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#ISOJ The Journal of the International Symposium on Online Journalism is an international journal devoted to advancing the scholarship in the area of journalism and innovative technologies. The editors invite manuscripts reporting original research, methodologies relevant to the study of journalism and innovative technologies (online, tablets, mobile platforms, etc.), critical syntheses of research and theoretical perspectives on journalism today. The journal maintains a social scientific and broad behavioral focus. We encourage submissions from scholars outside and within the journalism and mass communication discipline.

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Discovery, Distribution, and Democracy: Key Considerations in the Next Generation of Research on AI and News

A Guest Editor Introduction to the Special Issue

Seth C. Lewis

The hype cycle, developed by the U.S. consulting firm Gartner, famously illustrates a familiar pattern that tends to emerge with successive new technologies or innovations. It begins with a key breakthrough, a "technology trigger." Then early publicity of high-profile success stories leads to rapidly growing attention for the technology or innovation, culminating in a "peak of inflated expectations." This is generally followed by a crash in visibility and expectations as the technology or innovation is deemed to have fallen into a "trough of disillusionment," as interest slackens and many much-hyped experiments fail. However, in time—and this could be in months, years, or decades, or it could never happen at all—a technology's productive value begins to be recognized anew, with an emergent "slope of enlightenment" that may involve second- and third-generation iterations of the innovation finding some traction in various enterprises. This may finally be followed by a "plateau of productivity" in which the innovation achieves mainstream adoption as its utility becomes more fully and widely apparent. While there are plenty of critiques of the hype cycle—after all, it's certainly not a scientific analysis of innovation, and it's hard to tell when a technology is in one phase or another—the framework can serve as a simple heuristic for considering how technologies have developed over time: from the internet (think: 1990s dot-com bubble followed by the Web 2.0 social media era) to the current fascination with the likes of cryptocurrency, NFTs, and the metaverse (around which there has been no shortage of hype lately).

The hype cycle, however imperfect it may be, also serves as a catalyst for considering questions that are pertinent to this special issue: Where do we stand in the development of artificial intelligence (AI)? And what about the application of AI—and associated forms of algorithms, automation, and augmentation—to the context of media, news, and journalism specifically?

Indeed, talk about hype: few technologies in recent decades have gone through as many booms (and busts) in visibility and expectations as we have seen in the oft-inflated hopes and fears associated with artificial intelligence. After an initial

burst of interest in machines thinking like humans in the 1950s, there was an "AI winter" for several decades as the promise of such technology failed to materialize—followed by a strong resurgence in recent years fueled by several coalescing trends in tech development: "ever more sophisticated statistical and probabilistic methods; the availability of increasingly large amounts of data; the accessibility of cheap, enormous computational power"; and, with the growing digitalization of many elements of everyday life, "steady progress and cross pollination in these areas [reinvigorating] the feasibility, importance, and scalability of AI" (Cath et al., 2018, quoted in Lewis & Simon, forthcoming). As such, AI now is having something of a moment, both in terms of public awareness and discussion and in productive application. This is true across a vast array of industries and institutions (Mitchell, 2019) as well as, increasingly, in the domain of media and communication (Broussard, Diakopoulos, Guzman, Abebe, Dupagne, & Chuan, 2019; Guzman & Lewis, 2020).

Perhaps some of the hype—or, better put, mystery and magic—of artificial intelligence arises because it's so often misunderstood and poorly defined, making it hard to compare one person's invocation of AI with another. In the most general sense, AI refers to the use of computing to assume tasks normally associated with human intelligence. But many fields and industries have their own ideas of what counts as AI and how it works (Boden 2018). So, it is valuable to clarify between General AI and Narrow AI, or "imaginary" AI as opposed to "real" AI (Broussard, 2018). General AI, also called Strong AI, involves a machine possessing intelligence comparable to that of a human—which, for the foreseeable future, remains purely in the realm of science fiction (Mitchell 2019). By comparison, Narrow AI, also called Weak AI, gestures to the more realistic use-cases of AI that we are more familiar with today, often taking the form of machine learning, deep learning, neural networks, and so forth (Boden 2018). This is the training of algorithms to solve carefully bounded problems, and it's in this latter form of Narrow AI that we find journalistic applications of artificial intelligence.

Journalistic AI, defined as the use of and orientation toward artificial intelligence in newswork (Lin & Lewis, forthcoming), is coming into view as technologies for automating news have become more fully incorporated into the way that news is produced, distributed, and consumed (for a comprehensive overview, see Diakopoulos 2019). This includes a fast-evolving variety of "smart" tools used by reporters and editors, particularly at large and resource-rich news organizations, to gauge sentiment on social media, customize news for tailored audiences, automatically suggest edits on video clips, transcribe interviews at scale, and much more (see examples in Marconi 2020). "The hope," as one report signaled recently, "is that journalists will be algorithmically turbo-charged, capable of using their human skills in new and more effective ways" (Beckett, 2019).

So, where are we in the hype cycle for AI and journalism? While it is impossible to say for sure, what we can detect is that this crest in enthusiasm surrounding AI has been met by a corresponding swell of scholarly interest from many parts

of journalism and communication research. Studies have sought to explain, for example, the potential for AI in investigative reporting (Stray, 2019) as well as its democratically complicated role in adjudicating the news recommendations that people receive via algorithms (Helberger, 2019). Much of this research figures into the wider study of algorithms and automation as defining elements of journalism's present turn toward increasingly digitalization and AI approaches (Thurman, Lewis, & Kunert, 2019). This line of research also ranges, on the one hand, from exploring the depths and details of tools for semi- or fully automated media (Diakopoulos, 2019) to considering, on the other hand, what these developments mean for how we conceptualize—at an ontological level—the essence of what journalism is and how it is communicated (Lewis, Guzman, & Schmidt, 2019). However, it's also important to acknowledge that research is still at an early stage in capturing the full range of implications—be they sociotechnical, political, economic, ethical, philosophical, legal, and so forth—that arise at the intersection of news, media, and artificial intelligence.

This special issue, therefore, offers a key step forward in advancing this discussion on news in the era of AI. This is particularly so on three fronts: how news discovered, how news is distributed, and how news figures into broader democratic aims. These 3 D's—discovery, distribution, and democracy—each point to essential questions that scholars are only beginning to unravel, and which will be crucial to the next phase of research on artificial intelligence and journalism. First, if pattern detection at scale is a key affordance of AI, how could such tools be used by journalists (and others) to surface information that is relevant and newsworthy and thereby expand the capacity and impact of what journalism has to offer? Second, as media consumers increasingly rely on search and social media to encounter news, how are algorithms and related tools of automated media distribution prioritizing certain types of information and thereby shaping the public agenda vis-à-vis the traditional agenda-setting role of journalists? Third, and implicit in the above questions but more spelled out here: What kind of ethical, normative, and ontological implications emerge as journalists embrace automation?

Discovery

In the first article of this special issue, "Exploring Reporter-Desired Features for an AI-Generated Legislative News Tip Sheet," the authors—Patrick Howe, Christine Robertson, Lindsay Grace, and Foaad Khosmood—illustrate potential for advancements in what Diakopoulos (2020) calls "computational news discovery." The authors include a former political reporter, a former legislative chief of staff, a computer scientist, and a scholar of interactive media and communication. "An underlying motivation for the project," they write, "is to expand journalistic coverage of local governments, in this case state legislatures, by providing a tool for journalists to summarize for them potentially newsworthy developments happening in legislatures."

Howe and colleagues thus bring a tool-building sensibility and practicality to an important problem: the crisis in coverage of statehouses as local and regional news organizations cut back on reporting staff. They propose AI4Reporters, an "AI system that automatically generates news 'tip sheets' generated in response to triggers that are based on analyzing legislative transcripts and other sources for bill information and campaign donations." The authors try to gauge demand for and use of such a system through a survey of 193 journalists and semi-structured interviews with 10.

The overall response, they say, was positive: a large majority of journalists feel that they don't have the resources to cover state legislatures adequately, and said they would do more if barriers, such as the lack of ability to track newsworthy events, were removed. Could AI4Reporters help? Respondents expressed enthusiasm for the tool, but they also voiced concerns about trust, transparency, and timeliness. What's more, the paper also found that journalists want custom solutions, hinting at the challenge of designing a one-size-fits-all solution for improving statehouse coverage. Ultimately, this paper offers an important building block for future study: collaborations among journalists, computer scientists, and related specialists in prioritizing tools that augment the work of news discovery that can be so time-consuming for reporters and editors.

Distribution

The second article, "Algorithmic Agenda-Setting: The Shape of Search Media During the 2020 US Election," by Daniel Trielli and Nicholas Diakopoulos, offers a reminder that search algorithms, which often do not receive the level of research attention they deserve in journalism studies, are vitally important to analyze. Such algorithms are key conduits through which people receive and make sense of information in a world where we rely on Google incessantly and where the distribution of news increasingly is disconnected from the original source of its publication.

As we continue to transition from human gatekeeping to algorithmic varieties—and as the place of nonhuman selection systems for news prioritization become more prominent moving forward, with the potential for ever-greater personalization—what might we anticipate as a result? This study offers a clue. Trielli and Diakopoulos conducted an algorithm audit of Google to explore how the search engine depicted topics and issues in connection with the 2020 U.S. presidential election. In an extension of the long line of agenda-setting research, the authors ask: "First, to what extent does the distribution of topics selected by search media replicate the agenda of the news media?; and second, to what extent does searcher input alter this distribution?"

The findings, they say, suggest that there are differences between search and news media in the frequency of topics mentioned (e.g., Race and Environment were underrepresented in the news media), and yet they also find that "the rank-

ing of topics—that is, the order of importance in terms of topic prevalence given by search media and news media—is substantially similar." They also tested whether particular interests by the searcher (by including modifiers in search queries) might rearrange those relative rankings, finding that, no, there is "limited power by the user to reshape the topics in the search results."

Among other things, this study—combining algorithmic auditing with computational content analysis—itself is an illustration of social science taking advantage of developments in algorithms and automation that are widening the scope of research. This approach serves to illustrate, in this case, that search algorithms may yield variations in agenda-setting, but perhaps not with the level of user-driven influence that may be imagined, altogether indicating the need for more research into the quality, malleability, diversity, and representativeness of search results.

Democracy

Finally, this special issue concludes with "The Missing Piece: Ethics and the Ontological Boundaries of Automated Journalism," by Colin Porlezza and Giulia Ferri. This study rounds out our discussion of hype cycles, beginning as it does with a reflection on the overinflated boosterism—bordering on a technology-as-savior mentality—that have accompanied the emergence of algorithms, automation, and AI in journalism. Against that backdrop, and with a thorough review of the academic literature to date, the authors seek to tease out ethical and ontological dimensions that they believe have particular resonance for the democratic role of the news media and how that role may evolve in an AI era. "A profit orientation that accompanies the implementation of automation," they write, "is not in itself a problem given that news organizations are driven by profits, but if taken as the main ontological reason behind the use of AI in journalism, it can have a fallout that transcends the boundaries of newsrooms."

As part of a larger study of perceptions about journalism innovation, the authors conducted qualitative interviews in five countries (Austria, Germany, Spain, Switzerland, United Kingdom). In each country, some 20 experts from the news industry (journalists, editors, and media managers) and from academia (journalism scholars) were asked about the 20 most important journalistic innovations in the previous decade. Overall, more than a thousand innovations were cataloged through their research; 56 of these were related to news automation or AI. By analyzing if and how interview respondents legitimized these innovations in news automation, the researchers focused on what their perspectives indicated about evolving ideas about the ethics and ontology of journalism (e.g., what is journalism and what is it for?).

"The results show that automation is often viewed through an economic lens," they note, "offering opportunities to increase the efficiency of news production, personalization, or increase time for more complex investigations"—but without

a corresponding concern for questions about what constitutes journalism, what its purpose is, and how it is to be distinguished from other information products. Their findings point to the need for future study into how AI not only changes how journalism is done but why, pointing to essential normative questions about journalism and democracy that deserve further scrutiny in connection with artificial intelligence and the opportunities and challenges it portends (see Lin & Lewis, forthcoming).

In conclusion, regardless of whether the hype cycle offers a lens into the ebbs and flows of expectations for AI and journalism, what we can say conclusively is that as shifts in news discovery and distribution change in accordance with algorithms, automation, and augmentation, we need research to chart and critique those developments, and to illustrate their implications for the relationship between news and democracy. More broadly, we need scholarship that helps industry and academia alike to understand how shifts in relations between humans and machines may help or hinder the well-functioning of journalism, including the ultimate role that it can play in cultivating conditions for the good life.

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Exploring Reporter-Desired Features for an AI-Generated Legislative News Tip Sheet

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This research concerns the perceived need for and benefits of an algorithmically generated, personalizable tip sheet that could be used by journalists to improve and expand coverage of state legislatures. This study engaged in two research projects to understand if working journalists could make good use of such a tool and, if so, what features and functionalities they would most value within it. This study also explored journalists' perceptions of the role of such tools in their newswork. In a survey of 193 journalists, nearly all said legislative coverage is important but only 37% said they feel they have the resources to do such coverage now, and 81% said they would improve their coverage if barriers were removed. Respondents valued the ability to receive customizable alerts to news events regarding specific people, issues or legislative actions. A follow-up series of semi-structured interviews with reporters brought forth some concerns on such issues as transparency, trust and timeliness and identified differing normative assumptions on how such a tool should influence their newswork.

This article explores and evaluates a new kind of prototype tool for journalists: an AI-produced tip sheet system called AI4Reporters. In recent years, there have been many developments relating to the use of artificial intelligence in journalism. Purpose–driven tools now exist to help journalists discover potential stories, to help media outlets disseminate stories quickly, and to help audiences discover news stories of value to them and engage with them in novel ways. The tip sheet described in this research is designed to help the field of journalism buttress an important coverage area—public interest news coming out of state legislatures—that, due largely to upheavals in media economics, has been in decline.

In their 2011 article "Computational Journalism," Cohen, Hamilton and Turner described what they saw as one paradox of the information age: While computers connected via the Internet had made it possible for the public to

access seemingly limitless amounts of information, their rise had disrupted one institution that people had depended on to both provide them information about their government and to act as a check upon it.

Journalistic institutions, particularly newspapers, in the digital age have seen both their core mission and their economic model come under threat. Where journalists' main mission had once been to find information, now their role was increasingly to sift through an abundance of it to find what is relevant and important. Where news companies once offered advertisers convenient access to a local audience, now social media companies offer the ability to micro-target audiences based on the block that they live on and their favorite pastimes, all for less cost. By 2020, daily circulation of newspapers had fallen from a high of $62 million to an estimated $25 million, and advertising revenue had fallen from a high of $49 billion to less than $9 billion (Pew Research Center, 2021).

Cohen, Hamilton and Turner (the latter two expanding on their 2009 work), however, saw a "silver lining" in the situation journalism was facing. If computers and technology had helped create the threat to public–service journalism, then, they argued, computer scientists had an obligation to work to help journalists perform their watchdog role by providing new interfaces, algorithms, and techniques for extracting data. They argued that "for public-interest journalism to thrive, computer scientists and journalists must work together, with each learning elements of the other's trade" (2011, p. 66).

Cohen and her co–authors saw such efforts as a logical continuation of the role that technology has played in advancing journalism, from the accountability that developed through the ability of journalists to photocopy government documents, to Philip Meyer's deployment of social–science methods and tools in newsrooms via so–called Precision Journalism, to the use of relational databases and the rise of computer-assisted reporting. Their paper also foreshadowed potential obstacles that included cultural and technological gaps between what they called "computationalists and journalists" (Cohen, Hamilton & Turner, 2011, p. 68).

Lewis and Usher (2013) encouraged a two–way exchange when it came to bridging those gaps. They explored the ways that the ethics of "hackers" engaged in producing open–source journalism tools might influence and change journalistic norms and practices. They noted that tools used in newsrooms had conventionally been critiqued based on their ability to fit into pre-existing journalistic conventions. They called this a "tool–driven normalization" that assumed that traditional methods were the "inherent good" (2013, p. 9). How, they asked, might journalism innovation be increased if normative values of transparency, iteration, tinkering, and participation—represented in open-source hacking—were adopted by newsrooms?

One concrete example of an aspect of public–affairs journalism that has suffered in recent years is coverage of activities at state legislatures. State legislatures

pass laws that dramatically affect people's lives, but the number of statehouse reporters has declined sharply in recent decades (Enda, Matsa, & Boyles, 2014; Shaw, 2017), leading to less coverage overall. Those reporters that remain in statehouses are more likely to be students or assigned only part– time. Resulting legislative coverage is more superficial (Weiss, 2015; Williams, 2017), focusing largely on the final passage of major bills. That's too late in the process for citizens to offer informed responses to their lawmakers in a way that could influence policies. State legislative officials have tried to fill the gap in coverage by, for example, offering more legislative-produced social media, video offerings, websites and news-like stories (Weiss, 2015), but government watchdogs say more needs to be done to increase coverage of state legislative news (Shaw, 2017).

The government and political reporters who continue to cover state legislators make use of technology including Internet–era tools and live streams (Cournoyer, 2015). But much of their day-to-day reporting activity wouldn't look much different from 50 years ago. As described in a Pew Research Center report (2014), statehouse reporters spend their time meeting with lobbyists and lawmakers to learn about potential developments of interest, physically attending committee hearings to track bills, and monitoring legislative floor proceedings, which often progress into the night. The same reporters generally also are expected to cover gubernatorial news, political developments, newsworthy developments among state agencies and court proceedings.

The project described in this paper (AI4Reporters) is motivated by the same spirit reflected in those computational journalism articles. The authors of this paper include a former political reporter, a former legislative chief of staff, a computer scientist, and a scholar of interactive media and communication. An underlying motivation for the project is to expand journalistic coverage of local governments, in this case state legislatures, by providing a tool for journalists to summarize for them potentially newsworthy developments happening in legislatures. An additional motivation is to explore how a cross–section of modern journalists respond to the idea of incorporating AI tools into their daily work. Are journalism AI tools still subjected to a "tool-driven normalization," judged by their conformance with conventional methods of conducting journalism, or are there signs they might serve to disrupt existing workplace patterns and normative assumptions to serve audiences better?

