

NSF Convergence Workshop on Crowdsourcing

Friday, May 18, 2018 -
Saturday, May 19, 2018

Courtyard by Marriott
Alexandria Old Town/Southwest
2700 Eisenhower Ave, Alexandria, VA 22314

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Organized by

Heng Xu, Penn State University
Gautam Das, UT Arlington
Senjuti Basu Roy, NJIT



Welcome

Thank you for joining us in this beautiful month of May in the historic Old Town Alexandria, Virginia, for the NSF Convergence Workshop on Crowdsourcing.

The goal of the workshop is to develop a coherent research agenda of crowdsourcing towards the convergence of human and technological perspectives. As you can see from the program, our speakers come from many different disciplines spanning computer science, data science, business and management, and social sciences. Correspondingly, topics discussed in the workshop are also diverse, covering 1) the motivation, behavior and performance of crowd workers, 2) the design of crowdsourcing platforms, 3) the applications of crowdsourcing, e.g., on scientific discoveries and innovation, on public safety and public health, etc., 4) the implications of crowdsourcing on employment and economic opportunities, among many others.

We thank all participants and speakers of the workshop for their invaluable contributions, and the National Science Foundation for the generous support making this workshop possible. Welcome to Alexandria, and we hope you enjoy the workshop!



Heng Xu, Penn State



Gautam Das, UT Arlington



Senjuti Basu Roy, NJIT

Friday, May 18

9:30am

Crowd-Based Innovation

Barry L. Bayus

*Kenan-Flagler Business School
University of North Carolina at Chapel Hill*

Abstract: Crowdsourcing is the practice of obtaining participants, services, ideas, or content by soliciting contributions from a large unselected group of people, generally via the Internet. In this short presentation, I will make some observations of crowdsourcing platforms in practice and outline several interesting research questions.

Speaker: Barry L. Bayus is Roy O. Rodwell Distinguished Professor of Marketing & Entrepreneurship at the University of North Carolina's Kenan-Flagler Business School. His research and teaching interests are in the areas of crowdsourcing, innovation, design thinking, and new product development. Prior to joining the marketing faculty at UNC, Barry worked in both industry and academia. He has published in all of the top marketing journals and is widely cited in the innovation management field. He was the inaugural winner of the Thomas P. Hustad Best Paper Award from the Journal of Product Innovation Management. He has been cited in the Journal of Product Innovation Management as being one of the world's top scholars in innovation management and Management Science as being one of the top researchers in the field of innovation.

Friday, May 18

10:15am

Algorithmic Crowdsourcing meets Social Science

Sihem Amer-Yahia

CNRS, Univ. Grenoble Alpes

Abstract: Crowdsourcing creates new opportunities in the design of algorithms that involve humans as computational resources. Those opportunities are due to several human factors such as skills, motivation, and affinities, that need to be incorporated in algorithm design. I will discuss how Social Science is helping us conduct more useful human-centric research and how we can help Social Science shape ethics in crowdsourcing.

Speaker: Sihem is a CNRS Research Director. Her interests are at the intersection of large-scale data management and social data exploration. Sihem held positions at QCRI, Yahoo! Research and at&t Labs. She served on the SIGMOD Executive Board and the VLDB Endowment. She is Editor-in-Chief of the VLDB Journal and serves as co-chair for PVLDB 2018, WWW 2018 Tutorials and ICDE 2019 Tutorials.

Friday, May 18

11:00am

An Investigation of Crowdsourced Crisis Mapping Messages in the context of the 2010 Haiti Earthquake

Rohit Valecha & H. Raghav Rao

College of Business, University of Texas at San Antonio

Abstract: Crisis mapping is the process of real-time collection, and visualization of crisis data for humanitarian relief. Crisis mapping has become possible with the advent of recent ICTs to collect and disseminate crisis information. In this paper, we focus on the 2010 Haiti earthquake and explore a specific aspect, information categorization on a crisis mapping platform (known as Ushahidi). Information categorization is a process wherein messages from affected citizens are categorized by crowd volunteers for use by relief workers and crisis responders. It makes citizen reported messages actionable by facilitating the mobilization of the response teams on-site. However, the quality of information categorization has recently been questioned in the context of crowdsourced crisis mapping.

