

Mind & Machine Virtual Summit Agenda

June 1, 2021 — AI, Doctors, and Patients

- 9:05am **Keynote: What AI Can Teach Us About Human Intelligence**
[Ziad Obermeyer](#), Public Health, UC Berkeley
- 10:10am Moderator: [Misha Sra](#), Computer Science, UC Santa Barbara
- 10:15am **Death by Siri: The Dangers of Asking AI for Medical Advice**
[Tim Bickmore](#), Computer Science, Northeastern University
- 10:40am **Machine Learning in Real-world Healthcare Settings: How Far We Have Come and Where We Are Going**
[Katherine Heller](#), Statistical Science, Duke University and Google Medical Brain
- 11:05am **Shadow Learning: Building Robotic Surgical Skill When Approved Means Fail**
[Matt Beane](#), Technology Management Program, UC Santa Barbara

June 2, 2021 — AI, Radiology, and Decisions

- 9:00am **Keynote: Intelligent Imaging: From Acquisition to Precision Medicine**
[Sharmila Majumdar](#), Bioengineering and Therapeutic Sciences, UC San Francisco
- 10:05am Moderator: [Miguel Eckstein](#), Psychological and Brain Sciences, UC Santa Barbara
- 10:10am **AI for Breast Cancer Screening in Europe: Possibilities and Current Results**
[Ioannis Sechopoulos](#), Radiology and Nuclear Medicine, Radboud University
- 10:35am **Machine Intelligence in Critical Care; Role of Interpretability and Trust**
[Shamim Nemati](#), Biomedical Informatics, UC San Diego
- 11:00am **AI-Enabled Systems in Medical Imaging: FDA Research in Support of Regulatory Pathways**
[Kyle Myers](#), Division of Imaging, Diagnostics, and Software Reliability, FDA

June 3, 2021 — AI and COVID-19

- 9:00am **Keynote: COVID-19 Vaccinations and AI: Harnessing the Power and Avoiding the Pitfalls**
[Lynn Fitzgibbons](#), MD, Infectious Disease Specialist, Cottage Health Santa Barbara
- 10:05am Moderator: [William Wang](#), Computer Science, UC Santa Barbara
- 10:10am **A Journey Through the Disorderly World of Diagnostic and Prognostic Models for Covid-19: a Living Systematic Review**
[Laure Wynants](#), Epidemiology, Maastricht University
- 10:35am **Deployment of AI-Based Risk Assessment Tools for COVID at UCI - A Single-Center Experience**
[Daniel Chow](#), Radiological Sciences, UC Irvine
- 11:00am **A Deployed Model for COVID-19**
[Rajesh Ranganath](#), Computer Science, New York University

June 1, 2021 — AI, Doctors, and Patients

Moderator: [Misha Sra](#), Computer Science, UC Santa Barbara

Bio: Misha Sra is the John and Eileen Gerngross Assistant Professor and directs the Perceptual Engineering Lab in the Computer Science department at UCSB. She is affiliated with UCSB's Center for Responsible Machine Learning (CRML), Mind & Machine Intelligence and the Cognitive Science Program. Misha received her PhD at the MIT Media Lab in 2018. She has published at the most selective HCI and VR venues such as CHI, UIST, VRST, and DIS where she received multiple best paper awards and honorable mentions. From 2014-2015, she was a Robert Wood Johnson Foundation wellbeing research fellow at the Media Lab. In spring 2016, she received the Silver Award in the annual Edison Awards Global Competition that honors excellence in human-centered design and innovation. MIT selected her as an EECS Rising Star in 2018. In 2020, she received the Google Research Faculty Award. Her research has received extensive media coverage from leading media outlets (e.g., from Engadget, UploadVR, MIT Tech Review and Forbes India) and has drawn the attention of industry research, such as Samsung and Unity 3D.



Keynote: [Ziad Obermeyer](#), Public Health, UC Berkeley
What AI Can Teach Us About Human Intelligence

Abstract: Machine learning is increasingly widely deployed to solve real-world problems—but what can we learn from black box predictions? Using some examples from my work in health, I'll show how the contrast between algorithmic predictions and human decisions can be illuminating: it can help us test hypotheses about how we make inferences, and how we fall prey to biases. This suggests that algorithms are more than just aids for decision making; they are powerful new tools to generate scientific knowledge.