This paper addresses the following questions: 1. What is the perceived need among journalists for an AI–generated legislative news tip sheet such as ours?

2. What features, abilities and functionalities would journalists find most useful in their daily reporting? 3. What do the answers given by journalists in response to questions about such a tip sheet reveal about how these professionals conceptualize the role of journalistic AI technology in their newswork? We explore these through analysis of an opinion survey taken by 193 journalists and

via in–depth semi–structured interviews with 10 journalists who explored artifacts from a working model of our tip sheet.

This research contributes to the field by describing the development of an algorithmically generated legislative news tip sheet designed to be used by journalists to improve their coverage of state legislative actions (called in this article AI4Reporters Tip Sheet). We explore journalists' perceptions of their need for such a tool and their notions of how they might benefit from it. The findings elaborate on the importance that tools designed by computer scientists for use by journalists consider the specific needs and values held by journalists. It also highlights the varied ways that modern reporters think about what journalistic AI tools might help them do (or not do). This article concludes with discussion of potential impacts of the tool and how the project might proceed, particularly in light of what has been learned from the interviews. Overall, the work aims to introduce people to the potential of this tool and to help others more effectively design computational tools that could support public service-oriented journalism.

Literature

This review tackles two areas that inform our work. First, to review related tools that have used aspects of AI to aid in newsgathering. Second, to explore findings from works that have explored how journalistic news values come into play in the design and use of computational systems to aid in news discovery.

AI-powered newsgathering tools

AI tools have already taken on important roles in journalism in the reporting, writing and distribution of stories (Hansen, Roca-Sales, Keegan, & King, 2017). In 2019, Reuters Institute Digital News Report (Nielsen, Newman, Fletcher & Kalogeropoulos, 2019) researchers found that more than three–quarters of news leaders interviewed think it is important to invest more in Artificial Intelligence (AI) to help secure the future of journalism—but not as an alternative to employing more editors. Most news leaders (73%) saw increased personalization as a critical pathway to the future, according to the report (Nielsen, Newman, Fletcher & Kalogeropoulos, 2019).

News organizations use AI to automatically generate thousands of stories per year in genres such as financial, sports and weather, and this increased coverage has had effects. After The Associated Press partnered with Automated Insights to use AI to generate stories from corporate earnings reports—effectively expanding its corporate earnings coverage by 2,400 companies—investor interest, trading volume and stock prices related to the newly-covered companies increased (Blankespoor, deHaan & Zhu, 2018). One example of AI being used to help with legislative coverage is *The Atlanta Journal-Constitution* deploying a predictive model to describe a bill's chances of passage through the legislature (Ernsthausen, 2014). News organizations generally, however, have

not had success fully automating the writing of news stories in genres such as governmental reporting that depend on subjective judgment and for which there are no neatly standardized data sets available as algorithmic inputs (Hall, 2018).

Diakopoulos (2019) makes the case that much of the potential for algorithmic journalism lies in hybridization, in which human reporters use machines to help with tasks such as prioritizing, classifying, associating and filtering information (p. 19). He notes that computers are a long way from being able to do the sort of complex tasks listed above and thus researchers might productively focus on areas where computers can augment, rather than replace, the work of human reporters. He offers the example of Swedish sports site Klackspark, which relies on AI to both write short game summaries *and* to alert human reporters to newsworthy events within them so that they can conduct additional reporting.

Other AI-Journalism tools have included FactWatcher (Hassan et al., 2014), which aims to help journalists identify facts that might serve as leads for news stories, The City Beat tool (this and the immediately following tools described by Trielli & Diakopoulos, 2019), which aimed to let journalists know about local events in New York City, and the Tracer system, which searched Twitter to detect potentially newsworthy events. Local News Engine employed algorithms to gather and sift through government data in the United Kingdom to look for leads. RADAR, which stands for Reporters and Data and Robots, offers thousands of stories per month that are run by UK–based media outlets that subscribe to its wire service. RADAR data journalists figure out angles for stories and then create data-driven templates with rules for how to localize the stories. Each journalist can produce 200 “local” stories per template they create.

Perhaps most similar to the tool discussed in this article, another AI instrument that has recently come to be used in news gathering is the Lead Locator (WashPostPR, 2020). Used by *The Washington Post* during its 2020 election coverage, the Lead Locator used machine learning to generate a tip sheet for reporters that would analyze voter data from state and county level and point them to potentially interesting anomalies and outliers in the data.

Journalistic news values and AI

Diakopoulos and others have recently begun discussing the various types of projects described above as *computational news discovery* (CND). The work discussed in this article logically fits within this framework, which is defined as “the use of algorithms to orient editorial attention to potentially newsworthy events or information prior to publication” (Diakopoulos, Trielli & Lee, 2021). More broadly, this research falls within the field of Human-Computer Interaction (HCI), with particular attention to such works that emphasize the need to focus on human-centered technologies (Riedl, 2019), and works that emphasize the importance of designing systems that work within specific value frameworks (e.g., Friedman & Khan, 2006; Shilton, 2018).

Academics and computer scientists who seek to help journalists should understand the values that reporters bring to their work. If the tool is aimed at assisting with news discovery, there's a clear need to understand concepts of news, newsworthiness and other values of the newsroom. Analysis of previous journalist–computer science partnerships has uncovered tension over news values (Diakopoulos, 2020).

News values are those things that help reporters decide what is news. In an update to their earlier work, Harcup and O'Neill (2016) found that information considered for potential publication in news stories generally included one or more of the following characteristics: exclusivity, bad news, conflict, surprise, arresting audio or video, shareability, entertainment, drama, relevance, discussion of the power elite, magnitude, celebrity, good news, or stories that fit a news organization's agenda. In addition to norms about what news *is,* journalists share norms about *how* news should be gathered and about what principles should guide them in the process. Kovach and Rosenstiel (2021) distilled both of these concepts down to 10 "elements of journalism." Among these ideas are that journalists have an obligation to the truth, that they should put the public interest above their own, that information they report must be verifiable, that journalists should be independent from the influences of their sources, and that journalism should monitor power.

McClure Haughey, Muralikumar, Wood and Starbird (2020) explored how journalists used technology to investigate and report on misinformation and disinformation. After analyzing in-depth interviews with 12 journalists, they offered suggestions on how academics might better support journalists. For example, they found that, while researchers were inclined to build advanced analytical tools to see trends in big data, the journalists said they wanted help tracking specific bad actors who were posting in chatrooms, on Discord servers and on social media. In other words, the reporters saw their work as more akin to ethnography than data science. Turning to values, the authors found that the journalists were interested in the journalistic value of verifying sources, which in the data world could be translated as establishing the credibility of the data used. Journalists, they found, wanted to know exactly how the data was collected, processed and analyzed.

Diakopoulos has multiple works that explore elements of news values within computational news discovery tools. Interviews with journalists who had used CND systems (2020) emphasized that CND tools should work with journalistic evaluations of newsworthiness and quality, and also be designed for flexibility and configurability. In an assessment of a tool designed to spot algorithms used in government decision-making, he and coauthors Trielli and Lee (2021) found journalists were not satisfied with crowdsourced (by non-journalists) judgments of newsworthiness. Milosavljevic and Vobic (2019) conducted a series of semi-structured interviews with journalists from leading British and German news organizations on the topic of "automation novelties" (p. 16) and found that,

while views were in a state of flux, the process of coming to terms with change ultimately had reinforced rather than upended certain journalistic hegemonic belief systems, particularly around the ideals of objectivity, autonomy and timeliness. Most notably, they found a consensus that any automation must exist in a hybrid state that would continue to keep humans in the loop.

And Posetti (2018) found that the news industry has a focus problem, pursuing innovation such as AR and AI for innovation's sake and that this has, among other things, risked burnout in the newsroom. Posetti quotes journalist-turnedacademic Aaron Pilhofer as discussing journalists' tendency to judge new innovations by using their "tummy compass: if it feels like the right thing to do, it must be'' (2018, p. 18) One clear theme from the report was a need to make audience needs a main focus of innovation.

Furthermore, Lin and Lewis (2021) expand on this conceptualization of what journalistic AI should be. They suggest there ought to be a balance between journalists' wants and audience needs, arguing that any journalistic AI tools should be designed with certain normative ideals in mind, namely those in service of accuracy, accessibility, diversity, relevance, and timeliness. Timeliness, for example, may be exemplified by a tool saving a reporter time in producing certain parts of a story but then seeing that time spent elsewhere on more deliberative aspects in service of the audience.

AI News Tip Sheet Project

Previous work

The researchers of this article had earlier created Digital Democracy (Blakeslee et al., 2015), a free online resource that allowed users to search and examine transcripts of videos from the California legislature. While interesting studies were produced (Latner et al., 2017), that system was judged to be not impactful, as it required engaged and motivated citizens to proactively visit the website and use the tools.

So the team developed a system that produced AI-generated text summaries that could be offered to journalists. The idea was to use the same transcripts and other data from the Digital Democracy system to produce a short article. So-called algorithmic journalism has been in use in the industry for over a decade, but basically confined to generating sports, weather and certain financial news articles. This was among the first to be used for politics or government. A survey–based study (Klimashevskaia et al., 2021) of the AI-generated content showed the accuracy and usefulness of the summaries but raised concerns regarding the completeness of coverage. Early feedback also indicated journalists would rather be given the primary sources and the underlying information to form their own stories rather than modify or augment auto-generated ones. Attention turned to the news tip sheet concept.

System design

The AI4Reporters approach is an AI system that automatically generates stories and manages electronic “tip sheets” based on recent legislative events and data. Specifically, tip sheets contain vital information about a recent bill discussion (a portion of a committee hearing, or floor session dedicated to a specific bill). The idea is to try to recreate notes taken by an informed reporter who was there in person when the bill discussion took place. Each tip sheet appears like a single interactive web page accessible from the reporters’ dashboard on the AI4Reporters portal. The page includes basic information like committee composition, date, vote outcomes, link to bill texts, amendments, and video recording with time-synced professional–grade transcripts. Top quotable utterances are mined from the transcript and displayed together with the identity and affiliation of the speaker for possible use for the reporter. Quotes are suggested based on basic criteria such as complete, grammatically correct statements made without anaphora containing topic words. They are displayed together with the name of the speaker and are linked directly to the section of the video from which they are transcribed to allow reporters to investigate the context. There is also background information on lawmakers, such as donation amounts, percentage party alignments, list of top donors along with associated average donation amounts.

Data visualizations are rendered generally on the right column. These are derived charts and graphs based for example on speaker participation in terms of number of words or duration of time. The “alignment meter” visualization tool lets the user display an alignment score between any of the lawmakers involved in the bill discussion and any of the organizations that our system tracks. The score is based on a comparison of votes with officially submitted written positions of the organization which in California are public records available from the legislative analyst’s report on the bill. The tip sheet summary box near the top of the page, includes a section on “why you may be interested” in this discussion. Here, the system surfaces results of statistically anomalous triggers that AI4Reporters system automatically looks for in every bill discussion. A sentence is produced describing the trigger, if it is found. Examples of triggers include a close vote, a member who breaks ranks with their own party on a vote, a nontrivial “back and forth” exchange indicative of an argument between a lawmaker and another person, an unusually high number of witnesses testimonies. Many more triggers are possible, and the system can be constantly updated to include new and interesting observation patterns that can be checked. Triggers, however, are not required, as the system generates a tip sheet for every bill discussion regardless of any unusual events that may have occurred. Once generated, the system allows users to select tip sheets based on the subject, committee, lawmaker, keywords or geographical location that may have come up in the discussion.

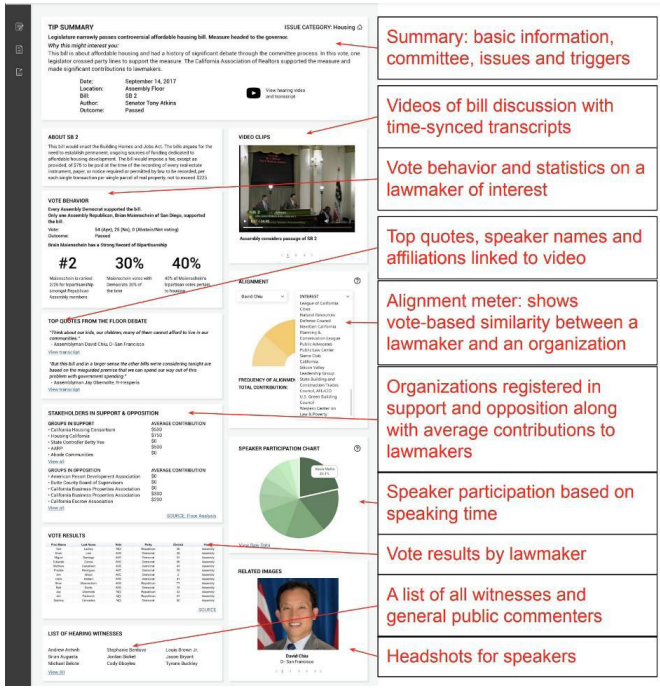

Figure 1: A Screenshot of an AI4Reporters Tip Sheet along with a Description of each Element.

This system has been designed, and a prototype produced, based on older data from the Digital Democracy database (2014-2018), containing legislative information from California (four years) as well as Florida, Texas and New York (two years each). The goal is to resume live data gathering and launch the production version of the tool once we show viability and demand for the systems.

Workflow

The general workflow of the system is as follows: First, a reporter logs on to the system by navigating to the website using a standard browser. Once logged in, the reporter is shown a dashboard with various “cards,” such as the ones shown in Figure 2, on display. Every card has something resembling a headline describing a particular tip sheet. The cards also display other metadata such as dates, state and bill information. The dashboard has filtering based on topic and also keyword searching capability from its main navigation bar. Applying filters or searching for keywords will constrain the cards that appear on the dashboard. Every card can be clicked and upon clicking will take the user to a full tip sheet (see previous Figure 1).

Customization

The system allows for customization so that only tip sheets of interest are shown to a user. From a settings screen accessible from the main dashboard, the user can select basic information such as state, county, issues (keywords) and lawmakers. After setting these options, the system automatically defaults to showing only cards that satisfy the reporter's constraints. For example, a California reporter may be interested in water and their hometown assembly member. By setting the state (California) and topic (water), as well as county, the system automatically shows the reporter California tip sheets either about water or ones that describe some activity from the county's assembly members or senator.

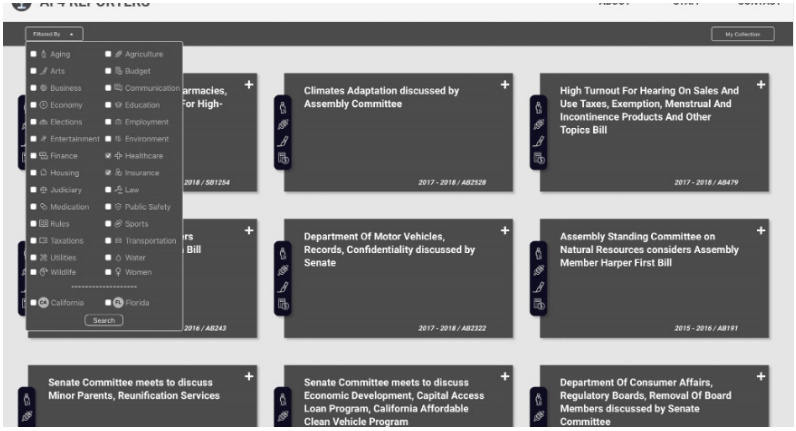

Figure 2: Topic-based Filters Available in the Tip Sheet

This study examines perceptions of utility regarding the project's AI-generated legislative news tip sheets. It does so through two research endeavors. The first was a survey of 193 journalists and the second was a series of hour-long, semi-structured interviews with working journalists. The overarching goal was to better understand how the designed system meets the needs and expectations of news organizations.

Method

Survey instrument

The team created a master list of targets for the survey. The largest source was from a commercial tool called Cision that has a large database of U.S. media professionals. Additional lists were compiled from attendees of a Knight Foundation–funded conference (Newslab, 2020) and from a list of Florida–based

journalism field contacts made available form one of the author's universities. After pruning duplicates, invalid addresses and opt–out requests, the final list was 4,516 addresses, 97% of which came from the Cision list; 4,296 were considered successfully delivered. Only fully completed surveys are included in this analysis; there were 193, representing 4.5% of the list. Participants received no compensation for completing the survey.

The primary aims of this questionnaire were to identify current trends in statehouse coverage, barriers to coverage, and priorities for state-level news reporting. The survey also aimed to determine which features in the completed system were of the highest interest.

Semi-structured interviews

More nuanced perceptions of utility were gathered from an analysis of semi–structured in–depth interviews with reporters with varying experience covering the state legislature in California. While time–consuming, labor intensive and often reliant on small sample sizes, the use of semi-structured interviews is powerful in that it allows for open-ended responses that can help guide formative development of a project or highlight unforeseen issues (Adams, 2015). As the demo material for the automated tool was specific to California's legislature, the team chose to only engage journalists familiar with California politics.

Six engagements involving 10 journalists were held in September and October 2021. Nine had already participated in the survey and indicated interest in further discussions about the tool. In addition to familiarity with California government, interviewees were selected to represent a cross–section of platforms (print/digital, television and radio), outlet size and audience reach (smaller and larger outlets in minor and major metropolitan areas), and position in their newsroom (junior– and senior–level). Each engagement was about 60 minutes in length and was conducted over video conference sessions. Typically, three individuals affiliated with the present study participated: one served as main presenter, one as official note taker, and the lead information architect was there to take notes and answer questions. The presentation was made entirely by one interlocutor while the others mainly took notes and answered specific questions. The participants were seven reporters, two editors and one television producer. The group was invited via email. Each journalist was offered a $100 incentive for the interview. However, only one person returned the form necessary for the payment to be sent, and the team believes the incentive was a non-factor.

