Workshop: Community

February 28 2023 (Online) - 8:00am/5pm MST

- The PanCommunity project is funded by
  - NSF CNS#2125246 SCC-IRG JST: PanCommunity: Leveraging Data and Models for Understanding and Improving Community Response in Pandemics

- https://www.pancommunity.org/
- https://www.pancommunity.org/community-workshop

Organizers and Speakers

(alphabetically ordered by last name)

K. Selçuk Candan, PhD

Professor of Computer Science and Engineering, ASU

Director, Center for Assured and Scalable Data Engineering (CASCADE)

PI, SCC-IRG JST: PanCommunity: Leveraging Data and Models for Understanding and Improving Community Response in Pandemics

Bio: K. Selcuk Candan is a Professor of Computer Science and Engineering at the Arizona State University, co-Director of ASU's School of Computing and Augmented Systems (SCAI), and the Director of ASU's Center for Assured and Scalable Data Engineering (CASCADE). His research spans various scalable and robust data management, integration, and analysis challenges and he has published over 250 journal and peer-reviewed conference articles, one textbook, and 15+ book chapters. He has 9 patents. Prof. Candan served/serving as an associate editor for the Very Large Databases (VLDB) journal, IEEE Transactions on Multimedia, the Journal of Multimedia, ACM Transactions on Database Systems, IEEE Transactions on Knowledge and Data Engineering, and IEEE Transactions on Cloud Computing. He is an ACM Distinguished Scientist. You

can find more information about his research and an up-to-date resume at kscandan.site.

Gerardo Chowell-Puente, PhD

Professor of Epidemiology and Biostatistics, School of Public Health, Georgia State University
co-PI, SCC-IRG JST: PanCommunity: Leveraging Data and Models for Understanding and Improving Community Response in Pandemics

Bio: Dr. Gerardo Chowell is professor of mathematical epidemiology in the Department of Population Health Sciences in the School of Public Health. He also holds an external affiliation as a Senior Research Fellow at the Division of International Epidemiology and Population Studies at the Fogarty International Center, National Institutes of Health. Before joining Georgia State, Dr. Chowell was an associate professor in the School of Human Evolution and Social Change at Arizona State University. Dr. Chowell is a member of the editorial boards of BMC Medicine, BMC Infectious Diseases, Epidemics, Mathematical Biosciences and Engineering, Infectious Disease Modeling, Scientific Reports, and PLOS One.

David Corman, PhD

Program Director, NSF Smart and Connected Communities

Bio: Dr. Corman obtained a dual BS degree in System Science and Mathematics and Applied Mathematics and Computer Science from Washington University in 1977. He then obtained a dual MS degree in SSM and Mechanical Engineering from Washington University in 1978. He completed his graduate education at the University of Maryland – College Park, and obtained a PhD in Electrical Engineering in 1983 with a major in controls and minor in communications. While at Maryland, Dr. Corman also worked at the Johns Hopkins Applied Physics Laboratory in the area of estimation, detection, and control. He worked for McDonnell Douglas / Boeing in a variety of positions. His work included a broad portfolio of DARPA and Air Force Research Laboratory research programs including Software Enabled Control, Mixed Initiative Control of Automa-teams, Threat Agent Cloud Tactical Intercept and Countermeasures, and Adaptive Vehicle Make. He was elected a Boeing Technical Fellow in 1999. Dr. Corman jointed NSF's Computer and Information System Engineering (CISE) directorate as an IPA in March 2013 as a Senior Research Scientist with the University of Maryland's Institute for Systems Research. He was appointed as a Research Associate Professor in the Preston M. Green Department of Electrical & Systems

Engineering at Washington University in St. Louis, in March 2015. Dr. Corman's research interests are in the field of Cyber Physical Systems (CPS), security for CPS, unmanned systems, manufacturing, and technologies supporting Smart and Connected Communities. At NSF, his current program responsibilities include

- Civic Innovation Challenge (CIVIC)
- Cyber-Physical Systems (CPS)
- Foundational Research in Robotics (FRR)
- Future of Work at the Human-Technology Frontier: Core Research (FW-HTF)
- NSF/FDA SCHOLAR-IN-RESIDENCE AT FDA
- Safe Learning-Enabled Systems
- Smart and Connected Communities (S&CC)