Bio: Ziad trained as an emergency doctor - and he still gets away as often as he can, to a hospital in rural Arizona, to do what he loves: work in the ER. But these days, Ziad spends most of his time doing research and teaching, at UC Berkeley. Inspired by his clinical work, he builds machine learning algorithms that help doctors make better decisions. He also studies where algorithms can go wrong - how they can scale up racial bias - and how to fix them. He has received many awards (from the National Academy of Medicine, the American Society of Health Economists, the NIH, and medical societies), and publishes in a wide range of journals (from Science to the New England Journal of Medicine to computer science conferences like NeurIPS). His work has been highly influential, and is frequently cited in the public debate about algorithms, as well as federal and state regulatory guidance to industry.



Tim Bickmore, Computer Science, Northeastern University

Death by Siri: The Dangers of Asking AI for Medical Advice

Abstract: I will discuss the safety risks when using natural language interfaces for automated health counseling, focusing on a study I conducted using Siri, Alexa, and Google Home. I demonstrated their ability to cause significant harm or death to users when used for actionable medical advice in certain situations. I will discuss some approaches to mitigating these risks, and research opportunities in the development of health dialogue systems that afford the naturalness and flexibility of unconstrained natural language input while ensuring that they do not kill their users.

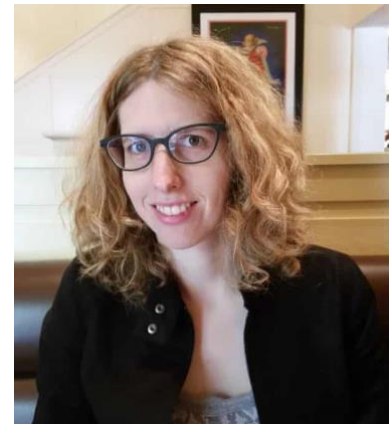
Bio: Dr. Timothy Bickmore is a Professor in the College of Computer and Information Science at Northeastern University. The focus of his research is on the development and evaluation of computer agents that emulate face-to-face interactions between health providers and patients for use in health education and health behavior change interventions, with a particular focus on the emotional and relational aspects of these interactions. Prior to Northeastern, he was an Assistant Professor of Medicine at the Boston University School of



Medicine. Dr. Bickmore received his Ph.D. from MIT, doing his dissertation work in the Media Lab studying emotional interactions between people and animated computer characters.

[Katherine Heller](#), Statistical Science, Duke University and Google Medical Brain
Machine Learning in Real-world Healthcare Settings: How Far We Have Come and Where We Are Going

Abstract: In this talk I will discuss three real-world Health applications of Machine Learning research, the progress that we have made in deployment to hospitals or directly to individuals, and where we hope to be heading next. In the first part, I will discuss Sepsis Watch, our Sepsis prediction system that has been deployed to the emergency departments of Duke University hospitals. This system performs prediction for incoming patients through a combination of Gaussian Processes, which estimate patient features in continuous time from uneven measurements, and Recurrent Neural Networks. Next I discuss Graph-coupled HMMs, work that we have done making individual-level predictions of disease spread in a social network in influenza, and how this might effect prediction abilities in other diseases, such as Coronavirus. Lastly, I will discuss the iOS app developed to record data on people with Multiple Sclerosis outside of a clinic environment, what collected data and basic analyses imply for our ability to do symptom and subpopulation



Bio: Katherine Heller is a Research Scientist at Google. She has worked on developing and integrating multiple machine learning systems into hospitals and clinical care including: a sepsis detection system which has been integrated into the Duke University Hospital Emergency Departments, a system for detecting the likelihood of complications resulting from surgery, and a nationally released mobile study on Multiple Sclerosis. She is interested in machine learning and ethics in a medical context, and the inclusion of all people in the development of medical technology. Before joining Google, she was at Duke University in Statistical Science, Neurobiology, Neurology, Computer Science, and Electrical and Computer Engineering. She was the recipient of an NSF CAREER award and a first round BRAIN initiative award.

[Matt Beane](#), Technology Management Program, UC Santa Barbara
Shadow Learning: Building Robotic Surgical Skill When Approved Means Fail

Abstract: In this study I explore how trainees in a community of practice learn new techniques and technologies when approved practices for learning are insufficient. I do so through two studies: a two-year, five-sited, comparative ethnographic study of learning in robotic and traditional surgical practice, and a blinded interview-based study of surgical learning practices at 13 top-tier teaching hospitals around the U.S. I found that learning surgery through increasing participation using approved methods worked well in traditional (open) surgery, as current literature would predict. But the radically different practice of robotic surgery greatly limited trainees' role in the work, making approved methods ineffective. Learning surgery in this context required what I call "shadow learning": an interconnected set of norm- and policy-challenging practices enacted extensively, opportunistically, and in relative isolation that allowed only a minority of robotic surgical trainees to come to competence.