The interviewees came from backgrounds including a major–market television station, a local television station, a public radio station, a metro newspaper and a non–profit news agency based at the state Capitol. All were shown a mock–up of the dashboard design and given examples of the results the model could generate. For the interviews, our primary objectives were as follows:

- Generally, would the reporters find the tool as modeled useful to their jobs?
- What abilities and features would be most valuable to them in a tip sheet tool?
- How would they like data conveyed, presented and delivered?
- How specifically would they envision using the tool in their daily reporting?

Table 1

Focus Group Engagements (about 60 minutes per session)

#	date	organizational description	number of journalists	roles in organization
1	9/7/21	major metro PBS TV and Radio	1	reporter
2	9/9/21	major metro network TV	1	reporter
3	9/10/21	statewide online	3	reporter, editor, data journalist
4	9/16/21	major metro print	1	reporter
5	10/5/21	minor metro network TV	3	reporters, producer
6	10/19/21	major metro print	1	politics editor

Table 1 lists the six interview sessions held while Table 2 provides an outline of each interview with predefined questions. Within each session, the conversation was not strictly controlled, and interviewees were free to focus on a single area or take the discussion in different directions. In analysis, all interviews were transcribed, and the authors analyzed the data for themes, followed by a coding process initially guided by the objectives listed above. This analysis also involved an adjective frequency analysis on the transcripts of all the sessions to better understand the overall sentiments expressed in the sessions. An additional round of thematic analysis and coding that was conducted to address the third research question focused on how the journalists conceptualize the role of journalistic AI in their newswork.

Table 2

The Question Instrument

Section	Duration (minutes)	Questions
Welcome and Introduction	5	
General Content	10	General impressions of the overall content provided? Problems, concerns, or specific issues with tip sheet provided? Which features stand out as most important and/or interesting? Which features stand out as least interesting? Words or phrases that best describe the sample content provided (How does this information compare to other sources you might use in the production of news content? Any section that was ambiguous or confusing and explain? How would you improve this tip-sheet in general?
Content Areas	25	Overall content: Relevant, neutral, or irrelevant to the tip? The way information is conveyed: Effective, neutral, ineffective? Highlight the most important feature of this content section as it relates to your work Problems, concerns, or specific issues with the content section? Any ambiguous or confusing items in this section? How would you improve this content area in general?
Review	5	If were to choose an area to develop further, which and why? If one area seems superfluous, which and why?
General Experience Questions	10	Minimum features you'd require to consider this tool useful in your work? How are you most likely to use this content in your current process of news gathering and production? How does the information organization compare to other tools you may be using to gather and produce news? Please describe the value add you see in this product in terms of time, money, etc. (Similar to 4 hours of investigating research, $500 in subcontracting, etc.) What is your preferred method for accessing this type of tool? Examples might include: ● Automated mail daily, weekly, or monthly (push) ● Filtering a website on your laptop or desktop computer ● Filtering a website on your mobile device ● Text messaging prompts Other (please describe)
Thanks and Conclusion	5	

Results

One hundred ninety-three news professionals completed the survey instrument. Respondents were asked to communicate from the perspective of their current employment roles and responsibilities. They self-identified primarily as editors (45%) and reporters (36%), and worked primarily for print or web-based news outlets (80%), with most of the rest in radio (11%) and television (8%). The bulk—46% of the respondents—worked in media outlets of less than five employees, while large news organizations of 51-99 employees (3%) and 100 or more employees (3%) were the least represented. Some 73% of the respondents indicated they cover statehouse news at least weekly. Only 1% never cover statehouse news. Table 3 highlights the pattern of statehouse coverage noted by all respondents.

Table 3

Frequency of News Coverage Among Respondents

Frequency of news coverage at least:	
Daily	43%
Weekly	30%
Monthly	15%
Infrequently	11%
Never	1%

The primary audience for respondent news outlets was local news at 50%. The next wider audience, regional news, was served by 24% of the audience. Statewide–focused news organizations represented 15% of the responses, and 7% of all were responses from nationally–focused news sources.

Eleven states are represented in the survey: Arizona, California, Colorado, Florida. Georgia, Illinois, New York, North Carolina, Oklahoma, Pennsylvania, and Texas. The number of respondents was greatest from California (59), Florida (34) and Texas (22). This is likely a product of the researchers' networks, which are based in California and Florida. It should not be interpreted as regional interest in artificial intelligence or allied solutions to improve statehouse coverage.

Respondents were asked to identify the importance of statehouse coverage as either critical, important, or not at all important. Unsurprisingly, 98.8% of respondents indicated that it is "important to cover policies and politics unfolding in state legislatures." Within that, 80% identified such coverage as "critical," while 1.2% identified it as not at all important. The survey provided these responses as mutually exclusive, so respondents could only choose one or the other.

From their responses, a minority (37%) of news organizations "feel well-resourced to cover the issues and events connected to a state legislature." The barriers to statehouse coverage abound. Respondents were asked to rank order the most common barriers to covering state news. When given a list of likely barriers to statehouse coverage, the most common response, "insufficient resources to research & report on newsworthy events, even if I am aware of a newsworthy event" was shared by 38% of the studied group. The next most common barrier, shared by 28% of the respondents, was "geographic distance—lack of access to proceedings."

The third most common barrier, “insufficient resources to track and identify newsworthy events,” challenged 19% of these news professionals.

The list of other challenges included: statehouse policies and politics are not of interest to my audience (6%), available wire service articles are not relevant to my audience (3%), and there are no limiting factors (<1%).

Some respondents offered other challenges as free-form responses or as added commentary to their sorted list. Of those who identified other barriers, the most common response was that all list barriers apply or confound their challenges. Others indicated missing resources such as “the wire service is huge too, we used to subscribe to CTNS but that went away” (respondent 83). While others addressed systemic issues such as staffing shortages or “state administration’s contempt for journalism, open government, and transparency” (respondent 154). General sentiments of note for this research emphasized the limitations of reduced staffing or having a single reporter in a statehouse.

Critical observations offered as barriers also included focus: One noted “we are a national publication and do not routinely focus on covering state legislatures” (respondent 191) and another offered “we are a very local paper and do not report on state or national issues” (respondent 166). These responses, while rare, hint at audiences that might see less benefit for the tip sheet. Others note that news discovery would shape their interest in statehouse reporting (e.g., identifying national trends reflected in a state legislature or hyper–local news shaped by the state legislature).

Given a Likert scale between very likely and very unlikely, 81% of the participants indicated they would increase state legislature coverage if these barriers were removed. Some 36% were very likely to increase coverage, 45% were likely, 1% were unsure, 5% were unlikely and 1% were very unlikely.

When prompted to choose from a list of six topics respondents were most likely to cover about state legislatures, 92% indicated likelihood of covering “topics of local/regional importance” (e.g., “Proposed law could mean more water for Central Valley farmers”). Likewise, 82% were likely or very likely to cover “topics related to a specific policy area” (e.g., “State proposes changes to K12 curriculum standards”). And 79% were likely or very likely to cover “topics of potential statewide importance” (e.g., “Florida budget vote fails”). Other options, such as “Topics of potential national importance” (e.g., “CA votes to become a sanctuary tate”) and “Topics related to the people who participate in the legislative process” (e.g., “Local dealership owner testifies in Sacramento”) retained majority interest, at 68% and 54% respectively. The least likely or highly unlikely topic was “Topics related to party politics” (e.g., “Republicans break ranks to support tax measure”) at 41%.

To help answer RQ1 and RQ2, the following section explains the specific features that respondents stated that would best support newsrooms.

This content, derived from existing or planned features, was evaluated on a Likert scale from very valuable to not valuable with a “neutral” option at the midpoint of the 5-point scale. The most desired content items are shown in Table 4, sorted by percentage responses at or above valuable:

Table 4

Most-Desired System Features

Most Desired System Features	
91.30%	Summarize the Facts Deemed Potentially Newsworthy
90.68%	Localization: Tips related to the interests and priorities of a specific community/region
83.85%	Primary Source Material (Link to relevant hearing transcripts, videos and other official records)
81.99%	Summary Quotes (Display some potentially interesting statements made by participants
80.75%	Fact-Checkable Statements (Present statements that contain a fact-checkable claim)
78.8%	List of Participants (Identify the legislators, lobbyists and witnesses in attendance)
77.64%	Analytics (Surface contextual data such as campaign contributions, rates of alignment between legislators and lobbyists/interest groups, measures of ideology and partisanship, anomalous voting behavior, etc.)
70.81%	Lobbyist/Witness Positions (Show what position each lobbyist/witness registered on the issue being discussed)
68.32%	Reveal the Triggers for “Newsworthiness” (What actions, features and criteria triggered this tip
63.98%	Speaker Profiles (Aggregate historical information about lawmaker, lobbyist and witness positions on legislation, campaign contribution activity, authorship/sponsorship of legislative proposals, links to prior statements, etc.)

The respondents were also asked to identify specific features implemented as part of the user experience. Such items include automatically–generated video clips, receiving email notifications when new tips are generated, filtering content by user generated criteria, etc. These features are generally common to such systems.

For user experience items, preferences primarily aimed toward content discovery and search. The most valued feature, based on a 5-point Likert scale of very valuable to not–at–all valuable, was customized triggers that allow users to subscribe and follow specific issues, people, regions and legislative actions. The second most valued trigger was filtering based on attributes like speaker, location or topic. Notably, multimedia aggregation such as photos and videos

ranked relatively low in the preference at 6% and 4.6% respectively.

Figure 3 illustrates the complete survey results for user experience features:

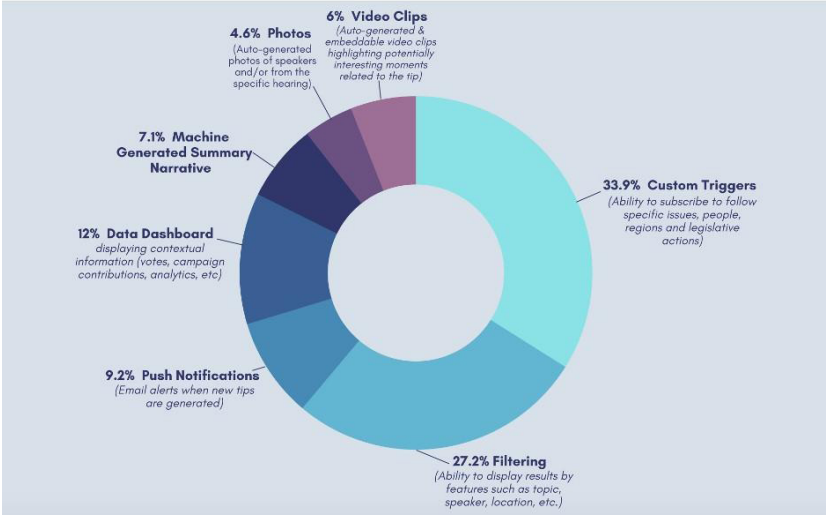

Figure 3: Desired User Features (Ranked 'Valuable' and 'Very Valuable)

Finally, 91% of the respondents indicated that they were likely or very likely to use a system that offered these features and functions as listed. Interest is also emphasized by the 122 respondents who requested early access to the beta version of the tool.

Interview Findings

As part of RQ1 and RQ2 findings, perceptions of usefulness of the tip sheet were positive in every case. Most reporters expressed excitement and surprise that such a tool could be a reality. Some described the inefficient and largely manual process they use to track legislative activities. Some aspects of the tip sheet were appreciated more by some reporters depending on their medium.

As one reporter said:

> "This would be an efficient way to do better to serve our communities like we claim we want to do with more than just click bait. These are stories that change lives, and if we're not reporting them, who will?" To the question of how they would like to receive alerts, most expressed dissatisfaction with email-based communication and preferred a web-based portal, dashboard or app with in-software alerting capability (such as text messages) as their method of interaction.

Regarding exactly how they would use the tool, answers again varied based on the reporters' legislative knowledge. Two Capitol-based journalists, for example, were enthusiastic about a tool highlighting relationships between lawmakers and lobbyist donations, while one general assignment reporter said she would be unlikely to use that information in daily news reports.

Concerns centered around areas of transparency, trust, and timeliness. For example, several reporters wanted to understand how the algorithm came to use the word "controversial" in a headline describing one bill's passage. Several also voiced concerns about how to attribute the source of the information, the tip sheet, in their reports. Another concern centered around timeliness, in that any delay in receiving alerts could decrease the information's newsworthiness.

One senior editor expressed some concern about non-neutral language in the descriptions pointing out that younger, less experienced reporters are likely to take these auto–generated descriptions and use them without verification. The same editor also said simple statistics such as "lawmaker participation score" as measured partly by the length of a legislator's speech is not terribly useful as there are many subjective qualities to such judgements.

As was indicated in the survey responses, journalists expressed interest in robust customization options. A television reporter, for example, said they would like to be able to get tips about upcoming actions for planning purposes.

Asked "How would this help you," one San Francisco–based newspaper reporter answered: "Both [in terms of] depth and breadth. For investigative pieces, it would help connect the dots. [It] also makes it easier to [do] more."

The authors also analyzed the six interview sessions using adjective frequency analysis. These efforts support the findings from the qualitative analysis, with the words "helpful," "interesting," "useful," "local," "great," and "good," appearing as among the most frequently used adjectives in the interviews. In terms of concerns raised, one of the tip sheet examples used the word "controversial" as a description of a vote, and several journalists said they found that description difficult to justify using algorithms. The general feedback was that we should try to stay value neutral on descriptions.

Turning to the third research question of how journalists conceptualize the tool, we found a wide variety of normative assumptions implicit in the interviews. One reporter, for a Los Angeles–based television station, expected any such tool to conform to prescribed methods of coverage she already employed. Shown an example artifact and asked her general impressions, she immediately focused on the precise ways that she might make use of it by, for example, using a headshot of a lawmaker and a quote from the summary, in a short television report. She noted that her station would not make use of legislative video unless it were unusually exciting. She described a sample one–page summary of a

proceeding as “a firehose of information,” and said that a feature that would offer an alignment meter—a visualization of synchronicity between an interest group’s interests and a lawmaker’s past votes—would not be of use to her: “I only have 90 seconds; it won’t make it in.” Broadly, she expressed that what the tool should offer is the ability to do more work of exactly the type she already does, faster and easier. She did not conceptualize the tool as something that might expand her vision and serve her audience differently or better.

Reporters and an editor for a smaller-market station, however, were more interested in using the tool to expand both the nature and the content of their coverage. Two journalists appreciated being able to discover new stories for themselves. They conveyed that currently the way they are alerted to a potentially newsworthy event in the legislature, is through press releases from the legislators themselves. A producer said that, while some summary information in the tool tip would not likely make it into a broadcast piece, it would be useful in letting them offer audiences more depth in a digital story. Continuing down the spectrum of how the tool might be employed, an editor and reporter with a legislative–based newsroom focused almost entirely on how the tool might be best used to unveil more complex patterns and relationships between money and power. They suggested new approaches and news products that could be offered based on the tool. Overall, they evidenced a view that the tool should be used to offer audiences greater clarity to how the legislature operates.

Discussion

AI4Reporters is an AI system that automatically generates news “tip sheets” generated in response to triggers that are based on analyzing legislative transcripts and other sources for bill information and campaign donations. The authors tested perceptions of the demand for, and utility of, the system via a survey of 193 journalists and semi–structured interviews with 10. The response was positive. Nearly all said coverage of legislatures is important, but only 37% said they feel like they have the resources to do such coverage. More than 80% said they would increase their coverage if barriers such as geographic distance, lack of ability to track newsworthy events, and insufficient access to relevant research, were removed. In the interviews, they were pleased by the tool and expressed enthusiasm for using it, but voiced concerns in the areas of trust, transparency, and timeliness.

It is obvious from the survey responses that there is a fundamental level of interest in the sort of assistance that AI tools could offer journalists with respect to their legislative coverage. It is also evident that survey participants want custom solutions. The responses underscore the obvious interest in user experience and user interface elements that support personalization and customization. They also hint at the challenge of designing a one–size–fits all solution.

This challenge to create bespoke software is also highlighted in the unique needs of a relatively small subset of users. As evidenced in the types of news organizations surveyed, staffing limitations at the many small organizations focusing on regional and local news are particularly interested in solutions that help increase their capacities. The responses show limited reticence for using the tool, but instead hint at ambitions to expand the news reporting capacities of these organizations. The interviews also supported this finding. While one might have assumed that larger outlets would be more interested in expanding coverage, this analysis finds equal or greater appetite for doing more public service– oriented journalism in smaller organizations.

Interestingly, the patterns seem to indicate a primary interest in news discovery, primary source parsing, and work that in concept expands the observational capacities of these news organizations. In other words, they seem to be affirming that they would increase reporting activity more if they were supported by tools that increase that capacity.

Since the specific focus of these organizations varies not only with their news audience, but with the topical focus of their publications and broadcasts, it is unsurprising that each wants a unique lens to specific elements of statehouse proceedings. While the survey is limited, it hints at the diverse needs of these organizations and their employees.

In terms of content, demand is clearest for summaries of relevant information that is localized and directly linked to primary source material. In short, journalists continue to want to do the work of journalism, maintaining the rigor of verified, independent and accountable work. They see the value of such systems as a means of supporting the traditional work of journalism.

Turning to evident normative assumptions, the authors find a variety evident in the interviews: Some reporters conceptualized the tool as one that ought to merely help them do their current work faster, while others jumped immediately to ways the tool could expand their coverage ambitions as well as their news product offerings to serve audiences better. This trend seemed to be independent of outlet size or medium. Future research might productively explore such connections. The authors have continued to iterate the tool's options and offerings based on the feedback from the survey and interview results. For example, the tip sheet will not characterize votes as "controversial."

Notably, although software systems are uniquely proficient at creating analytics or determining wide scale patterns, the appetite for such services is less strong. It is not clear if this is due to journalistic standards or the result of discomfort, distrust or other reticence. It is reasonable that in the age of algorithms, news professionals would rather do the pattern identification and calculations themselves. While this a wide generalization for a limited study, it is worth noting this preference as the community of AI designers and developers seeks to

support journalism. From this survey, it might be assumed that the ask for such an AI system may simply start with an old refrain: just the facts, for now.

