Workshop Proposal (Full Day Workshop)
7th International Workshop on Social Sensing (SocialSens 2022)
Special Edition on Belief Dynamics

***URL (not live yet):* https://socialsens.web.illinois.edu/**

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Abstract: The social sensing workshop (started in 2015) is a multidisciplinary meeting place that brings together social scientists, computer scientists, cognitive scientists, and other disciplines interested in social media analysis, around research that *interprets social media* as *measurement instruments*. Social media democratized information production offering an unprecedented view into human habits, customs, culture, stances, and indeed descriptions of physical events that transpire in the world. They also give unprecedented opportunities to spread misinformation, influence opinion, change beliefs, distract from truth, or advance specific agendas, hidden or overt. The potential of social media to influence populations has brought about interest in understanding human *belief dynamics* and their relation to social media influence, whether by means of benign information sharing or coordination to alter people's opinions, emotions, behaviors, or understanding of events. What are the scientific foundations for modeling social media as a new communication, measurement, and influence channel? How to utilize information media signals to better understand social systems, communities, and each other? How to identify and mitigate misuse of this medium? What specifically can one measure or influence, what underlying theoretical framework allows one to do so, and what applications are enabled by the endeavor? Since measurement and influence operations are well-studied in many physical domains, what can one learn from the physical domain (e.g., from the signal processing literature, management systems, or process control) to enable novel social media analysis methods? This scope brings about new interdisciplinary research challenges and opportunities at the intersection of communication, sensing, social network analysis, information theory, data mining, natural language processing, artificial intelligence, cognitive models, and social sciences.

Description of Topic and Themes: The 7th installation of the workshop focuses on an important piece of the above puzzle; the modeling of *belief dynamics* and their relation to *information operations* (such as the promotion of well-crafted narratives). The narrative is a construct that embodies linguistic, cognitive, and social aspects. It is one of the units of communication that intertwine subject descriptions with the author's point of view. Narratives that propagate on social media therefore potentially shed light simultaneously on both the source agenda and the different attitudes towards it. How can an agenda-carrying narrative be described and captured with computational techniques? How are information operations on social media different from traditional influence attempts using other media? How can one infer social attitudes from the response to different operations? Can one predict how a narrative might propagate on the medium? How are narratives used as means of influence? Can one determine if a certain narrative is organic or part of an influence/persuasion effort? What is an effective counter-narrative? How does finite human attention and cognitive capacity impact narrative propagation in the presence of accidental or

intentional concurrent distractions? What other elements of social media messaging are important to model? How to account for operations such as censorship/suspension? Ultimately, can one predict the evolution of human beliefs as a result of exposure to various narratives and interventions on social media? Historically, the intent of the social sensing workshop has been to combine scientists from computing, social, and cognitive domains around social media related topics. With belief dynamics (and their relation to information/influence operations) as the topic in 2022, we invite papers and vision abstracts that approach it from different perspectives, from physical signal processing to social science and from control to cognitive modeling. The hope is that such a multidisciplinary intellectual exchange generates insights that draw on the best of multiple worlds: analysis of physical signals (that propagate on physical channels, such as acoustic and vibration signals), analysis of information signals (that propagate on social channels), and analysis of social and cognitive systems.

The 7th international workshop on social sensing (special edition on information operations on social media) solicits contributions from academia, industry, and government on recent advances in both theoretical and experimental research in the above areas. We invite technical papers and position abstracts describing novel ideas, exciting results, and/or real-world experiences. Two types of submissions are solicited:

1. Full papers: Maximum length of 6 pages, including title, author list, abstract, all figures, tables, and references. At least one author of each accepted paper must register for the workshop and present the paper. Accepted papers will be broken into thematic sessions and presented in a panel discussion format.

2. Vision abstracts: This is a 2-page extended abstract that offers a future vision for a research direction in the field of social sensing. The abstract should include a title, author list, description (the vision statement), and references. A graphical illustration is highly desired (included in the 2-page limit). At least one author of each accepted abstract must register for the workshop and participate in a "Future Visions" session. The session will include short position talks by authors of accepted abstracts, followed by discussion.

All submissions should be in English. They should be prepared as per parent conference proceedings format. Templates of conference proceedings format can be found on the conference website. All paper/abstract submission will be electronic, in PDF format. Failure to register for the workshop may disqualify the paper/abstract from inclusion in the proceedings.

Workshop Format: The goal of this workshop is to foster interactive multidisciplinary discussion. Towards that end, it will include (in addition to contributed papers) a keynote, a panel, and a "Future Visions" session. Other than the keynote, all sessions, including contributed paper sessions, will be held in *panel format*. Authors will present their views on the topic of the session. Presenters of each session will then be invited back to the stage as a panel to discuss synergies, conflicts, multidisciplinary opportunities, analogies (across domains), gaps, and visions. The Future Visions session will include discussion on future directions of the field and emerging new interdisciplinary ideas and opportunities.

