Report on the 2nd Workshop on Reducing Online Misinformation through Credible Information Retrieval (ROMCIR 2022) at ECIR 2022

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Abstract

The 2022 Workshop on Reducing Online Misinformation through Credible Information Retrieval (ROMCIR 2022), at its Second Edition as part of the Satellite Events of the 44th European Conference on Information Retrieval (ECIR 2022), was concerned with providing users with access to genuine information, to mitigate the information disorder phenomenon characterizing the current online environment. This problem is very broad, as it concerns distinct information objects (e.g., Web pages, online accounts, social media posts, etc.) on different platforms, and several domains and purposes (e.g., detecting fake news, retrieving genuine health-related information, reducing propaganda and hate-speech, etc.). In this context, all those approaches that can serve, from multiple perspectives, to tackle the genuine information access problem, found their place. In particular, this year articles have been submitted that addressed the problem of preventing access to health misinformation and assessing the genuineness of multi-modal information.

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1 Background

Coming into contact with different types of misleading content that is propagated online, especially through social media platforms [Pasi and Viviani, 2020; Viviani and Pasi, 2017], can lead to several problems for individuals and society as a whole, as we have experienced especially in recent years. False news can, for example, influence public opinion in political and financial choices [Lazer et al., 2018; Caldarelli et al., 2020]; false reviews can promote substandard products or, on the contrary, damage florid economic activities by means on discredit campaigns [Barbado et al., 2019; Wu et al., 2020]; unverified health information can lead people to follow behaviors that can be harmful both individually and globally [Tagliabue et al., 2020; Upadhyay et al., 2021; Di Sotto and

Viviani, 2022; Caldarelli et al., 2021] (let us think, for example, of the risk of following negationism hypotheses in the context of the recent COVID-19 pandemic [Valenti and Silva, 2021]).

This scenario is due to the so-called *information disorder* phenomenon [Wardle and Derakhshan, 2017], which indicates the proliferation of different forms of (online) communication pollution, encompassing *dis-*, *mis-*, and *mal-information*. Specifically, *misinformation* is the spread of false content resulting from the spreader's ignorance; *disinformation* is a form of intentional sharing of false content to produce harm; *malinformation* indicates the spread of (private) information that is based on reality, having the same harmful intent (e.g., the despicable act of revenge porn). Access to this non-genuine information is made easier and easier due to the fact that, from a technological point of view, information is produced at a speed and volume never seen before, almost without any trusted traditional intermediary [Carminati et al., 2013; Eysenbach, 2008]. Faced with this huge amount of information, and the uncertainty associated with its degree of genuineness, human cognitive abilities are not always sufficient to take well-informed decisions [Metzger and Flanagin, 2013].

In this context, it is clear that the problem of guaranteeing access to genuine information online needs to find effective solutions, despite (and precisely because of) it is very broad, as it concerns different information objects (e.g., Web pages, online accounts, social media posts, etc.), different online platforms (e.g., Web portals, social networking services, question-answering systems, etc.), and different domains and purposes (e.g., detecting fake news, retrieving genuine health-related information, reducing propaganda and hate-speech, etc.).

2 Scientific Objectives and Topics of Interest

Within the ECIR conference, the key goal of the Workshop was to encourage a discussion between researchers, also belonging to different disciplines, and propose innovative approaches, about the problem of guarantee to users access to genuine information that does not distort their perception of reality, through Information Retrieval solutions [Ginsca et al., 2015]. In recent years, despite numerous approaches have been proposed to tackle the considered issue in different contexts, and for different purposes, we are still a long way from having found completely effective and domain-independent solutions.

The problem is still of great interest with respect to many research directions, such as the access to and retrieval of genuine information [Ginsca et al., 2015; Goeuriot et al., 2021], the early detection of dis-/mis-/mal-information [Zhou et al., 2020], the development of solutions that can be understood by final users (explainable AI) [Cabitza et al., 2022; Walambe et al., 2022], the study of the problem in the health domain [Di Sotto and Viviani, 2022; Goeuriot et al., 2021], the study of the relationship between security, privacy and genuineness in information access and dissemination [Campbell, 2019; Livraga and Viviani, 2019], the consideration of multi-modal information in assessing genuineness [Giachanou et al., 2020; Singh et al., 2021].

In this scenario, the role of researchers working in the fields of Information Retrieval, Social Computing, Social Sciences, Data and Web Science and other related research areas, is crucial to investigate the above-mentioned research directions. Hence, all those approaches that can serve, from different perspectives, to tackle the genuine information access problem, found their place in ROMCIR 2022.

