



True or False: Studying the Work Practices of Professional Fact-Checkers

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Misinformation has developed into a critical societal threat that can lead to disastrous societal consequences. Although fact-checking plays a key role in combating misinformation, relatively little research has empirically investigated work practices of professional fact-checkers. To address this gap, we conducted semi-structured interviews with 21 fact-checkers from 19 countries. The participants reported being inundated with information that needs filtering and prioritizing prior to fact-checking. The interviews surfaced a *pipeline* of practices fragmented across disparate tools that lack integration. Importantly, fact-checkers lack effective mechanisms for disseminating the outcomes of their efforts which prevents their work from fully achieving its potential impact. We found that the largely manual and labor intensive nature of current fact-checking practices is a barrier to scale. We apply these findings to propose a number of suggestions that can improve the effectiveness, efficiency, scale, and reach of fact-checking work and its outcomes.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI**; **Empirical studies in collaborative and social computing**; • **Information systems** → *Social networks*; Internet communications tools.

Additional Key Words and Phrases: fact-checking, fact-checker, journalism, work practices, misinformation, disinformation, social media

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1 INTRODUCTION

Fact-checking is rooted in journalism wherein it is related to the procedures used to verify claims before they are published [115, 123, 132]. In recent times, an exponential rise in online misinformation has led to a notable increase in the number of independent fact-checking organizations

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(e.g., Politifact¹) that are applying fact-checking to combat the challenges of the networked and hybrid media environment of the present times [27]. Fact-checking has thus evolved into a practice of systematically producing reports on the validity of viral claims to determine whether they are factual [57, 127]. Such fact-checking can play a key role in combating the spread of misinformation online [4, 75, 93, 127]. For instance, recent research efforts indicate that people from different demographics across the political spectrum tend to trust credibility judgments issued by fact-checkers more than those derived by other means, including those generated via automated techniques [134].

Existing research on fact-checking has covered practitioner views [8], effectiveness of fact-checking efforts [52, 55, 127], and professional and end-user practices for responding to political claims [13, 58, 62, 92]. Although researchers have recently started to investigate the challenges and barriers to fact-checking work [49, 89, 124], these efforts typically focus on traditional media outlets (e.g., Agence France-Presse²), rather than independent fact-checking organizations. Moreover, there has not yet been a systematic and comprehensive investigation covering the entire misinformation landscape, including the dissemination of the outcomes of fact-checking work. We address this gap by empirically investigating the work practices and computational tools used by professional fact-checkers working for independent fact-checking organizations and traditional media outlets. Specifically, we address the following research questions:

- **RQ1:** What practices are involved in the work of professional fact-checkers?
- **RQ2:** How do professional fact-checkers use computational tools to support their work practices?
- **RQ3:** What challenges do professional fact-checkers face in performing their work and disseminating its outcomes?

To answer these questions, we conducted semi-structured interviews with 21 professional fact-checkers from 19 countries. The interviews covered a number of topics that we drew from previous research analyzing fact-checking from a journalism perspective [7–9, 58, 59, 62]. We analyzed the responses using a bottom-up inductive approach inspired by techniques from grounded theory [116], allowing common themes to emerge from the data without a priori assumptions.

Based on the analysis, we make the following contributions:

- we present and characterize fact-checking as a *pipeline* of practices;
- we uncover the challenges and barriers that fact-checkers face when performing their work and disseminating its outcomes;
- we highlight that the limited scope, scale, and reach of fact-checking outcomes and the absence of effective mechanisms for disseminating these outcomes prevents fact-checking work from fully achieving its potential impact in curbing the spread of misinformation; and
- we surface the need for computational tools suitable for various stages of the fact-checking pipeline that can augment the capabilities of human fact-checkers and help raise the speed and scale of fact-checking efforts and the dissemination of their outcomes.

In the next section, we describe the emergence and development of fact-checking practices, along with their roots in journalism. Against this background, we synthesize previous research on journalism work and recent efforts that have started to shed light on computational tools used in journalism and fact-checking, including the challenges involved in fact-checking work. Next, we describe our method, participant recruitment, sample characteristics, and data analysis approach. We then present the findings related to each of the above research questions. We proceed to discuss the connection of the findings to the larger societal context and provide practical implications.

¹<https://www.politifact.com/>

²<https://www.afp.com/en/news-hub>

We conclude with remarks indicating promising directions for enhancing the effectiveness of fact-checking for combating online misinformation.

2 BACKGROUND

Fact-checking originated within the journalism profession as the practice used to verify claims prior to publication [115, 123, 132]. Some news magazines in the United States have had internal roles dedicated to fact-checking since the 1920s [115, 123, 132]. Over the years, fact-checking has come to signify the importance a media outlet places on factual accuracy [60].

The surge in user-generated content and the growth of online misinformation have increased the need for factual verification of claims that spread online [57]. The need for verifying such claims has resulted in changes to the role of fact-checking at traditional media outlets. For instance, between 2001 and 2012, fact-checking efforts increased at newspapers by 900% and at broadcast media by 2000% [6]. In fact, fact-checking work at prominent media outlets has been nominated for the Nobel Peace Prize³ and recognized with major honors, such as the Pulitzer Prize awarded to the New York Times [62]. The general public is increasingly aware of fact-checking outcomes, thus adding to the recognition of fact-checking as a professional practice [82]. In recent years, the explosive growth of online misinformation has led to the rise of independent fact-checking organizations, such as Chequeado,⁴ FactCheck.org,⁵ Snopes,⁶ StopFake,⁷ etc. Our research includes professional fact-checkers from such independent organizations as well as those from traditional media outlets, allowing us to examine the similarities and differences across these two fact-checking contexts.

2.1 Effectiveness of Fact-Checking

Fact-checking is one of the tools used to dampen the spread of false information online. However, the effectiveness of fact-checking is widely debated. For instance, several studies indicate that corrections have no measurable impact when false claims confirm a person's political beliefs [55, 95]. Other studies have found that people who hold the same political beliefs as that of the target of the fact-check are less likely to change their opinion [74]. Moreover, researchers have shown that false claims can be effective even after they have been debunked by fact-checking [118]. Counterintuitively, fact-checking may cause a "backfire" effect and strengthen the belief in the underlying false claim [95].

The backfire effect, however, has been contested by numerous subsequent studies [55, 131, 133]. Researchers have found that people exposed to a false political rumor as well as its subsequent correction are more likely to believe that the rumor is false than those exposed only to the rumor [131]. Similarly, other research studies have uncovered that misinformation corrections increase beliefs in factual political statements, regardless of people's political orientations [98, 130, 133]. Further, fact-checking has been found to be effective for correcting non-political false claims [100]. Moreover, people who hold positive opinions about those who check facts and generate corrections tend to believe their reports to a greater extent [96]. Recent research suggests that fact-checking is an effective means of countering misinformation [16, 68], which could potentially be attributed to the increasing visibility and popularity of fact-checking outcomes [82].

Several studies have investigated how the effectiveness of fact-checking is affected by various factors. For instance, researchers discovered that a Twitter user is more likely to accept the outcome of a fact-check if the user follows the person who posted the fact-check [87]. While the corrective

³<https://www.ndtv.com/world-news/fact-checkers-proposed-for-nobel-peace-prize-2356203>

⁴<https://chequeado.com/>

⁵<https://www.factcheck.org/>

⁶<https://www.snopes.com/>

⁷<https://www.stopfake.org/en/main/>

power of fact-checks does not seem to be influenced by anger and anxiety [130], women are more likely to be influenced by a critical fact-check than men [52]. In general, fact-checks that confirm the underlying claim are less effective than those that contradict it [53], and fact-checks presented as videos are more effective than those described using text [135]. In the case of non-political claims, fact-check reports that include a truth scale exhibit higher corrective power than those provided only as prose [10].

By examining professional fact-checking work practices in detail, we shed further light on factors that impact the effectiveness and dissemination of fact-checking outcomes.

2.2 Public Perceptions of Fact-Checking as a Professional Practice

Researchers have studied how fact-checking is perceived by the general public. In particular, researchers have found that public posts on social media express negative sentiment regarding the fact-checking sites Snopes and FactCheck.org. In contrast, sentiment regarding the site StopFake is mostly positive [22]. Lack of trust in fact-checkers can lead to negative opinions about fact-checking, while the usefulness of fact-checks influences positive perceptions [22]. Other research has revealed that inconsistencies in fact-checking accuracy lead to a negative perception of fact-checkers [73]. Yet, recent research findings indicate that people place greater trust in the results produced by human fact-checkers than in other types of credibility indicators [134]. A major shortcoming of these research studies is that they are mostly conducted within the American political context and do not cover perceptions of fact-checking practices in relation to the broader global misinformation landscape. In contrast, our study examines fact-checking practices across the world as they pertain to any type of misinformation.

2.3 Practitioner Perspectives on the Fact-Checking Profession

A considerable amount of research on fact-checking has examined the opinions of fact-checkers. For instance, when studying the motivations that lead traditional media outlets to engage in fact-checking, researchers found that American journalists are more inclined to conduct fact-checking due to the prestige associated with the practice, rather than due to readers requesting verification [62]. Brandtzaeg et al. [23] went a step further and investigated assessments of journalists regarding fact-checking work. These assessments characterize fact-checking as useful, but reveal that fact-checkers are only one of the sources journalists consult for verifying information. A broader investigation uncovered that fact-checkers believe that they ought to maintain clear boundaries between fact-checking practice and political activism [90]. Fact-checkers further advocate exercising care when choosing the terms used to deliver fact-checks (e.g., avoiding the use of overly judgmental words, such as “lie,” when referring to a false claim) [90].

While most research on practitioner perspectives is conducted in an American context, Amazeen [8, 9] is among the few who have studied fact-checking from a global perspective. Her initial exploration found that access to the Internet and the level of democracy in a country influence the emergence of fact-checking organizations within it [8]. A follow-up study revealed perceived public empowerment, support for independent journalism, technological advancement, and sociopolitical stability as additional factors contributing to the emergence of fact-checking organizations [9]. We augment these research findings by studying the motivations that drive fact-checkers to be involved in the fact-checking profession and provide important contextual nuance to help understand their practices.

3 RELATED WORK

Building on the background on fact-checking in the previous section, we discuss the literature that is closely related to each of our research questions.

3.1 Journalistic Work Practices and Fact-Checking

Journalists construct social reality by defining the context in which social phenomena are perceived and defined [123]. Over the years, journalistic work practices have evolved because of the Internet, which changed the conditions under which journalists operate [15]. The increased need for navigating online platforms to find and interact with sources and extract the context connected to a claim has required journalists to develop new skills. For instance, during crises, journalists may gather information from social media to provide more context [35]. The emergence of social media platforms has made it necessary for journalists to investigate the diffusion of information on online platforms [69]. In addition, news aggregation has changed some journalistic work practices as an increasing number of journalists are relying on the large volumes of aggregated news without interacting directly with sources [32].

These changes in the roles and work practices of journalists have brought about the rise of fact-checking as a separate practice of its own, challenging the traditional role of journalists as the only reporters of objective information [57]. Fact-checking has evolved into a practice of systematically producing reports based on determining whether a claim is factual and valid [115, 127]. Graves [58] found that the fact-checking process contains five stages: (1) choosing a claim to check; (2) contacting the party who made the claim; (3) tracing the evolution of the claim; (4) working with domain experts; and (5) explaining the rationale behind the fact-checking outcome. In our research, we investigate the extent to which professional fact-checkers across the world engage in these practices. In addition, we dig deeper into real-world fact-checking practices to understand the influences of their journalism roots.

3.2 Computational Tools for Journalism and Fact-Checking

Computational tools are being developed to support evolving journalistic and fact-checking practices and conditions resulting from the changes in the technological landscape [37]. In fact, the Internet has led to the emergence of the field of Computational Journalism, focusing on the design of data-driven tools for enhancing the journalism profession [33]. Many news organizations have adopted computational tools that aggregate data from social media platforms [76]. Such computational tools use several techniques to support journalistic and fact-checking work practices, including but not limited to: automated news discovery [86, 99, 110]; image and video verification [42, 88]; specialized search [103]; visualization [137]; social media data extraction [41, 43] and verification [122]; rumor detection [139], search [102, 136], tracking [114], and propagation [48, 91]; political-stance classification [84, 85, 138]; contradiction detection [78, 79]; credibility evaluation [63, 64]; etc. Researchers have generated suggestions for improving the design of these tools by studying how they are used [46, 119, 120]. For instance, these studies uncovered the need for filtering information according to domain expertise or preferred selection criteria [41, 97].

From a misinformation perspective, Artificial Intelligence (AI) techniques have been employed within tools designed to assign credibility ratings to information (e.g., BS-detector,⁸ Crosscheck,⁹ etc.). In contrast, other tools leverage the crowd to carry out supporting tasks that would otherwise be labor intensive and slow [19]. For instance, GroundTruth [125] helps journalists find crowd workers who could identify the location of the image being verified. At a higher level, platforms have been designed specifically for collecting, detecting, and analyzing misinformation and the corresponding fact-checks [108].

Isolated small-scale efforts have examined the real-world use of such fact-checking tools and platforms [18]. Brandtzaeg et al. [21] found that journalists use traditional image-verification tools

⁸<https://addons.mozilla.org/en-US/firefox/addon/bsdetect/>

⁹<https://crosscheck.firstdraftnews.org/france-fr/>

to check social media images and videos, but generally lack specialized skills and expertise to deal with online content. A stream of related research has investigated how journalists evaluate the use of algorithms during different stages of gatekeeping [111]. Several studies have found that the algorithms used during the gatekeeping process introduce bias in the information suggested to journalists [38, 121]. In addition, prior work has covered editor perceptions of data-based computational tools [12, 47]. Recent research efforts have focused on studying the tools for automated news discovery to examine the extent to which their operation matches the expectations of journalists and the manner in which journalists integrate these tools into their practices [40]. Based on the findings of these efforts, Diakopoulos [40] proposed a conceptual framework that could guide the design of the next generation of computational tools for journalism.

Initial work on the design of computational tools used in journalism highlighted the need for the developers of the tools to devote more research attention to incorporating journalist values and goals along with the context of use [11, 80]. Eldridge et al. [72] hypothesized that such a design approach has the potential to reconfigure journalistic practice. Though there have been meaningful strides in understanding the needs of journalists and designing solutions for these needs, the challenges created by social media suggest that there is more to learn, especially from the perspective of professional fact-checkers. Our study complements the work of Beers et al. [18] by examining the use of technology by professional fact-checkers, who represent a niche profession that has not yet received much research attention, especially from a global perspective.

3.3 Challenges and Barriers in Fact-Checking Work

Researchers have started surfacing the challenges and barriers involved in fact-checking work [65, 89, 124]. Van Wyk [124] used the lens of social responsibility theory [83, 113] to study the specific functions and funding models of three independent fact-checking organizations from the Global South. Social responsibility is defined as “the ideal way in which the media system should be structured and operated” [14]. Social responsibility has the following six functions: (1) supplying information and furthering debate about matters of public interest; (2) enlightening society; (3) performing oversight; (4) connecting buyers and sellers through advertising; (5) providing entertainment; and (6) ensuring financial sustainability to avoid undue pressure from advertisers and strong financial supporters [83, 113]. Van Wyk [124] found that the first four functions of social responsibility guide the funding aspirations of fact-checking organizations, but the funding model of each organization is distinct. In our research, we investigate the effect of social responsibility on fact-checking work practices by examining the motivations behind engaging in fact-checking as a profession.

More recently, Haque et al. [65] interviewed journalists and fact-checkers and surveyed the general public to analyze the current state of misinformation verification in Bangladesh. Their findings show that most people want traditional media outlets to verify information. More importantly, they found that voluntary fact-checkers in Bangladesh are not equipped with adequate infrastructure to fact-check online information. Moreover, McClure Haughey et al. [89] interviewed twelve journalists, mostly from traditional media outlets, to study how they investigate and report on online misinformation. They found that journalists who focus on misinformation need to overcome unique technical, methodological, and ethical challenges by embedding themselves in online communities, working with domain experts, and improving their data skills. Additionally, Allen et al. [4] investigated whether the involvement of lay people in the fact-checking process could address the challenge of scale. They found that the average ratings provided by the crowd are correlated with the average ratings of fact-checkers. While the crowd seems to have the potential to help with scale, it is unclear whether people would trust crowd-generated ratings. Despite similarities with research on uncovering the challenges and barriers related to fact-checking, our

research tackles not just challenges and barriers, but covers the entire misinformation landscape, including the dissemination of fact-checking outcomes for ensuring the impact of fact-checking work.

4 METHOD

To address our research questions, we conducted semi-structured interviews with professionals who worked at independent fact-checking organizations or fact-checking departments within traditional media outlets. The subsections below describe the study protocol, participant recruitment, and sample characteristics. All study procedures were approved by the Institutional Review Boards (IRBs) of New York University Abu Dhabi and Indiana University Bloomington.

4.1 Study Protocol

We provided the participants with an information sheet describing the study. Once the participants read the sheet and consented to take part in the study, we interviewed them individually using a semi-structured protocol that covered the following themes:

- Information about the fact-checking profession,
- Fact-checking processes and methods (*RQ1*),
- Use of computational tools for fact-checking (*RQ2*), and
- Challenges and barriers to fact-checking (*RQ3*).

