Fake News Detection: An Interdisciplinary Research

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ABSTRACT

The explosive growth of fake news and its erosion to democracy, journalism and economy has increased the demand for fake news detection. To achieve efficient and explainable fake news detection, an interdisciplinary approach is required, relying on scientific contributions from various disciplines, e.g., social sciences, engineering, among others. Here, we illustrate how such multidisciplinary contributions can help detect fake news by improving feature engineering, or by providing well-justified machine learning models. We demonstrate how news content, news propagation patterns, and users' engagements with news can help detect fake news.

CCS CONCEPTS

• **Human-centered computing** → *Collaborative and social computing theory, concepts and paradigms.*

KEYWORDS

Fake news detection; fake news research; misinformation; disinformation; false news

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OVERVIEW

Fake news is now viewed as one of the greatest threats to democracy, journalism and economies [4]. Recent studies have shown remarkable progress on detecting fake news [1, 3]. However, interdisciplinary research on fake news detection, which can facilitate new detection approaches and provide higher interpretability, is still in its early stages. Here, we detail how contributions in various scientific disciplines can be incorporated into a machine learning framework to detect fake news. Such detection can be achieved by analyzing (1) the writing style of fake news, (2) how it propagates among users, and (3) the intentions of users spreading it.

Style-based fake news detection. It assumes that writing style of news content can help distinguish fake news from the truth. Writing style has been represented comprehensively using machine learning features at various language levels [1], or even using latent features [3]. Nevertheless, without supportive theories, the engineered/latent features can be difficult to understand and can provide limited insights into fake style. In our recent survey [4], we detail theories such as *Undeutsch hypothesis* [2] that indicate how fake news differs in content quality, sentiment, among other attributes from the truth. Such theories enable one to represent news content using interpretable *theory-driven features* that can help detect fake news. This process also facilitates further research, especially on the relationships between clickbaits and fake news [5].

Network-based fake news detection. Similarly, theories that explain how news propagates among a network of users [4], i.e., *network-based patterns* of news propagation, is an information that has not been comprehensively utilized for fake news detection. Fake news patterns in social networks can refer to the (1) news being spread, (2) spreaders of the news and (3) relationships among the spreaders. Social psychological theories provide an in-depth understanding on why such patterns exist. These patterns can then be represented at various levels of a news propagation networks (e.g., node-level, ego-level, triad-level, community-level, or whole-network-level) as features and incorporated into a supervised learning framework to detect fake news. Our initial experiments conducted on real-world data demonstrate that this approach can be highly accurate and can facilitate *fake news early detection* [4].

Intention-based fake news detection. Social psychological theories suggest that *social influence* (e.g., how widely a news article has been spread) and *self-influence* (i.e., a user's preexisting knowledge) attract regular users to fake news. Greater societal- and self-influence skew regular users more towards trusting fake news and unintentionally spreading it. This phenomenon raises a new problem: *how can we determine one's intent when posting news articles?* While the problem is yet to be explored, its solution is essential for assessing user credibility, which in turn can be embedded to detect fake news. Clearly, users that have unintentionally posted fake news should be assigned higher credibility scores compared to those who have maliciously done so. Given the limited number and scale of current public fake news datasets [5], we envision a semi-supervised learning framework to be able to measure user intentions when posting news articles and detect fake news.

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