Limitations of study design

This research had some limitations. As is the case with any such study, it would be more beneficial to survey a wider audience or to interview more reporters. As to the applicability of the findings, respondents gave their impressions to prompts about what to them was an entirely hypothetical tool. The journalists who were interviewed saw some results generated from a working prototype, but they did not personally interact with the tool themselves. Thus, the authors were not able to collect data that reflects how people would actually use the tool in a real-world application.

Any conclusions regarding the impact of being able to personalize or customize tip sheet results should be considered subject to this same limitation: Respondents in these studies did not actually personalize the data themselves and get results. One obvious direction for further research would be gathering feedback from journalists after they test a working model of the tip sheet for themselves.

Conclusions

The potential for algorithmic journalism was envisioned for weather stories as far back as 1970 (Glahn), and in its ideal form carries obvious benefits in terms of speed, scale, accuracy, lack of subjectivity and capacity for personalization (Graefe, 2016). Given all of this, Ramo (2021) wonders why we aren't encountering more explicit examples of algorithmically–generated news in our daily lives and concludes it's because trust issues remain. In a 2020 meta-analysis of 11 peer-reviewed journals, Graefe and Bohlken found that people deemed reports that they thought were generated by humans (whether in fact they were created by humans or algorithms) as more readable, of higher quality, and of similar credibility.

Diakopoulos (2019) argues for the use of hybridized systems that rely on algorithms to do work they do well but to then turn those results over to humans to use their subjective judgment and expertise to craft final stories. AI4Reporters seems to fit this model. Use of customizable tip sheets could lead to more coverage of state legislative proceedings and votes, and that increased coverage could lead to more citizen interest and involvement in legislative actions. For now, the human journalists are needed regardless, but even if or when they are not needed, they may still be preferred by news consumers. The authors are designing a tool for journalists, but the main goal is to serve the public with better access to legislative news that impacts their lives. Time is the most limiting factor in a newsroom. A tool that allows journalists to save time in one way, by more quickly producing a story they would have already

done, is not expanding public service journalism if that time is not then spent on doing additional or more nuanced public service coverage. There is reason for optimism in this study: Not all, but many of the journalists surveyed, evidenced views that our journalist AI tool would help them do more and better coverage.

Concerns around algorithmically–generated news center on its potential to cost human jobs, on credibility concerns, on the fairness and accuracy of reports, and on accountability. Projects such as the one tested, that help humans do the job of journalism in a critically needed subject area faster and better but keep reporters and editors as final crafters and decision-makers, have promise in serving both journalism and democracy.

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Algorithmic Agenda-Setting: The Shape of Search Media During the 2020 U.S. Election

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An algorithm audit of results during the 2020 United States presidential election investigates the agenda of topics and issues curated by Google search about the two main candidates. This work is framed around the agenda-setting understanding that public opinion is shaped by the salience of issues in the media, and search, as an extension of that media ecosystem, should be evaluated through the same lens. This study asks: to what extent do the topics selected by search media replicate the agenda of the news media? And to what extent does searcher input alter these topics? The results show the differences between the topics in news media and in the search engine and a limited power by the user to reshape the topics in the search results. These findings elaborate an understanding of how search media can drive, shape, or counteract choices made by news media and search users.

Search engines are an integral part of the system of distribution of news information to the public (Bandy & Diakopoulos, 2020; Bentley et al., 2019; Diakopoulos, 2019; Trielli & Diakopoulos, 2019) and, as such, a significant new piece in the process of selection and emphasis of issues in the media. The Artificial Intelligence-driven curation of search media (Metaxa et al., 2019) has the potential to influence public opinion in political and social domains (Epstein & Robertson, 2015; Epstein, 2018; Kay et al., 2015), and exercises power by shaping how the public makes informed political choices (Dutton & Reisdorf, 2017; Knobloch-Westerwick et al., 2015), including what and how issues are presented during elections (Diakopoulos et al., 2018; Muddiman, 2013; Trevisan et al., 2016).

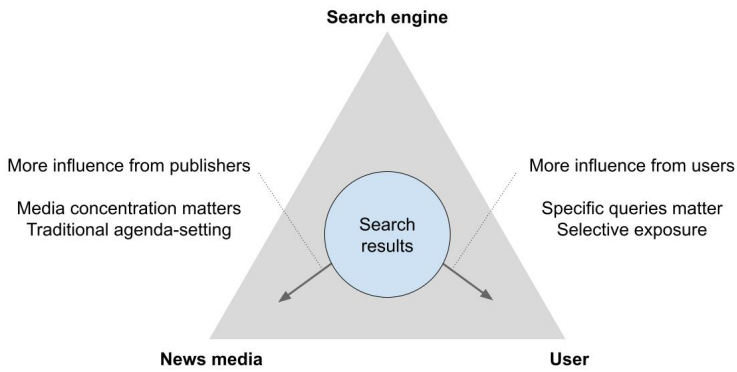
Public opinion is shaped by the salience of issues in the media, an idea that is at the heart of agenda-setting theory. This theory states that the salience that the media provides certain topics is associated with the importance that the public attributes to the issues reflected by these topics (McCombs & Shaw,

1972; Scheufele & Tewksbury, 2006; Valenzuela, 2019). With search now being an extension of how news media is distributed, the way its algorithms select and shape topics gains importance and warrants scrutiny (Mustafaraj et al., 2020; Whyte, 2016).

This study investigates the agenda of topics and issues that are curated by the Google search engine in the context of the 2020 U.S. presidential election. We investigate the salience of topics in search media, by pursuing two research questions: first, to what extent does the distribution of topics selected by search media replicate the agenda of the news media? And second, to what extent does searcher input (i.e., a user's specific selection of query terms) alter this distribution?

Addressing these two questions offers insight into how Google search acts as a curator of topics related to newsworthy queries. Firstly, if Google simply replicates the agenda of news media, this would signify a strong dependence on that news content. But differences in the distribution of topics between search and news media implies either dependence on other sources of information (candidate websites, blogs, other websites) or Google's editorial selection on those topics. Benchmarking this similarity, and translating it into dependence is difficult, since doing so depends on normative expectations of representativeness of news media in search results. However, we can calculate the degrees of similarity across topics to obtain an internal comparison of dependence on news media across them. Additionally, we can measure how that representativeness shifts with user input, which is related to the second question: To what degree does the Google search engine react to the inclusion of a modifier in the query by adjusting the results accordingly? At stake here is an assessment of the relative power of the user versus the news media in setting the agenda of exposure, a tradeoff which is mediated by the algorithms driving Google's search engine (see Figure 1).

Figure 1



To address these questions, we conducted an algorithm audit of Google search, comparing topics in news media articles about the two main presidential candidates in 2020 with topics that emerged in searches for the candidate names in the same timeframe. We found that while the relative rankings of prevalence of topics are correlated between the two datasets, there are divergences in the prevalence of those topics too. This suggests some overall congruence between the shape of search and news agendas while also indicating differences in the specific weight Google gave to topics in comparison to news media. We also found that, as expected, the inclusion of specific topic modifiers in the queries could reshape the topics of the results. However, there were also instances where this wasn't the case, in which user input alone did not drastically reshape the salience of topics.

Our findings advance a better empirical understanding of the relationship between search engine and news media, and to the connections and tensions between algorithms, journalism, and the democratic role of new AI-curated media (Helberger, 2019). We further discuss implications for news media in terms of how to influence the search agenda via third-level agenda-setting and elaborate how our methodological approach of looking at content, rather than sources, is a promising avenue for future work studying AI-driven curation systems at scale.

Related Work

In this study, we establish a connection between previous work on search engines and news—particularly political news—as well as agenda-setting theory and its implications for digital media. In the following subsections we describe previous work in these areas.

Search engines, politics, and news

The importance of search engines to the process of political information distribution and seeking has motivated extensive research in the last few years. A majority of people go to search engines first when they are seeking political information (Dutton & Reisdorf, 2017). In sessions of internet use that include news reading, 20% start with search engine use, compared with 16% for social media (Bentley et al., 2019). Search media is especially important for political contexts (Metaxa et al., 2019), and this importance is closely related to the trust that audiences have in search engines (Pan et al., 2007). Search results are co-constructed by the search engine's algorithmic curation and the searcher's demands. Searchers bring their own preconceptions to this transaction, and those preconceptions can be reinforced by the search engine (White, 2013; White & Horvitz, 2015). In the case of politics, voters have broad information needs and varied prior knowledge, and not considering those perspectives in search engine audits leads to failure to measure important aspects of quality of search results such as the bias of results that are generated both by the search

engine curation and the input bias of users as well as the presence of pollution in the ecosystem of information (Mustafaraj et al., 2020).

Much of the research on the connection between search and politics and news has focused on search engine audits that try to measure bias and personalization of results, with a focus on disparate curation of partisan information (Hu et al., 2019; Kulshrestha et al., 2019). Results show partisanship can be amplified by some elements of search results, such as snippets of text (Hu et al., 2019), and that the presence of candidate–controlled sources in search results increases positive bias towards the candidate (Diakopoulos et al., 2018; Kulshrestha et al., 2019; Puschmann, 2018).

While studies have found limited political bias of search results generated from platform personalization (Kliman-Silver et al., 2015), there is nonetheless bias exhibited in terms of selected mainstream sources (Courtois et al., 2018; Trielli & Diakopoulos, 2019). That mainstreaming effect is also resistant to user input: previous work has matched surveys of search queries to search results and found that Google partially neutralizes differentiation of search behaviors across different political groups (Trielli & Diakopoulos, 2020). While even a mainstream news media selection can reflect an improved and more diverse news consumption for some users on the individual level (Fletcher & Nielsen, 2018), previous work has highlighted that concentration of media audiences into a small number of news websites that are cooperative to tech intermediaries can negatively affect society-wide perspectives to news information (Smyrnaios, 2015).

Some of the biases found by research on Google search were also uncovered on another Google service, Google News. Just as in Google search, previous work has encountered dominance of highly frequented and national outlets over local outlets in Google News (Fischer et al., 2020; Haim et al., 2018). In terms of agenda-setting, Google News, being a repository of news articles, tends to replicate traditional industry structures, according to a study that asked real-world participants to use Google News to search for information about U.S. presidential candidates in the 2016 election (Nechushtai & Lewis, 2019). As in research on Google search, this study found little variation of curation across political identities of users, weakening the argument of filter bubbles in Google News (Nechushtai & Lewis, 2019). However, other work that used sock-puppet accounts to simulate use of the platform has noticed some political personalization based on browser history (Le et al., 2019).

Methodologically, these studies are complicated by the variety of factors in the act of using search engines that are within and beyond the control of the searcher (Ørmen, 2016). Furthermore, whether previous research has investigated Google search or Google News, the unit of analysis of these studies is typically either the specific web pages or sources that are represented in the

search results. Little attention has been given to the *content* of those websites, and their representation as a reflection of topics. In this study, we examine the topical content of the web pages that are represented in search results as another important avenue to measure potential search bias. That is because the salience of topics represented in media is relevant to political information and public discourse, as articulated by agenda-setting theory, which we elaborate further next.

From agenda-setting theory to search media

Agenda-setting theory reflects the idea that mass media influences the salience of issues in the public debate (McCombs & Shaw, 1972). According to this proposition, in determining what topics to cover, news organizations signal what topics are important and worthy of attention. News audiences, by consequence, learn how much importance to attach to certain topics (McCombs & Shaw, 1972), and topics that are more salient in the news media are considered to be more important in the public opinion as well (Valenzuela, 2019).

As new media started to appear and expand after the theory was proposed in the 1970s, agenda-setting theory has continued to expand and be refined (Valenzuela, 2019). One such expansion was the development of second-level agenda-setting, which connects to the idea of framing. Framing describes how a topic is presented in news media (Scheufele & Tewksbury, 2006) such as through the choice and usage of words, and second-level agenda-setting explores how that framing impacts the public agenda (McCombs et al., 1997). Specifically using the terms used in the description of this theory, first-level agenda-setting communicates the salience of topics in the news and second-level agenda-setting communicates the attributes of those topics. Finally, there is the third-level of agenda-setting, which examines how news media not only transfers the salience of topics and their attributes, but also the relationships between those topics (Guo & McCombs, 2011). This idea of networked agenda-setting is that news media also makes associations and relationships among different topics, and that has an influence on the public's cognitive picture (Wu & Guo, 2020).

The agenda-setting framework has previously been used to investigate digital media, particularly social media. Studies on fake news, for instance, have been able to make connections between agendas of traditional media, disinformation websites, and fact-checkers using the framework of networked agenda-setting, and have attempted to predict when other agendas overlap between these media outlets (Vargo et al., 2018). The new possibilities of data availability are particularly salient in studies that focus on social media, which also highlight how agenda-setting is transformed by the advent of audiences who are also producers of media (Groshek & Groshek, 2013). Research has found a symbiotic relationship between social media and traditional media (Conway et al.,

2015; Groshek & Groshek, 2013). Studies that compare content produced by audiences with the content of news media have shown that while the dynamics of attention in both types of media are similar, there are different rhythms of attention at play (Neuman et al., 2014).

While social media has been the focus of several agenda-setting theory studies in digital media, search media has been less investigated, despite clear applicability and opportunity for study. Search engines are clearly a venue to explore topics and agendas, representing a place of connection between different agendas from different agents of communication. Search media is co-constructed by the user who searches, the algorithm that computes relevance, and the underlying material that is found. Previous work has shown that Google web search such as search volume represented in Google Trends can be a viable source of analysis for social science research, both because it serves as a proxy for public opinion and as a good measurement for the impact of political campaigns on local interest in a topic (Whyte, 2016). In this study, we take this literature further by developing a method through which topics can be analyzed in search media.

Method

To answer whether the distribution of topics in search engines replicates the agenda of news media and how users can alter that distribution, we conducted a two-step algorithm audit. In the first step, we compare two datasets relating to our target subject, the 2020 U.S. presidential campaign. The first dataset reflects the topics in search results that are retrieved from searching the names of the presidential candidates; the second dataset is a baseline constituted from a broad sample of news articles that mention the candidates during the same timeframe. In the second step, we conducted another comparison, but this time between the results of a straightforward name search and a modified search that also contained topics of interest during the election. In the next subsections, we describe this method in more detail, including how we collected and analyzed this data.

Data collection and preparation

Search results were collected and parsed using the WebSearcher package (Roberston & Wilson, 2020). The automated searches were done on Google.com using a desktop browser configured with no user history, without being logged-in, and with language set to English, using a server located in Ohio. The searches were conducted during the general election period in 2020, from September 3 to November 3, 2020. This timeframe begins shortly after the nominating conventions and continues until election day. Searches were repeated every hour because news-related search results tend to have a relatively quick turn-over (Trielli & Diakopoulos, 2019).

To cover our two questions—the first about general searches about candidates and the second about searches paired with modifiers representing searcher interest in a topic—we conducted two types of searches simultaneously. For the first question, we searched and scraped the top 10 organic search results (search results that are neither ads nor links in widgets on the results page, such as the "In the News" box) for the queries *Joe Biden* and *Donald Trump.* These queries were not exact queries enclosed in quotes, which we argue is how a searcher might write a casual, general query. For the second question, we searched for each candidate name combined with specific topics of interest in the elections (again with the names and the topics not enclosed in quotes, e.g., *Joe Biden Healthcare*). By doing so we prod the search engine to provide different results based on a specific change in the query input. To come up with a list of such topics, we used Gallup's Most Important Problem survey[1], which asks Americans every month what they think is the most important problem facing the country. This survey has long been used to measure the public agenda (Edy & Meirick, 2018; McCombs & Zhu, 1995). An alternative approach would be to extract topics of interest using Google Trends (Whyte, 2016), which has partial correlation with the results from the Gallup poll (Mellon, 2014). However, while Google Trends is a viable source of political communication research (Whyte, 2016), the goal of our study was to measure the representativeness of the public agenda directly in the search media, without confounding this comparison with metrics of search volume. For June 2020, we collected data for 22 topics that at least 1% of respondents in the Gallup survey considered the most important problems (see Table 1). In the queries we used the same words used to describe each problem, only excluding the slash between them (e.g., *Donald Trump Coronavirus Diseases*).

Table 1: Topics that were mentioned by at least 1% of respondents in the Gallup poll about the most important problems facing the U.S. in June 2020, in alphabetical order

Most important problem	% of respondents	Most important problem	% of respondents
Coronavirus/Diseases	20	Judicial system/Courts/Laws	2
Crime/Violence	3	Lack of money	2
Economy in general	8	Lack of respect for each other	4
Education	1	Police brutality	2
Elections/Election reform	1	Poverty/Hunger/Homelessness	1
Environment/Pollution/Climate change	2	Race relations/Racism	19
Ethics/moral/religious/family decline	3	Situation with China	1
Federal budget deficit/Federal debt	1	The government/Poor leadership	21
Gap between rich and poor	3	The media	2
Healthcare	3	Unemployment/Jobs	5
Immigration	2	Unifying the country	4

We compare the datasets of search results with a baseline of news stories extracted from Media Cloud, an open-source platform that tracks and collects metadata about the online media ecosystem, including an extensive database

of links to news articles (Roberts et al., 2021). Media Cloud allows searches in its database over specific collections of sources. We selected two collections that encompass the main news media organizations in the United States: U.S. Top Newspapers 2018 (50 media sources) and U.S. Top Digital Native Sources 2018 (37 media sources)[2] and collected all the links from these media sources that mention either one of the two main presidential candidates in the 2020 U.S. presidential election, Donald Trump and Joe Biden. The timeframe for that collection matches the collection of search results—September 3 to November 3, 2020.

The search results both for the general and the topic searches yielded a total of 2,158 unique URLs that belong to 466 domains. There are 167 URLs for general search terms (across 34 domains) and 2,019 URLs for topic searches (across 461 domains)—28 of those URLs appear in both general and topic searches, as well as 29 domains (some domains repeat between the two types of searches with different URLs). The full baseline of news articles consisted of 27,663 unique URLs (across 87 domains), of which 27,073 had recoverable texts that mentioned either Donald Trump or Joe Biden. Of these 27,073 news articles, 96% contained reference to Donald Trump and 64% to Joe Biden. For the comparison between search results and news media, the news media baseline dataset is further split into two, one baseline for Trump news stories (25,968 news articles) and one baseline for Biden news stories (17,208 news articles).