Stephanie Deitrick, PhD

Lead, Enterprise GIS & Data Analytics, City of Tempe, AZ

Title: "It's a matter of scale: the importance of location in local government pandemic response

Abstract: Throughout the pandemic, access to relevant and timely data was critical to help inform leadership decisions. Initially, daily updates on resources such as PPE and case increases to help assess capacity were the main focus for decision makers and those working as part of emergency services. After those initial weeks, city leaders were looking for possible indicators that would provide insights into current conditions in the city to support decisions related to closing/opening of city facilities, education and communication efforts and other city services. The initial release of state and then city level data provided some insights, but were insufficient to support strategic decisions that reflected current conditions throughout the community. Additionally, access to only city level data limited our ability to provide resources where they were needed the most or to identify areas where there were high levels of COVID cases and high percentages of under-represented groups. The release of zip code level data later on was better, but was still insufficient for supporting strategic responses and targeted support.

The need for this more localized data was one factor in our quickly pivoting our wastewater testing from opioids to COVID soon after the pandemic started. The benefits of wastewater testing are that it captures the presence of COVID for anyone in the collection area that uses a restroom without the need for individual testing. This meant that we captured both symptomatic and asymptomatic cases regardless of whether they tested. Additionally, it provided a more equitable

assessment of current conditions as it captured all areas of the city, so that those who were unable to access testing facilities due to lack of resources or other reasons were included in the results. Since we collected and reported data for multiple collection areas (which were expanded during the pandemic), it also provided more granular data than zip code level.

If (or when) another pandemic emerges, this need for localized data will continue to be critical to provide situational awareness for both the city and community members. Efforts to understand these needs and identify core data that would be needed, and preparation for providing those data, would better position cities to meet the challenges of a future pandemic.

Angel Desai, MD, MPH
Assistant Professor, Division of Infectious Disease, UC Davis

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Nina Fefferman, PhD
Professor of Ecology and Environmental Biology, University of Tennessee at Knoxville
Lead PI, NSF PIPP Phase 1: Predicting Emergence in Multidisciplinary Pandemic Tipping-points (PREEMPT)

Title: A Template for Responsive Translational Pandemic Science

Abstract: Basic science is beautiful and important, but also scattered and siloed. It relies on expertise that is deeply engrained in particular modes of thought, making new collaborations between people and fields difficult. When new multifaceted challenges (such as pandemics) arise, it can be difficult to work across boundaries to identify, much less address, these challenges. While the scientific research challenges are case-specific, there is a clear and universal need for mechanisms that will enable us to shift from a slow and primarily independent world into a fast, adaptable, collaborative environment, where all types of stakeholders and researchers can work together more easily. The work my collaborators and I have been focusing on borrows from a mix of medical triage, operations research-based decision theory, and the science of team science to try to put in place mechanisms that help us turn the giant 'aircraft carrier' of real-time responsive research around fast, without disrupting daily life onboard. I'll describe what we've been trying to do and how it's been going.

Bio: Fefferman is the Director of the National Institute for Mathematical and Biological Synthesis (NIMBioS) and the Associate Director of the One Health

Initiative at the University of Tennessee, Knoxville, where she is also a Professor in both the Departments of Ecology & Evolutionary Biology and Mathematics. Her research uses mathematical modeling to explore the behavior, evolution, and control of complex systems with application in areas from basic science (evolutionary sociobiology and epidemiology) to deployable technology (bio-security, cyber-security, and wildlife conservation). Her work has been funded by NSF, NIH, DHS, DoD, and IARPA, among others. Fefferman is passionate about enabling transdisciplinary science and about communicating the utility and beauty of mathematics as a tool to make people's lives better.