Successful trainees engaged extensively in three practices: "premature specialization" in robotic surgical technique at the expense of generalist training; "abstract rehearsal" before and during their surgical rotations when concrete, empirically faithful rehearsal was prized; and "undersupervised struggle," in which they performed robotic surgical work close to the edge of their capacity with little expert supervision—when norms and policy dictated such supervision. Shadow learning practices were neither punished nor forbidden, and they contributed to significant and troubling outcomes for the cadre of initiate surgeons and the profession, including hyperspecialization and a decreasing supply of experts relative to demand.

Bio: Matt Beane is an Assistant Professor in the Technology Management Program at the University of California, Santa Barbara, and a Digital Fellow at Stanford and MIT. Matt studies how we adapt to work involving machine

intelligence - and specifically robotics. Matt has done extensive field research in settings such as robotic pick and pack work in fulfillment centers, robotic surgery, robotic materials transport, and robotic telepresence in healthcare, elder care and knowledge work. He received his Ph.D. from the Sloan School of Management at the Massachusetts Institute of Technology in the Information Technologies department. His research on robotic surgery was published in 2019 at Administrative Science Quarterly and Harvard Business Review, his related TED talk has over 1.8 million views, and his work on robotic telepresence was published in 2014 in Organization Science. He was selected in 2012 as a Human Robot Interaction Pioneer, and is a regular contributor to popular outlets such as Wired, MIT's Technology Review, TechCrunch, Forbes and Robohub. Matt also took a two-year hiatus from his doctoral studies to help found and fund Humatics, an MIT-connected, full-stack IoT startup.

June 2, 2021 — AI, Radiology, and Decisions

Moderator: Miguel Eckstein, Psychological and Brain Sciences, UC Santa Barbara

Bio: Miguel Eckstein earned a Bachelor Degree in Physics and Psychology at UC Berkeley and a Doctoral Degree in Cognitive Psychology at UCLA. He then worked at the Department of Medical Physics and Imaging, Cedars Sinai Medical Center and NASA Ames Research Center before moving to UC Santa Barbara. He is recipient of the Optical Society of America Young Investigator Award, the Society for Optical Engineering (SPIE) Image Perception Cum Laude Award, Cedars Sinai Young Investigator Award, the National Science Foundation CAREER Award, the National Academy of Sciences Troland Award, and a Guggenheim Fellowship. He has served as the chair of the Vision Technical Group of the Optical Society of America, chair of the Human Performance, Image Perception and Technology Assessment conference of the SPIE Medical Imaging Annual Meeting, Vision Editor of the Journal of the Optical Society of America A, the board of directors of the Vision Sciences Society, the board of editors of Journal of Vision, and as a member of National Institute of Health study section panels on Mechanisms of Sensory, Perceptual and Cognitive Processes and Biomedical Imaging Technology.



Keynote: [Sharmila Majumdar](#), Bioengineering and Therapeutic Sciences, UC San Francisco
Intelligent Imaging: From Acquisition to Precision Medicine

Abstract: Emerging artificial intelligence methods applied to quantitative imaging, across the imaging cycle – from image acquisition, reconstruction, feature extraction and disease trajectory modelling will be presented. In this talk we will focus on imaging methods related to imaging the musculoskeletal system, specifically tissues like cartilage, meniscus, muscle, bone and intervertebral disk. We will focus on relating the quantitative tissue imaging to function, pain, skeletal biomechanics, and movement changes. The clinical deployment of these methods and their impact on patient impact will be discussed.

Bio: Sharmila Majumdar, PhD, is a UCSF Professor and is the Vice Chair for Research and Margaret Hart Surbeck Distinguished Professor in Advanced Imaging in the Departments of Bioengineering and Therapeutic Sciences, Orthopedic Surgery at UCSF. She is Director of the Musculoskeletal Research Interest Group at UCSF, an interdisciplinary group consisting of faculty, post-doctoral scholars and students, and is the Scientific and Executive Director of the Center for Intelligent Imaging. Dr. Majumdar's research work on imaging, particularly magnetic resonance and micro computed tomography, and development of image processing and analysis tools, machine and deep learning has been focused in the areas of osteoporosis, osteo-arthritis and lower back pain. Her research, which is supported by grants from the NIH and corporate entities is diverse ranging from technical development to clinical trials. She is a PI of a technology development grant in NIH's BACPAC consortium. She also serves as a reviewer and is on the editorial board of scientific journals and is a recognized expert in the area of imaging.