This study uses collective sensemaking as an overarching framework to investigate the drivers of information categorization quality. Collective sensemaking is facilitated by shared comprehension of crisis messages through an understanding of the crisis context and interaction of the crowd volunteers on the crisis

mapping platform. We develop a research model that characterizes information categorization quality in terms of citizens' (victims') social and situational cues, information variety as well as crowd interaction. Based on an analysis of 1,459 crisis reports in the Ushahidi crisis mapping platform for the 2010 Haiti Earthquake, we find that the cues are positively associated to categorization quality. In addition, crowds' interaction (captured in this paper through the structuring and mapping posts) also has a positive relationship with categorization quality.

Speaker: Dr. Rohit Valecha is an assistant professor in the Department of Information Systems and Cyber Security at The University of Texas at San Antonio. He joined the UTSA faculty in 2016. His Ph.D. is from the University at Buffalo in management science and systems, and his undergraduate in electrical engineering and master's degree in computer science are also from University at Buffalo.

Dr. H.R. Rao was named the AT&T Distinguished Chair in Infrastructure Assurance and Security at The University of Texas at San Antonio College of Business in January 2016. He also holds a courtesy appointment as full professor in the UTSA Department of Computer Science. He graduated from Krannert Graduate School of Management at Purdue University. His interests are in the areas of management information systems, decision support systems, e-business, emergency response management systems and information assurance. He has chaired sessions at international conferences and presented numerous papers. He also has co-edited four books, including Information Assurance Security and Privacy Services and Information Assurance in Financial Services. He has authored or co-authored more than 200 technical papers, of which more than 125 are published in archival journals.

Lunch Break

Friday, May 18

12:45pm

The Promise of Crowdsourcing for Natural Language Processing and Other Data Sciences

Chris Callison-Burch

Computer Science, University of Pennsylvania

Abstract: Crowdsourcing is a tool for data scientists that allows us to collect data and annotations on a large scale and at low cost. This offers new possibilities for research in economics, linguistics and other social sciences, as well as for computer vision, natural language processing (NLP) and other machine learning applications.

I will discuss how I use crowdsourcing to create speech and language data for NLP. I will detail a number of my own recent experiments using Amazon Mechanical Turk for NLP, including

- * Building quality control models to achieve professional translation quality from non-professional translators
- * Taking a census of the language skills of 4000 Turkers from more than 100 countries
- * Collecting sufficient volumes of data to train statistical translation models that beat the state of the art translation systems.

I'll also present some of my preliminary studies into collecting political science data.

I will discuss the general challenges of crowdsourcing, including quality control,

conveying complex tasks to lay users, professional v. non-professional annotation, and the advantages, including scalability and access to a worldwide workforce with diverse language skills. Based on my own experience, I attempt to give general guidance about when crowdsourcing works and when it doesn't, and how to customize your annotation schemes to be more appropriate to the Mechanical Turk crowdsourcing platform.

Speaker: I am an associate professor of Computer and Information Science at the University of Pennsylvania. Before joining Penn, I was a research faculty member at the Center for Language and Speech Processing at Johns Hopkins University for 6 years. I was the Chair of the Executive Board of the North American chapter of the Association for Computational Linguistics (NAACL) from 2011-2013. I have served on the editorial boards of the journals Transactions of the ACL (TACL) and Computational Linguistics. I served as the General Chair of the ACL 2017 conference. I have more than 100 publications, which have been cited over 10,000 times. I am a Sloan Research Fellow, and I have received faculty research awards from Google, Microsoft, Amazon and Facebook in addition to funding from DARPA and the NSF.

Friday, May 19
1:30pm

Teaming at the Limit

Leslie DeChurch
*School of Communication
Northwestern University*

Abstract: Teams are changing, technologies are changing, and both of these shifts are outpacing the theoretical advances needed to understand and enable teams. Over the past 25 years, the rapid advancement of information communication technologies has facilitated new forms of collaboration and communication among individuals, and these have fundamentally shifted the ways in which people team up and work together. Yet, the rapid uptake of new technologies has largely outpaced research that explains basic organizing processes, and informs the design of technologies that can enable teams to function at, and perhaps beyond, current limits. This talk presents a conceptual framework and two studies designed to understand and enable teaming at the limit.

