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HOW TO SPOT AND STOP THE SPREAD OF FAKE NEWS: CURRENT PROBLEMS AND FUTURE RESEARCH

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ABSTRACT:

The need for methods to identify false information has risen in response to its meteoric rise and the damage it has done to democracy, fairness, and public confidence.

The multifaceted nature of the problem with false news necessitates a team effort from researchers in fields as diverse as computer science, political science, journalism, sociology, psychology, and economics. Attracting and uniting experts from adjacent fields to do research on fake news requires a comprehensive framework to systematically analyse and recognise false news. The goals of this tutorial are to provide a clear presentation of the following topics: (1) the state of fake news research; (2) a comparison of fake news and related concepts (such as rumours); (3) the fundamental theories developed across different disciplines that allow for interdisciplinary research; (4) different detection strategies unified under a comprehensive framework for fake news detection; and (5) the state-of-the-art datasets, patterns, and models. We provide many approaches to detecting false news, all of which make use of data mining, machine learning, natural language processing, information retrieval, and social search, and all of which incorporate news content and information in social networks. Challenges for automated, effective, and efficient false news identification ahead of the 2020 U.S. presidential election are also elucidated.

KEY WORDS: False news; identifying false news; confirming news.

I.INTRODUCTION

Fake news is now viewed as one of the greatest threats to democracy, journalism, and economies. It has weakened public trust in governments and its potential impact on the contentious “Brexit” referendum and the equally divisive 2016 U.S. presidential election - which it might have affected [1] - is yet to be realized. The reach of fake news was best highlighted during the critical months of the 2016 U.S. presidential election campaign, where top twenty frequentlydiscussed false election stories generated 8,711,000 shares, reactions, and comments on Facebook, ironically, larger than the total of 7,367,000 for the top twenty most-discussed election stories posted by 19 major news websites [12]. Our economies are not immune to fake news either, impacting stock markets and leading to massive trades. For example, fake news claiming that Barack Obama was injured in an explosion wiped out $130 billion in stock value [8]. The generous benefits in fake news activities are one of the motivations for people to initiate

and engage in such activities. Consider dozens of "well-known" teenagers in the Macedonian town of Veles who produced fake news for millions on social media and became wealthy by penny-per-click advertising during the 2016 U.S. presidential election [13]. Such stories attach greater importance to fake news detection and intervention as they provide an incentive for individuals to become the next "Macedonian teenagers" in the upcoming 2020 U.S. presidential election. On the other hand, with fake news detection research in its early stages, greater opportunities exist for malicious individuals to create and spread fake news in the absence of a worry. To facilitate further development in this area, we address both theoretical and technical aspects of fake news detection in this tutorial: (1) Interdisciplinary fake news research is encouraged, where fundamental theories developed across disciplines can facilitate qualitative and quantitative studies, as well as developing welljustified and explainable fake news detection techniques. (2) A comprehensive framework and strategy to systematically understand and detect fake news is necessary. Such strategies attract and unite researchers mastering knowledge and technologies in related areas to work on fake news topic. (3) Open issues and challenges for fake news studies should be clarified to highlight future research directions and priorities:

II. LITERATURE SURVEY

Preventing fake news from impacting democracy, journalism and economies demands researchers, practitioners, and industry leaders to attach great importance to understanding and detecting fake news. Given a clear definition of fake news, this tutorial presents a Tutorial Summary WSDM '19, February 11–15, 2019, Melbourne, VIC, Australia 836 comprehensive survey of fake news research. In particular, the tutorial (1) identifies fundamental theories across various disciplines; (2) elaborates the detection strategies under a comprehensive framework and further introduces the related datasets, patterns, models, and algorithms; (3) clarifies the open issues in the state-of-the-art, and challenges to be faced for the development of fake news studies. Fundamental Theories. Human vulnerability to fake news, which can bring in useful clues or further complicate fake news detection, has been a subject of interdisciplinary research. For instance, achievements in forensic psychology such as Undeutsch hypothesis [14] have pointed out the style difference between truth and deceptive information. Similarly, interdisciplinary research has looked at why individuals spread fake information, considering that the borderline between malicious and normal users becomes unclear – normal people can frequently and unintentionally participate in fake news activities as well, due to, e.g., social identity [2] or self-preexisting knowledge [6]. This tutorial conducts a comprehensive literature study across various disciplines. We review more than twenty well-known theories that can contribute to our understanding of fake news and participants in fake news activities. We present and discuss the problems arising as explained by these theories, ranging from the patterns they can reveal, the qualitative and quantitative fake news studies one can conduct based on these studies, to the specific roles they can play to detect fake news. Detection Strategies. Detecting fake news is a complex and multidimensional task due to the characteristics of fake news. The

detection strategies exploit multiple news-related (e.g., headline, body text, publisher) and social-related (e.g., feedback, propagation paths and spreaders) types of information. Each information type can be in the form of text, multimedia, network, etc., corresponding to various applicable techniques and usable resources. The tutorial reviews the detection of fake news from four perspectives of knowledge, style, propagation and credibility. Specifically, from a knowledge perspective, fake news detection is a "comparison" between the relational knowledge extracted from the to-be-verified news articles and that of knowledge-bases representing facts/ground truth [7]. Style-based fake news detection aims to capture and quantify the differences in writing styles between fake and true news. Propagation-based fake news detection uses information provided in news dissemination. Finally, credibility-based fake news detection assesses the credibility of headlines (e.g., using click-bait detection [11]), publishers (i.e., source websites), comments (e.g., using opinion spam detection [4]), and users to indirectly detect fake news. Each perspective carries its own usable set of tools [3], datasets [10] and various detection strategies in data mining, machine learning, natural language processing, information retrieval and social search. Various perspectives can be integrated under a unified framework for fake news analysis, which looks at fake news from the time being created and published to the time being disseminated. We review, summarize, compare and evaluate current studies within this framework during the tutorial.

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