Within the above themes, we covered several practices such as: selecting sources and claims for checking; interacting with domain experts, journalists, and other stakeholders; maintaining impartiality and transparency; avoiding conflicts of interest; using computational tools; overcoming challenges and barriers; etc. We based many of the questions on previous research that examined fact-checking within the journalism context [7–9, 62], including research on political fact-checking in the United States [58, 59]. At the end of the interview, the participants completed a brief demographic questionnaire. The complete interview protocol and the demographic questionnaire are included in Sections A and B of the Appendix, respectively.

The first author conducted all interviews. All interviews except one took place over conferencing software (i.e., Zoom). In one case, the participant provided written answers owing to a lack of fluency in spoken English. The written responses were understandable without difficulty. In one of the interviews that took place via conferencing software, the participant brought along a colleague to act as an interpreter. All other participants were fluent in English. The study sessions lasted between 60 to 90 minutes. As a token of appreciation for participating in the study, we offered each participant a \$50 gift card for an online store of their choice. Two participants declined the reward because they felt that participating in such a research study is part of their job.

4.2 Recruitment

Fact-checkers are a niche population. In June 2021, there were only 341 independent professional fact-checking projects in 102 countries.¹⁰ Therefore, it was challenging to find and recruit fact-checkers for our research study. The challenges were compounded by the high volume of misinformation spread during the COVID-19 pandemic [24, 30, 71]. Being busy in combating pandemic-related misinformation decreased the availability and willingness of fact-checkers to participate in research.

In the recruitment material, we introduced ourselves, briefly described the study, and provided a link to a page to register for the study. We emailed those who registered to confirm the appointment and sought informed consent for participation after they had read the study information sheet. We

¹⁰<https://reporterslab.org/fact-checking-census-shows-slower-growth/>

prioritized recruiting fact-checkers from independent organizations since this population has not yet been sufficiently studied. Nonetheless, we made sure to recruit a few fact-checkers who worked for traditional media outlets so that we could investigate the similarities and differences across organizational contexts. Further, we sought to recruit a sample that covered most regions in the world.

We recruited six participants by advertising the study on the International Fact-Checking Network (IFCN) mailing list at the end of February 2020. The seventh participant was a contact of one of the initial six. In March 2020, we sent around 150 emails to independent fact-checkers and fact-checkers who worked for traditional media outlets. We manually collected these email addresses from publicly available fact-checking sites obtained from the list of fact-checking organizations maintained by the Duke Reporters' Lab.¹¹ These recruitment attempts were unsuccessful, likely because March and April 2020 were the months when the first wave of the COVID-19 pandemic was reaching its peak in several countries. We therefore put recruitment on hold for a few months. Once the initial wave of the pandemic subsided, we used the same approach as that described above to send a further 250 emails between June 1st and August 5th, 2020. These efforts helped us recruit twelve participants. We recruited a further two participants in June 2021 to gather information about automated fact-checking tools developed by the organization at which these two participants worked.

4.3 Sample

Table 1 provides an overview of our sample. The 21 participants (10 women and 11 men) are from 19 countries covering Africa, Asia, Europe, Latin America, North America, and Oceania. The sample includes fact-checkers from a mix of organizations, with seven from small independent fact-checking organizations (around 4-6 employees), eight from medium/large independent fact-checking organizations (more than 12 employees), and five from large traditional media outlets. All participants reported living in the country in which they perform fact-checking. Eighteen participants worked as full-time fact-checkers, two were part-timers, and one was self-employed (freelancer). As Table 1 indicates, the participants cover a range of fact-checking experience, from beginner to senior staff. However, a majority of the participants were involved in fact-checking for more than 2 years.

4.4 Limitations

As typical of qualitative studies, the size of our sample is small. We did however achieve theoretical saturation with a diverse sample. Future research could investigate regional differences across independent fact-checking organizations and verify the generalizability of the main themes we uncovered. Our study is limited by the constraints inherent to self-reporting. Direct observations and analytics could help verify the extent to which the self-reports accurately captured the various facets of fact-checking work practices. Although we framed the interview questions to cover misinformation in general, the responses during the interviews necessarily referenced current topics, such as the COVID-19 pandemic. Whenever current events tended to dominate the conversation, we tried to steer the discussion to other topics. However, the influence of salient current events may still have affected the extent to which misinformation was covered in the responses.

4.5 Data collection and Analysis

We recorded all interviews with participant permission and transcribed them for analysis. We analyzed the transcripts via iterative bottom-up qualitative content analysis [70] that employed

¹¹<https://reporterslab.org/fact-checking/>

Table 1. Detailed demographics of the professional fact-checkers who participated in our study. In the Organizational Context column, “Independent” refers to independent fact-checking organizations and “Media” refers to traditional media outlets.

ID	Age	Gender	Fact-checking Experience	Organizational Context	Country	Region
P01	20-30	Female	2-3 years	Independent	USA	North America
P02	30-40	Male	4-5 years	Independent	Nigeria	Africa
P03	30-40	Female	4-5 years	Independent	Turkey	Asia
P04	20-30	Female	1-2 years	Independent	USA	North America
P05	50-60	Male	2-3 years	Independent	Brazil	Latin America
P06	20-30	Female	< 1 year	Media	Mexico	Latin America
P07	40-50	Female	> 5 years	Independent	Argentina	Latin America
P08	20-30	Male	1-2 years	Media	Guatemala	Latin America
P09	20-30	Female	1-2 years	Independent	Latvia	Europe
P10	20-30	Male	1-2 years	Independent	Slovenia	Europe
P11	40-50	Female	2-3 years	Media	France	Europe
P12	30-40	Female	4-5 years	Independent	Serbia	Europe
P13	20-30	Male	4-5 years	Independent	Greece	Europe
P14	30-40	Male	< 1 year	Independent	Ghana	Africa
P15	30-40	Male	3-4 years	Independent	Kazakhstan	Asia
P16	30-40	Male	4-5 years	Media	Australia	Oceania
P17	30-40	Male	3-4 years	Independent	India	Asia
P18	40-50	Male	2-3 years	Independent	Kyrgyzstan	Asia
P19	30-40	Female	2-3 years	Media	Indonesia	Asia
P20	20-30	Male	2-3 years	Independent	UK	Europe
P21	20-30	Female	< 1 year	Independent	UK	Europe

techniques from grounded theory [116], with no a priori hypotheses. Such an approach allowed common themes to emerge from the data in an interpretative and inductive manner [28]. Specifically, the first and second authors coded the transcripts iteratively, starting with open coding to label salient themes followed by axial and selective coding to organize the themes into higher-level categories. During open coding, the two authors coded the data sentence-by-sentence and created codes without initial hypotheses. They then labeled each sentence with an underlying concept. Subsequently, we examined the codes for similarity and connections and grouped them into overarching categories via axial and selective coding (see Table 2). For example, several participants mentioned that they select claims for verification by monitoring a variety of channels (e.g., social media, TV, newspapers, etc.). In our analysis, we grouped the monitored channels into the overarching theme: *monitoring multiple channels*. We reached theoretical saturation after analyzing 16 of the interviews as no new codes emerged. The trend of not encountering new codes continued during the analysis of the remaining five interviews.

5 FINDINGS

Our broad goal was to study professional fact-checkers from a variety of organizational contexts and regions to shed light on their work practices. To understand the influence of the operational contexts and motivations of fact-checkers, we started our interviews by asking the participants

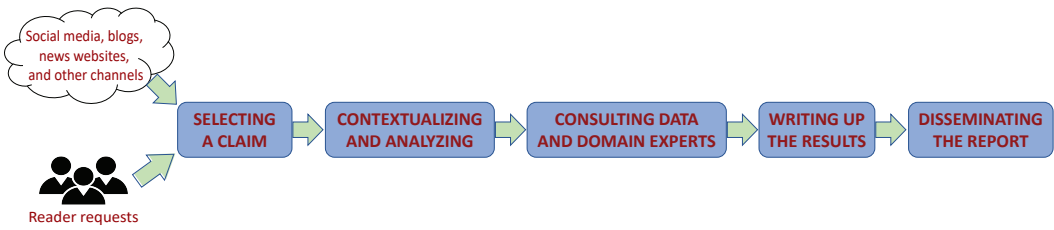


Fig. 1. The five steps in the fact-checking process described by the participants.

to define fact-checking and tell us about the practices involved in the job. Overall, we found that most fact-checkers in our study, irrespective of the organizational and regional context, feel that they have a social responsibility to correct harmful information and provide “a service to the public.” The participants emphasized that they want the outcomes of their work to educate and inform the public. Some fact-checkers from independent organizations further mentioned that they contribute to the information ecosystem to facilitate the creation of a balanced battlefield for the discussion of an issue, especially during elections. Others hope that their reports teach people to engage in critical thinking and fact-checking themselves. These findings echo Van Wyk [124], who found that social responsibility is important for the fact-checking organizations from the Global South. Compared to fact-checkers from the other regions, we noticed that independent fact-checkers from Latin America expressed greater frustration regarding “fake news,” which boosted their resolve to fight it.

After collecting the motivations for choosing fact-checking as a profession, we asked questions related to our research goals. Table 2 depicts the main themes that emerged from our qualitative analysis (see Section 4.5) along with the number of participants connected to each theme. At a high level, we found substantial similarities in work practices (RQ1), use of computational tools (RQ2), and challenges (RQ3) across nearly all participants, regardless of the organizational and regional context. At the same time, we uncovered a few low-level differences.

5.1 RQ1: What practices are involved in the work of professional fact-checkers?

Our interviews revealed that the fact-checking process contains the following steps (see Figure 1): (1) selecting a claim, which includes monitoring social media feeds and processing reader requests; (2) contextualizing and analyzing, which often involves contacting the originator of the claim; (3) consulting data and domain experts, which consists of searching for information sources and people to backup the claim; (4) writing up the results, which includes writing the fact-check report and explaining the method, along with deciding on the rating; and (5) disseminating the report, which deals with publishing and spreading the outcomes of fact-checking. The practices mirror the process of fact-checking political claims outlined by Graves [58], the fact-checking tasks listed in ‘The Fact Checker’s Bible’ [115], and the journalist workflow uncovered by Tolmie et al. [122].

The experience of carrying out each of the above five steps in the fact-checking process is illustrated by a participant who explained how he verified the claim: *A Canadian think tank ranked the Hong Kong Police Force the sixth most reliable in the world in 2019.*

“First, you need to find what was that Canadian think tank? Does it exist? If it exists, is it a think tank? Is it reliable? Or maybe it’s not a Canadian think tank but a firm that is registered in Canada. What was the source? Or maybe there’s no source, maybe just the imagination of a person on Twitter. So, okay, maybe we could find the source, could we find this think tank? The next step is to read this study. Can we see the method of

Table 2. Key themes pertaining to each research question along with the number of participants connected to each theme.

Research Questions	Key Themes
RQ1: What practices are involved in the work of professional fact-checkers?	Monitoring multiple channels (21) Dealing with reader requests (21) Filtering and prioritizing claims (21) Selecting claims to verify (21) Contextualizing and analyzing claims (21) Consulting data and domain experts (17) Reviewing write-ups (18)
RQ2: How do professional fact-checkers use computational tools to support their work practices?	Use of off-the-shelf applications and services (15) Limited scope and use of custom solutions (15) Fragmented use of computational tools (14) Skepticism about AI-based automation (14)
RQ3: What challenges do professional fact-checkers face in performing their work and disseminating its outcomes?	Limited reach of fact-checking outcomes (12) Difficulties finding the origin/history of claims (13) Analysis of audiovisual content (11) Resource constraints (21) Latency in producing fact-checks (11)
Personal and Collective Matters	Collaborations (12) Transparency and conflict of interest (21) Backlash and confrontation (16)

this study? How many countries were studied? What were the criteria? What were the parameters? After I finish all this, I need about half an hour for writing the article and half an hour to edit it and publish it on the site and social media.” (P15, Male, Kazakhstan, Independent fact-checking organization)

In the rest of this subsection, we describe the similarities and differences in the core fact-checking aspects of claim selection and verification. We discuss the dissemination of fact-checking outcomes later under challenges, since it is one of the main challenges we uncovered in our interviews (see Section 5.3).

5.1.1 Monitoring multiple channels. All participants reported that they monitor multiple channels to identify the claims that require fact-checking. Those who monitor traditional media sources follow statements issued by public officials during public engagements, press conferences, TV debates, and radio shows. In the case of social media, the fact-checkers in our study use specific dashboards (i.e., TweetDeck¹² or CrowdTangle¹³) or follow the accounts of public figures. The participants reported that they track several social media platforms, such as Facebook, Twitter, and Instagram. The process requires substantial manual effort, and the participants mentioned being overwhelmed by the need to access information across a multitude of sources, which makes them miss some claims that go viral.

¹²<https://tweetdeck.twitter.com/>

¹³<https://www.crowdtangle.com/>

“I use a variety of media and I’ll track social media posts. So I have dashboards for Facebook and Twitter to track accounts and keyword searches. In addition, I tune in pretty regularly to TV and radio programs to make sure I’m tracking statements made by politicians, and I sign up for emails from political campaigns and organizations to find fact-check-worthy claims there. [...] I feel that there are so many possible things that I could be looking into. It’s just so overwhelming to keep track of everything.” – (P01, Female, United States, Independent fact-checking organization)

The participants from independent organizations as well as traditional media outlets reported receiving claims via a Facebook dashboard accessible to fact-checkers who have a direct partnership with the platform. The dashboard shows posts flagged by the Facebook algorithm by taking into account various factors such as Shares, Likes, Comments, and the number of people who reported the post as problematic. While the participants mentioned prioritizing the claims in these posts, they additionally monitor various other channels, including other social media platforms and traditional news sources.

We found that the monitored channels differ across countries and regions because of differences in the media used the most to spread misinformation in a given region. For instance, all participants from Africa, Asia, and Latin America mentioned checking WhatsApp. Yet, WhatsApp was rarely mentioned by the participants from Europe, North America, and Oceania. The high usage of WhatsApp in Africa, Asia, and Latin America makes it one of the most common vehicles for spreading misinformation. To facilitate the monitoring of WhatsApp, the participants from these regions have created dedicated phone numbers that readers can use to flag questionable content received in the app. In contrast, European and North American fact-checkers are more inclined to follow traditional media, such as TV and radio, because that is where local public figures make statements that could contain inaccurate claims. In fact, two of the European fact-checkers mentioned that their organization developed a tool to transcribe the audio from live event feeds and extract checkable claims from the speech.

“...it automatically transcribes what’s going on, and we can refer back to the transcripts. It’s more useful than rewinding.” – (P20, Male, United Kingdom, Independent fact-checking organization)

Several European fact-checkers mentioned that they monitor articles published by news outlets (e.g., newspapers) because some media outlets in their countries do not follow a rigorous fact-checking process. Notably, some of these are state-sponsored news outlets with editorial goals influenced by the agenda of the state. Therefore, it is essential for another party to check the content of the articles, especially regarding important matters that could have a large impact on people.

“My job is to find and fight fake news in other media articles as well as on social media. So everyday we actually read newspapers, watch TV, and monitor social media. I find the most popular and viral content on that day and focus on that.” – (P12, Female, Serbia, Independent fact-checking organization)

5.1.2 Dealing with reader requests. Besides monitoring multiple platforms, the participants reported receiving reader communication in other ways, including email, social media, and messaging services (e.g., WhatsApp, Telegram, etc.). All fact-checkers in our study consider their readers to be a fundamental part of the claim selection process. Our findings reveal that the participants prioritize these requests because the reader-reported content is often relevant. In addition, the fact-checkers in our study mentioned that reader requests might point to stories that they might have missed or information that has not yet reached the other sources they monitor.

The fact-checkers in our study revealed that they are inundated with reader requests. In most cases, these requests are about suspicious claims that are going viral. Reviewing these requests and evaluating whether they need to be considered is labor-intensive and time-consuming.

“After you receive more than, I don’t know, 300 requests a day, the human cannot manage.” – (P07, Female, Argentina, Independent fact-checking organization)

A few participants mentioned that if the requests are about claims that were previously verified, they need to spend time in pointing the readers to the existing fact-checks. The fact-checkers in our study evaluate the relevance of a request based on whether it can be verified and on the volume of requests received about that particular claim. Some participants reported keeping track of who sends such requests and replying to them with a link to the fact-check report when it’s done. These findings show that reader requests can help fact-checkers establish a bond with their audiences. At the same time, the fact-checkers in our study feel that better computational tools could optimize the process and help them serve their readers better.

We found a few regional differences in how fact-checkers engage with their audiences. The African, Asian, and Latin American fact-checkers in our study reported communicating with their readers using multiple channels, such as popular social media and messaging platforms (e.g., Facebook, Twitter, WhatsApp, and Signal).