Speaker: Leslie DeChurch's research investigates teamwork and leadership in organizations. She is Professor of Communication Studies, and holds a courtesy appointment in the Department of Psychology, Weinberg College of Arts & Sciences. She is President and Chairperson of the Board of INGRoup, the Interdisciplinary Network for Group Research.

Friday, May 19
2:15pm

Vignette-experimental surveys using Amazon Mechanical Turk

Kirsten Martin
*School of Business
George Washington University*

Abstract: This talk will outline my use of Amazon Mechanical Turk as a sample for factorial vignette surveys. The methodology, sampling technique, analysis, and generalizability of the surveys on Turk are compared to running the same surveys using a national sample from Knowledge Networks. I explain how respondents on Amazon Mechanical Turk can be used successfully to test the relationships between theoretical concepts.

Speaker: Kirsten Martin is an associate professor of Strategic Management and Public Policy at the George Washington University's School of Business.

She researches privacy, technology, and corporate responsibility. She has written about privacy and the ethics of technology in leading academic journals across disciplines (Journal of Business Ethics, Harvard Journal of Law and Technology, Journal of Legal Studies, JASIST, Journal of Business Research, etc) as well as practitioner publications such as MISQ Executive. She is the Research and Business Ethics editor for the Journal of Business Ethics and the recipient of

three NSF grants for her work on privacy, technology, and ethics. Dr. Martin is also a member of the advisory board for the Future Privacy Forum and the Census Bureau's National Advisory Committee for her work on privacy and the ethics of Big Data. Dr. Martin is a fellow at the Business Roundtable Institute for Corporate Ethics for her work on stakeholder theory and trust. She is regularly asked to speak on privacy and the ethics of big data.

She earned her B.S. Engineering from the University of Michigan and her MBA and Ph.D from the University of Virginia's Darden Graduate School of Business.

Coffee Break

Friday, May 19

3:15pm

Studying Crowdsourcing using Organizational Genetics

Youngjin Yoo

*Weatherhead School of Management
Case Western Reserve University*

Abstract: Crowdsourcing represents one of the most dynamic and complex socio-technical phenomenon, characterized by the participation by a large group of distributed participants, who leverage different artifacts and knowledge base, connected through a global information infrastructure. It poses several challenges for scholars as it is a distributed loosely process utilizing heterogeneous socio-technical components which co-evolve in complex, and often unpredictable, patterns. Crowdsourcing often represents ever-changing landscape of actors, artifacts and activities, with ceaselessly shifting boundaries.

At the same time, crowdsourcing platforms often represents exciting contexts for research as they often leave unprecedented volume and richness of digital trace data. Such digital trace data allow scholars to study the changes in artifacts and actors, together with their evolve relationships and their unfolding actions that are involved in crowdsourcing. They archive not only multiple versions of the digital artifacts being developed, but also through traces of activities and communications that occur between the

participants on the platform who contribute to, or observe, the design, innovation, and development processes which occur there. As such, the malleable and dynamic nature of crowdsourcing is no longer an abstract theory concept, but concrete empirical phenomenon that can be studied. The manners and the pace by which changes in actors, their relationships and activities co-evolve in crowdsourcing can be precisely modeled, predicted, and validated.

In this talk, I propose a new form of computational social science, organizational genetics, as viable theoretical and methodological approach for studying crowdsourcing. An organizational genetics approach to crowdsourcing see it as a vast, evolving, open-ended space of possibilities that produces ever-changing relationships among constituent parts, which continuously reconfigure themselves and co-evolve. Each instance of crowdsourcing is only precarious form of an assemblage that can transform into different shapes.

In this talk, I will briefly explain the overall goal of organizational genetics as a branch of computational social science and, using a couple of on-going studies in Github, to show how the use of organizational genetics approach allows us to study the dynamic and complex pattern of evolutions in crowdsourcing. I will conclude with a recently received NSF grant to expand organizational genetics methods and theory testing with an aim to build a predictive analytical model based on the work that we have done so far. I will conclude the talk with implications on crowdsourcing research and practice.