[Ioannis Sechopoulos](#), Radiology and Nuclear Medicine, Radboud University
AI for Breast Cancer Screening in Europe: Possibilities and Current Results

Abstract: Many countries in Europe offer women within a certain age group program-based screening for breast cancer with digital mammography. These programs, either region- or nation-wide, have resulted in a very different implementation of mammographic screening than how it is commonly performed in the US. These high-volume screening programs are also ideal candidates to take advantage of current or upcoming advances in AI. However, the road will not be straight nor the route to get to the final destination apparent. The notion that these systems will just replace breast radiologists is too simplistic, and not realistic, at least as a one-size-fits-all option. Various different implementation options are envisioned, all having a different impact on performance and human workload. Results of the studies on performance evaluation will be presented and discussed, and the questions they arise posed. The different implementation options that exist, or will become feasible in the future, will be reviewed, with their pros and cons discussed.



Bio: Dr. Ioannis Sechopoulos is Associate Professor of Advanced X-Ray Imaging and Director of the Advanced X-ray Tomographic Imaging (AXTI) Lab at the Department of Medical Imaging of Radboud University Medical Center, and scientific advisor at the Dutch Expert Center for Screening (LRCB). He obtained his Ph.D. from the Georgia Institute of Technology, in Atlanta, Georgia, performing research in the area of digital breast tomosynthesis at Emory University. Since then, his main area of research is the development of advanced x-ray-based imaging techniques, having performed extensive work in radiation dosimetry, image acquisition optimization, and image reconstruction, processing and analysis algorithm development for various x-ray imaging modalities.

[Shamim Nemati](#), Biomedical Informatics, UC San Diego
Machine Intelligence in Critical Care; Role of Interpretability and Trust

Bio: Dr. Nemati obtained his PhD degree in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology (MIT) in 2013. While at MIT, he was a member of the Laboratory for Computational Physiology(LCP) and the Laboratory for Computational Physiology and Clinical Inference (CPCI) and a research fellow at the Brigham and Women's Hospital and the Harvard Medical School, where he held a National Research Service Award (NRSA). Upon completion of his PhD degree, Dr. Nemati joined the Harvard Intelligent Probabilistic Systems group (HIPS) as a James S. McDonnell Foundation (JSMF) postdoctoral fellow in complex systems. His postdoctoral work was focused on development of deep learning algorithms for pattern discovery in massive temporal biomedical datasets. He was a recipient of a Mentored Career Development Award (K01) in biomedical big data science (FOA: HG14-007) through the NIH Big Data to Knowledge (BD2K) initiative (2016-2020).



As the lead PI on a multi-center (BARDA-funded) study, Dr. Nemati is currently involved in retrospective validation, prospective implementation, and FDA clearance of a sepsis prediction algorithm that was developed as a part of his K01 award. Additionally, Dr. Nemati's group has been working closely with industry partners, including Samsung, Google, Microsoft, Roche, GE Healthcare, among others, to commercially disseminate research results and products related to application of Machine Learning/Deep Learning in Critical Care. He has published in several areas of research, including advanced signal processing and machine learning, computational neuroscience/brain machine interface, physiological control systems, predictive monitoring in the intensive care unit, and nonlinear and nonstationary multidimensional time-series analysis in massive temporal biomedical databases, resulting in over 80 peer-reviewed publications.

[Kyle Myers](#), Division of Imaging, Diagnostics, and Software Reliability, FDA
AI-Enabled Systems in Medical Imaging: FDA Research in Support of Regulatory Pathways

Abstract: Increases in computational power and growing numbers of sources of publicly available imaging data have greatly increased the ability of researchers and commercial innovators to develop new AI-enabled products for medical imaging and other medical device applications. One recent review (Wu et al. Nature Medicine 2021) analyzed 130 AI-enabled devices authorized for marketing in the US by the FDA in the past 5 years. The devices included applications in chest, heart, breast, head, and elsewhere. This paper, along with others in the literature as well as public information on the FDA website demonstrate the rapidly maturing field of AI-enabled medical devices and the rising availability of these devices to US patients and providers. In this talk I'll describe some of FDA/CDRH's efforts to be responsive to the rapid pace of innovation in this area. I'll also illustrate the research efforts being led by CDRH's laboratories to develop and make available datasets, assessment methods and evaluation strategies to support device developers and regulatory reviewers.