“Actually, we have a WhatsApp channel, we have a Telegram channel, we have a Signal channel, and people write us on Twitter and on Facebook. So we’re there for them.”
(P08, Male, Guatemala, Traditional media outlet)

The participants from the other regions (i.e., Europe, North America, and Oceania) reported fewer channels of direct interaction with their readers, with some using only a single communication mode. However, they expressed a desire to expand their interaction with their audiences.

It is important to note that not all reader requests are relevant.

“I would say that in the time I have worked at <ORGANIZATION>, maybe 50% of the content that people send us is relevant.” – (P06, Female, Mexico, Traditional media outlet)

For instance, one participant expressed frustration at having to deal with “crazy” reader requests. The participant elaborated that sometimes there is no way to obtain the data necessary to verify the requested matter, such as a politician claiming that his electorate is the fastest growing.

5.1.3 Filtering and prioritizing claims. The participants reported spending considerable time filtering and prioritizing the content extracted from the various sources mentioned above. Filtering requires fact-checkers to determine whether a claim is verifiable. A verifiable claim is a factual statement (e.g., numbers, geographical references, etc.) that can be checked. Opinions are not considered factual statements, hence they are not verified. In general, we found that the experienced fact-checkers in our study, regardless of the organizational or regional context, could determine whether a claim is verifiable by carrying out a quick search. However, the participants mentioned that sometimes they are unable to gather enough information pertaining to a claim. In such cases, if the claim is important to their audience, they produce a report describing what they did and why they could not verify the claim. Otherwise, they keep a record of the work done and might continue with the verification process later should relevant information become available in the future.

After filtering to retain only those claims where verification is feasible, the collection of the gathered claims is prioritized to determine the order in which each claim would receive fact-checking attention. The fact-checkers in our study mentioned that the prioritization process is an adaptation of the journalistic practice of determining the order in which news stories are reported. The prioritization is based on a number of factors, such as virality, timeliness, importance, etc.

For instance, a claim that is important but does not require urgent verification may get pushed down the order. The participants described prioritization as a collaborative and time-consuming deliberation that takes place daily. In larger fact-checking organizations and media outlets, claims are typically prioritized by the editors, while in smaller organizations (with 4-6 fact-checkers), prioritization is carried as a team.

“On a daily basis, I see the team. They identify the leads from social media platforms using various techniques. In addition, we receive a few leads from our WhatsApp helpline number. Once they [team members] enter all leads manually, they come and sit with me. Then, depending on virality and verifiability, I decide which stories need to be written.” – (P17, Male, India, Independent fact-checking organization)

5.1.4 Selecting claims to verify. In general, the fact-checkers in our study consider the process of claim selection as an opportunity to contribute to the discussion of the topics that affect public sentiment.

“...to be able to add to the conversation, not just look at obvious stuff and things that are polarizing because you will not change opinions. But you need to focus on gray zones where you can convince people.” – (P10, Male, Slovenia, Independent fact-checking organization)

All fact-checkers in our study prioritize political claims, especially during elections. In general, however, they select claims based on specific selection criteria. For instance, all of them select viral claims, mostly from public figures relevant to society. In addition, some participants mentioned that they try to find contested or controversial claims because they do not see the point of verifying claims where the facts are “*blindingly obvious*,” unless the claims are about important matters. Other participants reported revisiting previously checked claims when that data or context could be used to verify new claims that are similar.

“Quite often we see repeated claims. For example, the vaccine claims. We see them again and again, like the ones that say that vaccines change your DNA and things like that. We say okay, we’ve already written something about that, so we can use the information we’ve produced in the past to write a new report that would address that directly.” – (P21, Female, United Kingdom, Independent fact-checking organization)

Although a couple of fact-checkers in our study specialize in a particular domain (e.g., science), most check any claim assigned to them by the editorial team. We noted that a lack of expertise in the topic does not impact claim selection. As we describe later in this subsection, fact-checkers consult domain experts to help them contextualize and analyze the claims (see Section 5.1.6).

Across participants, we noted a few differences regarding claim selection. For instance, some do not check anonymous claims because they cannot track the originator. Yet, others stated that they do verify anonymous claims, especially viral rumors. Another difference relates to claims made by influencers [51]. While some participants reported not verifying claims from influencers out of a fear of backlash from the followers of the influencer, others mentioned that the large number of followers of such personalities makes their claims important to verify, especially for matters that could have a severe impact on individual or public health. Similarly, we uncovered differences in the importance given to specific selection criteria. While some fact-checkers in our study prioritize virality and social engagement metrics (e.g., Likes, Shares, Comments, Retweets, etc.), most place greater value on societal impact because they want to protect people. Fact-checkers from underdeveloped countries mentioned that societal impact includes issues that affect minorities and disadvantaged groups.

“The main thing for me is the consequences of the material if this information can negatively influence society, for example, hate speech or information on any intolerance of majorities and minorities. We pay attention to the consequences of these materials mentioned in the claims. When it comes to public officials and media outlets we pay attention to the interest to society. If this information has high level of societal interest, then we would check this information.” – (P18, Male, Kyrgyzstan, Independent fact-checking organization)

In general, we found that fact-checkers have come to recognize that considering only virality and engagement metrics can prevent them from paying attention to other important issues that can have a critical impact on society. The shift toward prioritizing societal impact is further evidence that fact-checking work practices are affected by social responsibility as mentioned above.

“We realized that some claims that are not very largely spread yet are still very important to check. They spread in the most diverse groups. Last year, we realized that spread alone is not the best criteria.” – (P15, Male, Kazakhstan, Independent fact-checking organization)

Most differences in fact-checking practices across regions are related to the criteria used for claim selection. For instance, religion is a key topic for the African participants and the participant from Indonesia. Although the selection of claims from government officials was mentioned by all participants, the Latin American participants seemed to devote greater attention to such claims, perhaps because of the constantly evolving political environment in the region.¹⁴ Constraints on resources and the lack of availability of relevant data lead some participants from independent fact-checking organizations from less developed countries to select only those claims that could be verified using openly available sources.

For misinformation related to COVID-19, the fact-checkers in our study reported verifying claims that were already verified by fact-checking organizations in other countries. The participants explained that they do consult fact-checks from trustworthy organizations in other countries. However, their audiences might not be familiar with the data sources or domain experts used by organizations in other countries, so they still engage in the whole fact-checking process using their own data sources and domain experts and write a report in the local language. One fact-checker mentioned that fact-checks from other organizations sometimes cannot be used because the country-specific context is different.

“There’s the context to put on things for the British audience, even though the language is the same obviously, for stuff which is like – the vaccine has these effects; well that’s going to be the same in every country, but especially if it has to do with country statistics it can vary.” – (P20, Male, United Kingdom, Independent fact-checking organization)

Interestingly, most participants reported verifying claims previously checked by another fact-checking organization in their own countries. The decision to check a previously verified claim is typically based on the societal significance of the underlying topic, large volume of reader requests for verification, or the importance of providing a different perspective. These observations point to a duplication of work that can hamper scale.

5.1.5 Contextualizing and analyzing claims. Contextualization is the deeper analysis of a claim using relevant background knowledge. For example, if a public official claims that unemployment figures have decreased, contextualization would involve providing the story behind the figures and explaining the patterns.

¹⁴<https://acleddata.com/2020/03/12/disorder-in-latin-america-10-crises-in-2019/>

“For example, we come across instances when the given numbers are true, but people avoid the context behind it. That’s also misinformation. Fact-checking is not only [reporting] when a piece of information that could be altered or modified is absolutely false ... it’s also about providing context around the numbers, the story behind the numbers, the patterns behind the numbers, the reasons...” – (P17, Male, India, Independent fact-checking organization)

Even though contextualization and analysis are manual and slow, the interviews underscore that it is an essential part of the fact-checking process. We found that contextualization and claim analysis is a process that is standard across organizations and regions.

During the contextualization stage, most fact-checkers in our study look into the evolution of the claim from its origin to the present state. They typically obtain this information via off-the-shelf search tools (e.g., Google search). In addition, some participants mentioned that they might get in touch with domain experts to help them contextualize claims that require knowledge of specific topics (e.g., science). The participants emphasized the importance of describing the context in detail to help readers understand the conclusion in the fact-checking report.

Although all fact-checkers in our study engage in contextualization, the process often relies on the knowledge of locally-specific information that may be missed by those who are external to the regions involved in the claim at hand. The participants stressed that human understanding of such nuance is an essential element of contextualization. Apart from text-based claims, human contextualization is invaluable for other types of media (e.g., videos) because current tools are unable to catch the deception in such media formats.

“I may need to fact-check a photo which shows the Greek border with soldiers running toward a specific building. The article claims that this is a photo of the Greek border with Turkish soldiers crossing the border. So I need to be able to use different tools to check the authenticity of the photo itself and then check the context of the photo. So I need to do a reverse image search and find if that specific photo exists on another site. For example, the article might claim that the photo is from yesterday, while the photo may have been taken five years ago. Also, the photo might be from Cameroon or the United States.” – (P13, Male, Greece, Independent fact-checking organization).

Our interviews revealed that the types of misinformation that need to be addressed by fact-checkers can differ across regions. The participants from developed countries encounter more instances of sophisticated and coordinated campaigns, such as those in which bots are used to spread misinformation. In contrast, the participants from developing countries typically deal with a fairly narrow set of claim types, such as speeches of public figures and statements in reports released by organizations and governments. The participants from developing countries do still face plenty of challenges in verifying such claims because they often lack access to the data required to verify these claims (see Section 5.1.6).

Some fact-checkers in our study stated that they verify a couple of claims each day, while others mentioned taking a few days to perform each fact-check. Most participants explained that the time taken for verification is claim dependent.

“In most cases it takes two to three days. Sometimes it’s a very difficult claim, so it can take a month or more. It mostly depends on the claim; the most passive checks can be done in an hour.” – (P18, Male, Kyrgyzstan, Independent fact-checking organization)

The time required can depend on the availability of the data needed for verification and any existing fact-checks of similar claims. A longer time is needed to produce the outcome if the verification requires content, such as a government report, that is not available online, as is frequently the case in less developed regions. On rare occasion, claim verification can take weeks or months if relevant

data sources are unavailable. The fact-checkers in our study further reported that the verification can take longer if they experience delays in getting government officials to provide responses and difficulties in reaching domain experts with busy schedules. The participants who verify claims based on the Facebook Dashboard mentioned that verification of these claims takes longer because the posts often contain multiple statements that require checking.

5.1.6 Consulting data and domain experts. After contextualizing and analyzing claims, the fact-checkers in our study consult primary sources and domain experts. The participants explained that they use the same process for verifying primary sources as that used by journalists to verify the information used in stories [122]. Primary sources are people who have a direct connection to the topic (e.g., people who witnessed an event or reporters who quoted people who did). Most fact-checkers in our study placed importance on verifying primary sources. The common practice is contacting the primary sources directly or accessing official reports from reputable and trustworthy repositories.

“We always want to get official data. If it’s not some data that’s freely available in an online database, then we have to ask some public institution to get us the data.” – (P10, Male, Slovenia, Independent fact-checking organization)

Most participants found it essential to give the person making the claim an opportunity to respond, which often entails waiting to hear back from busy public officials. The response is important because it can provide additional context.

“I’m going to the person who is referenced for the claim, like for a quote. It’s not enough just to look at a transcript or a news article. It’s important to get a video or an audio recording. [...] You do verification by looking at exactly where it came from, whether that is a study or a statement from a government official or their actual words, things like that.” – (P04, Female, United States, Independent fact-checking organization)

Yet, the fact-checkers in our study reported that they find it especially challenging to reach people from government agencies because public officials in most countries do not appreciate the scrutiny.

“Government press offices ... trying to get the information you want out of them can be quite difficult, even when it’s not like we’re writing a bad news story about them. We’re just trying to clarify exactly what their statistics mean, but it can take a few days to work out what that is.” – (P20, Male, United Kingdom, Independent fact-checking organization)

One participant mentioned that their inquiries have led some government officials to reduce communication with journalists and fact-checkers. In some cases, government officials talk only to pro-government journalists to avoid unwanted questioning and obstacles in promoting their agenda.

Most participants pointed out that dealing with external parties is one of the main barriers for scaling fact-checking work because there is no easy solution that can make these interactions faster. Despite being slow, verifying primary sources is an essential part of fact-checking, regardless of the organizational and regional context. Fact-checkers in all regions experienced difficulties in reaching primary sources, echoing findings of McClure Haughey et al. [89]. However, we noted greater challenges in verifying primary sources in less developed regions, such as Africa and Asia, because less data is available publicly [65].

Besides checking primary sources, the fact-checkers in our study contact domain experts to get a professional opinion about the claim, similar to the findings of McClure Haughey et al. [89]. As mentioned earlier, some participants contact domain experts during contextualization (see Section 5.1.5). Domain experts include reputed doctors, scientists, professors, and other relevant

professionals. All participants spend time and effort in cultivating relationships with domain experts to be able to consult them frequently. The exception was one participant from a traditional media outlet who mentioned that she varies the domain experts she contacts because of organizational policy.

Most participants consider it necessary to get a variety of perspectives by soliciting several external, balanced, and reputable local experts. For instance, when verifying political claims, they seek individuals of opposing political ideologies.

“You can get the data, but then you can interpret it in different ways. So we try to find the experts in that particular field and see what we get. It is important to find experts who have different views on the subject and try to see where they agree and where they don’t and then put it all together.” – (P10, Male, Slovenia, Independent fact-checking organization)

If the claim has already been fact-checked by another organization, some participants reported that they speed up the process of drafting their own report by using only one domain expert and including a link in their report to the fact-check report produced by the other organization.

5.1.7 Reviewing write-ups. In their reports, the participants mention all pieces of information they used to contextualize and analyze the claim (see Section 5.1.5), including any response from the originator of the claim. In addition, the report provides links to the data sources used and the information obtained from domain experts. When relevant, the report covers the evolution of the claim along with pointers to any related fact-checks by other trustworthy organizations. After writing the report, most fact-checkers in our study conduct a rigorous iterative peer review in which the editorial team verifies the report before publication. We noted that the participants from a few regions (e.g., Africa and Oceania) tend to use a longer peer review.

Our interviews reveal that the motivation behind an iterative peer review is to enable colleagues and the editorial team to verify that the appropriate process was followed, correct sources were used, and an accurate final judgment was reached. More specifically, those reviewing the report check whether the fact-checker conducted thorough contextualization and claim analysis, if the information obtained from external sources is correct, and whether all sides of the story have been considered. During the peer review, the conclusion is examined to check whether it corresponds accurately to the body of the report.

“The idea is to have somebody who is not in your environment look at your report from an objective perspective. At least three fact-checkers from <ORGANIZATION> check my report before it’s published on the site.” – (P02, Male, Nigeria, Independent fact-checking organization)

The assignment of a rating to the fact-check typically takes place during the iterative peer review. However, not all organizations handle ratings similarly. In larger independent fact-checking organizations and traditional media outlets, the rating is assigned by the editorial team after reviewing the report. In a few instances, the rating is assigned by the fact-checker for approval by the editorial team. In contrast, in smaller organizations, the decision on the rating is made collaboratively as a team.

5.2 RQ2: How do professional fact-checkers use computational tools to support their work practices?

We found that the use of computational tools is an integral part of fact-checking, regardless of the organizational and regional context, aligning with the findings of Beer et al. [18]. The fact-checkers in our study use such tools in a variety of ways to carry out several tasks in their

workflow (e.g., finding instances in which an image appeared online). In most cases, the participants from independent fact-checking organizations reported that financial constraints lead them to choose freely available computational tools. Only a small number of participants reported using custom solutions. In general, the use of technology described by the participants reveals a number of common practices carried out in a fragmented manner with off-the-shelf applications and services that lack integration. Yet, the participants expressed skepticism regarding the possibility of automating fact-checking with AI. Below we cover each of these aspects in more detail.

5.2.1 Use of off-the-shelf applications and services. The most common tasks performed by the participants using off-the-shelf applications and services are: (1) searching for the origin or history of claims (e.g., Internet and social media search); (2) identifying viral claims (e.g., CrowdTangle, TweetDeck, etc.); (3) extracting information from images and videos (e.g., Google reverse image search,¹⁵ TinEye,¹⁶ Citizen Evidence,¹⁷ etc.); and (4) checking whether a claim is verifiable (e.g., ClaimBuster [66, 67] and BSDetector [25]). Similar to journalists from traditional media outlets, the fact-checkers in our study found that these applications and services exhibit various shortcomings [89]. The participants struggle the most with search tools because current search tools, especially those provided by social media platforms, have limited functionality and do not fully address their needs. For example, an experienced participant mentioned that Facebook search was more useful in the past when it returned more relevant information.

“It would be great if Facebook would give us back the tools that we had a few years ago. Facebook has narrowed our searching possibilities. You cannot find anymore many of the things that you could find on Facebook three years ago. Nowadays, Facebook search is pretty much unusable.” – (P12, Female, Serbia, Independent fact-checking organization)

We found a few instances in which the participants from non-English-speaking countries mentioned that some tools are not compatible with their languages. In such cases, the participants expressed a desire for tools to cater to more countries and regions. Most participants used CrowdTangle to determine which posts are currently gathering the most attention on social media platforms. However, some participants criticized it because it brought claims to their attention after that they had already gone viral, instead of predicting virality in advance.