Speaker: Youngjin Yoo is the Elizabeth M. and William C. Treuhart Professor in Entrepreneurship and Professor of Information Systems at the department of Design & Innovation at the Weatherhead School of Management, Case Western Reserve University. He is also WBS Distinguished Research

Environment Professor at Warwick Business School, UK. and a Visiting Professor at the London School of Economics, UK. He has worked as Innovation Architect at the University Hospitals in Cleveland, overseeing the digital transformation efforts at one of the largest teaching hospital systems in the country. He has taught digital innovation strategy at Indian School of Business, Aalto University in Finland, and Korean Advanced Institute of Science and Technology. He was Innovation Architect at University Hospitals in Cleveland and a research associate at NASA Glenn Research Center. He has received over \$4.5 million in research grant from National Science Foundation, NASA, James S. and John L. Knight Foundation, the Department of Commerce, and National Research Foundation of Korea. His work was published at leading academic journals including MIS Quarterly, Information Systems Research, Organization Science, the Communications of the ACM, and the Academy of Management Journal. He was Senior Editor of MIS Quarterly, the Journal of AIS, the Journal Information Technology, and the Journal of Strategic Information Systems, and Associate Editor of Information Systems Research and Management Science. He is on the editorial board of Organization Science, Information and Organization, and Scandinavian Journal of Information Systems. He has worked with leading companies including Samsung Electronics, Goodyear Tire, American Greetings, Moen, NASA, Parker Hannifin, Poly One and the Department of Housing and Urban Development.

Friday, May 19

4:00pm

Crowdsourcing for Creative and Deliberative Tasks

Daniel Weld

*Computer Science & Engineering
University of Washington*

Abstract: While crowdsourcing has been gaining popularity, typical uses are limited to simple data annotation tasks. We describe novel workflows that support more open-ended creative and deliberative tasks, where workers collaborate and debate the best answers. We also discuss platform challenges that must be confronted to scale crowdsourcing to larger tasks requiring significant skill.

Speaker: Daniel S. Weld is Thomas J. Cable / WRF Professor in the Paul G. Allen School of Computer Science & Engineering and Entrepreneurial Faculty Fellow at the University of Washington. After formative education at Phillips Academy, he received bachelor's degrees in both Computer Science and Biochemistry at Yale University in 1982. He landed a Ph.D. from the MIT Artificial Intelligence Lab in 1988, received a Presidential Young Investigator's award in 1989, an Office of Naval Research Young Investigator's award in 1990, was named AAAI Fellow in 1999 and deemed ACM Fellow in 2005. Dan was a founding editor for the Journal of AI Research, was area editor for the Journal of the ACM, guest editor for Computational

Intelligence and Artificial Intelligence, and was Program Chair for AAAI-96. Dan has published two books and scads of technical papers.

Dan is an active entrepreneur with several patents and technology licenses. He co-founded Netbot Incorporated, creator of Jango Shopping Search (acquired by Excite), AdRelevance, a monitoring service for internet advertising (acquired by Nielsen NetRatings), and data integration company Nimble Technology (acquired by Actuate). Dan is a Venture Partner at the Madrona Venture Group and on the Scientific Advisory Boards of the Allen Institute for Artificial Intelligence, Context Relevant, the Madrona Venture Group, Spare5, and Voicebox Technologies.

Dan teaches many courses, including graduate classes on Artificial Intelligence, Extracting, Managing & Personalizing Web Information and Intelligent User Interfaces, and undergraduate classes on Artificial Intelligence, Advanced Internet Systems, and Machine Learning. In 2012, Dan co-organized a workshop on Crowdsourcing Personalized Online Education. During sabbaticals Dan was a visiting professor at Griffith University in Brisbane, Australia and visited the VIBE group at Microsoft Research.