Specifically, the topics of interest included, but were not limited to:

- Access to/retrieval of genuine information.
- Bias detection.
- Bot/spam/troll detection.
- Computational fact-checking.
- Crowdsourcing for information genuineness assessment.
- Deep fakes and multi-modal misinformation detection.
- Dis/misinformation detection.
- Evaluation strategies in assessing dis/misinformation.
- Fake news/reviews detection.
- Filter bubble/echo chamber/polarization detection.
- Harassment/bullying/hate-speech/propaganda detection.
- Security, privacy and information genuineness.
- Sentiment/emotional analysis and stance detection.
- Trust and reputation systems.
- Understanding and guiding the societal reaction in the presence of dis/misinformation.

Both theoretical studies, model-driven, and data-driven approaches, supported by publicly available datasets, were more than welcome.

3 Received Submissions

The ROMCIR 2022 Workshop received ten submissions (five less than the previous edition) from four different countries, i.e., Germany, India, UK, and USA. Of these articles, six were accepted, so with an acceptance rate of 60%. Although slightly fewer in number than in the first edition, the articles submitted this year addressed more specifically the relationship between Information Retrieval and the genuineness of information (unlike the first edition where they dealt more with the problem of information classification compared to its genuineness). This made it possible, this year, to better discuss research issues more closely related to the purpose of the Workshop. The accepted articles, in fact, have primarily considered two issues from distinct points of view. The first issue concerns *access to genuine information in the health-related domain*; the second issue concerns *access to multi-modal genuine information*.

3.1 Accessing Genuine Health Information

With respect to the first issue, in the article by Fröbe et al. [2022] entitled "Using Keyqueries to Reduce Misinformation in Health-Related Search Results", the authors investigate whether explicit relevance feedback provided by experts can guide query expansion methods to formulate queries that return fewer misleading or wrong results. In contrast to standard query expansion methods that pay no attention to feedback document ranks in expanded query results, the authors experiment with a keyquery-based approach to identify expanded queries for which feedback documents are ranked as high as possible. In the article by Huang et al. [2022] entitled "Fight Against COVID-19 Misinformation via Clustering-Based Subset Selection Fusion Methods", the authors

try to improve the retrieval quality of search engines with respect to different relevance dimensions via a data fusion technique. In particular, a clustering-based approach is proposed for selecting a subset of IR systems from all the available ones, for finding the most relevant, credible, and correct documents talking about COVID-19. Still in the health domain, the article by Pankovska et al. [2022] entitled "Suspicious Sentence Detection and Claim Verification in the COVID-19 Domain", addresses the claim verification and fact-check-worthiness issues, by proposing an approach that involves a two-step claim verification procedure consisting of a fake news detection task in the form of binary sequence classification and fact-checking using the Google Fact Check Tools. The aim of the authors is to alert the reader that a document contains suspicious statements, even if no already validated similar claims exist. The last article that deals with health misinformation, this time from a more high-level perspective, is the one by Janzen et al. [2022] entitled "Cognitive security and resilience: A social-ecological model of disinformation and other harms with applications to COVID-19 vaccine information behaviors". In this paper, the authors propose a novel application of Brofenbrenner's social ecological model to the study of cognitive security and resilience in the context of information disorder. First, they describe the refitting of the model from public health and human development to cognitive security. Using existing literature in the field, they identify the key factors at each level of influence that shape susceptibility and resilience to information disorder. They also consider the dynamic interactions between individuals, groups, societies, and characteristics of the technological environment, including how algorithms interact with individual behaviors, policies, and organizational decision-making to shape access to and discoverability of genuine information. Finally, they describe an application of the model to a use case involving COVID-19-related information behaviors.

3.2 Accessing Genuine Multi-modal Information

Coming to the second problem addressed by the articles submitted to ROMCIR 2022, namely that of multi-modal genuine information access, the article by Aghada [2022] entitled "An Alternative Approach to Ranking Videos and Measuring Dissimilarity Between Video Content and Titles", proposes a statistical approach to video retrieval and ranking by introducing a novel dissimilarity measure acting on a video's audio-visual content and its title, hence aiding in video click-bait detection. Finally, in the paper by Kirdemir et al. [2022] entitled "Towards Detecting Coordinated Inauthentic Behaviors on YouTube", the authors aim to explore new approaches to assess latent and implicit characteristics of coordination among users in YouTube channels that can indicate manipulation of information and communication. In particular, they propose computational models leveraging multi-step time-series analysis of engagement trends, network structural feature-based analysis, and a combination of unsupervised and supervised machine learning techniques.