Bio: Kyle J. Myers, Ph.D., received a Ph.D. in Optical Sciences from the University of Arizona in 1985. Since 1987 she has worked for the Center for Devices and Radiological Health of the U.S. FDA, where she is currently a Senior Advisor in the Division of Imaging, Diagnostics, and Software Reliability in the Office of Science and Engineering Laboratories. She is an expert in the objective assessment of imaging technologies and medical diagnostics. Along with Harrison H. Barrett, she is the coauthor of Foundations of Image Science, published by John Wiley and Sons in 2004 and winner of the First Biennial J.W. Goodman Book Writing Award from OSA and SPIE. She is an associate editor for the Journal of Medical Imaging as well as Medical Physics. Dr. Myers is a Fellow of AIMBE, OSA, SPIE, and a member of the National Academy of Engineering.

June 3, 2021 — AI and COVID-19

Moderator: [William Wang](#), Computer Science, UC Santa Barbara

Bio: William Wang is the Director of UC Santa Barbara's Natural Language Processing group and Responsible Machine Learning Center. He is an Assistant Professor in the Department of Computer Science at the University of California, Santa Barbara. He received his PhD from School of Computer Science, Carnegie Mellon University. He has published more than 80 papers at leading NLP/AI/ML conferences and journals, and received best paper awards (or nominations) at ASRU 2013, CIKM 2013, EMNLP 2015, and CVPR 2019, a DARPA Young Faculty Award (Class of 2018), a Google Faculty Research Award (2018), three IBM Faculty Awards (2017-2019), two Facebook Research Awards (2018, 2019), an Adobe Research Award in 2018, and the Richard King Mellon Presidential Fellowship in 2011. He frequently serves as an Area Chair for NAACL, ACL, EMNLP, and AACL. He is an alumnus of Columbia University, and a former research scientist intern of Yahoo! Labs, Microsoft Research Redmond, and University of Southern California. In addition to research, William enjoys writing scientific articles that impact the broader online community: his microblog @王威廉 has 100,000+ followers and more than 2,000,000 views each month. His work and opinions appear at major tech media outlets such as Wired, VICE, Scientific American, Fast Company, NASDAQ, The Next Web, Law.com, and Mental Floss



**Keynote: [Lynn Fitzgibbons](#), MD, Infectious Disease Specialist, Cottage Health Santa Barbara
COVID-19 Vaccinations and AI: Harnessing the Power and Avoiding the Pitfalls**

Abstract: The concordance of the COVID-19 pandemic with the information and technology era has led to unprecedented acceleration and advances in every aspect of the disease, from diagnostics to therapeutics, and now, in one of the greatest societal and ethical challenges of our time, the equitable rollout of the COVID-19 vaccine. We will review the power that information systems, metadata and of course AI has brought to this momentous effort, as well as some of the challenges, both foreseen and those challenges which were less expected.

Bio: Dr. Fitzgibbons is board certified in Infectious Diseases and Internal Medicine, and is chair of the Division of Infectious Disease at Cottage Health. She is the Medical Education Director of Research and Quality, and is a Clinical Associate Professor of Medicine at USC, as well as Adjunct Assistant Professor at UCSB in the Geography Department. She oversees the HIV and Infectious Disease clinic at the Santa Barbara County Public Health Department. Dr. Fitzgibbons has worked on many aspects of the COVID-19 pandemic including direct clinical care, clinical and community education, diagnostic development research and now a variant research collaboration with UCSB, including sequencing and surveillance of SARS-CoV2 variants, with epidemiology and public health collaborations.



**Laure Wynants, Epidemiology, Maastricht University
A Journey Through the Disorderly World of Diagnostic and Prognostic Models for Covid-19: a Living Systematic Review**

Abstract: Diagnostic and prognostic models could provide an evidence-based approach for efficient triage of suspected or infected patients. However, since the covid-19 outbreak, over 200 models have been proposed, and the number keeps growing. We performed a rigorous systematic review and standardized risk of bias assessment of published and pre-print papers proposing prediction models for covid-19. It has been dubbed "the fastest systematic review ever", and has transformed into a "living" review, with 3 updates published since the original publication. In this talk, we will describe the study setup and results. We review the spectrum of available models, ranging from simple scoring systems to AI based on medical imaging, and pinpoint important issues with the study design and analysis that hamper their reliability.