Friday, May 19

4:45pm

Organizing and Motivating E-Lance Team Collaboration: Creation of New Institutional Logic for the 21st Century

Yuqing Ren

*Carlson School of Management
University of Minnesota*

Abstract: Computer and information technologies have and will continue to change the nature of work and how work is organized in our society. New forms of sourcing and organizing work such as crowdsourcing and electronic freelancing challenge and expand the boundaries of traditional organizations. Inspired by Malone and Laubacher's vision of an e-lance economy (1998), we present the notion of an e-lance team as a group of electronic freelancers who join together to collaborate using computer mediated technologies and accomplish a shared task for monetary returns. Different from virtual teams in organizations and online communities, e-lance teams operate in an online marketplace where institutional support for team forming and performing is largely absent. In this essay, we apply the institutional logic perspective to understand the unique characteristics of e-lance teams and why existing literature on team effectiveness, virtual teams, and online communities needs to be expanded to account for the nuances in the new phenomenon. We identify four critical research areas related to: a) the formation and evolution of e-lance teams, b) member motivation and the interplay of intrinsic,

extrinsic, and social motivations, c) team task and reward allocation structures, and d) the balance between member autonomy and leadership. In each area, we provide example questions and invite scholars from all relevant fields to join forces to tackle these grand challenges.

Speaker: Yuqing (Ching) Ren is an Associate Professor and the Mary and Jim Lawrence Fellow at the Carlson School of Management at the University of Minnesota. Dr. Ren holds a Ph.D. from Carnegie Mellon University. Her research interests are social media, online community, distributed collaboration, knowledge management, and computational modeling of social and organizational systems. Her work has been published at Academy of Management Annals, Human-Computer Interaction, Information Systems Research, Journal of MIS, Management Science, MIS Quarterly, Organization Science, and other journals and conference proceedings. Her research has been funded by National Science Foundation and 3M Foundation. Dr. Ren is serving as a Senior Editor and the Diffusion Editor of Organization Science. She has also served as an Associate Editor for Management Science 2015-2017.

Saturday, May 19
8:00am

Motivating User-Generated Content with
Performance Feedback: Evidence from
Randomized Field Experiments

Gordon Burtch

*Carlson School of Management
University of Minnesota*

Abstract: We design a series of online performance feedback interventions that aim to motivate the production of user-generated content (UGC). Drawing on social value orientation (SVO) theory, we develop a novel set of alternative feedback message framings, aligned with cooperation (e.g., your content benefited others), individualism (e.g., your content was of high quality), and competition (e.g., your content was better than others). We hypothesize how gender (a proxy for SVO) moderates response to each framing, and we report on two randomized experiments, one in partnership with a mobile-app-based recipe crowdsourcing platform, and a follow-up experiment on Amazon Mechanical Turk involving an ideation task. We find evidence that cooperatively framed feedback is most effective for motivating female subjects, whereas competitively framed feedback is most effective at motivating male subjects. Our work contributes to the literatures on performance feedback and UGC production by introducing cooperative performance feedback as a theoretically motivated, novel intervention that speaks directly to users' altruistic intent in a variety of task settings. Our work also contributes

to the message-framing literature in considering competition as a novel addition to the altruism–egoism dichotomy oft explored in public good settings.

Speaker: Gordon Burtch is an Assistant Professor of Information & Decision Sciences, Jim & Mary Lawrence Fellow and McKnight Presidential Fellow at the University of Minnesota, in the Carlson School of Management. He is also a Consulting Researcher with Microsoft Research, NYC. His research, which focuses on the economic evaluation of information systems, employs empirical analyses rooted in econometrics and field experimentation to identify and quantify the drivers of individual participation in online social contexts. His work has been published in *Management Science*, *Information Systems Research* and *MIS Quarterly*. He is a recipient of both the AIS Early Career Award (2017) and the INFORMS ISS Sandra A. Slaughter Early Career Award (2017).

Saturday, May 19
8:45am

Amateurs

Kevin Boudreau

*D'Amore McKim School of Business;
Northeastern University*

Abstract: In many instances, platforms have “crowds” of amateurs working on them as complementors, in other cases professional entrepreneurs or a mix of both. What precisely can a platform owner do to implement these outcomes? This paper clarifies conditions shaping participation by amateurs and professionals, and the role played by platform design. Key empirical predictions are shown to be consistent in the analysis of data on app developers. Small incremental shifts in the bare minimum cost necessary to develop a minimum viable product lead the bottom to fall out to amateurs. This more than doubles the total number of complementors and produces a flood of lowest-quality complementary goods—leading to a “long tail” that is considerably longer than that predicted by standard theory. The added developers are longer-lived, thus tending to accumulate on the platform, despite their low quality. Nonetheless, in these data, overall product quality increases where the bottom falls out to amateurs. I discuss possible interpretations.