Chun Hai (Isaac) Fung, PhD

Assoc. Prof. of Epidemiology, Georgia Southern University
Optimization of COVID-19 vaccination strategies, Ghana

Title: Optimization of COVID-19 Vaccination Strategies, Ghana

Abstract: Ghana was the first African country to received COVAX donation of COVID-19 vaccine. In this presentation, I will present two mathematical modeling studies in which we explore the potential impact of varying vaccination strategies in Ghana. Prioritizing the elderly was associated with the lowest mortality rates in the population for the initial strain and the delta variant. Vaccine prioritization strategies in a country are dependent on its population structure, mixing patterns, and policy objective. A sustained, multi-faceted response at the national level helps mitigate the health impact of the pandemic. This is also a story of a Ghanian student (Sylvia Ofori) who came to Georgia Southern to receive training in mathematical modeling to help serve her country. Sylvia is now a Harvard postdoc.

Bio: Isaac Fung is an associate professor of epidemiology at Georgia Southern University. His research interests include infectious disease epidemiology and digital health. Dr Fung earned his BA in Natural Sciences from the University of Cambridge (2003) and MSc in Control of Infectious Diseases from the London School of Hygiene and Tropical Medicine (2005). He earned his PhD from the Department of Infectious Disease Epidemiology at Imperial College London (2009). In 2009-11, he completed his postdoc at the University of Georgia Department of Epidemiology and Biostatistics. He spent 2 years at the CDC as a Prevention Effectiveness Fellow from 2011 to 2013, during which he participated in the H7N9 emergency response, studied impacts of vaccination and WASH interventions against cholera in Haiti, and analyzed the costs of the 2009 federal H1N1 influenza vaccination campaign. Dr Fung authored 100+ publications. Currently he served on the editorial boards of Emerging Infectious Diseases and Public Health Reports.

Niu Gao, PhD

Senior fellow at the Public Policy Institute of California
PI, A Researcher-Practitioner Partnership to Improve Pandemic Recovery Efforts in California

Title: The Impact of COVID-19 on Science Education: Early Evidence from California

Abstract: Longstanding underinvestment in science education and the unprecedented disruptions caused by COVID-19 have heightened challenges faced by California's districts, schools, and students. Using data from multiple sources, we find that science became a lower priority during the 2020-21 school year when districts were closed for in-person instruction. Key activities to implement the new science standards (the Next Generation Science Standards) were delayed. Districts provided limited support. A quarter of districts provided small group instruction and 40 percent provided additional support to English learners. Most district recovery plans do not prioritize science education. Only 27 percent of districts made science a high priority, whereas more than 80 percent prioritized math/English language arts.

Bio: Niu Gao is a senior fellow at the Public Policy Institute of California. She is interested in policies that close the opportunity and achievement gaps for students. Currently she is leading work on education recovery in K-12 education. Her recent work focuses on understanding the impact of the COVID-19 pandemic on students and families, including the digital equity gaps, distance learning,school meals and food insecurities. She has served as PI or Co-PI on research grants from the Institute of Education Sciences, National Science Foundation, and Administration for Children and Families. She holds a PhD in education policy and an MS in economics from Florida State University.

Hyoshin Kim, PhD

Senior Research Scientist, Health Research and Analytics, Battelle

Title: Working Together to Predict, Prepare, Prevent, and Respond Better to the Next Pandemic Emergency with Data & Technology, Policies, and People

Abstract: Data systems during COVID-19 pandemic have been uncoordinated and siloed at local, national, and global levels, unable. This resulted in an inability

to translate scientific data and engineering innovations to actionable, reliable, and trustworthy information for decision makers and the public. The challenge to address this involves: (1) generating trusted, reliable, and predictive data and intelligence for novel and emerging pandemic events; and (2) providing actionable information to policy decision makers and societal communities. There is a need to build a comprehensive national pandemic surveillance network that can integrate data from existing and new systems (data modernization) and which will be used to transform biological, ecological, and social knowledge into models (risk assessment and forecast). Additional integrative efforts are needed to translate scientific information into policies (translation) and to communicate with and engage people in communities for actions (communication and engagement). Recent experiences related to each component will be highlighted for discussion.

