's search algorithms 'give' power to specific actors to shape the imaginaries of what AI is. It has been noticed that 'hyped' AI imaginary is spread by both companies and governments (Kazansky & Milan, 2021, p. 374). Operating between 'government' actors and 'industry' actors, Google does not dispel any "counter-imaginaries" of AI in the first page of its SERP, rendering civic counter-imaginaries of AI (Kazansky & Milan, 2021, p. 364) invisible for laymen. Instead, users, particularly in the US, are being delivered a 'hyped' industry-driven AI imaginary rather than a survey of actual socioecological AI issues and their possible consequences. Yet with a few algorithmic tweaks, the two different AI imaginaries that surfaced from the study discussed here, could be

switched or changed completely, without users noticing. Or, the diversity that's more apparent in the Italian context could be replaced with a single answer to the question posed by a pop-up Google Feature "what is AI." One could argue that such consolidation of 'knowledge,' or "transforming the web from a browsing and surfing space to a single Q&A" (Rogers 2022, 23), is what Google seems to strive for.

Conclusion

This study focused on differences in Google search results which appear in the SERP for queries on AI in the US and Italy. As Google remains the dominant gatekeeper of information online, it influences the imaginaries that people construct on such topics as AI. As part of its questionable objectivity and invisible logics of sorting information, Google's search results should not be taken as 'objective,' even in terms of queries which relate to topics that are not, seemingly, controversial, such as general knowledge of what AI is. In the spirit of sponsored content, one can state that Google's search results reflect both Google's interests and the interests of its most infomercial stakeholders; in case of AI, the industry (in the US context) and the government (in the context of Italy). Google's search results are in principle a survey of "the wisdom of the crowds" and "certified authorities" (Gillespie, 2014, p. 187). However, most users are not aware that they are only given a 'slice' of the content, or a different slice compared to what they could stumble upon if they searched from a different geographical location. Google's complete lack of transparency clashes with Google's strategy to appear 'objective' (Umoja Noble, 2018, p. 45). Google's monopoly on information is exercised upon billions of users across the globe in their daily searches.

While the US and the Italy (EU) results are different, and so are the sociotechnical imaginaries that emerge locally, some of the crucial differences and similarities that a layman user can perceive are well reflected in the localized Google search. Despite significant differences, queries performed in both contexts of the US and Italy are similar in that they exclude for the debate any perspectives, NGOs, or companies from the Global South. Instead, they show a certain transnational cooperation among corporations and localized results of NGOs or government specific actors. Given the small sample of this study, follow-up research could expand the scope on by focusing on different countries, and collecting a larger and more diverse data sample. One also has to note that this study was conducted before the release of OpenAI's ChatGPT, which significantly influenced the public debate around AI technologies and caused both a hype and panic globally, which had surely influenced (in both positive and negative ways) the public imaginary of AI.

References

Bareis, J., & Katzenbach, C. (2022). "Talking AI into Being: The Narratives and Imaginaries of National AI Strategies and Their Performative Politics." *Science, Technology, & Human Values*, 47(5), pp. 855–881. https://doi.org/10.1177/01622439211030007

Bogers, L., et al. (2020) "Confronting Bias in the Online Representation of Pregnancy." *Convergence*, vol. 26,

no. 5–6, Dec, pp. 1037–1059, doi:10.1177/1354856520938606.

Bory, S. & Bory, P. (2015). "New Imaginaries of the Artificial Intelligence." *Im@go. A Journal of the Social Imaginary*. Vol. 0, no. 6, pp. 66 – 85. https://doi.org/10.7413/22818138047.

Cave S, Dihal K. (2019) "Hopes and Fears for Intelligent Machines in Fiction and Reality." *Nat Mach Intell* 1: pp.74–78. https://doi.org/10. 1038/s42256-019-0020-9.

Garzonio, E. 2022. "Performative Intermediaries Versus Digital Regulation. A Multidisciplinary Analysis of the Power of Algorithms." In F. Comunello et al. (eds.), W*hat People Leave Behind, Frontiers in Sociology and Social Research*, https://doi.org/10.1007/978-3-031-11756-5_1.

Gillespie, T. (2014). "The Relevance of Algorithms." In T. Gillespie, P. J. Boczkowski, & K. A. Foot (Eds.), *Media Technologies: Essays on Communication, Materiality, and Society* (pp. 167–194). Cambridge, MA, USA: MIT Press.