With the two lists of article links at hand (i.e., search results and news media baseline), we then scraped the article text of each of the links[3]. This was necessary so that we could extract the topics from the content of each search result. The topic extraction process is described in the following section.

Data analysis

The two questions we aim to answer with this analysis are: 1) To what extent does the distribution of topics selected by search engines replicate the agenda of the news media?; and 2) to what extent does searcher input in the form of topic-related query elaborations alter this distribution? To address these questions, we developed a method that compares topics extracted from our collection and baseline.

To compute the topics from the content of the links collected both in the Google search results scrape and the baseline news media from Media Cloud, we used the NYT–Based News Tagger[4], which is also used by Media Cloud to conduct its analyses. This machine-learning (ML) based labeler was trained on a corpus of 1,800,000 texts from *The New York Times*. It returns various labels that are descriptors and taxonomic classifiers based on five different models in which different sets of descriptors are used. These labels were originally created by *The New York Times* to describe its own corpus[5]. The most accurate of the ML

labeling models, according to the documentation (Rubinovitz, 2017), is one that uses the 600 most common descriptors in the corpus[6]. This is the model that we used to extract the labels in each text in our baseline and search results datasets.

The model tags each text with up to 30 descriptor labels, and each of those labels is accompanied by a confidence score, from 0 to 1. Therefore, each text typically has multiple labels with varying levels of confidence. Not all 600 descriptors were represented in the datasets: 575 of the 600 labels were detected in the datasets. However, for most texts there are labels with a confidence score below 0.5. For our analysis, we exclude these labels since they indicate less certainty in their validity. After filtering out the labels that were below the 0.5 confidence threshold, there were 330 distinct labels.

Even with the imposition of the threshold of a confidence score of 0.5 or higher, there still remained the question whether those labels were accurate. To evaluate the accuracy of labels, we extracted a random sample of 100 texts from the search results dataset and the first author manually reviewed the appropriateness of the labels. Those 100 texts had a combined total of 276 labels that had a confidence score higher than 0.5; of those, 248 (89.9%) were appropriate, indicating that the 0.5 threshold yields labels with high accuracy. We repeated this process using another 100 articles randomly sampled from the media baselines and found that 206 of 235 labels (90.4%) with a confidence higher than 0.5 were appropriate.

The next task was to transform those labels into larger aggregations that reflect topics. To do so, we again resorted to the Gallup survey of the most important problems in the election. We manually developed a dictionary of topic groups that approximately maps between the set of 330 labels in the NYT–Based News Tagger and the 22 most important problems from the Gallup survey. However, in some cases, we collapsed the Gallup problems into a higher level group in order to more robustly capture the underlying topics that both these labels and this classification of problems describe. Some labels were broader than most important problems. For instance, “Lack of money” and “Gap between rich and poor” are mentioned as two of the most important problems in the elections according to Gallup. While socio–politically they imply different issues, they both might be described by the label “wages and salaries” which is a label produced by the News Tagger. Some interpretations from the news articles themselves were also used to inform the mapping. For instance, the most important problem “Situation with China” was renamed with the News Tagger label name “International Relations,” since that is a more general description of the issues to which those news stories relate, and this facilitates measuring with a broader array of labels from the News Tagger.

Another issue is that some labels present in the datasets are not represented

in the most important problems surveyed by Gallup. For instance, labels that mentioned art and culture, such as “books and literature” and sports, such as “superbowl” had no corresponding category in the most important problems. In the dictionary, these are marked as “Not classified”. They correspond to 45% of the number of detected labels from the NYT–Based News Tagger, but when considering the number of times that the labels appeared in the dataset, they only represent 17% of the volume of labels identified in the search results collection dataset.

This process yielded 13 substantive topic groups mapped to 180 labels from the News Tagger. The final dictionary (of which there is a summary in Table 2) allows us to create comparisons between the themes that emerged and their relative importance to the public. To conduct our analysis, we calculated and compared the prevalence of the topic groups across each dataset. Because one of the topic groups yielded no labels (“Unifying the Country”), we removed it from subsequent analyses. To address the first research question, we calculated the similarity of general search results and the news media baseline, both by calculating the similarity of distributions with chi-square testing for independence, and then by assessing similarity of the relative distribution of topic groups using Spearman correlations. To address the second research question we conducted an analysis of the topic searches (i.e., candidate names + topic) by comparing the topic groups of those results to the topic groups in general searches (i.e., just candidate names). We then calculated the ranking similarity of the distribution of topics via the Spearman correlation.

Table 2: Dictionary of topics groups, most important problems that include them, and the number of NYT-Based News Tagger labels in each important problem

Topic group	Most important topic	Number of NYT-Based News Tagger labels in the dataset that correspond to this topic
Courts	Judicial system Courts Laws	9
Crime and violence	Crime Violence	23
Economy	Economy in general	42
	Education	5
	Federal budget deficit Federal debt	1
	Lack of money	2
	Poverty Hunger Homelessness	1
	Unemployment Jobs	4
	Gap between rich and poor	0
Elections	Elections Election reform	10
Environment	Environment Pollution Climate change	8
Government	The government Poor leadership	13
Health	Coronavirus Diseases	3
	Healthcare	15
Immigration	Immigration	2
International relations	Situation with China	9
Media	The media	15
Morality and religion	Ethics moral religious family decline	6
Not classified	Not classified	150
Policing	Police Brutality	3
Race	Race relations Racism	9
Unifying the country	Lack of respect for each other	0
	Unifying the country	0

Results

From the top 20 most frequent domains represented in the search results (see Table 3), 16 belong to the news media, which indicates the importance of news media in establishing the agenda of search media. The exceptions were the websites that belong to Joe Biden's presidential campaign, the White House (then the official website for President Donald Trump), Wikipedia, and the Brookings Institute. These results also confirm previous findings indicating the skewed distribution of Google results toward the top sources (Muddiman, 2013; Trielli & Diakopoulos, 2019). Of the 466 domains, the top 4% corresponding to the 19 biggest sources of search results account for 50% of the appearances of links.

Table 3: Most frequent domains in search results

Domain	Percent of impressions
nytimes	6%
washingtonpost	5%
joebiden	4%
cnn	3%
theatlantic	3%
whitehouse	3%
politico	3%
npr	3%
cnbc	2%
wikipedia	2%
forbes	2%
latimes	2%
bbc	2%
theguardian	2%
brookings	2%
thehill	2%
apnews	2%
businessinsider	1%
vox	1%
usatoday	1%

In the following sections we elaborate analyses corresponding to each of our two research questions.

First step: General (name) searches

Our first research question asks whether the distribution of topics in search results corresponds to the distribution of topics of the news media in the same period. To conduct our analysis, we calculated the prevalence of each topic group

in each dataset by counting the labels assigned to each of the articles that were associated with that topic group. Table 4 shows the most frequent topic groups for Donald Trump and Joe Biden in comparison to the news media baseline.

Table 4: Proportion of prevalence of topic groups in the search results for only the candidate names

Topic group	Proportion in searches about Joe Biden (%)	Proportion in baseline of news about Biden (%)	Proportion in searches about Donald Trump (%)	Proportion in baseline of news about Trump (%)
Courts	0.0	0.5	0.0	0.8
Crime and violence	3.2	1.1	0.9	1.6
Economy	8.4	4.9	11.2	6.3
Elections	3.3	21.4	26.6	18.4
Environment	8.1	0.5	7.5	0.6
Government	54.1	54.0	38.4	48.9
Health	7.1	10.2	5.0	15.3
Immigration	0.0	0.2	0.0	0.2
International relations	6.2	1.3	2.0	1.8
Media	0.4	3.6	0.8	3.5
Morality and religion	0.0	0.4	0.1	0.4
Policing	1.0	0.5	0.0	0.7
Race	8.2	1.3	7.4	1.5

The results from Table 4 show, at a glance, some differences between the proportions of individual topics in search results and news media. For instance, there are salient differences when it comes to the topics of Race or Environment (underrepresented in the baselines as opposed to the candidate search results) and Health (overrepresented in the baseline as opposed to the candidate search results). And there can be wide variance in the proportion of topics with respect to either candidate such as the Elections topic which appears in 3.3% of search results for Joe Biden but represents 26.6% for search results about Donald Trump. Moreover, the search engine can boost the prevalence of a topic for one candidate while diminishing it for the other, such as for the Elections (diminished for Biden, boosted for Trump) or Crime and Violence topics (boosted for Biden but diminished for Trump).

To quantitatively assess the relationship between the relative distributions of topics, we calculated the Spearman correlation between the proportions of search result topics and the baseline news media topics. The Spearman correlation coefficient is a measurement of the similarity between two rankings. In this case, the rankings are defined by the prevalence of topics in the search results sample and the prevalence of topics in the baseline news media sample about the candidates in the same period. The higher the correlation coefficient (between 0 and 1), the more similar the relative distribution of topics between the two datasets. The Spearman correlations show some congruity between the news media topic selection and the search engine topic selection, and little difference between candidates: for Biden, the Spearman rho was 0.707 ($p = 0.007$) and for Trump, 0.713 ($p = 0.006$).

As previously mentioned, benchmarking similarity between topics depends on normative expectations of representativeness of news media in search results. However, we can calculate the degrees of similarity across topics to further assess the relationship between the prevalence of each topic for each dataset. We conduct chi-square tests for independence of the counts of the labels assigned to each of the articles that were associated with topic groups. For the comparison of both Biden's and Trump's search results with the news media baseline, the distributions were significantly different (Biden: x2(*12, N = 42,934*) = 3,951.06, p < .001; Trump: x2(*12, N = 54,849*) = 2,461.35, p < .001). These results indicate divergence in the proportion of individual topics, consistent with observations in Table 4. So, while the Spearman results indicate that the relative rankings of topic groups based on their prevalence are correlated, the chi-square results indicated divergence in the distribution of topic groups. In other words, the relative attention given to different topics in the agenda is fairly stable but the specific proportion of attention given to different topics differs.

Second step: Topic searches

In order to examine our second research question related to the extent to which user input alters the distribution of topics, we first describe those distributions and then again calculate the Spearman correlation of topic rankings. However, this time, instead of comparing search results with news media, we compare search results from generic searches (i.e., candidate name) with topic-specific searches (i.e., candidate name + topic) corresponding to each of the 22 most important problems from the Gallup survey. In Tables 5 and 6, we see how the search queries impact the distribution of topics in the search results. The first row of each table shows the proportions for the general (name) searches and the subsequent rows show the proportions for the searches altered for each of the 22 most important problems.

Table 5: Frequency in which topics (columns) appear per topic search query (rows) for Joe Biden

Search query	Courts	Crime and violence	Economy	Elections	Environment	Government	Health	Immigration	International Relations	Media	Morality and Religion	Policing	Race
Joe Biden	0.0	3.2	8.4	3.3	8.1	54.1	7.1	0.0	6.2	0.4	0.0	1.0	8.2
Joe Biden Judicial system Courts Laws	13.3	5.5	10.7	10.4	0.2	17.7	5.7	0.1	5.7	7.1	4.3	0.1	5.0
Joe Biden Crime Violence	5.1	10.5	8.6	14.2	0.0	14.5	4.4	0.5	9.2	8.1	2.4	2.0	6.2
Joe Biden Economy in general	0.0	5.0	36.0	9.6	1.5	11.3	7.9	0.2	9.6	5.6	1.1	0.1	0.7
Joe Biden Education	1.1	5.9	20.7	11.2	0.0	14.6	6.2	0.0	9.6	5.9	2.9	0.3	3.4
Joe Biden Federal budget deficit Federal debt	0.6	2.9	39.7	12.2	0.0	13.2	8.0	0.0	4.7	5.1	1.1	0.0	1.6
Joe Biden Lack of money	1.0	3.2	20.3	19.0	1.0	14.0	5.3	0.0	10.2	12.5	3.5	0.0	0.6
Joe Biden Poverty Hunger Homelessness	0.4	2.9	28.6	12.5	0.6	11.7	5.1	0.1	6.3	6.6	1.4	0.1	3.8
Joe Biden Unemployment Jobs	0.0	4.2	38.6	9.2	0.8	11.0	8.3	0.7	7.4	8.6	0.5	0.0	1.1
Joe Biden Gap between rich and poor	2.3	3.2	33.0	12.7	0.4	11.5	6.1	0.3	5.1	6.3	2.3	0.1	6.2
Joe Biden Elections Election reform	1.7	8.0	13.2	16.4	0.4	17.5	4.5	0.0	8.4	8.7	3.6	0.8	2.4
Joe Biden Environment Pollution Climate change	0.7	3.9	18.7	12.0	9.9	12.4	3.4	0.0	7.1	8.5	1.4	0.3	1.8
Joe Biden The government Poor leadership	1.0	7.1	13.8	12.3	0.4	13.7	9.2	0.0	11.4	10.2	2.8	0.4	1.1
Joe Biden Coronavirus Diseases	0.1	9.4	15.0	9.7	0.7	11.9	14.6	0.0	11.9	8.7	1.5	0.1	0.0
Joe Biden Healthcare	1.8	2.7	24.7	15.7	0.0	13.8	21.3	0.0	3.7	6.3	0.8	0.0	0.2
Joe Biden Immigration	1.7	7.2	15.2	14.8	0.1	14.1	4.9	5.8	10.1	6.4	1.9	0.2	4.0
Joe Biden Situation with China	1.3	6.4	21.5	9.8	0.1	12.7	3.4	0.1	13.5	9.4	2.7	0.6	0.7
Joe Biden The media	0.8	7.4	8.0	17.2	0.1	12.7	4.7	0.0	9.8	16.4	3.3	0.2	1.9
Joe Biden Ethics moral religious family decline	1.1	6.7	11.1	11.9	0.4	12.2	3.0	0.0	11.0	9.0	9.2	0.9	3.2
Joe Biden Police brutality	3.2	7.7	12.5	13.2	0.0	13.7	5.8	0.1	8.2	9.6	2.9	5.5	5.7
Joe Biden Race relations Racism	0.8	6.0	11.5	15.0	0.5	12.4	4.3	0.0	8.4	12.3	2.7	1.2	9.9

Table 6: Frequency in which topics (columns) appear per topic search query (rows) for Donald Trump

Search query	Courts	Crime and violence	Economy	Elections	Environment	Government	Health	Immigration	International Relations	Media	Morality and Religion	Policing	Race
Donald Trump	0.0	0.9	11.2	26.6	7.5	38.4	5.0	0.0	2.0	0.8	0.1	0.0	7.4
Donald Trump Judicial system Courts Laws	15.6	7.3	9.7	6.6	0.6	16.6	3.7	0.0	4.8	8.4	3.2	0.0	2.9
Donald Trump Crime Violence	1.9	14.4	10.0	10.0	0.2	12.9	6.0	0.5	9.8	9.6	1.1	5.0	2.6
Donald Trump Economy in general	0.0	2.4	42.4	8.9	2.0	10.6	4.5	0.3	7.4	6.3	0.0	0.0	0.8
Donald Trump Education	2.5	5.0	22.8	11.1	0.5	13.9	4.3	0.5	7.7	9.0	2.0	0.2	3.9
Donald Trump Federal budget deficit Federal debt	0.8	3.4	48.2	10.1	0.1	11.9	4.8	0.0	8.7	3.8	0.0	0.0	0.0
Donald Trump Lack of money	3.9	6.4	26.8	10.6	0.1	12.8	3.4	0.1	6.4	12.0	2.7	1.9	2.1
Donald Trump Poverty Hunger Homelessness	0.3	4.0	35.1	2.5	1.6	10.9	7.5	0.2	7.1	5.9	0.7	0.1	0.6
Donald Trump Unemployment Jobs	1.2	5.0	51.3	5.0	0.2	7.9	9.5	0.3	5.8	2.9	0.0	0.7	1.2
Donald Trump Gap between rich and poor	0.8	1.7	50.6	7.9	0.0	10.4	3.4	0.0	4.0	8.4	0.8	0.0	1.7
Donald Trump Elections Election reform	2.4	5.8	13.0	14.6	0.3	15.5	3.3	0.4	9.2	11.4	2.7	0.4	4.2
Donald Trump Environment Pollution Climate change	1.5	2.2	23.1	4.6	13.5	13.2	2.9	0.2	4.7	4.9	1.4	0.0	0.6
Donald Trump The government Poor leadership	0.5	7.6	16.3	5.4	1.5	11.8	4.9	0.8	13.1	12.6	3.2	0.4	1.3
Donald Trump Coronavirus Diseases	1.2	9.5	12.5	2.8	0.4	10.2	20.6	0.0	8.5	8.6	2.5	0.2	0.3
Donald Trump Healthcare	2.0	5.7	22.0	7.4	0.6	11.9	19.8	0.4	7.7	5.9	1.4	0.1	1.7
Donald Trump Immigration	2.5	7.7	17.7	7.5	0.5	13.2	5.5	6.8	11.2	5.4	2.0	0.3	2.4
Donald Trump Situation with China	0.8	8.5	24.9	3.0	0.2	10.9	6.6	0.0	14.1	9.2	2.4	0.7	0.1
Donald Trump The media	1.0	7.3	9.6	7.7	0.0	11.6	4.5	0.0	12.7	20.8	2.9	0.6	1.9
Donald Trump Ethics moral religious family decline	2.7	6.0	10.4	6.1	0.1	10.9	6.6	0.1	10.0	11.7	10.1	0.3	6.5
Donald Trump Police brutality	1.4	12.4	10.0	5.1	0.0	11.6	2.5	0.2	12.4	10.3	1.0	8.7	9.6
Donald Trump Race relations Racism	2.2	6.9	11.6	9.7	0.1	11.9	3.2	0.6	10.1	12.0	3.4	2.6	11.4

As we see, the inclusion of topics in queries defined by the user appears to change some distributions. At first glance, these shifts reflect that the search engine is working as expected: matching the user interest with new results about the topics they search. But the results paint a far more complex picture too. For instance, the relative weight of the topic of Government, which is the most prominent in the general searches, decreases by a large margin when any topics are included in the search. On the other hand, the topic of Elections is boosted by any topic search for Biden but reduced by any topic search for Trump including for the query most expected to be boosted (*Donald Trump Elections Election reform*). Another distinctive change is in the distributions of topics around the Economy. For Joe Biden, adding almost any modifier in the searches increases the proportion of content about the economy (with the exception of the search *Joe Biden the media*. For Donald Trump, 16 of the 20 query modifiers also increase that proportion.