Bio: Dr. Kim is Senior Research Scientist in Battelle's Health Research & Analytics group. As a quantitative multidisciplinary researcher, she has over 20 years of experience developing research projects and evaluating measures and policies/programs in the public health area by synthesizing multiple data sources and types across clinical, bio-behavioral, and community/environmental domains for population level applications. Dr. Kim has led multiple federal grants and contracts in the areas of healthcare system, healthcare quality measures, health disparities, contextual/social systems, tobacco control and substance use policy, and has published research articles in peer-reviewed journals. She holds a PhD in policy analysis from Cornell University.

Timothy Lant, PhD

Lead, COVID-19 modeling task force, Modeling Emerging Threats for Arizona (METAz)

Bio: Timothy Lant is director of program development for Arizona State University's Knowledge Enterprise and the project manager for the Compact X-ray Free Electron Laser project. With more than 20 years of experience in government, academic, think-tank, corporate and nonprofit positions, Lant's areas of professional expertise are in research administration, program management, data science, information technology, risk and threat assessment, medical and public health and policy analysis.
In his current role, Lant is responsible for supporting all program management activities, including planning, requirement setting, budgeting, risk management and project lifecycle performance evaluation. He coordinates with science and engineering teams to align resources with execution requirements and leads project documentation efforts. Lant is credited with leading ASU's efforts to

capture and execute midscale ($7-70M) federal research contracts and projects in high-value, strategic portfolios.
Prior to joining ASU, Lant was director of the Division of Analytic Decision Support, Biomedical Advanced Research and Development Authority (BARDA), Office of the Assistant Secretary for Preparedness and Response, Department of Health and Human Services (HHS). His primary responsibilities included leading HHS efforts to assess medical and public health consequences for disease outbreaks, chemical, biological, radiological and nuclear defense terrorism and pandemic influenza. He also developed scenario-based and initial capabilities assessments, product specific requirements and requests for proposals across a multi-billion-dollar portfolio of medical countermeasures. Lant also led multiple inter-agency boards and committees related to medical and public health preparedness planning and acquisition of required products and services. He has worked extensively with the U.S. federal interagency, the White House and national labs. Lant created and led the HHS 2014 Ebola Modeling Coordination Group charged with developing analysis products and requirements with diverse stakeholder groups within federal, state, local and international organizations.

Martin I. Meltzer, PhD
Lead, Health Economics and Modeling Unit (HEMU) at CDC

Title: Engaging community planners with simple tools: The basics

Abstract: State and local public health officials and community leaders must plan, prepare, and respond to emergencies, including infectious diseases epidemics. For this, they need graphs and tables of estimated burdens of disease and impacts of potential interventions – scaled for their jurisdictions. Many jurisdictions have neither the time nor the staff to contemplate complicated models. Experience has taught us that such jurisdictions prefer being able to download simple tools that they can independently operate. We have developed a set of rules to guide the production of a such tools. These rules include the following: Clearly identify the question and audience; Build the model to answer the question; List and keep separate the epidemiological, clinical, intervention and costs aspects; and, allow for variability (“what if” scenarios). Finally, the tool should always produce outputs that can be quickly explained to multiple, non-modeling audiences. I will illustrate these concepts with examples from the, 2009 H1N1 influenza pandemic, the 2014 Ebola epidemic in West Africa, and the COVID-19 Response (2020 – 2022).Some of these tools have been downloaded, combined, over 250,000 times. Given that public health interventions often cannot be “fine tuned,” and that the quality of input data is often less than desired, “ballpark estimates” are often sufficient for such planning and response.

Finally, it must always be remembered that such tools are often primarily teaching aids – illustrating to the users what variables greatly impact outcomes.