Speaker: Dr. Boudreau is an associate professor at Northeastern University and a Research Associate at the National Bureau of Economic Research. His research focuses on understanding how platforms, defined broadly, can be optimized for growth and innovation. This research emphasizes empirical discoveries based on econometric analysis of large data sets and field experiments. Teaching responsibilities have included Strategy, Entrepreneurship, Innovation, Empirical Methods, Digital Economics and Platform Business.

At Northeastern, he is affiliated with the D'Amore McKim School of Business, the College of Computer and Information Science, the College of Social Science and Humanities, and the College of Engineering's IoT Research Cluster at the Interdisciplinary Science and Engineering Complex.

His primary external service responsibilities relate to serving as Associate Editor at Management Science in both the Innovation & Entrepreneurship department and the Strategy department, and serving on the editorial board at the Strategic Management Journal. He also serves other journals in management, economics, science and technology.

Prior to becoming an academic researcher, Dr. Boudreau carried out engineering research and experiments at the Canadian Space Agency and Nortel/Bell Northern Research, and then worked in tech management and strategy at The Economist Group, Qualcomm and Deloitte/Braxton Associates. He also helped with founding several telecommunications, software and data science start-ups.

Saturday, May 19
9:30am

Digital Transformations, Open Innovation, and Future of Work

Sunil Mithas

*Robert H. Smith School of Business
University of Maryland*

Abstract: Firms are increasingly embracing a more open model of knowledge creation and innovation management to transform themselves, in contrast to a relatively closed model of knowledge management that earlier focused on managing internal research and development (R&D) and other resources such as information technology (IT), and employees. In my talk I will describe some findings and lessons based on my research that examines how firms innovate by leveraging IT, and tapping into external sources, such as customers, complementors, employees of other firms belonging to the same conglomerate, and partners. I will also touch on some broader issues related to managing knowledge across borders and cultures that concern knowledge workers and knowledge work.

Speaker: Sunil Mithas is the Ralph J. Tyser Professor of Information Systems in the Robert H. Smith School of Business at the University of Maryland, where he is Co-Director of the Center for Digital Innovation, Technology and Strategy and the Center for Excellence in Service. He is the author of the books Digital Intelligence: What Every Smart Manager Must Have for

Success in an Information Age and Dancing Elephants and Leaping Jaguars: How to Excel, Innovate, and Transform Your Organization the Tata Way. He earned his PhD from the Ross School of Business at the University of Michigan and an engineering degree from IIT, Roorkee.

Identified as an MSI Young Scholar by the Marketing Science Institute, Mithas is a frequent speaker at industry events for senior leaders. He has worked on research or consulting assignments with organizations such as Johnson & Johnson, Lear, A.T. Kearney, and the Tata group. His papers have won best-paper awards, and have been featured in practice-oriented publications such as MIT Sloan Management Review, Bloomberg, and CIO.com.

Coffee Break

Saturday, May 19

10:30am

Hunch and Crunch: iterative crowdsourced hypothesis generation

James Bagrow

Mathematics & Statistics

University of Vermont

Abstract: Crowdsourcing is a powerful technique for gathering scientific data, including training data for machine learning models, survey data, or the results of behavioral experiments. While data gathering is a crucial use of crowdsourcing, crowd participants are uniquely capable of ingenuity and creativity, and the most powerful applications of crowdsourcing exploit this to provide crowdsourcers with novel ideas and out-of-the-box thinking. Here I will discuss two crowdsourcing projects that combine human intuition and creativity with computational methods to better understand problems of scientific interest.

First, we study the ability of the crowd to construct and explore large networks. Crowds can explore many types of social and information networks, but we focus on the network of causal attributions. Humans can provide explanations for causal relationships and generate hypotheses for new causes and effects. While such hypotheses can be noisy and plagued with potential cognitive biases, the alternative, computational methods, remain unable to generalize to beyond input data. In general,

efficiently exploring a large network is resource-intensive and challenging when crowd participants only make small individual contributions, so we introduce a theoretically-principled network exploration mechanism. Participants interacting with this mechanism reveal characteristics of causal perception and the network data we generate can improve our understanding of causality and causal inference.