“CrowdTangle doesn’t always do a good job of finding posts that are about to become viral. It sort of does it afterward.” – (P01, Female, United States, Independent fact-checking organization)

5.2.2 Limited scope and use of custom solutions. In contrast to off-the-shelf applications and services, custom computational tools are designed to support a specific facet of fact-checking work. The fact-checkers in our study reported the use of the following custom computational tools: (1) an end-to-end automated fact-checking tool that verifies straightforward claims (e.g., “2020 unemployment rate in the UK is 8%”); (2) a transcription tool for live events, which includes claim detection to extract factual items from the text transcripts of the live audio and flags statements that are similar to previously checked claims; (3) a trends tool that shows instances in which other media outlets have mentioned a particular statement; and (4) a monitoring tool to keep track of previously verified claims and corresponding fact-check reports.

However, we found that the fact-checkers in our study made limited use of such custom applications with the notable exception of those from Latin America and the United Kingdom, where

¹⁵<https://images.google.com/>

¹⁶<https://tineye.com/>

¹⁷<https://citizenevidence.org/>

the leading independent fact-checking organizations have developed a number of custom tools. For instance, some participants from the United Kingdom worked for an organization that has developed several tools used in their fact-checking work. The custom computational tools developed in Latin America are used to differentiate between opinion and factual statements¹⁸ and optimize the process of collecting and responding to WhatsApp reader requests.¹⁹

“All tools that we develop are open source, so we are not preparing them just for us. What is important is that this tool exists, at least in our case, because we have been working in Artificial Intelligence since 2017 to make our bot prepared to do some activities that we want to do now. Since some years ago, everyday, the editor and reporters from the newsroom can go to a site where the bot brings us statements from online articles. These statements are from 30 media sources and all speeches of the President and the Parliament. The bot can already distinguish opinion or ideas from factual statements because we train it with Artificial Intelligence.” – (P07, Female, Argentina, Independent fact-checking organization)

A couple of other participants mentioned internally developed computational tools to keep track of the life cycle of a claim and to interact with readers via a custom chatbot.

When talking to the participants about these custom solutions, they commended the functionality of these tools. However, the praise was typically qualified with comments indicating that the tools have much room for improvement.

5.2.3 Fragmented use of computational tools. One of the reasons for the limited uptake of computational tools, including custom solutions, might be that their scope is typically limited to a specific function within the fact-checking pipeline. For instance, a given computational tool might be useful only for differentiating between opinion and fact. The various tools mentioned above are not integrated with each other, resulting in their use being fragmented across the fact-checking stages. The fragmentation increases the manual labor required by fact-checkers, which could be minimized if the tools were better integrated.

In addition, there are multiple tools that perform the same task with similar, yet not identical, outcomes. However, the results seen previously in other tools cannot be filtered out. For instance, several independent fact-checkers in our study reported annoyance at the inability to filter similar results from different image analysis tools. When using multiple tools to search for images, these participants would sometimes need to go through tens of pages of results within each tool to look for results unique to that tool because most search results were common among all tools.

“Sometimes it makes you lose time trying to look for the same image in all these tools because you have the same results. That’s frustrating because you’re on a time schedule, and you want all these results in the same place so that you don’t have to do the same search from the beginning again. I think that’s very time-consuming, and it makes it unpleasant to find and manipulate images because you know you’re going to do these same searches at least three or four times before you realize there is no more information. They are presenting you with the same information.” – (P06, Female, Mexico, Traditional media outlet)

One of the factors that leads to this fragmentation is that the tools are developed by different entities. Moreover, our interviews surfaced that it is difficult to connect and integrate computational tools to meet custom needs because fact-checking organizations typically lack the financial resources to employ the people with the required technical expertise to put together a custom solution.

¹⁸<https://chequeabot.chequeado.com/desgrabador/>

¹⁹<https://chequeado.com/el-chatbot-de-ifcn-contra-la-desinformacion-adaptado-al-espanol-por-chequeado/>

5.2.4 Skepticism about AI-based automation. Given the research attention paid to computational support for fact-checking and journalism [20, 31, 38, 42, 112, 117, 122, 129], we asked the participants about the use of such techniques. We found skepticism regarding the feasibility of fully-automated fact-checking, similar to the sentiment of journalists about algorithmic journalism [120, 121]. The fact-checkers in our study explained that various essential steps within their workflow, such as contextualization, could not be carried out without human input. It is interesting to note that the skepticism was not limited to the participants who lack experience with AI-based solutions. Even those who reported using AI-based solutions were doubtful that these tools could be improved sufficiently to match human performance.

“I’m always skeptical about how much it [AI-based automation] can help because fact-checking is such a subjective and nuanced process. I can’t imagine a situation where most of my job would be taken over by AI.” – (P16, Male, Australia, Traditional media outlet)

Moreover, some participants mentioned cases where the use of AI backfired and produced counterproductive outcomes.

“I do not necessarily trust such technology. Like the things that we have seen, algorithms that generate mean tweets that go viral, they talk about racism. It seems like these things often go wrong or don’t work well without human assistance anyway.” – (P09, Female, Latvia, Independent fact-checking organization)

Fact-checkers expressed concern that malicious users could exploit AI tools, leading to severe negative consequences. The participants felt that this problem could be addressed by including humans as an essential component in the deployment of such tools, echoing findings from previous research on the human element in journalism [38, 42, 50].

Despite the skepticism, most participants expressed openness toward AI-based tools if the system is transparent about its operation and provides a clear rationale behind the outcomes. Similar desires for transparency and accountability are highlighted in prior work on journalist perceptions of algorithmic journalism [120, 121].

“We should know what kind of tools it is using for fact-checking. We should know that it’s doing the right thing. So if the computer is performing this fact-check, it will need to provide all information: how it checked it, what kind of sources it used, and the reasoning behind the rating.” – (P18, Male, Kyrgyzstan, Independent fact-checking organization)

5.3 RQ3: What challenges do professional fact-checkers face in performing their work and disseminating its outcomes?

As depicted in Figure 2, we found that fact-checkers face several challenges in carrying out their tasks and disseminating the outcomes of their work: (1) limited reach of fact-checking outcomes; (2) difficulties finding the origin/history of claims; (3) analysis of audiovisual content; (4) resource constraints; and (5) latency in producing fact-checks. In the following subsections, we discuss each of these challenges in detail.

5.3.1 Limited reach of fact-checking outcomes. The fact-checkers in our study believed that limited reach prevents fact-checking outcomes from fully achieving their potential in curbing the spread of misinformation. The participants felt that they need to become better at understanding how social media users consume information so that they could use this knowledge to broaden their audiences to reach all people who consumed the original misinformation.

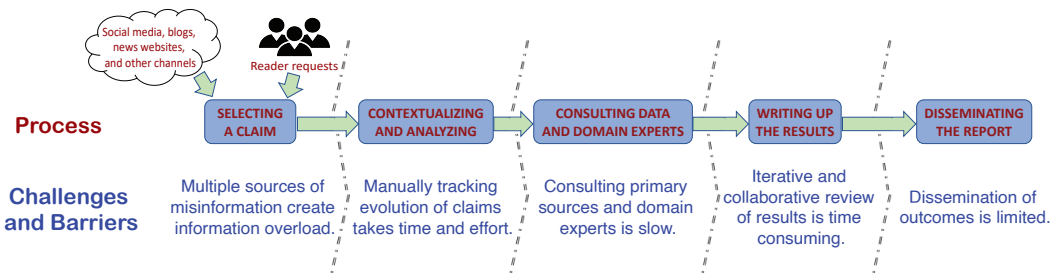


Fig. 2. The challenges and barriers to fact-checking reported by the participants.

“The other problem is in the way the content that we publish circulates. In some cases, it has different or less impact than what we’d like. That’s because of the algorithm and the way that people consume content in social networks.” – (P07, Female, Argentina, Independent fact-checking organization)

Although some participants reported using Claim Review²⁰ to annotate their fact-checks with metadata to broaden the audience, they still expressed a general frustration with the lack of wider dissemination of the reports.

“We believe that the reach of the fact-check is way less than that of the corresponding misinformation. Even if one claim was debunked by multiple fact-checkers across the country, taken together, we still don’t reach the entire set of people who believe the misinformation to be true. So that’s one big challenge.” – (P17, Male, India, Independent fact-checking organization)

Such frustration was more evident in the responses of the fact-checkers from independent fact-checking organizations, who tend to have smaller audiences than those from large outlets. Yet, we found that even those from traditional media outlets would like their outcomes to reach an audience beyond their regular followers. The participants believed that the lack of “sensationalism” associated with fact-checking information coupled with social media echo chambers [36, 54, 101] prevents fact-checks from achieving widespread dissemination similar to misinformation.

“If I publish a true statement made by the President, someone who loves the President is going to share it. But if I publish a report that says that the President made a false claim, someone who loves the President will not share it, and that group of people perhaps believes that we are not necessarily autonomous or independent. It’s the content that confirms the bias and so on.” – (P07, Female, Argentina, Independent fact-checking organization)

In addition, the participants pointed out that platform features, business interests, and local regulatory influences can hamper the dissemination of fact-checks. In particular, some participants mentioned that fact-checks of their organizations do not appear on Google News and that some social media platforms prioritize countries based on commercial considerations.

“We are working with Google so that our articles are at the top of search results. But it’s not working very well, and sometimes we cannot find articles even on the third or the fourth page. In many countries, we are not in the Google News section. For example, in Turkey, fact-checkers are not in the Google News section, and when people are searching for something in the news section, they do not see our articles. Another

²⁰<https://www.claimreviewproject.com/>

example: YouTube does something with Brazilian, Indian, and American fact-checkers, but not with those from other countries. It seems that the market strategy of the platforms is important. Maybe if these platforms can change something about this, it would be great.” – (P03, Female, Turkey, Independent fact-checking organization)

Regardless of the organizational and regional context, the fact-checkers in our study try various techniques to broaden their reach. For instance, the participants from independent fact-checking organizations in Asia and Europe reported trying to engage in investigative journalism because it attracts a diverse and broader audience than fact-checking reports alone.

“I think that we have to do more investigations because the audience that’s reading fact-checks is our loyal audience. They know us; they read us every day. What we need is to involve larger and newer audiences. From our experience, the only way to do this is from investigations.” (P15, Male, Kazakhstan, Independent fact-checking organization)

One participant mentioned delivering fact-checks via video to reach younger audiences, while another mentioned that her organization is trying to increase the visibility of its articles by collaborating with social media platforms. These strategies seem to have achieved some success.

“How can we make the fact-checking article viral like the misinformation? Our organization requested [Google and Facebook] to show our articles on the main pages of Google and Facebook. Give them priority and advertise our account on Facebook and Instagram so that more people can reach our articles. Till now, this seems to be working.” (P19, Female, Indonesia, Traditional media outlet)

The participants from an independent fact-checking organization mentioned that they have two departments to deal with the dissemination of fact-checking outcomes. The communications department creates a dissemination campaign, which involves distributing the fact-checking reports via social media, newsletters, and press releases. The policy department reaches out to the originator of the misinformation, which could be a public figure or another news source, describing why their claim was wrong and asking them to correct it.

5.3.2 Difficulties finding the origin/history of claims. During the contextualization and claim analysis stage, fact-checkers spend large amounts of time searching for the origin of claims (i.e., where they first started) and tracking their spread (i.e., collecting text, images, and videos in which the claims appeared over time). If historical information is missing or difficult to find, the fact-checking process can slow down.

“I think a big one is figuring out the origin of the items and then tracking how they evolved over time. [...] All this takes a lot of time.” – (P04, Female, United States, Independent fact-checking organization)

The participants mentioned several factors that make it challenging to find historical information related to a claim. For instance, some participants mentioned that it is difficult to conduct searches because they struggle to come up with fitting keywords related to claims, especially in languages other than their own. Although translation tools help, they typically miss the context that can be provided only by locals. Identifying contextually appropriate keywords is critical because misinformation goes viral in some countries before reaching others. Although one participant mentioned that his organization developed an advanced search tool that can gather the history of a claim, dealing with this tool requires a lot of manual effort.

Sometimes a claim is spread anonymously through a viral photo or a statement in a meme. In these instances, extracting the history and trajectory of the claim becomes crucial since the identity of the person who made the claim is unknown. Some fact-checkers in our study do not verify such

claims. However, most participants reported that if the photo or meme has gone viral or is about an important topic, they try to gather the context necessary to verify it.

5.3.3 Analysis of audiovisual content. Most fact-checkers in our study find it challenging to deal with misinformation transmitted via video and audio because the tools available to process these formats are resource-intensive, slow, and technically complex to use. While the technology or expertise to deal with multimedia misinformation exists [42], it is often not free or affordable, thus limiting its use by independent fact-checking organizations that lack the means to license these solutions. Fact-checkers from traditional media outlets may not face the same financial constraints to acquire these tools. However, they still encounter technical challenges when dealing with audiovisual content, echoing the sentiments of journalists [18]. Most participants highlighted the need for the development of affordable and easy to use tools for multimedia processing.

“In the past, we didn’t necessarily find an excellent solution for dealing with audio. Last year, we partnered with a group of sound engineers to check the audio because there was a lot of misinformation in WhatsApp audio clips, and we didn’t have the chance to check if the audio was from the person it was attributed to. There is no open source tool to do so, and it’s not cheap because we have to pay a particular company more or less \$200 or \$300 for each audio clip. That’s a lot of money for us. There needs to be a good way to do that in a more open way. It would be super useful for all markets that are WhatsApp-intensive like India, Brazil, Latin America, etc.” – (P07, Female, Argentina, Independent fact-checking organization)

Our interviews uncovered that the challenges in processing audio are felt most acutely in regions with heavy WhatsApp use (i.e., Asia and Latin America). The participants mentioned several challenges related to processing audio. For instance, they find it challenging and time-consuming to extract verifiable claims from audio content. Further, it is difficult to verify the authenticity of the speaker because sophisticated tools or technical expertise are required to perform this task.

“You see a lot of audio files. These audio files are very difficult to check because there are some people imitating other people’s voices. So in this case, you need to have technical expertise, almost like the police, because we don’t have the tools to fact-check the tones of the voices and how they modulate, comparing the real voices with fake voices. This is too technical for us. Audio is really problematic in Brazil because WhatsApp is really big here.” – (P05, Male, Brazil, Independent fact-checking organization)

5.3.4 Resource constraints. The participants lamented the resource constraints they faced. Limits on resources, such as personnel, money, data, technical expertise, etc., greatly restricted the amount of misinformation they could handle individually, as well as collectively as an organization.

“We have a team of five, and the volume of information that we need to fact-check really weighs down on the team. As and when we evolve in terms of our numbers, in terms of our personnel and our capacity, we hope that we could increase the number of reports we put out.” (P14, Male, Ghana, Independent fact-checking organization)

Although the participants from traditional media outlets seem to have fewer resource constraints, they mentioned that they would still like to have more personnel for verifying claims.

“You can always have more staff, and we would always like to put out more content, but we don’t have the resources.” – (P16, Male, Australia, Traditional media outlets)

The participants from developed countries encounter relatively fewer hurdles in accessing data as the institutions in these countries tend to have the technical means and transparency requirements to make data publicly available. In contrast, the participants from less developed regions (i.e.,

Africa, Asia, Eastern Europe, and Latin America) find public access to official data difficult, if not impossible, echoing previous research [65]. The participants from these regions reported that hurdles in accessing data considerably increase the time required to verify many of the claims. In some instances, claims cannot even be verified due to a lack of data availability.

“For us fact-checkers in Nigeria, we think that our biggest challenge is access to data. For example, we have no national census right now. For instance, there is no official data that can tell you how many people are poor.” – (P02, Male, Nigeria, Independent fact-checking organization)

5.3.5 Latency in producing fact-checks. As described earlier (see Section 5.1), fact-checking is a long process that involves a series of steps. The time taken to carry out these steps allows the underlying misinformation to spread like wildfire in the meantime.

“The speed of spread of misinformation is much faster than that of facts. We have to fact-check everything, and we have to follow the IFCN method which requires us to perform a lot of steps and wait for the response of the person that is being fact-checked. For example, if we’re going to fact-check a politician’s speech and we see that there are false claims, we have to call the politician and say, ‘We are fact-checking your speech. What do you have to say about it?’ So the time needed for fact-checking is different from the time needed for spreading misinformation. [...] Fact-checking is slower.” – (P05, Male, Brazil, Independent fact-checking organization)

Moreover, the fragmentation of the various steps across disparate computational tools (see Section 5.2.3) exacerbates the latency issue.

The latency in producing fact-checking outcomes affects the ability of fact-checkers to curb the spread of misinformation. A few fact-checkers in our study expressed the desire for a system that could flag potential misinformation *before* it goes viral.

“This is something that’s been trending on social media platforms. At that point, so many people have seen it. I wish there was a way to be able to identify potentially false information before it reaches so many people.” – (P01, Female, United States, Independent fact-checking organization)

5.4 Personal and Collective Matters

Apart from the insight related to our research questions, the interviews uncovered a number of other themes. Although these themes are not central to our research questions, we discuss them below as they are relevant for understanding the larger context within which fact-checking work takes place.