In other topics, the effect is minimal across the board. The topic of Environment, which represents 8.1% in generic searches for Biden and 7.5% for Trump, only goes up to 9.9% and 13.5% when specifically mentioned in the topic searches. But in all other topic searches the Environment topic markedly decreases. Additionally, some topics only appear when specifically searched on by the user. This is the case for Immigration, which goes from 0% of topics in the general searches for both candidates to 5.8% with topic–specific searches for Biden and 6.8% for Trump. And so while Google search unsurprisingly works to adapt the topics based on the query, it's also interesting to consider what topics are left out in the baseline agenda, and the *degree* to which user input can shift away from that baseline. On average, the inclusion of a topic in a query increases the

prevalence of that topic by 11 percentage points for Biden (SD: 15) and 14.4 percentage points for Trump (SD: 16), but for some topics the change can be as high as 40.1%, such as for the impact on Trump Economy results of a *Donald Trump Unemployment Jobs* search, or as minimal as just 1.8%, such as for the impact on Biden Environment results of a *Joe Biden Environment Pollution Climate change* search.

To compute whether these differences are strong enough to alter the relative order of prevalence of topics, we again calculate the Spearman correlation to compare the ranking of the prevalence of these topics in the datasets. The results are reported in Table 7. A high Spearman correlation would indicate a similarity in the relative topic distributions between the general and topic-adapted searches. A high Spearman correlation would mean that the user input, even if it impacts the distribution of topics by altering their frequency of appearances in search results, would not have much influence on the relative prevalence of topics. A low correlation, on the other hand, indicates that the relative distribution of results over topic groups is more heavily influenced and co-constructed by the user. As we see from Table 7, the modifiers of topics make the correlations between the topic rankings for general searches and topic-specific searches decrease substantially in some cases, to the point that, in some topics (15 for Biden and 11 for Trump) p-values demonstrate that there is no statistical significance in the correlations of rankings between general searches and topic searches. But for the other topics (seven for Biden, 11 for Trump), the rankings were still significantly similar. Thus, the relative distribution of topics appeared to be more sensitive to topic searches in the case of Biden than for Trump.

Table 7: Spearman correlation of topic groups, comparing their relative ranking in the general search results and the topic search results.

	Joe Biden		Donald Trump	
Topic of search	**Spearman rho**	**p-value**	**Spearman rho**	**p-value**
Situation with China	0.409	0.167	0.425	0.150
Coronavirus Diseases	0.513	0.077	0.519	0.073
Crime Violence	0.403	0.174	0.490	0.094
Federal budget deficit Federal debt	0.567	0.046*	0.686	0.013*
Economy in general	0.661	0.016*	0.800	0.003*
Education	0.582	0.040*	0.681	0.014*
Elections Election reform	0.459	0.119	0.647	0.021*
Environment Pollution Climate change	0.713	0.008*	0.713	0.010*
Ethics moral religious family decline	0.420	0.156	0.382	0.200
Gap between rich and poor	0.586	0.038*	0.649	0.021*
The government Poor leadership	0.534	0.063	0.569	0.048*
Healthcare	0.422	0.155	0.630	0.026*
Immigration	0.381	0.200	0.492	0.092
Judicial system Courts Laws	0.338	0.260	0.365	0.222
The media	0.309	0.304	0.432	0.144
Lack of money	0.429	0.148	0.496	0.089
Police brutality	0.497	0.087	0.274	0.365
Poverty Hunger Homelessness	0.606	0.031*	0.691	0.013*
Race relations Racism	0.503	0.084	0.486	0.096
Lack of respect for each other	0.420	0.156	0.718	0.009*
Unemployment Jobs	0.661	0.016*	0.562	0.051
Unifying the country	0.541	0.059	0.598	0.037*

* Indicates statistically significant Spearman correlation (p-value < 0.05); p-values are corrected using the Benjamini–Hochberg procedure to decrease the false discovery rate.

Discussion

This study has investigated the agenda of topics and issues that are curated by the Google search engines, by asking two questions: First, to what extent does the distribution of topics selected by search media replicate the agenda of the news media?; and second, to what extent does searcher input alter this distribution? Through the analysis of topics that emerge in search results in the 2020 United States presidential election, this research makes contributions related to its empirical findings and the connection to agenda-setting theory.

The empirical findings indicate that there is a difference between search media and news media when it comes to the frequency in which the topics are curated, according to the chi-square test on general searches of candidate names compared to the news media baseline. Meanwhile, the ranking of topics—that is, the order of importance in terms of topic prevalence given by search media and news media—is substantially similar, according to the results of Spearman tests on the same datasets. This distinction between proportion of attention and relative attention given to different topics is an important nuance when it comes to agenda-setting in this domain, since it implies that although news media may not have the same power to set the absolute attention that certain topics get, they still largely influence the relative shape of attention given to different topics.

Our findings also speak to the extent to which the search agenda is co-constructed with the user who conducts searches (see Figure 1). For instance, we find that the impact of the use of topic modifiers in queries is not consistent across topics—many (but not all) are boosted as expected but to widely varying degrees. Additionally, most topics searched in addition to the candidate's name increase the proportion of content that mentioned the topic of Economy, whether that search modifier was directly related with the economy (e.g., *Donald Trump Gap between rich and poor* and *Donald Trump Federal budget deficit Federal debt*), but also with terms that are not necessarily in the same topic group (e.g., *Donald Trump Environment Pollution Climate change* and *Donald Trump Immigration*). Users clearly have influence on the agenda they are shown, but this is moderated by the search engine in uneven ways. We see a real, but limited power by the user to reshape the order of topics that are represented in the search results, which perhaps counters the imagined absolute power of the searcher and their biases in shaping these results.

One possible reason for these findings may relate back to the concept of the third-level of agenda-setting, which examines how news media not only transfers the salience of topics and their attributes, but also the relationships between those topics (Guo & McCombs, 2011). As we have seen, search engines are a place of connection between different agendas from different agents of communication, because they connect the input of the user with the input of the material they curate. The fact that our findings show that some topics "pull"

others, such as with the economy, is a sign that candidates and news stories may be making connections about a variety of topics with the economy, perhaps in order to make their messages and coverage resonate more with voters and readers. The news media may therefore attempt to re-establish their agenda by pairing a third-level agenda with a known user-driven agenda (such as through surveys or search trends) such that when users search on their own agenda, the search engine would then still convey the correlated third-level agenda of the news media.

On some topics, the potential user interest is enough to fill in gaps in the general searches. The appearance of the topic Immigration, for instance, is 0% of topics in the general searches for both candidates, which mirrors the small prevalence of coverage of this topic by news media in this election cycle (only 0.2% of stories in our baseline had that topic)[7]. But when the search query includes that topic, the proportions increase to 5.8% for Biden and 6.8% for Trump. However, the relative impact that topic searches had in their distributions of their own topics is not always straightforward, and on some topics, the impact of query modifiers about them has a reduced effect. This is the case for Environment, which for Biden goes from 8.1% in generic searches to 9.9% in topic searches. Still, the amount of environmental coverage in search results even just for the general queries for candidate names is far greater than the prevalence of the topic in the news baseline, suggesting that even when there is little content available Google can sometimes boost a topic.

This study has found that Google provides more or less attention to some topics than news media, and that happens even if users try to influence the results by mentioning specific topics. What might cause those disparities in results? In its public communications, Google asserts that their search engine is designed towards finding “information that might be relevant to what you are looking for” (Google, n.d.). According to Google, signals for relevance include whether the web page contains the same keywords as the search query and interaction data from previous users. But even when we tested the use of specific search terms to elicit more results around specific topics, not all topics got an outsized boost in representation. This represents a limited power for even the user to shape the results around some topics. It is possible that Google is supply–limited, and surfaces fewer results about some intersections of topics and candidates because there is less media content available. However, we found no significant correlation between the relative increase of topic representation in the results when searching for queries specific for that topic and the distribution of those topics in our baseline dataset.

At the same time, it’s possible that Google does not consider all those sources in the baseline news dataset equally valuable and might extract potential results from only a limited subset of those sources. For instance, in an environment of polarized news media, metrics of page quality might correlate with a particu-

lar perspective (e.g., low quality pages may correlate with some perspectives but not others). We also know from previous work that Google tends to prefer mainstream sources in their curation (Trielli & Diakopoulos, 2019; Trielli & Diakopoulos, 2020). Further work should investigate how factors such as source quality and size may relate to the inclusion of various topical or ideological perspectives which impact the overall search agenda. Stepping back, for journalists, these results also suggest an opportunity to direct coverage: Some topics seem to be under-covered by the media but might be a larger part of the search agenda and may therefore receive outsized attention via search if produced.

Finally, the methodological approach of this work—combining algorithmic auditing with computational content analysis—exposes further opportunities for studying search media. By looking into the content of search results by way of the topics that emerge from them while varying endogenous factors of search (Ørmen, 2016)—in this case, search terms—through a long period of data collection which controls for exogenous factors such as experimentation and randomization of results by the algorithm (Ørmen, 2016), we are able to provide novel insights into how search media relates to the news media and to the extent of the impact that the user has in shaping those results. Future research that investigates the representation, diversity, quality or any other feature of search results should take into account the particular complexities of the content of search results, and not only the sources (i.e., websites), as has been more common for search media audits (Kulshrestha et al., 2019; Trielli & Diakopoulos, 2019). A similar methodological approach as taken here, leveraging targeted queries and media baselines could, for instance, tackle questions of how search media frames various issues such as climate change, immigration, or other topics of societal interest.

Conclusion

In this study, we have conducted an algorithm audit of Google to investigate how the search engine shapes the topics and issues associated with the 2020 United States presidential election. Using datasets of news media articles as baselines, we compared the topics that emerged in general searches about the candidates in the same timeframe and found that while the relative rankings of prevalence of the topics are correlated, there is some divergence in the overall weights in their distributions. For instance, there are salient differences when it comes to the topics of Race or Environment (underrepresented in the news media as opposed to the candidate search results) and Health (overrepresented in the news media as opposed to the candidate search results). We also tested whether specific interests by the searcher, by way of including modifiers to the queries related to specific topics, can reshape those relative rankings, and we found a limited power by the user to reshape the topics in the search results. These findings elaborate an understanding of how search media can drive, shape, or counteract choices made by news and the users. While previ-

ous research has focused on biases of Google search, this work contributes to the literature by testing whether Google-curated media is resistant to inputs by news media and users. Additionally, it advances ways of using the framework of agenda-setting theory in the analysis of search media, combining scraping of search results and computational extraction of themes from their contents.

Endnotes

1. https://news.gallup.com/poll/1675/most-important-problem.aspx
2. Both these datasets were developed by Media Cloud based on reports and definitions provided by Pew Research https://sources.mediacloud.org/#/collections/186572435 https://sources.mediacloud.org/#/collections/186572515
3. We used the Newspaper3k Python library for text extraction: https://newspaper.readthedocs.io/en/latest/
4. https://github.com/mediacloud/nyt-news-labeler
5. https://catalog.ldc.upenn.edu/LDC2008T19
6. https://mediacloud.org/support/theme-list
7. Reports have also noted the drastic drop in interest in this issue during the 2020 election: https://www.cnbc.com/2020/10/13/immigration-was-a-dominant-i.html

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The Missing Piece: Ethics and the Ontological Boundaries of Automated Journalism

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Over the last couple of years, artificial intelligence and automation have become increasingly pervasive in newsrooms, permeating nearly all aspects of journalism. Scholars have highlighted both the potentials and pitfalls of these technologies, both when it comes to the changing nature, role and workflows of journalism and the way they affect the dynamics between humans and machines as editorial decisions are increasingly determined by algorithms. The way news automation is understood by journalism scholars and practitioners raise important ontological questions about both the impact of these technologies, but also about new communication scenarios and the social connotation of news automation. Drawing on Helberger's (2019) normative and Just and Latzer's (2017) algorithmic construction approach, this research aims to investigate the opportunities and challenges of automation in the light of the ontological understanding by experts in the field of journalism. Analyzing data gathered from the research project "Journalism innovation in democratic societies," the findings show that opportunities are often seen in economic terms, while ethical issues are completely ignored.

On October 27, 2021, the London-based website PressGazette, a trade magazine that offers industry-related news about digital media, published an article by one of its commercial partners, "United Robots," about the potentials of news automation, entitled "Automated journalism: Journalists say robots free up time for deeper reporting" (Campbell, 2021). The piece offered a boosting overview of how Scandinavian news publishers have been using automation in their newsrooms, which is not surprising given that United Robots is among the main companies that have delivered news automation programs to Swedish news media groups since 2015. The author concludes the article on a highly positive note:

> As of October 2021, Scandinavian—specifically Swedish and Norwegian—publishers use news robots a lot more extensively than the news publishing industry in other markets. As a result, journalists are familiar with the technology and its benefits in the newsroom. With news media in countries beyond Scandinavia now increasingly deploying robot journalism, I believe the talk we used to hear, of content automation as a threat, will shift to a focus on the opportunities and benefits that automating routine reporting can bring to newsrooms. (paragraph 10)

While the article offers a slanted evaluation of news automation, it resonates to a certain extent with industry-wide perceptions. In one of the largest studies carried out, Beckett (2019, p. 7) found that "some of the hopes and fears are based on false premises and conjecture" when it comes to news automation. In addition, a fifth of the respondents declared that they are not particularly concerned by the ethical and ontological challenges linked to the implementation of automation, and that they are far more excited by the impact that artificial intelligence (AI) and automation will have in the news industry (idem, p. 53).

AI, algorithms, and machine learning are increasingly becoming part of newsrooms, influencing nearly every aspect of journalism (Zamith, 2020). Both the pervasiveness (Thurman, Lewis & Kunert, 2019) of these innovative tools as well as their disruptive potential in restructuring newswork and professional roles become thus central elements worth of studying (Lewis et al., 2019). Even more so as the pervasiveness of automation entails new relational and communicative dynamics in the newsroom (Wu, Tandoc & Salmon, 2019), but also when it comes to the relation with the audience (van Dalen, 2012). This process leads to the creation of a new hybrid scenario (Diakopoluos, 2019; Porlezza & Di Salvo, 2020), in which traditional human–machine relationships are rewritten from the perspective of algorithms, which can be seen on the most basic level as problem-solving mechanisms (Just & Latzer, 2017, p. 239). Several researchers have already highlighted the potentials and pitfalls of this automated turn—such as in the case of journalistic authority (Carlson, 2015; Wu et al., 2019), the internal organization of newsrooms (Thurman, Dörr & Kunert, 2017), or ethical issues (Dörr & Hollnbuchner, 2016).

However, the implications of automation go far beyond the boundaries of organizations, also affecting the public sphere: Issues of accountability, transparency, and governance (Aitamurto et al., 2019; Graefe et al., 2016; Weber et al., 2018) raise important questions about the ontological roles attributed to AI and automation in the editorial process (Ananny, 2016). This study is grounded on a theoretical framework that rests on two pillars: first, it includes Helberger's (2019) normative approach that she developed in relation to news recommenders. According to her, "the power to actively guide and shape individuals' news exposure also brings with it new responsibilities and new very fundamental

questions about the role of news recommenders in accomplishing the media's democratic mission" (Helberger, 2019, p. 994). Algorithms and AI have therefore crucial implications on journalism's role in society and democracy. The second pillar is represented by Just and Latzer's (2017) algorithmic construction approach, in which they discuss how algorithmic selection has become a significant element in shaping realities, thus affecting our perception of the world. Helberger (2019) and Just and Latzer's approach are thus compatible in that both frameworks argue that algorithmic selection exert an impact on social reality.

Based on these theoretical frameworks, this research aims to understand the opportunities and challenges of news automation, focusing in particular on the relevance that ethical and democratic challenges have on the ontology of the journalism profession. Taking into account that journalism's relationship with technological innovations has been extensively investigated (Boczkowski, 2004; Reich, 2013), with differing positions regarding the opportunities and challenges of their implementation (Gynnild, 2014; Pavlik, 2013; Wahl-Jorgensen et al., 2016), the purpose of the project is to evaluate, from a perspective of the news media's democratic role, the place of these technologies in the "social dynamic of news production and news consumption" (Lewis, et al., 2019, p. 421). Our study wants therefore to shed light on the following research questions:

RQ1: What kind of opportunities and challenges does automation pose for the democratic role of news media?

RQ2: To what extent are ethical issues mentioned by experts?

RQ3: What kind of ontological issues arise in relation to the implementation of automation?

The data for the analysis was obtained through qualitative interviews in five different countries (Austria, Germany, Spain, Switzerland, United Kingdom), in which 20 experts from the news industry (journalists, editors and media managers) and academia (journalism scholars) were asked about the 20 most important journalistic innovations in the last decade. Overall, more than a thousand innovations have been collected, of which 56 were directly related to news automation or AI. Through a comparative approach, the study seeks to understand the democratic relevance of journalism innovations. Within this larger framework, experts' legitimization strategies with respect to news automation were analyzed, focusing in particular on the ethical and ontological considerations of this particular innovation.

This contribution is relevant for two reasons: first, the analysis offers specific insights about how journalism is seen in the light of new technological innovations such as AI. While ethical issues of news automation have been studied before (e.g. Dörr & Hollnbuchner, 2016; Rydenfelt, 2021), it has never been questioned

to what extent automation represents an ontological issue, in particular when it comes to innovations. Second, the study offers an empirically grounded framework that offers and interpretative filter through which it is possible to assess the social and democratic impact that comes with news automation (Lewis et al., 2019; Túñez-López et al., 2021). This contribution can thus contribute to a better understanding of the ethical and ontological conditions under which AI technology is (thought to be) used in journalism.