Second, we investigate new ways to incorporate crowd creativity and wisdom into machine learning. Are crowd participants, who are likely not machine learning experts, able to contribute in more creative ways than labeling training data? To study this, we introduce algorithms and perform experiments asking participants to help construct predictive models and even frame entire machine learning problems. We found that participants can collectively build machine learning problems with minimal guidance, judge the importance or merit of those problems, collect training data, and predictive models can be trained automatically for those crowd-proposed problems. Better understanding how non-experts can contribute to the process of machine learning is increasingly important as advances in automation and AI change the role of individuals in the future workforce.

Speaker: James Bagrow is an Assistant Professor of Mathematics & Statistics at the University of Vermont and a member of the Vermont Complex Systems Center. His research interests include network science, computational social science, and statistics and machine learning. Before joining the University of Vermont, he was a postdoctoral researcher at the Center for Complex Network Research at Northeastern University and a research professor at Northwestern University. Professor Bagrow received his Ph.D. in Physics from Clarkson University in 2008.

Saturday, May 19

11:15am

Enhancing the "Call for Bids" to Improve Matching Efficiency in Online Labor Markets: Evidence from Freelancer.com

Paul A. Pavlou

Fox School of Business

Temple University

Abstract: To improve matching efficiency in online labor markets (matching employers with service providers), we seek to enhance the "Call for Bids" (CFBs) that describes the services requested by employers. CFBs help service providers to understand the project requirements by reducing description uncertainty about the requested services. In this study, we first explore three dimensions of description uncertainty in CFBs: (a) codifiability (i.e., provisions regarding detailed procedures), (b) flexibility (i.e., provisions regarding renegotiation opportunities for project period and budget), and (c) outcome standards (i.e., provisions regarding quantity and quality standards). Second, we examine the role of these dimensions in matching efficiency (i.e., contract success rate) between the employer and service provider. Third, we explore the mediating role of bid characteristics (i.e., number of bids, average quality of bids, and average price of bids) in the matching process. We use content analysis and deep learning algorithms to analyze unstructured textual data of CFBs to quantify the three dimensions of description uncertainty, and then test our empirical model using archival data from a major online labor market (Freelancer.com). We

find that codifiability is positively associated with matching efficiency by reducing the number of bids received by a project. Flexibility reduces matching efficiency by increasing the average bidding price. Outcome standards increase matching efficiency by reducing the number of bids and improving the average quality of bids. Our study contributes to the online labor markets literature by enhancing matching efficiency from the employer's perspective by focusing on the key dimensions of CFBS. The study also contributes to the IT outsourcing literature by incorporating key characteristics of online labor markets to the contract structure design. Third, our study contributes to the online labor markets literature by developing new measures of textual data from CFBS using a novel deep learning algorithm, which can also be applied to other fields that involve analyzing large-scale textual data. Our results also have practical implications for employers, service providers, and platform owners.

Speaker: Paul A. Pavlou is Senior Associate Dean for Faculty, Research, Doctoral Programs, and Strategic Initiatives at the Fox School of Business at Temple University. He is also the Milton F. Stauffer Professor of IT & Strategy. He also serves as the Co-Director of the university-wide Data Science Institute at Temple University.

As the Senior Associate Dean and Chief Research Officer, Paul oversees all research activities at the Fox School. He is responsible for the development and mentoring of research faculty and PhD students. During his tenure, five disciplines in the Fox School's are among the Top 10 in the nation in terms of their research productivity. Paul initiated and implemented the FOX RESEARCH strategic plan to enhance the Fox School's research visibility, including developing the 'Research Impact Report' to showcase the broader impact of the Fox School's research for academia, industry, practice, and society. He also oversees over \$6M in research grants at the Fox School.

Paul is also responsible for all doctoral programs at the Fox School, such as the PhD in Business Administration, PhD in Statistics, the Inter-Disciplinary PhD program in Decision Neuroscience, and the Executive Doctorate in Business Administration (EDBA), a new doctoral program catered to senior executives in Philadelphia and China.

Paul also leads several strategic initiatives at the department, school, and university levels, such as Data Science. As Co-Director of the Data Science Institute, Paul oversees the business analytics programs at the Fox School, including Masters in Business Analytics, Masters in Statistical Science, and Bachelors in Statistical Science and Data Analytics. He also facilitates grant proposals across schools and promotes the Institute's fundraising efforts.