4 Keynote Speech

As part of the Workshop, a keynote speech was given by Prof. Reza Zafarani, on current open issues that still concern fake news detection.

Title: Fake news detection: limited ground truth, limited text, no understanding of spreading intent.

Abstract: "Fake news" is now viewed as one of the greatest threats to democracies and journalism. The massive spread of fake news has weakened public trust in governments and its potential impact on various political outcomes such as the Brexit is yet to be realized. We will briefly review fake news detection techniques, along with some of the current challenges that these methods face. We will discuss some recent advancements to tackle these challenges, particularly focusing on multi-modal fake news analysis and assessing the intent of fake news spreaders.

Speaker bio: Reza Zafarani[1] is an Assistant Professor of Electrical Engineering and Computer Science at Syracuse University. His research interests are in Data Mining, Machine Learning, Social Media Mining, and Social Network Analysis. His research has been published in major academic venues and highlighted in various scientific and news outlets. He is the principal author of "Social Media Mining: An Introduction" a textbook by Cambridge University Press and the associate editor for SIGKDD Explorations and Frontiers in communication. He is the winner of the NSF CAREER award, President's Award for Innovation, and outstanding teaching award at Arizona State University.

5 Organizing Team

The ROMCIR 2022 Organizing Team was composed of the following people with respect to their distinct roles.

5.1 Co-chairs

Marinella Petrocchi[2] is a Senior Researcher at the Institute of Informatics and Telematics, part of the National Research Council (IIT-CNR), Pisa, Italy, under the Trust, Security and Privacy research unit. She collaborates with the Sysma unit at IMT School for Advanced Studies, in Lucca, Italy. Her field of research lies between Cybersecurity and Data Science. She studies novel techniques for online fake news/fake accounts detection. She is in the core team of the *TOols for Fighting FakEs* (TOFFEe) project, funded by IMT, and WP leader in H2020 Medina, where she studies how to automatically translate NL cloud security requirements to machine-readable, enforceable policies.

Marco Viviani[3] is an Associate Professor at the University of Milano-Bicocca, Department of Informatics, Systems, and Communication (DISCo), Milan, Italy. He works in the Information and Knowledge Representation, Retrieval and Reasoning (IKR3) Lab. He is involved in numerous research initiatives that involve accessing and retrieving information, especially genuine information. He has been Co-chair of several Special Tracks and Workshops at International Conferences,

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General Co-chair of MDAI 2019, and Co-organizer of the First Edition of the ROMCIR Workshop. He is Associate Editor of *Social Network Analysis and Mining* (SNAM), Springer-Verlag, and Editorial Board Member of *Online Social Networks and Media* (OSNEM), Elsevier. His main research activities include Social Computing, Information Retrieval, Natural Language Processing, Text Mining, and User Modeling. On these topics, he has published more than 80 research works in International Journals, at International Conferences, as Monographs, and Book Chapters.

5.2 Publicity and Publication Chair

Rishabh Upadhyay[4] is a PhD Student at the University of Milano-Bicocca, Department of Informatics, Systems, and Communication (DISCo), Milan, Italy. He works within the framework of the DoSSIER Project: "Domain-Specific Systems for Information Extraction and Retrieval", which has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Marie Skłodowska-Curie Grant Agreement No 860721.

5.3 Program Committee

- **Rino Falcone**, Institute of Cognitive Sciences and Technologies (ISTC) – CNR, Rome, Italy.
- **Carlos A. Iglesias**, Universidad Politécnica de Madrid, Madrid, Spain.
- **Petr Knoth**, The Open University, London, UK.
- **Udo Kruschwitz**, University of Regensburg, Regensburg, Germany.
- **Preslav Nakov**, Qatar Computing Research Institute, HBKU, Doha, Qatar.
- **Symeon Papadopoulos**, Information Technologies Institute (ITI), Thessaloniki, Greece.
- **Marinella Petrocchi**, Institute of Informatics and Telematics (IIT) – CNR, Pisa, Italy.
- **Francesco Pierri**, Politecnico di Milano, Milan, Italy.
- **Adrian Popescu**, CEA LIST, Gif-sur-Yvette, France.
- **Paolo Rosso**, Universitat Politècnica de València, València, Spain.
- **Fabio Saracco**, Centro Ricerche Enrico Fermi (CREF), Florence, Italy.
- **Marco Viviani**, University of Milano-Bicocca, Milan, Italy.
- **Xinyi Zhou**, Syracuse University, Syracuse, NY, USA.
- **Arkaitz Zubiaga**, Queen Mary University of London, London, UK.