Literature Review

The continuous datafication and quantification of journalism (Coddington, 2015; Loosen, 2019; Porlezza, 2018) has not only led to structural changes in newswork (Waisbord, 2019; Zelizer, 2015), but also to a progressive epistemological reassessment of the journalistic profession (Lewis & Westlund, 2015; Splendore, 2016). In other words: both datafication and quantification, combined with the growing possibilities of AI technology, led to shifts in many different areas related to newswork. This process is made even more complex as artificial intelligence is "a term that is both widely used and loosely defined" (Brennen et al., 2018, p. 1). Here AI is understood as a computer system's capacity to exhibit "behavior that is commonly thought of as requiring intelligence" (NSTC, 2016, p. 6). Given the quick growth—and the breadth—of the literature that looks into the impact of AI technology on journalism, the state of the art will be structured into different parts in order to segment and organize the material thematically.

Journalists and the "Technological Drama"

Lindén (2017, p. 72) showed quite early in the empirical investigations into automated journalism that the "work of journalists is empowered and supplemented, but also replaced by smart machines." Earlier studies tended to offer a bleak vision of automation, describing it for instance as a "technological drama over the potentials of this emerging news technology concerning issues of the future of journalistic labor" (Carlson, 2015, p. 416). Van Dalen's (2012, p. 651) investigations also revealed that journalists expected that "what can be automated, will be automated." However, studies that are more recent showed that journalists are less concerned by the implementation of algorithms and automation, particularly when it comes to their own role perceptions (Schapals & Porlezza, 2020).

Particularly in the news industry, new digital technology is met, as Bossio and Nelson (2021, p. 1377) state, with great expectations: "The promise of technological innovation as a savior to journalism has persisted, and news media organizations have sought to restructure newsrooms, diversify content product and encourage journalists to use new digital and online tools." Technological innovations are thus often accompanied with quasi-religious beliefs or myths about their revolutionary powers (Mosco, 2004). Artificial intelligence and automation

are no exception: especially in grim economic times, the possibilities of AI in terms of making journalistic work more efficient are persistent in industry–based discourses (Beckett, 2019). Sometimes they can even fall for boosterism when AI technology is uncritically praised, even if innovation changes almost always entail potential failures, too (Steensen, 2011).

The field of automation in journalism, as well as elsewhere, is a domain of inquiry in which the relational dynamics between the actors are deeply challenged (Montal & Reich, 2016). The introduction of tools characterized up to a certain point by agency calls into question the very foundations of the journalistic system (Schmitz Weiss & Domingo, 2010), to the extent that "there is perhaps no aspect of the news production pipeline that isn't increasingly impacted by the use of algorithms" (Diakopolous, 2020, p. 2). Automation therefore implies investigating a completely new field with new dynamics and actors, a hybrid field as Diakopolous (2019) defined it, characterized by a constant evolution of the relational dynamics between social actors (Wu et al., 2019). The fact that the field has still moving semantic and interpretive boundaries is for instance visible by different denominations that are used when it comes to news automation: automated journalism (Carlson, 2015), computational journalism, algorithmic journalism (Diakopoulos, 2014), robot journalism (Clerwall 2014), are just some of the terms that describe automation.

The role of technology in journalism

However, ignoring technology when it comes to changes in journalism is complex. Zelizer (2019, p. 343) declares that "separating journalism from its technology is difficult, because journalism by definition relies on technology of some sort to craft its messages and share them with the public." This is even truer in the case of artificial intelligence since it has become an integral part of a new media ecosystem (Ali & Hassoun, 2019), influencing the entire structure of public communication (Thurman et al., 2019). Even if these tools are now widely regarded as helpful tools to support newswork (Bucher, 2018), they have become pervasive of journalism practice (Thurman et al., 2019), to the point that "algorithms today influence, to some extent, nearly every aspect of journalism, from the initial stages of news production to the latter stages of news consumption" (Zamith, 2019, p. 1). In fact, AI supports journalists in their everyday work, but at the same time, it changes the nature, role, and workflows of journalism (Thurman et al., 2017). It therefore contributes to making "journalism in new ways, by creating new genres, practices, and understandings of what news and newswork is, and what they ought to be" (Bucher, 2018, p. 132).

What needs to be taken into account is the fact that these innovations are not only mere tools, but they are also new actors in the field (Lewis et al., 2019; Primo & Zago, 2015), setting the stage for what Diakopoulos (2019) calls "hybrid journalism," understood as the interplay between algorithms and hu-

man journalists (Porlezza & Di Salvo, 2020). Hence, algorithms not only affect newsroom relations between humans and machines (Wu et al., 2019), but automation also raises questions with regard to the authority of journalists (Lewis et al., 2019)—not only because automation tools reshape journalistic practice, but also because they challenge human leadership in newsrooms (Carlson, 2018). The introduction of AI in newsrooms represents thus a major challenge to journalism studies because it blurs the ontological divide between the human and the machine (Gunkel, 2012; Wu et al., 2019), even more so it questions what it means to be human (Turkle, 1984). In fact, with "the emergence of algorithmic journalism, the human journalist—the individual—is not the major moral agent anymore as other actors, journalistic and non-journalistic, are involved in news production on various levels, e.g. algorithms with delegated agency, media organizations, programmer/service providers of NLG or data collectors" (Dörr & Hollnbuchner, 2017, p. 414). The individual, human journalist becomes less relevant with regard to normative assumptions, while news organizations, as the major customer of AI-driven tools, become the central moral agents.

Social and cultural implications of AI in journalism

In order to understand the impact of AI in journalism—as well as its challenges for journalism—it is necessary to enlarge the frame of analysis and adopt a wider lens that includes social and cultural changes in relation to technology's dimensions in journalism. Especially when it comes to the implications of automation beyond the boundaries of newsrooms, it is relevant to investigate journalism's understanding about new communication scenarios (Ananny, 2016) and the social connotation of news automation. In this sense, Zelizer (2019, p. 349) states:

> Like other enterprises that have been transformed by digital technology, such as education, the market, law and politics, it is the enterprise—journalism—that gives technology purpose, shape, perspective, meaning and significance. […] If journalism is to thrive productively past this technological revolution and into the next, we need to do better in sustaining a fuller understanding of what journalism is, regardless of its technological bent, and why it matters.

This raises both ethical and ontological questions with regard to automated journalism. Ryfe (2019, p. 206) tackles this issue:

> The single biggest challenge facing Western journalism today, and especially American journalism, is not economic or political, it is ontological. The challenge arises from this fact: there has never been a time in which more news is produced than today, yet not since the 19th century has so little of it been produced by journalists.

This is not only true for the competition for instance arising from corporate communications, but also from machines within newsrooms.

Algorithms are "self-contained processes and 'black boxes' but they are socially constructed" (Lindén, 2017, p. 72). Not only is the creation of algorithms subject to discussion, but the social context in which they are implemented needs to be taken into account as well. The role of journalism in democracy, which has often been the subject to criticism (Hanitzsch, 2011; Kleis-Nielsen, 2017; Meyers, 2010), is now challenged by additional epistemological and ontological questions, which call for a careful assessment of the social impact of these innovations.

Therefore, algorithms and artificial intelligence can be seen as part of an already ongoing process of re–evaluation of journalistic values, expanding questions on aspects such as transparency, data security and accountability (Ananny, 2016). Alongside these ethical assumptions, questions arise about the reliability and diversity of news, readers' trust and readers' ability to recognize machine–made editorial content (Graefe et al., 2016; van der Kaa & Krahmer, 2014; Waddell & Franklin, 2018). A good example to show how AI can impact newswork even if it is not used in the production of news, are machines used to moderate user comments. Wang (2021, p. 64) looked into the use of machines in the moderation of uncivil comments and hate speech: "The results indicated that perceptions of news bias were attenuated when uncivil comments were moderated by a machine (as opposed to a human) agent, which subsequently engendered greater perceived credibility of the news story." All these issues lead to questioning the ontological assumptions underlying the implementation of these technologies in journalism (Aitamurto et al., 2019; Diakopoulos, 2020), and "how people discern between the nature of people and technology and the resulting implications of such ontological interpretations" (Guzman & Lewis, 2020, p. 80).

Algorithmic construction of reality

Just and Latzer (2017) have elaborated a theoretical framework that describes reality construction on the web as the outcome of algorithmic selection. Drawing on co-evolutionary innovation studies as well as institutional approaches, they assert that algorithms act as "governance mechanisms, as instruments used to exert power and as increasingly autonomous actors with power to further political and economic interests on the individual but also on the public/collective level" (Just & Latzer, 2017, p. 245). The two authors laid the groundwork to understand how algorithmic selection processes determine both media production and consumption, specifically because they shape reality construction: "Algorithmic selection shapes the construction of individuals' realities, i.e. individual consciousness, and as a result affects culture, knowledge, norms and values of societies, i.e. collective consciousness, thereby shaping social order in modern

societies" (Just & Latzer, 2017, p. 246). The central role of algorithms in a datafied information society bears a critical power that entails specific consequences for the public sphere in terms of what news is published, but also the way in which it is framed. Algorithms act therefore increasingly as gatekeepers, making autonomous decisions "as to which of the events taking place or issues being discussed receive coverage" (Napoli, 2019, p. 54). The traditional gatekeeping function carried out by (human) journalists is now undertaken by an array of technological actors that select, filter and organize, becoming thus a strategic factor in current societies (Stark et al., 2020).

Although Just and Latzer (2017) differentiate between reality construction by algorithms and by the mass media in their paper, the described effects of algorithmic selection applies nowadays to news media as well: first, algorithms provoke a strict personalization that contributes to increase society's fragmentation and individualization through the construction of individualized realities. This personalization happens "on the basis of one's own user characteristics (socio-demographics) and own (previous) user behavior, others' (previous) user behavior, information on user-connectedness, and location" (Just & Latzer, 2017, p. 247). Second, the authors argue that the constellation of actors is also relevant, in the sense that private Internet services such as social media platforms dominate when it comes to the use of algorithms. However, many news organizations have adopted algorithms and AI as well when it comes to news distribution and personalization. In other words: algorithmic reality construction has become standard in the news media, too, since algorithms increasingly act as relatively autonomous agents (see for instance Leppänen et al., 2017).

Algorithmic gatekeeping and democracy

From both a democratic and public policy perspective, this trend highlights several risks: not only are algorithms that shape the individual reality construction opaque, but they usually elude any form of accountability. Helberger (2019, p. 1009) points out that news organizations need therefore to be aware of the "democratic values algorithmic recommendations can serve," and to what extent they are actually able to do so. This however depends on the specific democratic perspective one follows:

> In other words: there is no gold standard when it comes to democratic recommenders and the offering of diverse recommendations. This is why there is a typology of recommenders and different avenues the media can take to use the technology in the pursuit of their democratic mission. (Helberger, 2019, p. 1009)

The fate of algorithmic gatekeeping at news organizations is thus still open to debate, and much depends on the strategic goals as well as the democratic perspective news organizations have. If algorithms are employed the wrong

way, they can “have potentially a detrimental effect on the public sphere, on pluralism, privacy, autonomy and equal chances to communicate” (Helberger et al., 2020, p. 1). These societal dimension of the use of AI-driven technologies in news organizations need to be taken seriously, otherwise there could be dysfunctional consequences for both the public sphere and for democracy:

> Gatekeeping through AI-driven tools can not only affect individual users but also the structure of the public sphere as a whole. If algorithmic personalization is taken to the extreme, combining algorithmic gatekeeping with AI-driven content production, every news article might one day reach an audience of exactly one person. This has implications for all collective processes that form the pillars of modern democracies. (Helberger et al., 2019, p. 13)

This further evidences the ontological shift regarding the boundaries between human and machine-driven news production. It is therefore natural to ask what kind of impact they can have in the democratic consolidation of public communication (Esser & Neuberger, 2018; Túñez-López et al., 2021).

Methodology

The study was carried out as part of the project “Journalism innovation in democratic societies–JoInDemoS,” a comparative investigation into the most important journalistic innovations in recent years. The sample included five countries from different journalistic cultures and with different media systems: Austria, Germany, Spain, Switzerland and United Kingdom. Overall, the research followed a two–step methodology. First, 20 semi–structured interviews were conducted in each country with experts, from both industry and academia, to understand the main journalistic innovations of the last 10 years (2010-2020), according to the experts interviewed. In the selection of interviewees, a variety of professional profiles were sought, also taking into account criteria of gender equality, geographical diversity and age. The interviewees from academia were scholars specialized in digital journalism and technological innovations, while the representatives of the industry were either journalists or media managers of companies of different sizes. The interviewees were largely selected through snowball sampling (Becker, 1963): every country team had some initial contacts both in the industry and in academia. Every interviewee was then asked to provide up to five potential interviewees active in the area of journalism innovation. All interviewees were previously contacted by email, explaining the goal of the project, the definition of journalistic innovation and providing them with the questionnaire in advance. Overall, 108 experts (Austria: 23; Germany: 20; Spain: 25; Switzerland: 20; United Kingdom: 20) were interviewed, which resulted in a database of 1,062 innovations. The large number of experts, together with the snowball sampling, naturally causes a certain heterogeneity of actors being interviewed: they range from academics to media policy actors, journal-

ists, editors, technologists, media managers, and entrepreneurs.

The interviews, carried out between January and May 2021, took place exclusively online due to the health emergency. However, this method did not create any problems for the project, as it is well established that online interviews can be a useful ally for the social sciences, not only during crisis times (Gray et al., 2020; Salmon, 2012; Sedgwick, 2009).

The interviewees were asked to come up with 10 successful journalism innovations that they consider to be among the most important ones in each country in the past 10 years ("Please mention if possible 10 *successful* journalism innovations that you consider to be among the most innovative or most important in (insert country) and whose introduction occurred at least one year ago"). Successful means that the innovation is still in progress and has achieved, from the interviewees' perspective, a desired goal or outcome. It was also relevant to know why they mentioned the innovation in question and who was instrumental in conceiving or designing it. Follow-up questions were therefore asked to identify where the innovation is located, when it was launched, who played a major role in shaping and designing it, and who is responsible for it? The interviews also used an aided recall in the four different areas product, organization, distribution and commercialization to check for innovations that have not been mentioned before. Each of the mentioned innovations was then discussed in detail in terms of its design, development, rationale, its goal(s), as well as its implementation.

All the interviews were recorded, subsequently transcribed and catalogued into an analytical framework common to all countries. This led to the creation of an overall database in which every mentioned innovation was recorded, together with the specific quotes from the interviewees. The quotes in the database were transcribed in their original language and then translated to English by the research team in order to allow for a comparison between the countries. Each innovation was categorized according to four areas of interest: production, organization, distribution, commercialization. This section was relevant in order to understand more clearly the ontological framework that accompanies the innovations in the various countries. The innovations for each country were then ranked based on the number of mentions by the experts. The data analysis was carried out manually in each step, so no computer software was used.

In a second step, innovations related to news automation were gathered from the overall list. All those innovations that were considered by the experts to be related to AI, machine learning, or included any form of algorithm were taken into account. Once the innovations were aggregated, it was carried out a descriptive statistical analysis regarding the frequencies and the type of innovations related to news automation. Subsequently, experts' justifications were also analyzed carrying out an inductive thematic analysis (Braun & Clarke, 2013).

Initially, the interviews were analyzed, generating codes for relevant features such as the understanding of AI, rationales for using AI, concerns over its use, or the strategy news organizations adopted regarding the implementation of AI–driven tools. These codes allowed to identify meanings that lie more or less "beneath the semantic surface of the data" (Brown & Clarke, 2012, p. 61).

Emergent themes were subsequently identified based on these initial codes. The prevalence of specific themes was determined on the frequency of them being mentioned by different experts. However, as Braun and Clarke repeatedly stress (2006, p. 82), the simple frequency of a theme appearing in the data is not the only element determining the existence of a theme, but it very much depends on the researcher's perspective. Validity measures, which certainly belong to content analyses, are therefore not common in thematic analysis (Braun & Clarke, 2021, p. 336). This final stage also explored whether, among the different expert explanations provided in the respective countries, there were similarities both nationally and internationally. This has allowed also to identify any interpretive gaps between countries, and the general interpretive trend that accompanies the ontological recognition of automation, regardless of the social context.

Results

The data collected during the interviews revealed that in all five countries automation was considered to be one of the most successful innovations. Automation is mentioned as a journalistic innovation 56 times out of a total of 1,062 innovations that were gathered in all expert interviews. This is an equivalent of 5% of all the innovations mentioned. There are slight differences in the number of mentions: in Spain (15 mentions, 27%), automation is mentioned more often than in the United Kingdom (12 mentions, 21%), Austria (11 mentions, 20%), Switzerland (10 mentions, 18%), and Germany (8 mentions, 14%) (see Figure 1).

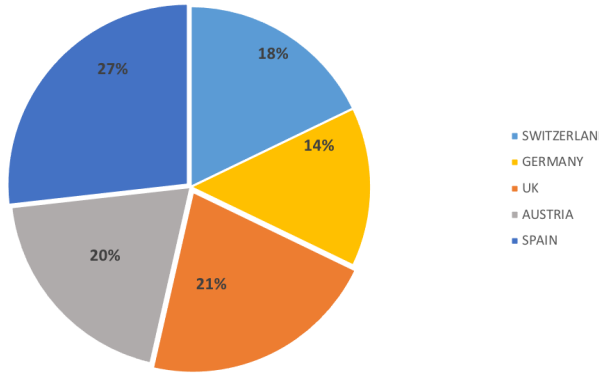

Figure 1: Distribution of mentions in the five countries *(n=56)*

What exactly is automation? Different understandings and types of automation

When talking about automation, experts used several terms, from the more generic automated journalism, to robot journalism, to more circumscribed definitions such as artificial intelligence, algorithms and chatbots. The difficulties of finding a common label was both mentioned by scholars as well as journalists. One academic from Germany for instance stated: “I find the word a bit difficult but: robot journalism. Yes, that you can have news, just simple things like weather and sports, etc., automated there.” In Austria, a journalist focused instead more strongly on AI, mentioning a specific news organization that uses “AI approaches in forum moderation, hate bots or whatever it means. Also in general AI approaches in community building and moderation.”