5.4.1 Collaborations. The participants from independent fact-checking organizations mentioned that an important piece within the overall fact-checking pipeline is collective practices and external collaborations, especially with fact-checkers from other organizations, thus confirming previous research indicating that fact-checking is increasingly collaborative [82, 89]. Such collaborations are particularly useful when handling misinformation that travels across countries [109].

“A lot of times, we have to contact other fact-checkers. Due to the nature of the Internet, fake articles or fake photos which first appear in say Mexico can very easily appear later on Greek social media. Not only that, it can appear on Greek social media with a claim that the photo represents something in a place. For example, there was a video showing people burning Bibles, and there was a post on Greek social media saying that refugees in Greece were doing that. Actually, they were religious sects in Mexico. We had to analyze the video frame by frame to find landscapes of the place where

the video was taken. It was a bit of a difficult process, and we had to contact people from there [Mexico]. So collaboration is essential in cases in which we need to contact others.” – (P13, Male, Greece, Independent fact-checking organization)

Apart from assistance in the fact-checking process, these collaborative avenues are used to share tips and technical knowledge, learn from others, and organize events and get-togethers, thus pointing to a desire for professional development. Such collaboration typically happens over mailing lists and regional forums. Specifically, the participants from the Balkan region and Latin America reported being active on WhatsApp groups related to fact-checking.

Our findings uncovered strong mutual ties and cooperation among fact-checkers and journalists within the same media outlet. The participants from traditional media outlets mentioned that they collaborate with journalists within their organizations, mainly when investigative reporting is required to verify a claim. On the other hand, during events that require substantial human fact-checking resources (e.g., fact-checking during live political debates), journalists support fact-checking efforts. In contrast, the participants from independent fact-checking organizations are not as strongly connected with journalists from traditional media outlets. Yet, they expressed a desire for establishing stronger ties and co-operation with journalists and fact-checkers from other organizations, especially in regions other than their own.

5.4.2 Transparency and conflict of interest. Regardless of the organizational and regional context, the fact-checkers in our study place high importance on transparency because they are aware that it is crucial to build and maintain reputation. The participants who mentioned that their reports go through multiple iterations reported that the colleagues who check their reports not only verify their information sources but also check that the process is transparent. In addition, most participants from independent fact-checking organizations reported that the Internet sites of their organizations have sections explaining the high-level process they use.

A strategy that all fact-checkers in our study use to provide transparency is explaining how they reached their judgment (as described in Section 5.1). Some participants mentioned that they ensure transparency by focusing on the claim rather than the originator.

“We try very much to focus on the claim itself rather than the claimants, so that we try to keep that neutrality in place.” – (P21, Female, United Kingdom, Independent fact-checking organization)

A few participants mentioned that transparency affects the data sources they use to verify claims. If the data is not openly accessible to readers, they would not use it because that could hinder reader perception of transparency. Others reported that they explain how they use tools to verify the data and take screenshots of their data sources in case the data is subsequently altered or removed.

“In our article we put all sources. We specifically show the evidence on the side of the article so that people can see it clearly. Second, we show the ways we used to get all the information. For example, if we do a reverse image search, we mention this. We try to show how they [readers] can use the tools when they try to access the source or the information. This is really important to us because we really want to make everyone a fact-checker. We try to put the archived versions of the links in our article because if the links are removed, they would not be able to access the information. So it’s really important for us to put archival links to the sources.” – (P03, Female, Turkey, Independent fact-checking organization)

Regarding conflict of interest, the participants from independent fact-checking organizations reported that they list their donors on their Internet sites, which is one of the requirements in

IFCN's code of principles.²¹ If they need to verify claims that involve any of their donors, some participants mentioned that they make it clear to the donors that the truth comes before any other considerations and interests.

“If it [conflict of interest] exists, we have to be clear from the beginning that we are journalists, and the truth is what is important for us.” – (P11, Female, France, Traditional media outlet)

In addition, a few participants from independent fact-checking organizations mentioned that they may refuse contributions from some entities to avoid potential conflict of interest issues that could arise from that donation. Others mentioned that considerations of conflict of interest apply not only to their organization, but also the domain experts that they use when verifying a claim.

5.4.3 Backlash and confrontation. All participants reported that they routinely deal with backlash and confrontation, especially on social media. As previous research indicates, a fact-check can get contested immediately after it is published [58].

“We are professional and civil when responding to backlash. I realized that sometimes people don't understand the rationale of fact-checking, while others see it as confrontational.” – (P02, Male, Nigeria, Independent fact-checking organization)

Further, fact-checking work can sometimes result in unexpected negative consequences for fact-checkers. For instance, some participants from independent fact-checking organizations reported cases of legal action against them and their organizations. Alarming, in some countries, fact-checkers face significant personal danger. Even within our small sample, we encountered several fact-checkers who had experienced physical violence.

The fact-checkers in our study use various strategies to deal with backlash. Some participants mentioned that they ignore these comments to avoid a negative impact on their well-being. Others reported that they welcome constructive criticism and respond to such comments. A few participants stated that they sometimes argue with people to try and change their opinions, but only when the topic is of great importance and the argument could influence public discourse.

6 DISCUSSION

Below we discuss the salient insight that can be gathered from our findings.

6.1 Influence of Social Responsibility

Our findings show that the fact-checking movement has taken on the “truth-seeking” role of journalism [44, 58, 61]. The fact-checkers in our study consider themselves and their organizations not simply as *verifiers* of claims, but also as potential *influencers* of society. In particular, we observed that the most common motivations for conducting fact-checking reported by the participants can be connected to the three functions of social responsibility [83, 113, 124]: supplying information and furthering debate about matters of public interest; enlightening society; and performing oversight. Van Wyk [124] similarly found that three fact-checking organizations from the Global South justify their funding considerations based on these functions. We build on Van Wyk's [124] findings with a much broader reach, covering independent fact-checking organizations as well as traditional media outlets across the world.

Our findings reveal that social responsibility might be connected to the transformation of claim prioritization from a focus on virality to one that values less popular topics that impact minority populations. Prioritizing reader requests over other claims is another work practice driven by social

²¹<https://www.ifcncodeofprinciples.poynter.org/>

responsibility. The fact-checkers in our study believe that verifying claims provided by their readers could have more societal impact because these topics better reflect the interests of their audiences.

Such a professional orientation explains the strong desire expressed by the participants to broaden the reach of fact-checking reports and their frustration at falling far short of the desired levels of dissemination. We found that the dissemination of fact-checks is currently limited by a number of practical challenges, including but not limited to: enormous volume of misinformation, algorithms that favor virality, confirmation bias of information consumers, existence of echo chambers in online spaces, insufficient resources for fact-checking efforts, etc. Although a few fact-checking organizations work with social media platforms to make their outcomes available to a broad audience, more collaboration is required to make such dissemination more effective.

6.2 Strong Ties to Journalism

Our findings echo prior work underscoring that fact-checking has journalism at its core [58–60]. Similarly, we found that some of our findings regarding the use of computational tools and related challenges echo findings from research on perceptions of journalists or editors [11, 18, 33, 38, 50, 80, 89, 120].

The current fact-checking movement is a re-invigoration of the journalism profession to combat the challenges brought about by the evolution of the media ecosystem into a networked and hybrid environment [27, 58, 60]. Although fact-checking has evolved as a profession in its own right, the strong ties between fact-checking and journalism that surfaced during our interviews reveal that the fact-checking profession has not abandoned its roots in journalism. In fact, the fact-checking process we uncovered via our interviews (see Figure 1) is similar to the workflow of journalism [122].

It is important to consider that most fact-checkers in our study reported that they are trained journalists. The participants characterized fact-checking as a subset of what journalists normally do, which is researching a topic and writing about it. In the case of fact-checking, however, the focus is on verification or on adding context to a claim. A common foundation rooted in the journalism profession could explain why we encountered only minor differences in fact-checking practices and challenges across organizational and regional contexts.

6.3 Collaborative and Collective Practices

Our work surfaced a collection of internal collaborative and collective practices that are an integral part of the fact-checking workflow. We found that claim selection and determination of the final ratings are sometimes conducted as a collective exercise, especially in smaller independent fact-checking organizations. Although larger organizations (including traditional media outlets) tend to have fewer internal collective routines, they still have strong collaborative practices. For instance, the participants stressed that peer review of fact-checks is an important step in the workflow. Regardless of the organization size and context, the editorial team plays a key role in these collective practices. Fact-checkers interact with the editorial team during claim prioritization, selection, and peer review of reports, aligning with the anatomy of a fact-check described by Graves [58].

Since (mis)information from one locale can sometimes resurface as misinformation in another region, fact-checkers need to track its context in the original locale. To handle such cases, independent fact-checkers maintain external connections with fact-checkers from other regions. We noted that the fact-checkers in our study exhibited a clear sense of camaraderie with other fact-checkers across the world and expressed a strong desire to develop collaborative ties with them.

Surprisingly, the participants reported that they verify claims that have already been verified by other local or international fact-checkers. In most cases, the separate additional verification is driven by the need to deal with different languages, domain experts, sources, and contexts. Nonetheless, the

duplication of effort could potentially be minimized by leveraging the collaborative and community mindset of fact-checkers mentioned above. Such a reduction could help increase the scale and decrease the latency involved in fact-checking work. A possible way to motivate organizations to use fact-checks performed by other organizations is to propose ways in which these collaborations could increase the reach and impact of their individual efforts [61]. More research is required to study how to facilitate effective cross-organizational collaborations that increase the scale and dissemination of fact-checks.

6.4 Human-Centered and Inclusive Design

Echoing journalist perceptions of algorithmic journalism [38, 42, 50], most fact-checkers in our study expressed skepticism at the possibility of AI performing fact-checking on its own because they felt that having a human in the loop is essential for accurate and effective fact-checking. The understanding of the sociotechnical context of fact-checking work surfaced by our findings can be applied for a more human-centered design of computational tools that can be more effective at supporting fact-checking work practices. Such an approach would align with the calls to strengthen the connection between research efforts in Computer-Supported Collaborative Work (CSCW) and Human-Computer Interaction (HCI) with those in journalism and fact-checking [3, 11, 33, 39, 40, 80].

A broad global sample helped us uncover several regional differences in the challenges and barriers that fact-checkers encounter, aligning with the differences between resource-rich and resource-poor traditional media outlets found by Fink and Anderson [47]. For instance, the monitored misinformation channels differ across regions because they are driven by the mechanisms used the most to spread misinformation in a given region. In addition, fact-checkers from non-English-speaking countries reported running into language barriers. Although tools like CrowdTangle cater to a variety of languages, there seems to be a need for more advanced algorithms that consider local nuance that is generally not taken into account by standard translation services. Moreover, fact-checkers from countries with underdeveloped information infrastructure need to contend with limited availability of data. Although the development of specific tools is insufficient for overcoming the larger infrastructural challenges, better computational tools could still be useful for reducing the latency involved in fact-checking work by minimizing the manual labor and time taken for the other steps in the workflow (e.g., data discovery, tracking the evolution of a claim, etc.).

7 IMPLICATIONS

Based on the insight from our study, we offer a number of suggestions to improve the effectiveness, efficiency, and scale of fact-checking work and dissemination of its outcomes.

7.1 Dynamic Data Discovery

Needing to keep up with multiple information sources and reader requests results in significant information overload that overwhelms fact-checkers. Although work to automate the discovery of claims that need verification is already being conducted by researchers in the field of computational journalism [41, 81, 94, 107] as well as by some fact-checking organizations,²² there is a need for more effective tools that can fully or partially automate the laborious and slow processes involved in manually collecting, filtering, and prioritizing claims for checking.

Such tools could be further enhanced with the functionality for dynamic discovery, collection, and pre-processing of multimedia content (i.e., text, images, videos, audio, and URLs) that contains potential misinformation from well-known (e.g., social media), obscure (e.g., niche blogs), and

²²<https://fullfact.org/about/automated/>

emergent sources (e.g., new apps) that are leveraged by misinformation campaigns.²³ Such dynamic and automated data discovery has the potential to reduce the time and effort fact-checkers spend on collecting and selecting misinformation worthy of their attention.

Our findings reveal that the computational tools for data discovery can benefit from human input. Specifically, fact-checkers need to be able to add topics that may not have been detected by the automated mechanisms as well as to solicit input from domain experts and readers. In addition, such tools could permit editors to provide guidance for prioritizing and selecting claims. For instance, if the editorial board of a traditional media outlet wishes to prioritize the verification of claims related to minorities, then the automated dynamic data discovery should adjust the algorithms to discover more claims of these types.

The efficiency of these tools could be increased by personalizing the discovery mechanisms based on the expertise, preferences, and past work of individual fact-checkers. Although personalization would not entirely eliminate algorithmic bias in claim selection [39, 121], it has the potential to minimize it [38].

In addition to the automated techniques, dynamic data discovery could incorporate crowdsourcing to permit end users to flag potential misinformation [4]. The flagged content can then be vetted via computational techniques to determine its suitability for fact-checker attention. For instance, researchers have found that crowdsourcing can successfully assist experts in geolocating images [125], assessing news credibility [19], etc. Further, crowd-based techniques could potentially overcome the challenges of large-scale data collection from platforms on which it is difficult to capture misinformation because of end-to-end encryption (e.g., WhatsApp). Effective crowdsourcing requires careful attention to designing mechanisms that engage the crowd [125]. For instance, mechanisms would need to be implemented to generate flagging of misinformation by a diverse set of individuals and to ensure the development of rapport between the crowd and fact-checkers [104, 105, 125].

7.2 Early Warning and Detection

Since producing fact-checks involves laborious manual effort, the outcomes lag significantly in comparison to the time at which the underlying misinformation originated. The latency issue is exacerbated because fact-checkers often use virality as a metric for selecting claims worthy of their attention. The latency in generating fact-checks allows misinformation to spread and cause damage while fact-checking efforts are in progress. Moreover, by the time the fact-checking outcomes become available, it might be too late to change people's opinions.

A few participants pointed out that being proactive in detecting misinformation that has not yet gone viral but has a high potential for spreading widely in the near future could help reduce the latency between the spread of misinformation and the availability of corresponding fact-checks. Moreover, providing fact-checkers with early warnings about misinformation topics that are likely to trend can help them prepare and gather information on the topics in advance, thus reducing the time spent in 'fire-fighting' mode. Although research on virality prediction [2, 5, 17, 77, 126] has produced tools like CrowdTangle, the participants noted that the tools have significant shortcomings and often do not detect many claims that go viral. Therefore, further research is needed to improve early warning and detection techniques that predict which misinformation could go viral.

At the same time, it is important to note that there is a risk associated with fact-checking misinformation too early, since early verification might inadvertently result in drawing attention that it would not have received otherwise [45]. Therefore, early warning and detection algorithms must strive to minimize the potential for damage from early verification. Integration with tools that

²³<https://www.wired.com/story/russia-secondary-infection-disinformation/>

track topical relationships and corresponding fact-check history across fact-checking organizations and media outlets could possibly help in this regard (see Section 7.4). For instance, having more information about previous related fact-checks could help fact-checkers assess the risks of verifying a claim before it has achieved a reasonable spread.

Expanding the data used by the algorithms to generate their predictions could possibly improve the existing techniques for predicting topics that are likely to trend in the near future [2, 5]. For instance, the algorithms could incorporate data from a wider set of social media platforms, rather than basing predictions on the activity from a single platform such as Twitter or Facebook [49]. Although some social media platforms provide access to their data,²⁴ these public Application Programming Interfaces (APIs) typically limit the amount of data that can be retrieved. The limited subset of data that can be collected via current APIs might not be enough for improved and more effective early warning and detection. These constraints on data access necessitate that fact-checking organizations develop collaborations with social media companies to get access to a larger amount of data. However, forging such collaborative arrangements is not straightforward since several competing factors (e.g., business interests, costs, etc.) must be considered. Even if the companies make the data available, there would still be challenges related to the computational resources required to store and analyze such large volume of data. Overcoming these sociotechnical challenges would be required to ensure the availability of sufficient data for generating fast predictions even when misinformation content is in infancy and yet to gather enough ‘steam’ on any single platform.

7.3 Unified Fact-Checking Platform with Humans in the Loop

The use of computational tools and services for fact-checking that function independently of each other often results in a duplication of effort, thus wasting time. A unified approach that integrates all pieces of the fact-checking pipeline, from claim collection to dissemination, can transform the ad-hoc, piecemeal, and time-consuming nature of current fact-checking practices into an efficient and streamlined operation. Alternatively, a set of standards could be established so that the developers of fact-checking tools could have the guidance necessary to produce better integrated tools and APIs.

As in the case of data discovery (see Section 7.1), when implementing a unified approach to integrate computational tools, it is critical to augment and empower, rather than attempt to replace, the human fact-checker. Such a human-in-the-loop approach [1] has been shown to be effective in other settings, such as the moderation of comments on news articles [106]. An analogous approach to fact-checking would ensure that the attention and effort of fact-checkers is focused on matters in which human perception and understanding of nuance is essential. We found limited instances in which fact-checking organizations have attempted to integrate automation tools (e.g., Chequeado²⁵ and FullFact²⁶). However, these efforts are still in their infancy and limited in scope.