Bio: Dr. Martin I. Meltzer is the Lead of the Health Economics and Modeling Unit (HEMU), and a Distinguished Consultant in the Division of Preparedness and Emerging Infections, CDC in Atlanta, GA. He received his undergraduate degree from the University of Zimbabwe in 1982, and Masters and a Doctorate in Applied Economics from Cornell University, NY, in 1987 and 1990, respectively. From 1990 to mid-1995, he was on the faculty at the College of Veterinary Medicine at the University of Florida. In 1995, he moved to CDC, where he was in the first class of Prevention Effectiveness (health economists) Fellows. He led the modeling teams supporting CDC's response to the 2009 H1N1 influenza pandemic. Other responses in which he lead the modeling activities include estimating the residual risk associated with the 2012 contaminated steroid injectable products that caused fungal meningitis among patients, Ebola outbreaks in West Africa (2014-16) and the Democratic Republic of the Congo (2018-19), the Zika epidemic, the COVID Response, and the current Ebola outbreak in Uganda. Examples of his research include estimating the impact of the 2009 influenza pandemic, the modeling of potential responses to smallpox as a bioterrorist weapon and assessing the economics of controlling diseases such as rabies, dengue, hepatitis A, meningitis, Lyme, and malaria. Dr. Meltzer has published approximately 300 publications, including over 180 papers in peer-reviewed scientific journals and more than 60 software tools. These tools include FluAid, FluSurge and FluWorkLoss, COVIDSurge, COVIDTracer and COVIDTracer Advanced. Collectively, these tools have been downloaded more than 200,000 times and have been used by local, state, national and international public health agencies, with jurisdictions exceeding a total of 1 billion persons. He also, in 2022, led the team that developed the COVID Quarantine and Isolation Calculator, which has had over 7 million unique visitors in 6 months on CDC's webpages. He is an associate editor for Emerging Infectious Diseases. He also supervises several post-doctoral health economists at CDC.

Vel Murugan, PhD

Assoc. Research Director, ASU Biodesign Center for Personalized Diagnostics and ASU Biodesign Clinical Testing Laboratory

Bio: Dr. Vel Murugan is a trained molecular cell biologist with extensive experience in studying cell cycle regulation, cancer biology, vaccine discovery and development. Dr. Murugan brings with him a wealth of experience from his time in both industry as well as academic institutions. Dr. Murugan earned his PhD from the Tata Institute of Fundamental research and completed his

post-doctoral work at The University of Texas at Austin and Dana-Farber Cancer Institute in Boston. Prior to joining ASU, he worked on the development of attenuated vaccine against Malaria at Sanaria, Inc. He has contributed more than 30 original research publications, reviews and book chapters. At the Center for Personalized Diagnostics, he led a team that developed a high throughput diagnostic test to detect and quantify radiation exposure in humans. His laboratory studies epigenetic changes in response to environmental exposures and develops epigenetic-biomarker based diagnostic tests to detect exposures to toxic chemicals, pathogens, explosives and radiological agents.

Hiroshi Nishura, PhD

Professor of Hygiene, Kyoto University
Adviser for the Japanese Government during COVID-19 pandemic
co-PI, SCC-IRG JST: PanCommunity: Leveraging Data and Models for Understanding and Improving Community Response in Pandemics

Title: Spotting High-Risk Events for COVID-19 Transmission: Estimating the Risk of Clustering Using Nationwide Data

Bio: Dr. Nishura's research interests span the areas of statistical epidemiology of infectious diseases, epidemiological modeling and biomathematical formulation of the transmission dynamics of infectious diseases. He aims to answer policy-relevant questions by integrating various mathematical models with empirically observed data. A common thread in his research is an understanding of the epidemiological dynamics underlying empirically observed data. Having a background in medicine and being a licensed physician in Japan, he became infectious disease epidemiologist because he strongly believes that population science is the most important and useful subject for elucidating the most effective strategy for infectious disease control.

Giulia Pedrielli, PhD

Associate Professor of Industrial Engineering, Arizona State University
co-PI, PIPP Phase I: Computational Foundations for Bio-social Modeling of Unseen Pandemics
co-PI, SCC-IRG JST: PanCommunity: Leveraging Data and Models for Understanding and Improving Community Response in Pandemics

Bio: Prof. Pedrielli Associate Professor for the School of Computing and Augmented Intelligence at Arizona State University. She was previously

postdoctoral fellow at the Department of Industrial and Systems Engineering at National University of Singapore and Department of Mechanical Engineering of Politecnico di Milano. She was also research fellow for the Institute of Industrial Technologies and Automation within the National Research Council, Italy, (ITIA-CNR). She has been a visiting doctoral student at University of California at Berkeley, Department of Industrial Engineering and Operations Research (IEOR) collaborating with Professor Lee W. Schruben and Phil Kaminsky.