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[4] https://ikr3.disco.unimib.it/people/rishabh-upadhyay/

[5] https://romcir2022.disco.unimib.it/

References

Kalp Abhinn Aghada. An alternative approach to ranking videos and measuring dissimilarity between video content and titles. In Marinella Petrocchi and Marco Viviani, editors, *Proceedings of the 2nd Workshop Reducing Online Misinformation through Credible Information Retrieval 2022 co-located with The 44th European Conference on Information Retrieval (ECIR 2022), Stavanger, Norway, April 10, 2022*, volume 3138 of *CEUR Workshop Proceedings*, pages 89–99. CEUR-WS.org, 2022. URL http://ceur-ws.org/Vol-3138/paper5_jot.pdf.

Rodrigo Barbado, Oscar Araque, and Carlos A Iglesias. A framework for fake review detection in online consumer electronics retailers. *Information Processing & Management*, 56(4):1234–1244, 2019.

Federico Cabitza, Davide Ciucci, Gabriella Pasi, and Marco Viviani. Responsible ai in healthcare. *arXiv preprint arXiv:2203.03616*, 2022.

G. Caldarelli, R. De Nicola, F. Del Vigna, et al. The role of bot squads in the political propaganda on Twitter. *Commun Phys*, 3(81), 2020.

Guido Caldarelli, Rocco De Nicola, Marinella Petrocchi, Manuel Pratelli, and Fabio Saracco. Flow of online misinformation during the peak of the COVID-19 pandemic in italy. *EPJ Data Sci.*, 10(1):34, 2021. doi: 10.1140/epjds/s13688-021-00289-4.

Alex Chen Campbell. How data privacy laws fight fake news. Technical report, Lawrence Livermore National Lab.(LLNL), Livermore, CA (United States), 2019.

Barbara Carminati, Elena Ferrari, and Marco Viviani. Security and trust in online social networks. *Synthesis Lectures on Information Security, Privacy, & Trust*, 4(3):1–120, 2013.

Stefano Di Sotto and Marco Viviani. Health misinformation detection in the social web: An overview and a data science approach. *International Journal of Environmental Research and Public Health*, 19(4):2173, 2022.

Gunther Eysenbach. Credibility of health information and digital media: New perspectives and implications for youth. In Miriam M. Metzger and Andrew J. Flanagin, editors, *Digital Media, Youth, and Credibility*, pages 123–154. The MIT Press, 2008.

Maik Fröbe, Sebastian Günther, Alexander Bondarenko, Johannes Huck, and Matthias Hagen. Using keyqueries to reduce misinformation in health-related search results. In Marinella Petrocchi and Marco Viviani, editors, *Proceedings of the 2nd Workshop Reducing Online Misinformation through Credible Information Retrieval 2022 co-located with The 44th European Conference on Information Retrieval (ECIR 2022), Stavanger, Norway, April 10, 2022*, volume 3138 of *CEUR Workshop Proceedings*, pages 1–10. CEUR-WS.org, 2022. URL http://ceur-ws.org/Vol-3138/paper1_jot.pdf.

Anastasia Giachanou, Guobiao Zhang, and Paolo Rosso. Multimodal fake news detection with textual, visual and semantic information. In *International Conference on Text, Speech, and Dialogue*, pages 30–38. Springer, 2020.

Alexandru L Ginsca, Adrian Popescu, and Mihai Lupu. Credibility in information retrieval. *Foundations and Trends in Information Retrieval*, 9(5):355–475, 2015.

Lorraine Goeuriot, Hanna Suominen, Liadh Kelly, Laura Alonso Alemany, Nicola Brew-Sam, Viviana Cotik, Darío Filippo, Gabriela Gonzalez Saez, Franco Luque, Philippe Mulhem, et al. Clef ehealth evaluation lab 2021. In *European Conference on Information Retrieval*, pages 593–600. Springer, 2021.

Yidong Huang, Qiuyu Xu, Shengli Wu, Christopher Nugent, and Adrian Moore. Fight against COVID-19 misinformation via clustering-based subset selection fusion methods. In Marinella Petrocchi and Marco Viviani, editors, *Proceedings of the 2nd Workshop Reducing Online Misinformation through Credible Information Retrieval 2022 co-located with The 44th European Conference on Information Retrieval (ECIR 2022), Stavanger, Norway, April 10, 2022*, volume 3138 of *CEUR Workshop Proceedings*, pages 11–26. CEUR-WS.org, 2022. URL http://ceur-ws.org/Vol-3138/paper2_jot.pdf.