7.4 Facilitating Collaboration for Misinformation Tracking

The fact-checkers in our study reported spending large amounts of time tracing the evolution of the claims they verify. To make the process of misinformation tracking more efficient and effective, the existing tools could be enhanced to facilitate greater collaboration across organizations and regions. Researchers have already developed computational tools that allow end users to investigate the origin, propagation, and refutation of a rumor on a single platform, such as Twitter [91]. In addition, some participants reported that their organizations have developed mechanisms to track claims

²⁴<https://techcrunch.com/2021/01/26/twitters-new-api-platform-now-opened-to-academic-researchers/>

²⁵<https://chequeabot.chequeado.com/desgrabador/>

²⁶<https://fullfact.org/about/automated/>

that have been previously fact-checked, with two participants mentioning that their organization developed advanced search tools to help fact-checkers track the history of a claim. Nonetheless, the existing tools have a limited scope because they are either constrained to a single social media platform or to a few regional news sources. To overcome these limitations, it is important to enhance such tools with the ability to track topical relationships and the corresponding fact-check history across organizations and regions. Even if fact-checkers choose to verify a claim previously verified by another organization, such tools could reduce the latency in producing the fact-check report because fact-checkers would have ready access to information that currently requires time and effort to compile. Our interviews revealed that tools with collaborative features need to be compatible with many languages and available globally because misinformation travels and morphs across regions [109].

Collaborative tools for fact-checking could potentially be coupled with the dynamic data discovery techniques mentioned above (see Section 7.1). Alternatively, or in addition, the tools can leverage the mechanisms provided by social media and search platforms to trace claim history in an efficient and automated manner. At the same time, such tools must pay careful attention to data provenance because it can often become ambiguous, inaccurate, or untrustworthy when collecting and processing large volumes of information from a multitude of sources [26, 29, 34, 56, 128].

7.5 Broader and Faster Dissemination

Fact-checking can be effective only if its outcomes are delivered to many individuals. Further, reducing the latency between the initial appearance of misinformation and its subsequent verification can potentially increase the relevance of fact-checking outcomes because people are more likely to be interested in fact-checks related to the misinformation they recently encountered.

Although a few of the fact-checkers we interviewed worked for organizations that have specific departments to deal with dissemination, most fact-checking organizations lack such resources. Instead, some participants employ a variety of other strategies to broaden their reach (e.g., using ClaimReview to mark their fact-checks). Moreover, the fact-checkers in our study stressed that cooperation with social media platforms is required for disseminating their work and commended some platforms for helping combat the spread of misinformation. For instance, Facebook is engaging fact-checkers in the verification of misinformation flagged by its algorithms. Facebook then reports the fact-checking outcomes to those who were exposed to that misinformation.²⁷

One of the ways in which social media platforms can be of further assistance to fact-checkers would be by leveraging the extensive online tracking infrastructure used for personalized advertising to deliver targeted fact-check notifications based on user exposure to misinformation. In addition, fact-checking organizations could solicit partnerships with influencers who can help spread fact-checks.

8 CONCLUSION

Fact-checking is one of the most effective mechanisms to counter misinformation [4]. The growing threat of online misinformation has led to an increased demand for fact-checkers. Our empirical investigation of the work practices of professional fact-checkers from independent fact-checking organizations and traditional media outlets revealed that fact-checkers are influenced by social responsibility. Fact-checkers consider themselves and their organizations not simply as *verifiers* of claims, but also as *influencers* of society. However, fact-checkers encounter several challenges in achieving the desired societal impact because the current fact-checking practices are largely manual, ad-hoc, and limited in scale, scope, and reach. As a result, the rate at which misinformation

²⁷<https://www.politico.com/news/2020/04/16/facebook-fake-news-coronavirus-190054>

can be fact-checked is much slower than the speed at which it is generated. We point out the need for unified and collaborative computational tools that empower the human fact-checker in the loop and support the entire pipeline of fact-checking work practices from claim selection to outcome dissemination. Such tools could help narrow the gap between misinformation generation and fact-check dissemination by improving the effectiveness, efficiency, and scale of fact-checking work and the dissemination of its outcomes.

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REFERENCES

- [1] Bill Adair, Mark Stencel, Cathy Clabby, and Chengkai Li. 2019. The human touch in automated fact-checking. In *Proceedings of the 2019 Computation + Journalism Symposium* (Miami, FL, USA) (C+J 2019). 5 pages. <https://par.nsf.gov/servlets/purl/10111586>
- [2] Luca Maria Aiello, Georgios Petkos, Carlos Martin, David Corney, Symeon Papadopoulos, Ryan Skraba, Ayse Göker, Ioannis Kompatsiaris, and Alejandro Jaimes. 2013. Sensing Trending Topics in Twitter. *IEEE Transactions on Multimedia* 15, 6 (2013), 1268–1282. <https://doi.org/10.1109/TMM.2013.2265080>
- [3] Tanja Aitamurto, Mike Ananny, Chris W. Anderson, Larry Birnbaum, Nicholas Diakopoulos, Matilda Hanson, Jessica Hullman, and Nick Ritchie. 2019. HCI for Accurate, Impartial and Transparent Journalism: Challenges and Solutions. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland, UK) (CHI EA '19). 8 pages. <https://doi.org/10.1145/3290607.3299007>
- [4] Jennifer Allen, Antonio A. Arechar, Gordon Pennycook, and David G. Rand. 2021. Scaling up fact-checking using the wisdom of crowds. *Science Advances* 7, 36 (2021), 10 pages. <https://doi.org/10.1126/sciadv.abf4393>
- [5] Tim Althoff, Damian Borth, Jörn Hees, and Andreas Dengel. 2013. Analysis and Forecasting of Trending Topics in Online Media Streams. In *Proceedings of the 21st ACM International Conference on Multimedia* (Barcelona, Spain) (MM '13). 907–916. <https://doi.org/10.1145/2502081.2502117>
- [6] Michelle A. Amazeen. 2013. Making a Difference: A Critical Assessment of Fact-checking in 2012. *New America Foundation Policy Research Paper* (2013), 40 pages. https://static.newamerica.org/attachments/10215-making-a-difference/Amazeen_-_A_Critical_Assessment_of_Factchecking.4a3289cb3fcd4a8faf0d94f40ebcdc35.pdf
- [7] Michelle A. Amazeen. 2016. Checking the Fact-Checkers in 2008: Predicting Political Ad Scrutiny and Assessing Consistency. *Journal of Political Marketing* 15, 4 (2016), 433–464. <https://doi.org/10.1080/15377857.2014.959691>
- [8] Michelle A. Amazeen. 2019. Practitioner perceptions: Critical junctures and the global emergence and challenges of fact-checking. *International Communication Gazette* 81, 6–8 (2019), 541–561. <https://doi.org/10.1177/1748048518817674>
- [9] Michelle A. Amazeen. 2020. Journalistic interventions: The structural factors affecting the global emergence of fact-checking. *Journalism* 21, 1 (2020), 95–111. <https://doi.org/10.1177/1464884917730217>
- [10] Michelle A. Amazeen, Emily Thorson, Ashley Muddiman, and Lucas Graves. 2018. Correcting political and consumer Misperceptions: The effectiveness and effects of rating scale versus contextual correction formats. *Journalism & Mass Communication Quarterly* 95, 1 (2018), 28–48. <https://doi.org/10.1177/1077699016678186>
- [11] Chris W. Anderson. 2013. Towards a sociology of computational and algorithmic journalism. *New Media & Society* 15, 7 (2013), 1005–1021. <https://doi.org/10.1177/1461444812465137>
- [12] Ester Appelgren and Gunnar Nygren. 2014. Data Journalism in Sweden. *Digital Journalism* 2, 3 (2014), 394–405. <https://doi.org/10.1080/21670811.2014.884344>
- [13] Mihai Avram, Nicholas Micallef, Sameer Patil, and Filippo Menczer. 2020. Exposure to social engagement metrics increases vulnerability to misinformation. *The Harvard Kennedy School Misinformation Review* 1, 5 (2020), 11 pages. <https://doi.org/10.37016/mr-2020-033>
- [14] Stanley J. Baran, Dennis K. Davis, and Kelli Striby. 2012. *Mass communication theory: Foundations, ferment, and future* (7th ed.). Cengage Learning.
- [15] Jo Bardoel and Mark Deuze. 2001. 'Network journalism': Converging competences of media professionals and professionalism. *Australian Journalism Review* 23, 2 (2001), 91–103. <https://doi.org/10.3316/ielapa.200204961>
- [16] Oscar Barrera, Sergei Guriev, Emeric Henry, and Ekaterina Zhuravskaya. 2020. Facts, alternative facts, and fact checking in times of post-truth politics. *Journal of Public Economics* 182 (2020), 104–123. <https://doi.org/10.1016/j.jpe.2020.101616>

jpubeco.2019.104123

- [17] Hila Becker, Mor Naaman, and Luis Gravano. 2021. Beyond Trending Topics: Real-World Event Identification on Twitter. *Proceedings of the International AAAI Conference on Web and Social Media* 5, 1 (Aug 2021), 438–441. <https://ojs.aaai.org/index.php/ICWSM/article/view/14146>
- [18] Andrew Beers, Melinda McClure Haughey, Ahmer Arif, and Kate Starbird. 2020. Examining the digital toolsets of journalists reporting on disinformation. In *Proceedings of the 2020 Computation + Journalism Symposium* (Boston, MA, USA) (C+J 2020). 5 pages. https://cj2020.northeastern.edu/files/2020/02/CJ_2020_paper_50.pdf
- [19] Md Momen Bhuiyan, Amy X. Zhang, Connie Moon Sehat, and Tanushree Mitra. 2020. Investigating Differences in Crowdsourced News Credibility Assessment: Raters, Tasks, and Expert Criteria. *Proc. ACM Hum.-Comput. Interact.* 4, CSCW2, Article 93 (Oct 2020), 26 pages. <https://doi.org/10.1145/3415164>
- [20] Christina Boididou, Symeon Papadopoulos, Yiannis Kompatsiaris, Steve Schifferes, and Nic Newman. 2014. Challenges of Computational Verification in Social Multimedia. In *Proceedings of the 23rd International Conference on World Wide Web* (Seoul, Korea) (WWW '14 Companion). 743–748. <https://doi.org/10.1145/2567948.2579323>
- [21] Bert Jan Brands, Todd Graham, and Marcel Broersma. 2018. *Social Media Sourcing Practices: How Dutch Newspapers Use Tweets in Political News Coverage*. Springer International Publishing, Cham, 159–178. https://doi.org/10.1007/978-3-319-61708-4_9
- [22] Petter Bae Brandtzaeg and Asbjørn Følstad. 2017. Trust and Distrust in Online Fact-Checking Services. *Commun. ACM* 60, 9 (Aug 2017), 65–71. <https://doi.org/10.1145/3122803>
- [23] Petter Bae Brandtzaeg, Asbjørn Følstad, and María Ángeles Chaparro Domínguez. 2018. How Journalists and Social Media Users Perceive Online Fact-Checking and Verification Services. *Journalism Practice* 12, 9 (2018), 1109–1129. <https://doi.org/10.1080/17512786.2017.1363657>
- [24] J. Scott Brennen, Felix Simon, Philip N. Howard, and Rasmus Kleis Nielsen. 2020. Types, sources, and claims of COVID-19 misinformation. *Reuters Institute for the Study of Journalism* 7 (2020), 13 pages. [https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2020-04/Brennen%20-%20COVID%2019%20Misinformation%20FINAL%20\(3\).pdf](https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2020-04/Brennen%20-%20COVID%2019%20Misinformation%20FINAL%20(3).pdf)
- [25] Janelle Brown. 1996. BS Detector: 'Internet Addiction' Meme Gets Media High. <https://www.wired.com/1996/12/bs-detector-internet-addiction-meme-gets-media-high/> Accessed: 2022-02-13.
- [26] Peter Buneman, Sanjeev Khanna, and Tan Wang-Chiew. 2001. Why and Where: A Characterization of Data Provenance. In *Database Theory — ICDT 2001 (ICTD 2001, Lecture Notes in Computer Science, Vol. 1973)*, Jan Van den Bussche and Victor Vianu (Eds.). 316–330. https://doi.org/10.1007/3-540-44503-X_20
- [27] Andrew Chadwick. 2017. *The Hybrid Media System: Politics and Power* (2nd ed.). Oxford University Press. <https://doi.org/10.1093/oso/9780190696726.001.0001>
- [28] Kathy Charmaz and Linda Liska Belgrave. 2012. Qualitative Interviewing and Grounded Theory Analysis. In *The SAGE Handbook of Interview Research: The Complexity of the Craft* (2nd ed.), Jaber F. Gubrium, James A. Holstein, Amir B. Marvasti, and Karyn D. McKinney (Eds.). Vol. 2. SAGE Publications, Inc., Thousand Oaks, CA, USA, 347–366. <https://doi.org/10.4135/9781452218403.n25>
- [29] You-Wei Cheah and Beth Plale. 2012. Provenance analysis: Towards quality provenance. In *2012 IEEE 8th International Conference on E-Science*. 8 pages. <https://doi.org/10.1109/eScience.2012.6404480>
- [30] Emily Chen, Kristina Lerman, and Emilio Ferrara. 2020. Tracking Social Media Discourse About the COVID-19 Pandemic: Development of a Public Coronavirus Twitter Data Set. *JMIR Public Health Surveillance* 6, 2 (29 May 2020), 9 pages. <https://doi.org/10.2196/19273>
- [31] Giovanni Luca Ciampaglia, Prashant Shiralkar, Luis M. Rocha, Johan Bollen, Filippo Menczer, and Alessandro Flammini. 2015. Computational Fact Checking from Knowledge Networks. *PLOS ONE* 10, 6 (Jun 2015), 13 pages. <https://doi.org/10.1371/journal.pone.0128193>
- [32] Mark Coddington. 2020. Gathering evidence of evidence: News aggregation as an epistemological practice. *Journalism* 21, 3 (2020), 365–380. <https://doi.org/10.1177/1464884918817608>
- [33] Sarah Cohen, James T. Hamilton, and Fred Turner. 2011. Computational Journalism. *Commun. ACM* 54, 10 (Oct 2011), 66–71. <https://doi.org/10.1145/2001269.2001288>
- [34] Chenyun Dai, Dan Lin, Elisa Bertino, and Murat Kantarcioglu. 2008. An Approach to Evaluate Data Trustworthiness Based on Data Provenance. In *Secure Data Management*, Willem Jonker and Milan Petković (Eds.). 82–98. https://doi.org/10.1007/978-3-540-85259-9_6
- [35] Dharma Dailey and Kate Starbird. 2014. Journalists as crowdsourcers: Responding to crisis by reporting with a crowd. *Computer Supported Cooperative Work (CSCW)* 23 (2014), 445–481. <https://doi.org/10.1007/s10606-014-9208-z>
- [36] Michela Del Vicario, Alessandro Bessi, Fabiana Zollo, Fabio Petroni, Antonio Scala, Guido Caldarelli, H. Eugene Stanley, and Walter Quattrociocchi. 2016. The spreading of misinformation online. *Proceedings of the National Academy of Sciences* 113, 3 (2016), 554–559. <https://doi.org/10.1073/pnas.1517441113>
- [37] Nicholas Diakopoulos. 2016. Computational Journalism and the Emergence of News Platforms. In *The Routledge Companion to Digital Journalism Studies* (1st ed.), Bob Franklin and Scott A. Eldridge II (Eds.). Routledge, 176–184.