Important Dates:

Papers submission: March 27, 2022; ***Acceptance notification:*** April 10, 2022
Camera-ready paper due: April 17, 2022; ***ICWSM-2021 Workshops Day:*** June 6, 2022

Review Process: Following the process in past years, a technical program committee (TPC) will be formed. Each full-length paper will receive at least 3 TPC reviews, and each extended abstract at least 2 TPC reviews. In addition, a keynote speaker and a panel will be invited. No review delegation will be allowed. After reviews are entered a short online discussion will occur, followed by an online TPC meeting to make acceptance decisions.

Potential TPC Members (including individuals who served in past years): Elisa Bienenstock, Arizona State University, USA (Mathematical Sociology, Social Psychology), Mark Finlayson, Florida International University, USA (Narratology), Michael Gabbay, University of Washington, USA (Models/Simulations of Network Dynamics), Wei Gao, Victoria University of Wellington, New Zealand (Social Media Analysis, Linguistics, ML), Ivan Garibay, University of Central Florida, USA (Agent-based economic and social systems modeling), Hamed Haddadi, Queen Mary University of London, UK (IoT, Applied ML, Human-Data Interaction), Susan Herring, Indiana University, USA (Information Science and Linguistics), Heng Ji, University of Illinois at Urbana Champaign, USA (Natural Language

Processing, AI), George Mohler, Indiana University Purdue University Indianapolis, USA (Social System Modeling), Mark Orr, Virginia Tech., USA (Cognitive Psychology, Neuroscience, and Computational Modeling)**,** Art Ramirez, University of South Florida, USA (Computer-mediated Social Interaction), Dr. Murat Sensoy, Ozyegin University, Turkey (Web Intelligence, Semantic Web), Mudhakar Srivatsa, IBM Research, USA (Machine Learning, Data Analytics), Venugopal V. Veeravalli, University of Illinois at Urbana Champaign, USA (Information Theory).

History: The organization and program of prior workshops in the series can be found at:

1st SocialSens: http://www3.nd.edu/~dwang5/SocialSens2015/ (collocated with IEEE MASS 2015)
2nd SocialSens: https://www3.nd.edu/~dwang5/SocialSens2017/ (collocated with IoTDI 2017)
3rd SocialSens: https://cse.buffalo.edu/~lusu/SocialSens2018/ (collocated with IoTDI+IC2E 2018)
4th SocialSens: https://www3.nd.edu/~dwang5/SocialSens2019/ (collocated with CPS-IoT Week 2019)
5th SocialSens: https://socialsens.web.illinois.edu/2020/ (collocated with ICWSM 2020)
6th SocialSens: https://socialsens.web.illinois.edu/ (collocated with ICWSM 2021)

Physical attendance varied between **25** and **38** individuals, depending on year, number of papers/panels, and size of hosting conference. In 2020 and 2021, the workshop was held online (in conjunction with ICWSM) and the number of registered attendees hit a record-setting **83** (in 2020) and **132** (in 2021), respectively. The workshop program in the preceding years is summarized in the table below. The workshop aims to rotate across multiple constituent communities to build its interdisciplinary base. Early format was perceived as too dense by the attendees, resulting in gradual downwards adjustment of the number of papers presented, leaving more room for discussions and interaction between participants.

	Keynotes	Panels	Full Papers (6 pages)	Vision Abstracts (2 pages)
1st SocialSens (2015)	Mike Kolodny, ARL	2 panels	6 papers	None
2nd SocialSens (2017)	Dinesh Verma, IBM Research	2 panels	14 papers	6 papers
3rd SocialSens (2018)	Radu Marculescu, CMU	2 panels	8 papers	7 papers
4th SocialSens (2019)	Kathleen M. Carley, CMU	1 panel	6 papers	4 papers
5th SocialSens (2020)	Heng Ji, UIUC	3 panels*	4 papers	None
6th SocialSens (2021)	Cecile Paris, CSIRO, Australia	3 panels*	6 papers	3 papers

*Contributed paper sessions were held as panels of contributed paper authors (included in the panel count).