Shawn Janzen, Carolin Orr, and Sara-Jayne Terp. Cognitive security and resilience: A social ecological model of disinformation and other harms with applications to COVID-19 vaccine information behaviors. In Marinella Petrocchi and Marco Viviani, editors, *Proceedings of the 2nd Workshop Reducing Online Misinformation through Credible Information Retrieval 2022 co-located with The 44th European Conference on Information Retrieval (ECIR 2022), Stavanger, Norway, April 10, 2022*, volume 3138 of *CEUR Workshop Proceedings*, pages 48–88. CEUR-WS.org, 2022. URL http://ceur-ws.org/Vol-3138/paper4_jot.pdf.

Baris Kirdemir, Oluwaseyi Adeliyi, and Nitin Agarwal. Towards characterizing coordinated inauthentic behaviors on youtube. In Marinella Petrocchi and Marco Viviani, editors, *Proceedings of the 2nd Workshop Reducing Online Misinformation through Credible Information Retrieval 2022 co-located with The 44th European Conference on Information Retrieval (ECIR 2022), Stavanger, Norway, April 10, 2022*, volume 3138 of *CEUR Workshop Proceedings*, pages 100–116. CEUR-WS.org, 2022. URL http://ceur-ws.org/Vol-3138/paper6_jot.pdf.

David MJ Lazer, Matthew A Baum, Yochai Benkler, Adam J Berinsky, Kelly M Greenhill, Filippo Menczer, Miriam J Metzger, Brendan Nyhan, Gordon Pennycook, David Rothschild, et al. The science of fake news. *Science*, 359(6380):1094–1096, 2018.

Giovanni Livraga and Marco Viviani. Data confidentiality and information credibility in on-line ecosystems. In *Proceedings of the 11th International Conference on Management of Digital EcoSystems*, pages 191–198, 2019.

Miriam J Metzger and Andrew J Flanagin. Credibility and trust of information in online environments: The use of cognitive heuristics. *Journal of pragmatics*, 59:210–220, 2013.

Elitsa Pankovska, Konstantin Schulz, and Georg Rehm. Suspicious sentence detection and claim verification in the COVID-19 domain. In Marinella Petrocchi and Marco Viviani, editors, *Proceedings of the 2nd Workshop Reducing Online Misinformation through Credible Information Retrieval 2022 co-located with The 44th European Conference on Information Retrieval (ECIR*

2022), Stavanger, Norway, April 10, 2022, volume 3138 of *CEUR Workshop Proceedings*, pages 27–47. CEUR-WS.org, 2022. URL http://ceur-ws.org/Vol-3138/paper3_jot.pdf.

Gabriella Pasi and Marco Viviani. Information credibility in the social web: Contexts, approaches, and open issues. *arXiv preprint arXiv:2001.09473*, 2020.

Vivek K Singh, Isha Ghosh, and Darshan Sonagara. Detecting fake news stories via multimodal analysis. *Journal of the Association for Information Science and Technology*, 72(1):3–17, 2021.

Fabio Tagliabue, Luca Galassi, and Pierpaolo Mariani. The "pandemic" of disinformation in covid-19. *SN Comprehensive Clinical Medicine*, 2(9):1287–1289, 2020.

Rishabh Upadhyay, Gabriella Pasi, and Marco Viviani. Health misinformation detection in web content: A structural-, content-based, and context-aware approach based on web2vec. In *Proceedings of the Conference on Information Technology for Social Good*, pages 19–24, 2021.

Vitor E Valenti and Alan Patricio da Silva. The effect of negationism on public health. *Journal of Human Growth and Development*, 31(2):189–191, 2021.

Marco Viviani and Gabriella Pasi. Credibility in social media: opinions, news, and health information—a survey. *WIREs: Data Mining and Knowl. Discovery*, 7(5):e1209, 2017.

Rahee Walambe, Ananya Srivastava, Bhargav Yagnik, Mohammed Hasan, Zainuddin Saiyed, Gargi Joshi, and Ketan Kotecha. Explainable misinformation detection across multiple social media platforms. *arXiv preprint arXiv:2203.11724*, 2022.

Claire Wardle and Hossein Derakhshan. Information disorder: Toward an interdisciplinary framework for research and policy making. *Council of Europe Report*, 27, 2017.

Yuanyuan Wu, Eric WT Ngai, Pengkun Wu, and Chong Wu. Fake online reviews: Literature review, synthesis, and directions for future research. *Decision Support Systems*, page 113280, 2020.

Xinyi Zhou, Atishay Jain, Vir V Phoha, and Reza Zafarani. Fake news early detection: A theory-driven model. *Digital Threats: Research and Practice*, 1(2):1–25, 2020.