- [38] Nicholas Diakopoulos. 2019. *Automating the News: How Algorithms Are Rewriting the Media*. Harvard University Press. <https://doi.org/10.4159/9780674239302>
- [39] Nicholas Diakopoulos. 2019. Towards a Design Orientation on Algorithms and Automation in News Production. *Digital Journalism* 7, 8 (2019), 1180–1184. <https://doi.org/10.1080/21670811.2019.1682938>
- [40] Nicholas Diakopoulos. 2020. Computational News Discovery: Towards Design Considerations for Editorial Orientation Algorithms in Journalism. *Digital Journalism* 8, 7 (2020), 945–967. <https://doi.org/10.1080/21670811.2020.1736946>
- [41] Nicholas Diakopoulos, Munmun De Choudhury, and Mor Naaman. 2012. Finding and Assessing Social Media Information Sources in the Context of Journalism. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Austin, Texas, USA) (CHI '12). 2451–2460. <https://doi.org/10.1145/2207676.2208409>
- [42] Nicholas Diakopoulos, Sergio Goldenberg, and Irfan Essa. 2009. Videolyzer: Quality Analysis of Online Informational Video for Bloggers and Journalists. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Boston, MA, USA) (CHI '09). 799–808. <https://doi.org/10.1145/1518701.1518824>
- [43] Nicholas Diakopoulos, Mor Naaman, and Funda Kivran-Swaine. 2010. Diamonds in the rough: Social media visual analytics for journalistic inquiry. In *2010 IEEE Symposium on Visual Analytics Science and Technology*. 115–122. <https://doi.org/10.1109/VAST.2010.5652922>
- [44] Michael Dobbs. 2012. *The Rise of Political Fact-checking – How Reagan Inspired a Journalistic Movement: A Reporter's Eye View*. New America Foundation.
- [45] Ullrich K. H. Ecker, Ziggy O'Reilly, Jesse S. Reid, and Ee Pin Chang. 2020. The effectiveness of short-format refutational fact-checks. *British Journal of Psychology* 111, 1 (2020), 36–54. <https://doi.org/10.1111/bjop.12383>
- [46] Cristian Felix, Anshul Vikram Pandey, Enrico Bertini, Charles Ornstein, and Scott Klein. 2015. Revex: Visual Investigative Journalism with A Million Healthcare Reviews. In *Proceedings of the 2015 Computation + Journalism Symposium* (New York, NY, USA) (C+J 2015). 6 pages. <http://cj2015.brown.columbia.edu/papers/revex.pdf>
- [47] Katherine Fink and Chris W. Anderson. 2015. Data Journalism in the United States. *Journalism Studies* 16, 4 (2015), 467–481. <https://doi.org/10.1080/1461670X.2014.939852>
- [48] Samantha Finn, Panagiotis Takis Metaxas, and Eni Mustafaraj. 2015. Spread and Skepticism: Metrics of Propagation on Twitter. In *Proceedings of the ACM Web Science Conference* (Oxford, United Kingdom) (WebSci '15). Article 39, 2 pages. <https://doi.org/10.1145/2786451.2786512>
- [49] Claudia Flores-Saviaga and Saiph Savage. 2021. Fighting disaster misinformation in Latin America: The #19S Mexican earthquake case study. *Personal and Ubiquitous Computing* 25 (2021), 353–373. <https://doi.org/10.1007/s00779-020-01411-5>
- [50] Heather Ford and Jonathon Hutchinson. 2019. Newsbots That Mediate Journalist and Audience Relationships. *Digital Journalism* 7, 8 (2019), 1013–1031. <https://doi.org/10.1080/21670811.2019.1626752>
- [51] Karen Freberg, Kristin Graham, Karen McGaughey, and Laura A. Freberg. 2011. Who are the social media influencers? A study of public perceptions of personality. *Public Relations Review* 37, 1 (2011), 90–92. <https://doi.org/10.1016/j.pubrev.2010.11.001>
- [52] Kim Fridkin, Jillian Courey, Samantha Hernandez, and Joshua Spears. 2016. Gender Differences in Reactions to Fact Checking of Negative Commercials. *Politics & Gender* 12, 2 (2016), 369–390. <https://doi.org/10.1017/S1743923X16000076>
- [53] Kim Fridkin, Patrick J. Kenney, and Amanda Wintersieck. 2015. Liar, Liar, Pants on Fire: How Fact-Checking Influences Citizens' Reactions to Negative Advertising. *Political Communication* 32, 1 (2015), 127–151. <https://doi.org/10.1080/10584609.2014.914613>
- [54] Kiran Garimella, Gianmarco De Francisci Morales, Aristides Gionis, and Michael Mathioudakis. 2018. Quantifying Controversy on Social Media. *Trans. Soc. Comput.* 1, 1, Article 3 (Jan 2018), 27 pages. <https://doi.org/10.1145/3140565>
- [55] R. Kelly Garrett and Brian E. Weeks. 2013. *The promise and peril of real-time corrections to political misperceptions*. Association for Computing Machinery, New York, NY, USA, 1047–1058. <https://doi.org/10.1145/2441776.2441895>
- [56] Boris Glavic and Klaus R. Dittrich. 2007. Data provenance: A Categorization of existing approaches. In *Datenbanksysteme in Business, Technologie und Web (BTW '07: Lecture Notes in Informatics (LNI) Proceedings*, 103). 227–241. <https://doi.org/10.5167/uzh-24450>
- [57] Lucas Graves. 2016. *Deciding What's True: The Rise of Political Fact-Checking in American Journalism*. Columbia University Press. <https://cup.columbia.edu/book/deciding-whats-true/9780231542227>
- [58] Lucas Graves. 2017. Anatomy of a Fact Check: Objective Practice and the Contested Epistemology of Fact Checking. *Communication, Culture and Critique* 10, 3 (Oct 2017), 518–537. <https://doi.org/10.1111/cccr.12163>
- [59] Lucas Graves. 2018. Boundaries Not Drawn. *Journalism Studies* 19, 5 (2018), 613–631. <https://doi.org/10.1080/1461670X.2016.1196602>
- [60] Lucas Graves and Michelle A. Amazeen. 2019. Fact-checking as Idea and Practice in Journalism. In *Oxford Research Encyclopedia of Communication*. <https://doi.org/10.1093/acrefore/9780190228613.013.808>

- [61] Lucas Graves and Magda Konieczna. 2015. Sharing the news: Journalistic collaboration as field repair. *International Journal of Communication* 9 (2015), 1966–1984. <https://ijoc.org/index.php/ijoc/article/view/3381/1412>
- [62] Lucas Graves, Brendan Nyhan, and Jason Reifler. 2016. Understanding Innovations in Journalistic Practice: A Field Experiment Examining Motivations for Fact-Checking. *Journal of Communication* 66, 1 (Jan 2016), 102–138. <https://doi.org/10.1111/jcom.12198>
- [63] Aditi Gupta and Ponnurangam Kumaraguru. 2012. Credibility Ranking of Tweets during High Impact Events. In *Proceedings of the 1st Workshop on Privacy and Security in Online Social Media* (Lyon, France) (PSOSM '12). Article 2, 7 pages. <https://doi.org/10.1145/2185354.2185356>
- [64] Aditi Gupta, Ponnurangam Kumaraguru, Carlos Castillo, and Patrick Meier. 2014. *TweetCred: Real-Time Credibility Assessment of Content on Twitter*. Springer International Publishing, Cham, 228–243. https://doi.org/10.1007/978-3-319-13734-6_16
- [65] Md Mahfuzul Haque, Mohammad Yousuf, Ahmed Shatil Alam, Pratyasha Saha, Syed Ishtiaque Ahmed, and Naeemul Hassan. 2020. Combating Misinformation in Bangladesh: Roles and Responsibilities as Perceived by Journalists, Fact-Checkers, and Users. *Proc. ACM Hum.-Comput. Interact.* 4, CSCW2, Article 130 (Oct 2020), 32 pages. <https://doi.org/10.1145/3415201>
- [66] Naeemul Hassan, Fatma Arslan, Chengkai Li, and Mark Tremayne. 2017. Toward Automated Fact-Checking: Detecting Check-Worthy Factual Claims by ClaimBuster. In *Proceedings of the 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (Halifax, NS, Canada) (KDD '17). 1803–1812. <https://doi.org/10.1145/3097983.3098131>
- [67] Naeemul Hassan, Gensheng Zhang, Fatma Arslan, Josue Caraballo, Damian Jimenez, Siddhant Gawsane, Shohedul Hasan, Minumol Joseph, Aaditya Kulkarni, Anil Kumar Nayak, Vikas Sable, Chengkai Li, and Mark Tremayne. 2017. ClaimBuster: The First-Ever End-to-End Fact-Checking System. *Proc. VLDB Endow.* 10, 12 (Aug 2017), 1945–1948. <https://doi.org/10.14778/3137765.3137815>
- [68] Emeric Henry, Ekaterina Zhuravskaya, and Sergei Guriev. 2021. Checking and sharing alt-facts. *Economic Policy* (2021). <https://doi.org/10.2139/ssrn.3597191> In Press.
- [69] Alfred Hermida. 2010. Twittering The News. *Journalism Practice* 4, 3 (2010), 297–308. <https://doi.org/10.1080/17512781003640703>
- [70] Hsiu-Fang Hsieh and Sarah E. Shannon. 2005. Three Approaches to Qualitative Content Analysis. *Qualitative Health Research* 15, 9 (2005), 1277–1288. <https://doi.org/10.1177/1049732305276687>
- [71] Binxuan Huang and Kathleen M. Carley. 2020. Disinformation and Misinformation on Twitter during the Novel Coronavirus Outbreak. arXiv:2006.04278 [cs.SI]
- [72] Scott A. Eldridge II, Kristy Hess, Edson C. Tandoc Jr., and Oscar Westlund. 2019. Navigating the Scholarly Terrain: Introducing the Digital Journalism Studies Compass. *Digital Journalism* 7, 3 (2019), 386–403. <https://doi.org/10.1080/21670811.2019.1599724>
- [73] Kathleen Hall Jamieson. 2013. *Electing the President, 2012: The Insiders' View*. University of Pennsylvania Press.
- [74] Jeffrey W. Jarman. 2016. Influence of Political Affiliation and Criticism on the Effectiveness of Political Fact-Checking. *Communication Research Reports* 33, 1 (2016), 9–15. <https://doi.org/10.1080/08824096.2015.1117436>
- [75] Shan Jiang and Christo Wilson. 2018. Linguistic Signals under Misinformation and Fact-Checking: Evidence from User Comments on Social Media. *Proc. ACM Hum.-Comput. Interact.* 2, CSCW, Article 82 (Nov 2018), 23 pages. <https://doi.org/10.1145/3274351>
- [76] Kenza Lamot and Steve Paulussen. 2020. Six Uses of Analytics: Digital Editors' Perceptions of Audience Analytics in the Newsroom. *Journalism Practice* 14, 3 (2020), 358–373. <https://doi.org/10.1080/17512786.2019.1617043>
- [77] Kathy Lee, Diana Palsetia, Ramanathan Narayanan, Md. Mostofa Ali Patwary, Ankit Agrawal, and Alok Choudhary. 2011. Twitter Trending Topic Classification. In *2011 IEEE 11th International Conference on Data Mining Workshops*. 251–258. <https://doi.org/10.1109/ICDMW.2011.171>
- [78] Piroska Lendvai, Isabelle Augenstein, Kalina Bontcheva, and Thierry Declerck. 2016. Monolingual social media datasets for detecting contradiction and entailment. In *Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC '16)*. 4602–4605. <https://aclanthology.org/L16-1729>
- [79] Piroska Lendvai and Uwe D. Reichel. 2016. Contradiction Detection for Rumorous Claims. arXiv:1611.02588 [cs.CL]
- [80] Seth C. Lewis and Oscar Westlund. 2015. Actors, Actants, Audiences, and Activities in Cross-Media News Work. *Digital Journalism* 3, 1 (2015), 19–37. <https://doi.org/10.1080/21670811.2014.927986>
- [81] Xiaomo Liu, Armineh Nourbakhsh, Quanzhi Li, Sameena Shah, Robert Martin, and John Duprey. 2017. Reuters tracer: Toward automated news production using large scale social media data. In *2017 IEEE International Conference on Big Data (Big Data 2017)*. IEEE, 1483–1493. <https://doi.org/10.1109/BigData.2017.8258082>
- [82] Wilson Lowrey. 2017. The Emergence and Development of News Fact-checking Sites. *Journalism Studies* 18, 3 (2017), 376–394. <https://doi.org/10.1080/1461670X.2015.1052537>

- [83] Niklas Luhmann. 1975. Einfache Sozialsysteme. In *Soziologische Aufklärung 2*. Springer, 21–38. https://doi.org/10.1007/978-3-663-12374-3_2
- [84] Michal Lukasik, Trevor Cohn, and Kalina Bontcheva. 2015. Classifying Tweet Level Judgements of Rumours in Social Media. arXiv:1506.00468 [cs.SI]
- [85] Michal Lukasik, P. K. Srijith, Duy Vu, Kalina Bontcheva, Arkaitz Zubiaga, and Trevor Cohn. 2016. Hawkes processes for continuous time sequence classification: An application to rumour stance classification in Twitter. In *Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics*, Vol. 2: Short Papers. 393–398. <https://doi.org/10.18653/v1/P16-2064>
- [86] Måns Magnusson, Jens Finnäs, and Leonard Wallentin. 2016. Finding the news lead in the data haystack: Automated local data journalism using crime data. In *Proceedings of the 2016 Computation + Journalism Symposium* (Stanford, CA, USA) (C+J 2016). 4 pages. <https://journalism.stanford.edu/cj2016/files/Finding%20the%20news%20lead%20in%20the%20data%20haystack.pdf>
- [87] Drew B. Margolin, Aniko Hannak, and Ingmar Weber. 2018. Political Fact-Checking on Twitter: When Do Corrections Have an Effect? *Political Communication* 35, 2 (2018), 196–219. <https://doi.org/10.1080/10584609.2017.1334018>
- [88] Hana Matatov, Adina Bechhofer, Lora Aroyo, Ofra Amir, and Mor Naaman. 2019. DejaVu: A System for Journalists to Collaboratively Address Visual Misinformation. In *Proceedings of the 2019 Computation + Journalism Symposium* (Miami, FL, USA) (C+J 2019). 5 pages.
- [89] Melinda McClure Haughey, Meena Devii Muralikumar, Cameron A. Wood, and Kate Starbird. 2020. On the Misinformation Beat: Understanding the Work of Investigative Journalists Reporting on Problematic Information Online. *Proc. ACM Hum.-Comput. Interact.* 4, CSCW2, Article 133 (Oct 2020), 22 pages. <https://doi.org/10.1145/3415204>
- [90] Paul Mena. 2019. Principles and Boundaries of Fact-checking: Journalists' Perceptions. *Journalism Practice* 13, 6 (2019), 657–672. <https://doi.org/10.1080/17512786.2018.1547655>
- [91] Panagiotis Takas Metaxas, Samantha Finn, and Eni Mustafaraj. 2015. Using TwitterTrails.Com to Investigate Rumor Propagation. In *Proceedings of the 18th ACM Conference Companion on Computer Supported Cooperative Work & Social Computing* (Vancouver, BC, Canada) (CSCW '15 Companion). 69–72. <https://doi.org/10.1145/2685553.2702691>
- [92] Nicholas Micallef, Mihai Avram, Filippo Menczer, and Sameer Patil. 2021. Fakey: A Game Intervention to Improve News Literacy on Social Media. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW1, Article 6 (April 2021), 27 pages. <https://doi.org/10.1145/3449080>
- [93] Nicholas Micallef, Bing He, Srijan Kumar, Mustaque Ahamad, and Nasir Memon. 2020. The role of the crowd in countering misinformation: A case study of the COVID-19 infodemic. In *2020 IEEE International Conference on Big Data (Big Data 2020)*. IEEE, 748–757. <https://doi.org/10.1109/BigData50022.2020.9377956>
- [94] Armineh Nourbakhsh, Quanzhi Li, Xiaomo Liu, and Sameena Shah. 2017. “Breaking” Disasters: Predicting and Characterizing the Global News Value of Natural and Man-made Disasters. arXiv:1709.02510 [cs.SI]
- [95] Brendan Nyhan and Jason Reifler. 2010. When corrections fail: The persistence of political misperceptions. *Political Behavior* 32, 2 (2010), 303–330. <https://doi.org/10.1007/s11109-010-9112-2>
- [96] Brendan Nyhan, Jason Reifler, and Peter A. Ubel. 2013. The Hazards of Correcting Myths About Health Care Reform. *Medical Care* 51, 2 (2013), 127–132. <https://doi.org/10.1097/MLR.0b013e318279486b>
- [97] Deokgun Park, Simranjit Sachar, Nicholas Diakopoulos, and Niklas Elmquist. 2016. *Supporting Comment Moderators in Identifying High Quality Online News Comments*. Association for Computing Machinery, New York, NY, USA, 1114–1125. <https://doi.org/10.1145/2858036.2858389>
- [98] Raymond James Pingree, Dominique Brossard, and Douglas M. McLeod. 2014. Effects of Journalistic Adjudication on Factual Beliefs, News Evaluations, Information Seeking, and Epistemic Political Efficacy. *Mass Communication and Society* 17, 5 (2014), 615–638. <https://doi.org/10.1080/15205436.2013.821491>
- [99] Titus Plattner, Didier Orel, and Olivier Steiner. 2016. Flexible data scraping, multi-language indexing, entity extraction and taxonomies: Tadam, a Swiss tool to deal with huge amounts of unstructured data. In *Proceedings of the 2016 Computation + Journalism Symposium* (Stanford, CA, USA) (C+J 2016). 5 pages. <https://journalism.stanford.edu/cj2016/files/Flexible%20data%20scraping%20multi-language%20indexing%20entity%20extraction%20and%20taxonomies.pdf>
- [100] Ethan Porter, Thomas J. Wood, and David Kirby. 2018. Sex Trafficking, Russian Infiltration, Birth Certificates, and Pedophilia: A Survey Experiment Correcting Fake News. *Journal of Experimental Political Science* 5, 2 (2018), 159–164. <https://doi.org/10.1017/XPS.2017.32>
- [101] Walter Quattrociocchi, Antonio Scala, and Cass R. Sunstein. 2016. Echo chambers on Facebook. *Available at: Social Science Research Network (SSRN)* (2016), 15 pages. <https://doi.org/10.2139/ssrn.2795110>
- [102] Paul Resnick, Samuel Carton, Souneil Park, Yuncheng Shen, and Nicole Zeffer. 2014. RumorLens: A system for Analyzing the Impact of Rumors and Corrections in Social Media. In *Proceedings of the 2014 Computation + Journalism Symposium* (New York, NY, USA) (C+J 2014). 5 pages.
- [103] Ronald E. Robertson and Christo Wilson. 2020. WebSearcher: Tools for Auditing Web Search. In *Proceedings of the 2020 Computation + Journalism Symposium* (Boston, MA, USA) (C+J 2020). 4 pages. <https://cj2020.northeastern.edu/>

