

Editorial

Editorial for the Special Issue on Multi-Disciplinary Dis/Misinformation Analysis and Countermeasures

Yuhong Liu

Santa Clara University, USA; yhliu@scu.edu

Online social media has recently become a battleground for massive propagation of dis/misinformation, which is often referred to as the “info-demic”. Combating such “info-demic”, however, is a very complex issue that requires collaboration efforts across disciplines. First, dis/misinformation contents can take various format, including text, images, voices, and/or videos, requiring effective defense strategies to broadly adopt technologies from different computing fields, including but not limited to cyber security, Natural Language Processing (NLP), multimedia processing, Artificial Intelligence (AI) and Machine Learning (ML). Furthermore, the involvement of human users across different languages, cultures, race and ethnicity raises unique challenges that require researchers from different disciplines (e.g., computing, communication, journalism, sociology, psychology, law, etc.) to collaboratively investigate the fundamental reasons, working mechanisms and potential solutions. This themed series aims to provide a venue to facilitate idea exchange among researchers of relevant but diverse disciplines. In particular, it comprises a collection of eight excellent articles that were reviewed and highly recommended by the editors and reviewers.

The first paper is “A Network-Based Approach to QAnon User Dynamics and Topic Diversity During the COVID-19 Infodemic”, authored by Wentao Xu and Kazutoshi Sasahara. This paper investigates social network users’ dynamics related to QAnon conspiracy theory during COVID-19 pandemic. Real data has been collected from Twitter during the pandemic, which provides credible sources supporting this work. The results show that during the pandemic, QAnon was expanding its topic diversities to attract users, effectively

converting swing users to more pro-QAnon leaning and significantly increasing its global influence.

The second paper is “Psycho-linguistic Differences among Competing Vaccination Communities on Social Media”, authored by Jialiang Shi, Piyush Ghasiya and Kazutoshi Sasahara. In this paper, the authors quantitatively study the differences between the pro- and anti-vaccination communities on Twitter during the COVID-19 pandemic. In particular, the network structures, psycho-linguistic characteristics, and the morality tendency of these groups are analyzed. This paper sheds lights on the reasons behind the communities’ behaviors from social and psychology perspectives. The integration of moral foundation analysis in this study is also interesting.

The third paper is “RGID: A Robust and Green GAN-Fake Image Detector” by Yao Zhu, Xinyu Wang, Ronald Salloum, Hong-Shuo Chen and C.-C. Jay Kuo. Since Generative adversarial networks (GANs) has become one of the most popular techniques to generate deepfake images, this paper aims to propose a robust and lightweight detector that can effectively detect fake images generated by GAN model. The major advantages of the proposed scheme include two aspects. First, it achieves a much smaller model size when compared to typical deep neural network models. Second, it can robustly detect GAN-fake images even with the presence of distortions introduced by common image manipulations in real-world applications.

The fourth paper is “An Application-Oriented Taxonomy on Spoofing, Disguise and Countermeasures in Speaker Recognition”, authored by Lantian Li, Xingliang Cheng and Thomas Fang Zheng. This paper provides a comprehensive literature review on fake actions and countermeasures in voice recognition systems from an application-oriented perspective. Specifically, the authors propose a new application-based taxonomy and focus on two major fake forms: (1) spoofing attack that “imitates the voice of an authorized speaker to get access to the target system”; and (2) disguise cheating that “makes someone unrecognizable by altering his/her voice”. For each fake form, more delicate categories and the corresponding countermeasures are discussed in details.

The fifth paper is “DeepFake and its Enabling Techniques: A Review”, authored by Rachael Brooks, Yefeng Yuan, Yuhong Liu and Haiquan Chen. This paper focuses on essential techniques contributing to Deepfakes with a human being as a target and define them as synthetic image animation techniques. By further categorizing these techniques into three classes as human pose transfer, human motion transfer and human motion generation, this paper discusses each class in details with the state-of-the-art literature, followed by a vision on future directions.

The sixth paper is “DefakeHop++: An Enhanced Lightweight Deepfake Detector”, authored by Hong-Shuo Chen, Shuowen Hu, Suyu You and C. -C. Jay Kuo. This paper proposes a lightweight Deepfake image detection model, DefakeHop++, which extracts spatial and spectral features from multiple

landmark facial regions and selects discriminant features by leveraging a supervised tool, Discriminant Feature Test (DFT). Compared with MobileNet v3, a lightweight CNN model targeting at mobile applications, the proposed scheme achieves a better detection performance but a much smaller model size.

The seventh paper is “Combating Misinformation/Disinformation in Online Social Media: A Multidisciplinary View”, authored by Mauro Barni, Yi Fang, Yuhong Liu, Laura Robinson, Kazutoshi Sasahara, Subramaniam Vincent, Xinchao Wang and Zhizheng Wu. This article is written by the guest editorial team of this themed series based on two relevant panel discussions on dis/misinformation: the “Social Media Disinformation and its Impact on Public Health During the COVID-19 Pandemic”, at the IEEE Global Humanitarian Technology Conference (GHTC), October 20th, 2021, and the “Dis/Misinformation Analysis and Countermeasures - A Computational Viewpoint” on March 7th, 2022 hosted by the U.S. local chapter of the APSIPA. This article aims to promote broader understanding of the problem from different disciplines and integrate wisdom from the communities towards potential countermeasure strategies.

The eighth paper is “Detecting Deepfake Videos in DataScarcity Conditions by Means of Video Coding Features”, authored by Jun Wang, Omran Alamayreh, Benedetta Tondi, Andrea Costanzo and Mauro Barni. This paper proposes a feature-based approach to detect deepfake videos. Different from deep learning-based deepfake detection approaches that require extensive training data, the proposed scheme in this paper can work in data scarcity scenarios by leveraging a video coding feature extracted from motion prediction modes in video sequences. The effectiveness of the proposed scheme is demonstrated by experiments on three different datasets.