Other Related Workshops: A number of other workshops cover research related to social media narrative understanding and exploitation. These workshops typically join linguistics/NLP and machine learning communities (plus, in some cases, social sciences and humanities) around topics of automatic narrative understanding, modeling, and generation. Our workshop is unique in its focus on the *use of narratives to influence beliefs on social media*. Information units on social media have diffusion characteristics that are unique to the content of these units; they propagate differently through different communities and produce an impact that depends on the message and on community beliefs and attitudes. The propagation pattern adds a new dimension to narrative detection, modeling, and understanding. The spread of signals through different media is studied in communities that include information theory, communication networks, network science, and social network analysis that we try to bring together. We therefore believe that the proposed edition of the social sensing workshop, collocated with the International Conference on Web and Social Media (ICWSM), offers a novel perspective on the topic, unique in the world of narrative analysis on social media. This perspective is not covered by other workshops, such as those listed below:

- *Computational Models of Narrative, 2009-2016:* This workshop series, Computational Models of Narrative (CMN), is dedicated to advancing the computationally grounded scientific study of narrative.
  `http://narrative.csail.mit.edu/cmn16/`
- *Workshop on Narrative Understanding* (collocated with NAACL HLT 2019): Methods to improve automatic narrative understanding capabilities.
  `https://sites.google.com/view/narrativeunderstanding/`
- *Workshop on Narrative Understanding, Storylines, and Events* (collocated with ACL 2020): Methods to improve automatic narrative understanding capabilities.
  `https://sites.google.com/view/nuse`

- *SIGHUM Workshop on Computational Linguistics for Cultural Heritage, Social Sciences, Humanities and Literature*, 2017-present (an ACL workshop): Applications of NLP to a wide variety of literary data.
  https://www.aclweb.org/portal/content/3rd-joint-sighum-workshop-computational-linguistics-cultural-heritage-social-sciences
- *Workshop on Storytelling* (an ACL workshop): Neural and linguistic approaches to understanding and generating stories in narrative texts, social media, and visual narratives
  https://www.aclweb.org/anthology/venues/story-nlp/
- *Intelligent Narrative Technologies, 2007-2018*: Artificial intelligence for the computational understanding and expression of narrative.
  https://sites.google.com/ncsu.edu/intwiced18/home

Workshop Organizers

Our workshop organizers cover a wide space of related topics from physical sensing to natural language processing and from predictive analytics to the exploitation of social media to understand population beliefs. Please see below.

Dr. Kristina Lerman, General Co-Chair, *Dept. of Computer Science, USC Viterbi School of Engineering*

Dr. Kristina Lerman is a Principal Scientist at U. of Southern California Information Sciences Institute and holds a joint appointment as a Research Professor in the USC Computer Science Department. Trained as a physicist, she now applies network analysis and machine learning to problems in computational social science, including crowdsourcing, social network and social media analysis. Her recent work on modeling and understanding cognitive biases in social networks has been covered by the Washington Post, Wall Street Journal, and MIT Tech Review.

Dr. Ivan Garibay, General Co-Chair, *Dept. of Industrial Engineering and Management Systems, UCF*

Dr. Ivan Garibay is an Associate Professor at the Department of Industrial Engineering and Management Systems, University of Central Florida. He is the Director of UCF Artificial Intelligence and Big Data Initiative, Director of Master of Science Program in Data Analytics, and the Director of the Complex Adaptive Systems Laboratory. He is also the Founding Director of the UCF I-Corps program. His interests lie in studying complex socio-technical systems such as social media and artificial social intelligence.

Dr. Christian Lebiere, Program Co-Chair, *Dept. of Psychology, Carnegie Mellon University*

Dr. Lebiere is a Research Faculty in the Psychology Department at Carnegie Mellon University. He received his Ph.D. from the CMU School of Computer Science. Since 1991, he has worked on the development of the ACT-R hybrid cognitive architecture and was co-author with John R. Anderson of the 1998 book The Atomic Components of Thought. Most recently, Dr. Lebiere has been involved with John Laird and Paul Rosenbloom in defining the Common Model of Cognition, a community-wide effort to consolidate and formalize the scientific progress resulting from the 40-year research program in cognitive architectures. Dr. Lebiere is a founding member of the Biologically Inspired Cognitive Architectures Society, the International Conference on Cognitive Modeling, and the Editorial Board of the Journal of Artificial General Intelligence. His main research interests are cognitive architectures and their applications to psychology, artificial intelligence, human-computer interaction, decision-making, intelligent agents, network science, robotics and neuromorphic engineering.

Dr. Yanbing Mao, Program Co-Chair, *Dept. of Mechanical Science and Engineering, UIUC*

Dr. Yanbing Mao received the B.S. degree in Electronic Information Science and Technology from Liaocheng University, Shandong, China, in 2010, and the M.E. degree in Circuits and Systems from University of Electronic Science and Technology of China, Sichuan, China, in 2013. He received the Ph.D. degree in Electrical and Computer Engineering from The State University of New York at Binghamton, NY, USA, in 2019. He is currently a postdoctoral research associate in the Department of Mechanical Science and Engineering at University of Illinois at Urbana–Champaign. His research interests include social cybersecurity, computational social science, safety and security of cyber-physical systems and physics-informed AI.