[files/2020/02/CJ_2020_paper_38.pdf](#)

- [104] Niloufar Salehi, Andrew McCabe, Melissa Valentine, and Michael Bernstein. 2017. Huddler: Convening Stable and Familiar Crowd Teams Despite Unpredictable Availability. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) (CSCW '17). 1700–1713. <https://doi.org/10.1145/2998181.2998300>
- [105] Niloufar Salehi, Jaime Teevan, Shamsi Iqbal, and Ece Kamar. 2017. Communicating Context to the Crowd for Complex Writing Tasks. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) (CSCW '17). 1890–1901. <https://doi.org/10.1145/2998181.2998332>
- [106] Matthew J. Salganik and Robin C. Lee. 2020. To Apply Machine Learning Responsibly, We Use It in Moderation. <https://open.nytimes.com/to-apply-machine-learning-responsibly-we-use-it-in-moderation-d001f49e0644> Accessed: 2022-02-13.
- [107] Raz Schwartz, Mor Naaman, and Rannie Teodoro. 2021. Editorial Algorithms: Using Social Media to Discover and Report Local News. *Proceedings of the International AAAI Conference on Web and Social Media* 9, 1 (Aug 2021), 407–415. <https://ojs.aaai.org/index.php/ICWSM/article/view/14633>
- [108] Chengcheng Shao, Giovanni Luca Ciampaglia, Alessandro Flammini, and Filippo Menczer. 2016. Hoaxy: A Platform for Tracking Online Misinformation. In *Proceedings of the 25th International Conference Companion on World Wide Web* (Montréal, Québec, Canada) (WWW '16 Companion). 745–750. <https://doi.org/10.1145/2872518.2890098>
- [109] Karishma Sharma, Sungyong Seo, Chuizheng Meng, Sirisha Rambhatla, and Yan Liu. 2020. COVID-19 on Social Media: Analyzing Misinformation in Twitter Conversations. arXiv:2003.12309 [cs.SI]
- [110] Matt Shearer, Basile Simon, and Clement Geiger. 2014. Datastranger: Easy dataset monitoring for journalists. In *Proceedings of the 2014 Computation + Journalism Symposium* (New York, NY, USA) (C+J 2014). 5 pages.
- [111] Pamela J. Shoemaker and Timothy Vos. 2009. *Gatekeeping Theory* (1st ed.). Routledge. <https://doi.org/10.4324/9780203931653>
- [112] Kai Shu, Amy Sliva, Suhang Wang, Jiliang Tang, and Huan Liu. 2017. Fake news detection on social media: A data mining perspective. *SIGKDD Explor. Newsl.* 19, 1 (Sep 2017), 22–36. <https://doi.org/10.1145/3137597.3137600>
- [113] Fred S. Siebert, Theodore Peterson, and Wilbur Schramm. 1956. *Four Theories of the Press: The Authoritarian, Libertarian, Social Responsibility, and Soviet Communist Concepts of What the Press Should Be and Do*. University of Illinois Press.
- [114] Craig Silverman. 2015. Lies, Damn Lies, and Viral Content. A Tow/Knight Report (Sep 2015), 149 pages. <https://doi.org/10.7916/D8Q81RHH>
- [115] Sarah Harrison Smith. 2007. *The Fact Checker's Bible: A Guide to Getting It Right*. Knopf Doubleday Publishing Group.
- [116] Anselm Strauss and Juliet M. Corbin. 1997. *Grounded Theory in Practice*. SAGE Publications, Inc.
- [117] James Thorne, Andreas Vlachos, Christos Christodoulopoulos, and Arpit Mittal. 2018. FEVER: A large-scale dataset for Fact Extraction and VERification. arXiv:1803.05355 [cs.CL]
- [118] Emily Thorson. 2016. Belief echoes: The persistent effects of corrected misinformation. *Political Communication* 33, 3 (2016), 460–480. <https://doi.org/10.1080/10584609.2015.1102187>
- [119] Neil Thurman. 2018. Social Media, Surveillance, and News Work. *Digital Journalism* 6, 1 (2018), 76–97. <https://doi.org/10.1080/21670811.2017.1345318>
- [120] Neil Thurman, Konstantin Dörr, and Jessica Kunert. 2017. When Reporters Get Hands-on with Robo-Writing. *Digital Journalism* 5, 10 (2017), 1240–1259. <https://doi.org/10.1080/21670811.2017.1289819>
- [121] Neil Thurman, Steve Schifferes, Richard Fletcher, Nic Newman, Stephen Hunt, and Aljosha Karim Schapals. 2016. Giving Computers a Nose for News. *Digital Journalism* 4, 7 (2016), 838–848. <https://doi.org/10.1080/21670811.2016.1149436>
- [122] Peter Tolmie, Rob Procter, David William Randall, Mark Rouncefield, Christian Burger, Geraldine Wong Sak Hoi, Arkaitz Zubiaga, and Maria Liakata. 2017. Supporting the Use of User Generated Content in Journalistic Practice. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) (CHI '17). 3632–3644. <https://doi.org/10.1145/3025453.3025892>
- [123] Gaye Tuchman. 1973. Making News by Doing Work: Routinizing the Unexpected. *Amer. J. Sociology* 79, 1 (1973), 110–131. <https://doi.org/10.1086/225510>
- [124] Annamari Van Wyk. 2017. *Fact-checking in the Global South: Facts about non-profit journalism funding models – A case study*. Master's thesis. Stellenbosch University. <http://hdl.handle.net/10019/1/101020>
- [125] Sukrit Venkatagiri, Jacob Thebault-Spieker, Rachel Kohler, John Purviance, Rifat Sabbir Mansur, and Kurt Luther. 2019. GroundTruth: Augmenting Expert Image Geolocation with Crowdsourcing and Shared Representations. *Proc. ACM Hum.-Comput. Interact.* 3, CSCW, Article 107 (Nov. 2019), 30 pages. <https://doi.org/10.1145/3359209>
- [126] Carlos Vicent and Antonio Moreno. 2015. Unsupervised topic discovery in micro-blogging networks. *Expert Systems with Applications* 42, 17 (2015), 6472–6485. <https://doi.org/10.1016/j.eswa.2015.04.014>
- [127] Nathan Walter, Jonathan Cohen, Lance Holbert, and Yasmin Morag. 2020. Fact-Checking: A Meta-Analysis of What Works and for Whom. *Political Communication* 37, 3 (2020), 350–375. <https://doi.org/10.1080/10584609.2019.1668894>

- [128] Jianwu Wang, Daniel Crawl, Shweta Purawat, Mai Nguyen, and Ilkay Altintas. 2015. Big data provenance: Challenges, state of the art and opportunities. In *2015 IEEE International Conference on Big Data (Big Data 2015)*. IEEE, 2509–2516. <https://doi.org/10.1109/BigData.2015.7364047>
- [129] William Yang Wang. 2017. “Liar, Liar Pants on Fire”: A New Benchmark Dataset for Fake News Detection. arXiv:1705.00648 [cs.CL]
- [130] Brian E. Weeks. 2015. Emotions, Partisanship, and Misperceptions: How Anger and Anxiety Moderate the Effect of Partisan Bias on Susceptibility to Political Misinformation. *Journal of Communication* 65, 4 (Jun 2015), 699–719. <https://doi.org/10.1111/jcom.12164>
- [131] Brian E. Weeks and R. Kelly Garrett. 2014. Electoral Consequences of Political Rumors: Motivated Reasoning, Candidate Rumors, and Vote Choice during the 2008 U.S. Presidential Election. *International Journal of Public Opinion Research* 26, 4 (Mar 2014), 401–422. <https://doi.org/10.1093/ijpor/edu005>
- [132] David Manning White. 1950. The “Gate Keeper”: A Case Study in the Selection of News. *Journalism Quarterly* 27, 4 (1950), 383–390. <https://doi.org/10.1177/107769905002700403>
- [133] Thomas Wood and Ethan Porter. 2019. The elusive backfire effect: Mass attitudes’ steadfast factual adherence. *Political Behavior* 41, 1 (2019), 135–163. <https://doi.org/10.1007/s11109-018-9443-y>
- [134] Waheeb Yaqub, Otari Kakhidze, Morgan L. Brockman, Nasir Memon, and Sameer Patil. 2020. Effects of credibility indicators on social media news sharing intent. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) (*CHI ’20*). 14 pages. <https://doi.org/10.1145/3313831.3376213>
- [135] Dannagal G. Young, Kathleen Hall Jamieson, Shannon Poulsen, and Abigail Goldring. 2018. Fact-checking effectiveness as a function of format and tone: Evaluating FactCheck.org and FlackCheck.org. *Journalism & Mass Communication Quarterly* 95, 1 (2018), 49–75. <https://doi.org/10.1177/1077699017710453>
- [136] Zhe Zhao, Paul Resnick, and Qiaozhu Mei. 2015. Enquiring Minds: Early Detection of Rumors in Social Media from Enquiry Posts. In *Proceedings of the 24th International Conference on World Wide Web* (Florence, Italy) (*WWW ’15*). 1395–1405. <https://doi.org/10.1145/2736277.2741637>
- [137] Jonathan Zong, Dhiraj Barnwal, Rupayan Neogy, and Arvind Satyanarayan. 2021. Lyra 2: Designing Interactive Visualizations by Demonstration. *IEEE Transactions on Visualization and Computer Graphics* 27, 2 (2021), 304–314. <https://doi.org/10.1109/TVCG.2020.3030367>
- [138] Arkaitz Zubiaga, Elena Kochkina, Maria Liakata, Rob Procter, and Michal Lukasik. 2016. Stance Classification in Rumours as a Sequential Task Exploiting the Tree Structure of Social Media Conversations. arXiv:1609.09028 [cs.CL]
- [139] Arkaitz Zubiaga, Maria Liakata, and Rob Procter. 2016. Learning Reporting Dynamics during Breaking News for Rumour Detection in Social Media. arXiv:1610.07363 [cs.CL]

A INTERVIEW PROTOCOL

[Ice breaker question on a topic unrelated to fact-checking to establish connection and rapport.]

Thank you for taking the time to participate in this interview. With your permission, I will start the recording. Your responses will be anonymized. Your participation in this interview will not be revealed to anyone other than the researchers. We will not publish the name of your organization.

The purpose of this interview is to understand the work practices and processes that fact-checkers adopt in their daily job. We want to understand the reasoning behind your choices when fact-checking items. Please keep in mind that there is no single correct answer to these questions. Please answer the questions based on your own knowledge and experiences.

This interview can take up to an hour and a half. Make yourself comfortable, and feel free to stop and take a break at any time.

- Do you have any questions before we start?

A.1 Introductory Questions

- What do you do for a living?
- How do you define fact-checking?

A.2 Process and Methods

- Which type of claims do you fact-check? From which media?
- How does the process differ based on whether you are fact-checking text, images, video, or audio?
- What happens if the images, video, and audio come from a source other than the source of article? Do they get fact-checked separately?
- What are the situations in which these methods or principles change?
- How long does it take you to fact-check a claim?
- How many claims do you normally check in a day?
- Is your organization involved in live fact-checking (e.g., fact-checking an ongoing speech or debate)? If yes, how does the process change based on the time constraints and the importance of the event?
- What do you do if you find out that a claim was fact-checked by another organization? Do you still carry out an independent investigation? Why or why not?
- What do you do if new information comes out during the fact-checking process?
- What kind of challenges do you encounter in the fact-checking process? What do you do when you run into these issues? How do you address them?
- How does being a fact-checker affect your personal safety and well-being?

A.3 Personnel Selection

- What factors are taken into consideration in your organization when assigning a person to fact-check a claim?
- Who makes this decision?
- In which situations does the reasoning used to make this decision depend on the person who will fact-check the claim?

A.4 Claims and Sources

- How do you select which claims to fact-check?
- How do you handle multiple claims? How do you decide whether to combine or split claims?

- How often is the primary source of the claim checked?
- What do you do if the primary source cannot be reached?
- How does the reliability of the source of the claim affect fact-checking rigor?
- How do you decide on the method(s) used to fact-check a claim from a given source?

A.5 Stakeholders

- How do you reach out to persons who are mentioned in a claim? What happens if the persons cannot be reached?
- What type of domain experts do you use in the process?
- At which stage do you contact domain experts? Are they internal or external domain experts? Which of these do you prefer and why?
- During the fact-checking process, how do you collaborate with journalists and other fact-checkers? What is your opinion about such collaboration?

A.6 Impartiality, Transparency, and Conflicts of Interest

- What do you do when a claim cannot be checked reliably or at all?
- What does impartiality mean to you?
- How do you keep yourself impartial during the fact-checking process?
- How do you communicate your impartiality when you publish your results?
- What does conflict of interest mean to you?
- How do you handle conflicts of interest?
- Which strategies and techniques do you use to keep your fact-checking process transparent? How do you communicate your process when you publish your results?
- During the fact-checking process, how do you handle potential backlash to your judgment? How do you prepare for potential backlash?
- How do you determine what rating (e.g., false, mostly false, mostly true, true, etc.) to assign to an article that you fact-checked?
- Who comes up with the rating scheme?

A.7 Increasing Efficiency

- What could make your work as a fact-checker easier?
- What could help you fact-check more claims in the same amount of time?

A.8 Technology

- How is technology used in your organization during the fact-checking process? What is your experience regarding the technology used?
- What is your opinion about the use of technology for fact-checking?
- How do you think that technology could be used to make your life easier and enable you to fact-check more claims in the same amount of time?
- In which stages of the fact-checking process do you feel that technology could be used effectively?
- What technologies do you think should be developed for fact-checking purposes?
- What is your opinion about the fact-checking process being automated?

A.9 Closing

- Is there anything else that we should have asked?
- Is there anything else you would like to tell us?

B DEMOGRAPHIC QUESTIONNAIRE

- (1) What is your year of birth?
 - [Drop-down menu of years]
- (2) What is your gender?
 - Male
 - Female
 - Non-binary
 - Prefer to self describe: [Text box]
- (3) Please provide the city and country where you work/live: [Text box]
- (4) How many years have you lived in this country?
 - 1
 - 2
 - 3
 - 4
 - 5
 - More than 5
- (5) Which of the options below best describes the locality where you live?
 - Urban
 - Suburban
 - Rural
 - Other. Please specify: [Text box]
- (6) What is your ethnic background? (*Select all that apply.*)
 - American Indian or Native American
 - Asian
 - Black or African American
 - White
 - Hispanic
 - Prefer not to say
 - Other. Please specify: [Text box]
- (7) What is the highest level of education you have completed? (If currently enrolled, highest degree received.)
 - Less than high school
 - High school graduate
 - High school diploma
 - Vocational training
 - Some college
 - College graduate (B.S., B.A., or other 4 year degree)
 - Master's degree
 - Doctoral degree
 - Professional degree after college (e.g., Law or Medical school)
 - Prefer not to say
 - Other. Please Specify: [Text box]

- (8) What is your current employment status? (*Select all that apply.*)
- Employed full-time
 - Employed part-time
 - Unemployed looking for work
 - Unemployed not looking for work
 - Retired
 - Student
 - Disabled
 - Homemaker
 - Prefer not to say
 - Other. Please Specify: [Text box]
- (9) On a scale of 1-7, with 1 being Extremely Conservative and 7 being Extremely Liberal, where would you place yourself?
- 1 (Extremely Conservative)
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7 (Extremely Liberal)
- (10) What is your religious affiliation? [Text box]
- (11) What is your native language? (*Select all that apply.*)
- Arabic
 - Bengali
 - Chinese
 - English
 - French
 - German
 - Hindi
 - Japanese
 - Portuguese
 - Russian
 - Spanish
 - Other. Please specify: [Text box]
- (12) How long have you worked as a fact-checker? [Text box]
- (13) For which organization(s) do you perform or have you performed fact-checking? [Text box]

- (14) Which of the following types of news are you interested in? (*Select all that apply.*)
- News about your region
 - Local News about your town or city
 - Business and financial news
 - News about the economy
 - Entertainment and celebrity news
 - Fun and/or weird news
 - Health and education news
 - Arts and culture news
 - Sports news
 - News about politics
 - Science and technology news
 - Other. Please specify: [Text box]
- (15) Which of the following sources do you consider the most important for news and information?
- Print newspapers
 - Radio
 - Local television
 - National television (e.g., ABC, CBS, NBC)
 - Cable television (e.g., CNN, Fox News, MSNBC)
 - Online news sites or apps (excluding social media and blogs)
 - Blogs
 - Social media (e.g., Facebook, Twitter, Whatsapp)
 - Other. Please specify: [Text box]

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