Haraway, D. (1988). "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies*, vol. 14, no. 3, pp. 575–99. https://doi.org/10.2307/3178066.

Houli, D., et al. (2021). "'COVID19 is_': The Perpetuation of Coronavirus Conspiracy Theories via Google Autocomplete." *ASIS&T Annual Meeting*.

Avis, J. (2018). "Socio-Technical Imaginary of fhe Fourth Industrial Revolution and Its Implications for Vocational Education and Training: A Literature Review," *Journal of Vocational Education & Training*, 70:3, 337-363, DOI: 10.1080/13636820.2018.1498907.

Jansen, J. & Spink, A. (2006). "How Are We Searching the World Wide Web? A Comparison of Nine Search Engine Transaction Logs." *Information Processing & Management*. 42; pp. 248- 263. 10.1016/j.ipm.2004.10.007.

Jürgens, P., & Stark, B. (2017). "The Power of Default On Reddit: A General Model to Measure the Influence of Information Intermediaries." *Policy & Internet*, 9(4), pp. 395–419. https://doi.org/10. 1002/poi3.166.

Kazansky, B., & Milan, S. (2021). "'Bodies not templates': Contesting dominant algorithmic imaginaries." *New Media & Society*, 23(2), pp. 363-381. https://doi.org/10.1177/1461444820929316.

Latzer, M., Hollnbuchner, K., Just, N., & Saurwein, F. (2016). "The Economics of Algorithmic Selection on the Internet." In J. M. Bauer & M. Latzer (Eds.), *Handbook on the economics of the Internet*. pp. 395–425. Edward Elgar.

Mager, A., & Katzenbach, C. (2021). "Future Imaginaries in The Making and Governing of Digital Technology: Multiple, Contested, Commodified." *New Media & Society*, 23(2), pp. 223–236. https://doi.org/10.1177/1461444820929321

Noble, S. (2018). *Algorithms of Oppression*. New York: NYU Press.

Pan, B., Hembrooke, H., Joachims, T., Lorigo, L., Gay, G., & Granka, L. (2007). "In Google We Trust: Users' Decisions on Rank, Position,aAnd Relevance." *Journal of Computer-Mediated Communication*, 12(3), pp. 801–823. https://doi.org/10.1111/j.1083-6101.2007.0035.x.

Rogers, R. (forthcoming). "Google Critique: Auditing Search Engines." In *Doing Digital Methods (second edition)*. London, United Kingdom.

Rogers, R. (2017). "Foundations of Digital Methods: Query Design." In eds Mirko Schaefer and Karin van Es, *The Datafied Society: Studying Culture through Data*. pp.75-94. Amsterdam University Press

10.5117/9789462981362.

Romele, A. (2022). "Images of Artificial Intelligence: A Blind Spot in AI Ethics." *Philos. Technol*. 35, 44. https://doi.org/10.1007/s13347-022-00498-3.

Sartori, L., Bocca, G. (2023). "Minding the Gap(S): Public Perceptions of AI and Socio-Technical Imaginaries." *AI & Soc* 38, pp. 443–458. https://doi.org/10.1007/s00146-022-01422-1.

Solon, O., and Levin, S. (2016). "How Google's Search Algorithm Spreads False Information with a Rightwing Bias." *The Guardian*. Retrieved from https://www.theguardian.com/technology/ 2016/dec/16/google-autocomplete-rightwing-bias-algorithm-political-propaganda.

Srnicek, N. (2017). *Platform Capitalism*. Cambridge, UK: Polity.

Statista. (2022). "Worldwide desktop market share of leading search engines from January 2010 to July 2022." Statista Research Department. https://www.statista.com/statistics/ 216573/worldwide-market-share-of-search-engines/.

Steiner, M., Magin, M., Stark, B. & Geiß, S. (2022) "Seek and you shall find? A content analysis on the diversity of five search engines' results on political queries." *Information, Communication & Society*, 25:2, pp. 217-241, DOI: 10.1080/1369118X.2020.1776367.

Sweeney, L. (2013). "Discrimination in Online Ad Delivery: Google ads, black names and white names, racial discrimination, and click advertising." *Queue* 11, 3, pp. 10–29. https://doi.org/10.1145/2460276.2460278.