Bio: Laure Wynants is assistant professor of Epidemiology at Maastricht University in the Netherlands and post-doctoral fellow of the Research Foundation Flanders in Belgium. She earned a M.A. in Biostatistics, summa cum laude, and a PhD from the KU Leuven in Belgium. She's interested in methods to handle heterogeneity between populations when developing and validating prediction models, and in the utility of prediction models in clinical practice. Her work has received the Lee Lusted award for Quantitative Methods and Theoretical Developments from the society of medical decision-making and the Doug Altman award. Her article "Random-effects meta-analysis of the clinical utility of tests and prediction models" was recognized as one of the most read in Statistics in Medicine in 2019. She is associate editor for BMC Diagnostic and Prognostic Research, member of the International Society for Clinical Biostatistics and member of STRATOS' (STRengthening Analytical Thinking for Observational Studies) topic group on the evaluation of diagnostic tests and prediction models. Her applied work includes models for gynecological cancers, hospital-acquired infections, and covid-19. She worked closely with the IOTA consortium on the development and validation of diagnostic models for ovarian cancer. These models are now implemented in mobile apps and ultrasound machines of GE and Samsung, and are incorporated in international clinical guidelines. Since March 2020, she leads an international consortium to systematically review models for covid-19, for which she has been awarded the Edmond Hustinx science prize. This review already has over 600 citations, has been picked up by policymakers, including the European Commission and the WHO.

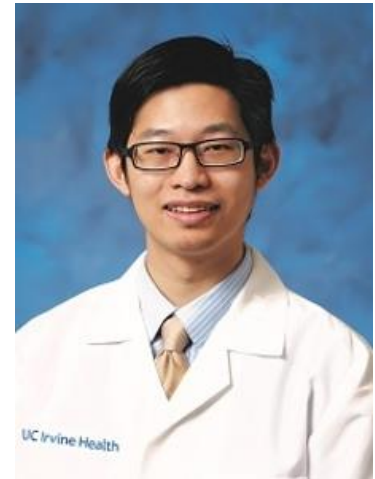


[Daniel Chow](#), Radiological Sciences, UC Irvine

Deployment of AI-Based Risk Assessment Tools for COVID at UCI - A Single-Center Experience

Abstract: The rapid spread of coronavirus disease 2019 (COVID-19) revealed significant constraints in our critical care capacity. In anticipation of subsequent waves, reliable prediction of disease severity is essential for critical care capacity management and may enable earlier targeted interventions to improve patient outcomes. At UCI, we developed, externally validated, and deployed a prognostic model/clinical tool for predicting COVID-19 critical disease at presentation to medical care. The tool has since been used in nearly 2,000 patients and we report our single-center experience.

Bio: I'm an Assistant Professor in Residence at UCI in the Department of Radiological Sciences with joint appointments in Neurology and Experimental Pathology. At UCI, I co-founded and currently co-direct the Center for Artificial Intelligence in Diagnostic Medicine as well the Precision Health through Artificial Intelligence Academic Initiative. I have published over 60 peer-reviewed manuscripts and have several grant rewards in areas dealing with AI applications for diagnostic medicine. Outside UCI, I serve as a commissioned officer in the US Army Reserves.



[Rajesh Ranganath](#), Computer Science, New York University

A Deployed Model for COVID-19

Abstract: AI holds many promises for medicine. The COVID-19 pandemic provided an occasion for AI to demonstrate its value for an urgent public health need. The data available for COVID-19 predictive modeling early in the pandemic was difficult to use: little was known about the data, the data was changing from evolving treatment guidance, and features were often missing. In this talk, I will discuss our work on developing a model for COVID-19 that was deployed in a clinical setting. Along the way, I'll discuss some advances we have made in interpretability and explainability techniques.

Bio: Rajesh Ranganath is an assistant professor at NYU's Courant Institute of Mathematical Sciences and the Center for Data Science. He is also affiliate faculty at the Department of Population Health at NYUMC. His research focuses on approximate inference, causal inference, probabilistic models, and machine learning for healthcare. Rajesh completed his PhD at Princeton and BS and MS from Stanford University. Rajesh has won several awards including the NDSEG graduate fellowship, the Porter Ogden Jacobus Fellowship, given to the top four doctoral students at Princeton University, and the Savage Award in Theory and Methods.