She develops her research activity in the area of stochastics and simulation with a particular interest in simulation based optimization, blackbox optimization, and she develops techniques at the crossroads between optimization and machine learning. She has dealt with applications across life science, intelligent systems and critical infrastructures. Within the first area, she is interested in next generation biomanufacturing systems, nanotechnology, and molecular design. In the area of intelligent systems she works on digital twins with focus on safety and security. Within the context of critical infrastructures, she has looked into large scale supply chains, power and water networks and the intersection of these systems. She is increasingly involved in real time control under uncertainty in the domain of cyber-physical systems including robotics.

Gabriel Rainisch, PhD

Epidemiologist, Division of Preparedness and Emerging Infections (DPEI), Centers for Disease Control and Prevention (CDC)

Bio: Gabriel Rainisch is an epidemiologist with over 18 years of service with the US CDC. He currently works within CDC's Health Economics Modeling Unit, where he specializes in the development of models used for developing public policy and planning and responding to public health emergencies. Over the years, his work has informed how to use diagnostic tests and deploy immunizations, provided estimates of the impact of interventions, and optimized medical supply stockpiles. These contributions have supported decision-making at state and local health departments and at the national level for various diseases, including COVID19, RSV, Anthrax, Ebola, and Influenza.

Louiqa Raschid, PhD

Professor, University of Maryland at College Park

Lead PI, NSF PIPP Phase 1: Evaluating the Effectiveness of Messaging and Modeling during Pandemics (PandEval)

Bio: Louiqa Raschid is a professor at the University of Maryland where she holds appointments in the Smith School of Business, the Institute of Advanced Computer Studies (UMIACS) and the Department of Computer Science. She is a member of the Computational Linguistics and Information Processing (CLIP) Lab, the Database Group and the Center for Bioinformatics and Computational Biology.

She has over two decades of experience in data science, a computational paradigm with the potential to fundamentally change the way we exploit data driven decision making to support a broad range of human activities. Raschid has made pioneering contributions towards meeting data integration, data management and data mining challenges in multiple non-traditional domains. Her multidisciplinary research spans the fields of computer science to business information systems, with a strong link to important data science applications including the life sciences and health sciences, humanitarian disaster relief applications, human behavior modeling within social streams, and the modeling and management of financial ecosystems. She has been an ACM Distinguished Scientist since 2008 and was named an ACM Fellow in 2016.

Kieran Sharkey, PhD

Professor of Mathematics, University of Liverpool

Investigator, EcoGamesPlus ITN: Evolutionary games and population dynamics: from theory to applications

Title: Effectiveness of the Oxford-AstraZeneca and Pfizer-BioNTech Vaccines for Reducing Susceptibility to the Delta Variant of SARS-CoV-2

Abstract: I will show how we used a compartmental epidemic model to determine the effectiveness of the Oxford-AstraZeneca and Pfizer-BioNTech vaccines in reducing susceptibility to infection with the Delta variant of the corona virus SARS-CoV-2. We used very high-quality data public health data collected in the Merseyside and Cheshire regions of the UK covering about 3 million individuals including their infection history and their vaccination history. Our results with this method are consistent with other methods based on test-negative case control designs. This work is published here https://doi.org/10.1186/s12879-022-07239-z.

Bio: Kieran Sharkey is Professor of Applied Mathematics at the University of Liverpool. He started his research career with a PhD in theoretical physics. After a few years working in a small start-up company he moved back to academia and gained a lectureship at Liverpool in 2009. His research interests are in

complex systems and networks, particularly with applications in epidemiology and evolution.

Pavan Turaga, PhD

PI, PIPP Phase I: Computational Foundations for Bio-social Modeling of Unseen Pandemics

Bio: Prof. Turaga is a Professor jointly between the departments of Arts, Media, and Engineering and Electrical Engineering (ECEE). I direct the School of Arts, Media, and Engineering. He also leads the Geometric Media Lab (GML) at ASU, with Max Bernstein and Tejaswi Gowda. Their work spans tools for representation drawn from statistics, optimization, geometry, and topology, and applied to the areas of computer vision, machine learning, immersive technologies, health-analytics, public understanding of science, arts and performance, and more.