Paul received his Ph.D. from the University of Southern California. He was #1 in the world in publications in the top two Information Systems journals (MISQ & ISR) for 2010-2016. His research has been cited over 35,000 times by Google Scholar, and he is recognized among the "World's Most Influential Scientific Minds" by Thomson Reuters based on an analysis of "Highly Cited" authors in Economics & Business for 2002-2012.

His research appeared in Management Information Systems Quarterly, Information Systems Research, Journal of Marketing, Journal of Marketing Research, Journal of the Academy of Marketing Science, Decision Sciences, Journal of Management Information Systems, Journal of the Association of Information Systems, among others. His research spans several disciplines (information systems, marketing, management, and decision sciences), and it focuses on data science, business analytics, digital business strategy, and developing research methods.

Paul won several Best Paper recognitions for his research, including the Maynard Award nomination for the "Most Significant Contribution to Marketing" in the Journal of Marketing in 2015, the ISR Best Paper award in 2007, the 2006 IS Publication of the Year award, and the Top 5 Papers award in Decision Sciences in 2006. He also won the Best Paper Award in 2012, the Runner-Up to the Best Paper award of the 2005, the Best Interactive Paper award in 2002, and the Best Student Paper award in 2001 from the Academy of Management Conference. He won the Best Innovation Theme Track Paper of the International Conference on Information Systems in 2016. Finally, Paul also won the Best Doctoral Dissertation award of the 2004 International Conference on Information Systems. He received over \$2,000,000 in grants from funding agencies, such as the National Science Foundation (NSF).

Paul is a Senior Editor at ISR and earlier at MISQ and JAIS. Moreover, Paul also won several Reviewer awards, including the 2009 Management Science Meritorious service award, the 'Best Reviewer' award of the 2005 Academy of Management Conference, and the 2003 MISQ 'Reviewer of the Year' award. He organized several conferences, including the Statistical Challenges in Electronic Commerce Conference (2018), the INFORMS Conference on Information Technologies and Systems (2015), the AMCIS Conference (2015), the Mediterranean Conference on Information Systems (2011 & 2014), and the Workshop on Information Systems Economics (2010).

List of Attendees

Sihem Amer-Yahia
CNRS
Université Grenoble Alpes

James Bagrow
Mathematics & Statistics
University of Vermont

Senjuti Basu Roy
Department of Computer Science
New Jersey Institute of Technology

Barry L. Bayus
Kenan-Flagler Business School
University of North Carolina at Chapel Hill

Michael Bernstein
Computer Science
Stanford University

Kevin Boudreau
D'Amore McKim School of Business;
Northeastern University

Gordon Burtch
Carlson School of Management
University of Minnesota

Chris Callison-Burch
Computer Science
University of Pennsylvania

Leslie DeChurch
School of Communication
Northwestern University

Mohammadreza Esfandiari
Department of Computer Science
New Jersey Institute of Technology

Elizabeth Gerber
School of Engineering &
School of Communications
Northwestern University

Brad Greenwood
Carlson School of Management
University of Minnesota

Jared Kenworthy
Psychology
University of Texas at Arlington

Mary Elizabeth Koone
Computer Science & Engineering
University of Texas at Arlington

Matt Lease
School of Information
University of Texas at Austin

Kirsten Martin
School of Business
George Washington University

Sunil Mithas
Robert H. Smith School of Business
University of Maryland

Paul A. Pavlou
Fox School of Business
Temple University

H Raghav Rao
College of Business
University of Texas at San Antonio

Yuqing Ren
Carlson School of Management
University of Minnesota

Md Abdus Salam
Computer Science & Engineering
University of Texas at Arlington

Raghu Santananam
W. P. Carey School of Business
Arizona State University

Rohit Valecha
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NSF Convergence Workshop on Crowdsourcing | Friday, May 18, 2018 - Saturday, May 19, 2018
Courtyard by Marriott Alexandria Old Town/Southwest | 2700 Eisenhower Ave, Alexandria, VA 22314
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Sponsored by the National Science Foundation through a Convergence HTF Grant No.1744401