However, even in the case of more circumscribed innovations such as chatbots, experts almost always refer to automation in a very broad and generalized way, without a clear nomenclature or (technical) expertise regarding the peculiarities of each innovation. This has prevented further categorization within the field of automation since there are no clear parameters for determining the various tools. The experts often referred to similar tools using different explanations, or using different explanations they were referring to similar types of automation tools. The same term can therefore be used to refer to different technological tools or practices. Some journalists, for example, describe automated journalism as an improvement in the process of personalizing content, by analyzing audience metrics algorithmically in order to offer users content in line with their interests. Others link the term to the automation of archive search or news and source–gathering programs. Others again use vague terminology such as “AI systems” or “AI approaches,” which can refer to almost any form of automation:

> A Spanish startup that produces content automatically, through AI systems. There are other companies using this kind of system, but none in such a powerful way. (Journalist, Spain)

The field of interpretation is therefore still developing, particularly when it comes to the news industry representatives. Automations are characterized by a performativity and terminological malleability that does not yet allow to precisely categorize the different tools and programs that belong to the macro category of automation. At the same time, the vagueness of the descriptions demonstrate a lack of consensus around what AI encompasses in relation to newsroom innovation. This finding is consistent with what Beckett (2019) identified in his exploratory study: it demonstrates the news organizations’ high level of tinkering and experimentation around initiatives involving AI, and the often–missing AI strategy. However, by observing the fields of practical application of innovation, it is nevertheless possible to obtain useful data in order to understand the main ontological implications of automation.

Different domains of automation

Looking at the different fields of application (production, organization, distribution, commercialization), common trends could be identified in almost all countries. In all countries' automation is mainly associated with the fields of production and organization (see Figure 2). It is important to point out that these fields of application are not exclusive, but they are mutually influenced by each other. For instance, production, which refers to the editorial content production process (news gathering, writing and editing), is also linked to the organizational domain (newsroom structure and organizational strategy) as well as distribution, e.g. through the use of metrics, which are algorithmically analyzed or that inform news recommenders.

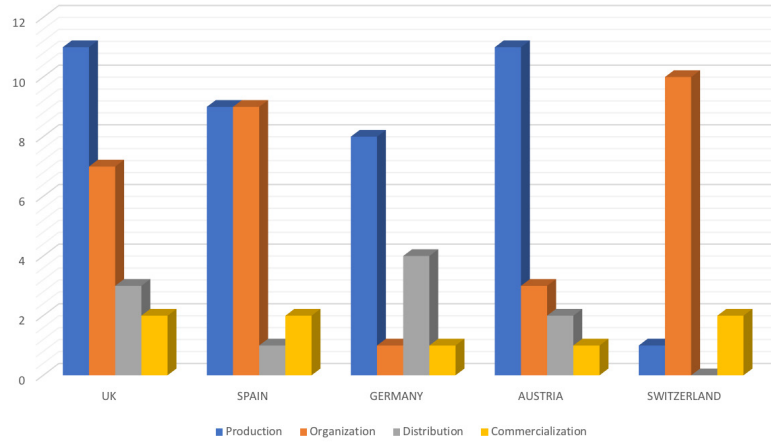

Figure 2: Area of innovation

Specifically, automation influences the field of production allowing, for example, the creation of artificial texts without the participation of humans (automated journalism), or the creation of news with graphics and customizations that facilitate the work of journalists. The countries that have achieved the highest range in the production field are the United Kingdom and Austria.

> They are mostly used in very specific fields, like financial and sport news. But we have also experiences that instead use these tools regularly, on a large scale, on local and general news. They use big data and natural language machines on very common news. (Academic, U.K.)

> […] Artificial intelligence helps you to know what content to put behind the wall, what not to put behind the wall. (Other expert, Spain)

The possibility of facilitating the work of journalists is also linked to the organizational domain, which is an area of major interest in both Switzerland and Spain. In this case, the interest is focused more on internal editorial dynamics. In all countries experts stressed how automation can make journalism more efficient by speeding up individual editorial steps, and that automation frees up additional time, allowing journalists to work on more in–depth investigations by automating routine tasks that rely on structured data.

> Bots are those who are in charge of generating news that have little added value by themselves through data processing. It saves a lot of time for the newsroom regarding traffic generation, and journalists can focus on their objective of producing information. That gives us autonomy as a medium. (Journalist, Spain)

Nevertheless, the domain of distribution is, together with the commercial field, one of the least mentioned domains overall. The only exception is Germany, which has the highest range of all countries. In general, the influence of automation in regarding distribution is linked to two aspects: first, to format and content customization and personalization, a field that affects not only content production, but also its distribution to the users. A second aspect concerns community management, particularly when it comes to moderating and filtering hate speech and other forms of harmful content.

> The tool is there to look for hate speech in the comments, in the webpages, in your articles and draws your attention to it. Possible hate speech is filtered out, blocked, and sent to those actors, who can react to it. But at the same time, it frees them up. (Other expert, Germany)

As far as commercialization is concerned, the interviews showed that the experts do not consider this a primary area for automation. Few interviewees mentioned content monetization, automated subscription recommendations or reducing editorial costs as areas of application, but they are not among the most influential areas for automated tools.

> The use of data and AI is used for the personalization of advertising and subscription sales. It doesn't matter whether it is advertising, for example, programmatic advertising, which has triumphed all over the world and generates the most revenue in any media, or even segmenting the audience to sell them a subscription. […] Getting more traffic and monetizing content. (Journalist, Spain)

Justifications offered by the experts

The ontological reasons that determine the choice of an innovation over another

are a key component to understanding which role AI will play in the future of journalism and public communication. As mentioned above, the main fields of application seem to be news production as well as organizational aspects. Going into more detail in each country, and looking specifically at the experts' justifications, we can see how the ontological matrices behind the implementation of automation have both common aspects across all countries as well as national peculiarities. We can therefore identify three main themes that emerge from the interviews with the experts, and that are present in all five countries:

1. Automating "safe news"
2. Making journalism more efficient
3. News personalization

Almost all the country experts emphasized that AI could be used mainly in relation to so-called "safe news," that is news with little potential for in-depth analysis mostly based on structured data. This means reporting this kind of news equals a routine job without the need for any special expertise that can quite easily be automated. This occurs often in sports or financial journalism. This dominant theme is also related to another topic common to many countries, namely saving time and costs in terms of producing information, making journalism thus more efficient. By having tools that can deal independently and without human intervention with data, transforming it into news through automation, journalists are able to concentrate on more relevant and interesting topics, where automation is more difficult to implement as human creativity is requested more strongly (although research shows that even in the area of creativity automation and AI are starting to contribute, see for instance Franks et al., 2021).

> They are certainly among the most renowned innovations. They are used very well in the case of "safe" news, where the margin of error is very low. Like in sports journalism or business news. (Expert, U.K.)

> Inspired by the USA, where it is also used for sports results. Where it is not a pure cost-cutting measure, it can help to free up resources so that journalists have more time for other tasks afterwards. (Academic, Switzerland)

Another aspect that emerged in several countries, albeit with different nuances depending on the specific case, is the improvement of content personalization. Not only the analysis of users' interests, but also the best ways to present content or which news format to use are seen as the most important innovations of recent years. However, the implementation of this kind of automation is also the most complex to realize: Obtaining tools that are able to autonomously classify users through algorithms and databases, or that provide products, formats

or even suggestions for content creation (how to choose headings, images or keywords) based on user metrics and expectations, is a process that implies improvements throughout all areas, from news production to organizational aspects to the distribution and marketing of content.

Besides the three main themes there are also the specificities of each country. Germany, for example, is the country with the lowest number of innovations, and the one with the highest number of innovations in the distribution domain. However, a closer look at the justifications of the experts reveals a varied picture. In addition to the already mentioned safe news, there are also tools for video transcription and translation, moderation in online forums and content personalization. The latter actually confirms the trend towards distribution, since personalization in this case is focused on the best way to distribute content to users. In other countries, personalization is mediated through the news production perspective, having therefore as main ontology the improvement of the production itself, and not the final fruition of the content.

> Together with our customers, we have now begun to understand what effect which content has on which user in which context, when does he access it? Is he on the train with his smartphone or is he sitting on the sofa at home with his tablet and relaxed? We can understand all of that right now. And in the formulas today, we can then just work through algorithms and artificial intelligence. We can then make those work. Those algorithms and that's maybe the next innovation of bringing artificial intelligence and technology into the newsroom. (Journalist, Germany)

The justifications provided by the Austrian experts, highlight a main interpretative filter: the 2020 Viennese state elections. Several respondents emphasized the usefulness of bots and algorithms in managing and updating data from the election campaign. As a result, the Austrian experts focused more on the automation of the content production.

> On the evening of the election at 7 p.m., there was an automated text, not only the result, but also an automated text for all municipalities in Austria, meanwhile in Vienna also at district level and so on. And that you can look up—I live in Benno-Gasse, how did my neighborhood actually vote? (Journalist, Austria)

It should also be noted that there is an interest in the role of mediator in public forums, as in the case of Germany. This more "social" role of automation was also mentioned among Austrian respondents, but not in the remaining countries.

> In the past few years, two additional tools have been built with the sponsorship of the Google News Initiative. "ForUs" took a close

> look at the influences of quality and design on the quality of the comments, as well as the possibility of making comments only temporarily and not indefinitely accessible on the website. The De-Escalation Bot, financed by the Google News Initiative, has also brought important insights into the use of regulating AI in forum maintenance and can predict outbreaks of escalation early enough in the future and relieve human moderation over distances. (Journalist, Austria)

The Swiss experts focused more on the organizational side, often emphasizing the editorial improvements that can be achieved. Speed and the possibility to work on more complex stories are among the main ontological inputs provided. The same perspective is offered by Spanish experts, who repeatedly stressed the importance of automation in facilitating the work of journalists by reducing the cost of labor. A particularly interesting aspect in the answers of the Spanish experts is the interest in different communication formats, mentioning also podcasts and interactive videos:

> A podcast that mixes information and narration (talking about the example). It tells controversial stories about the Spanish King Juan Carlos I. And it does it in a very original way, as well as using artificial intelligence to recover or emulate the voices of people who have died, such as the dictator Francisco Franco. There is not only an innovative component in the use of the tool, but also in how they approach the topic. (Journalist, Spain)

Finally, the U.K. experts not only underlined the possibilities with regard to the transcription and translation of texts, the archiving of documents and sources, but they offered also a more holistic perspective of automation. Many of the interviewees underlined how the implementation of AI is part of a more radical and structural change in society itself, modifying not only journalism practice and news distribution, but also the authority of the journalism profession.

> Data is becoming more and more important as a source of story, they assume more authority in society (like with covid, climate change. All based on data). It's radically expanding in many different forms and fields. (Journalist, U.K.)

> Automation both in terms of production, i.e. filtering information and monitoring trends, but also in terms of structured journalism, which is perhaps the most interesting aspect. A system of cooperation between machines, databases and journalists, who are required to know how to write in a new way, one that is close to the machines that reorder and organize everything. (Journalist, U.K.)

Overall, automation is still an emerging phenomenon in the journalism industry. This is reflected by the fact that experts describe automation—or artificial intelligence—generally in broad terms, referring to similar tools with different explanations. Additionally, the different domains of implementation, from information gathering to news distribution, make a common definition of automation a complex issue. The findings also show that automation, in terms of its innovative potential, is primarily attributed either to news production or to organizational aspects. Hence, the innovative potential of automation seems to be attributed more strongly to the editorial production process rather than to news distribution. The interviewees underline this aspect by highlighting the efficiency–increasing potential of AI, which includes the focus on highly structured "safe news" that can be automated without too many risks of producing inaccuracies such as sports results. Nevertheless, it is worth noting that some interviewees pointed out that the increasing pervasiveness of automation in newsrooms is just a reflection of a wider change in society that comes with a shift towards quantification and datafication.

Discussion and Conclusion

Even if there is a broad range of views, the interviewees have a common understanding of the pervasiveness of automation (Thurman et al., 2019). These findings are therefore in line with current research: news automation is not a phenomenon that is circumscribed to its manifest expressions such as automated journalism or news personalization through the algorithmic analysis of user metrics. News automation also influences the newsroom and the organizational structure, and it also entails consequences for users as well as the public sphere. It is a phenomenon of major impact that follows the previous process of datafication of journalism (Loosen, 2018; Porlezza, 2018). Eventually, algorithms have infiltrated different areas of newswork, which is reflected by the diversity of the legitimizations offered by the experts.

When analyzing the justifications for implementing AI in newsrooms, it emerged that the opportunities offered by automated tools are mainly related to issues of efficiency and (economic) resources: in the domain of news production, experts mentioned the possibility to automate "safe news," that is to say news that can be easily automated without too much risk, saving therefore time for more interesting and complex investigations. Other examples that were mentioned, such as the creation of interactive tools or using databases, also support an ontological understanding of journalism that is mainly focused on improving the internal dynamics of the editorial staff in terms of production, organization, and distribution. This becomes particularly clear in the case of personalization, which is an example of automation that has been mentioned in previous literature as well (e.g., Helberger, 2019), where an economic logic prevails. This exclusive focus on the economic and production perspective indirectly answers to RQ1, revealing how the opportunities and issues that the introduction of AI may have on the

democratic role of journalism, are not a priority for the interviewed experts. This may be justified, in part, by the fact that the experts were interviewed on the most innovative cases, which may have contributed to the dominant perspective on the automation of news production rather than the implementation of AI-driven tools in news distribution. The interviewees do not take into account any democratic issues related to AI, but in certain situations, as in the case of personalization, it can have significant and potentially dysfunctional consequences for users. Just and Latzer state that:

> algorithmic selection essentially co-governs the evolution and use of the Internet by influencing the behavior of individual producers and users, shaping the formation of preferences and decisions in the production and consumption of goods and services on the Internet and beyond. (2017, p. 247)

Automation affects, therefore, the fruition of news, causing an individualized and fragmented news consumption that makes it more difficult to find common grounds and topics. But, as Helberger (2019, p. 1009) states:

> So instead of simply asking whether, as a result of algorithmic filtering, users are exposed to a limited media diet, we need to look at the context and the values one cares about. Depending on the values and the surrounding conditions, selective exposure may even be instrumental in the better functioning of the media and citizens.

The automation of engagement and audience consumption data certainly helps editorial offices to read more clearly the needs of the majority of users. In addition, offering the individual citizen a product calibrated on the basis of their needs and preferences might well increase profits. However, if the algorithmic control is not well balanced, it could potentially have various consequences on the democratic role of journalism, and on its traditional public authority. Resuming Helberger's thought on the processes of content personalization, it is important not to fall into the error of judging only positively or negatively the use of these editorial strategies, as much as assessing their relevance and coherence within the democratic context of reference, i.e., "to use AI–driven tools in a way that is conductive to the fundamental freedoms and values that characterize European media markets and policies" (Helberger et al., 2019, p. 23). A profit orientation that accompanies the implementation of automation is not in itself a problem given that news organizations are driven by profits, but if taken as the main ontological reason behind the use of AI *in journalism*, it can have a fallout that transcends the boundaries of newsrooms. This also answers RQ3: taking into account that algorithms and AI can become autonomous agents within newsrooms, these tools have the potential to exert a significant influence on the editorial production process, bringing up several ontological issues. Indeed, from this perspective, the question of "what journalism is, and is for, and how

it is to be distinguished from an array of other news produces, is raised anew" (Ryfe, 2019, p. 206).

Regarding RQ2—"To what extent are ethical issues mentioned by experts?"—the interviewees did not raise any particular concerns, demonstrating, as in the case of the democratic role of journalism, that ethical issues are not among the main metrics for judging AI. The reasons for the missing ethical considerations can be explained in two different ways: first, methodology—the interviewees were not specifically asked about ethical concerns regarding news automation or any other journalism innovation. However, this omission was willingly chosen to offer the respondents as much freedom regarding their legitimation strategies for the different innovations, in some cases supported more by ethical–democratic motivations and in others, as in the case of automation, by profit and production reasons.

The second reason can be linked to the fact that, often, within the news industry, ethical considerations are not among the primary concerns of news organizations when it comes to the implementation of AI technology. Beckett's (2019) research has shown that tech-savvy experts in particular are less concerned about the negative consequences of these particular innovations. However, even if the interviewees did not mention explicitly ethical issues, they specifically pointed out the pervasiveness of news automation as well as the centrality of data. Once more, the industry perspective resonates up to a certain extent with the responses from the interviewees. While the (over–)excited discourse within the news industry with regard to news automation reflects previous research, it was unexpected to see that the interviewed journalism scholars did not take a more critical stance regarding the implementation of these technologies.

This paper wanted to evaluate the relevance of ethical and democratic principles in the ontological construction of automated journalism, and by doing so circumscribed the role of news automation in the "social dynamics of news production and consumption" (Lewis et al., 2019). Drawing on Helberger's (2019) normative approach and Just and Latzer's (2017) algorithmic construction, professional priorities were investigated by experts in the field in light of the opportunities and challenges offered by AI. The results show that automation is often viewed through an economic lens, offering opportunities to increase the efficiency of news production, personalization, or increase time for more complex investigations. Ethics do not appear to be a primary concern, offering an ontological understanding in line with previous studies of industry perspectives.

As with all research, this study has limitations. First, ethical concerns were not specifically part of the interviews. Although this was a conscious decision in order to understand whether ethical concerns would emerge in the experts' legitimization strategies, it could be interesting in future research to investigate whether ethical issues have become a relevant issue in newsrooms. Another

limitation comes with the original orientation of the project. Given that the project was focused on journalistic innovations in general, the specific social implications of automated journalism and other forms of news automation are lacking. Future research should therefore specifically investigate the social implications of automation, particularly in terms of ethical notions such as transparency or accountability.

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