

# Keynote: A Cross-Domain Machine Learning Framework for Pervasive Sensing

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**Abstract**—Recognizing human activity and behavior is a well-known research problem. State-of-the-art machine learning approaches, a variety of smart home sensor systems, and Internet-of-Things (IoT) devices are in place to help aid activity discovery, recognition, and inference processes. However, the current approaches work with single user, a predefined set of devices and in a specific smart environment. Scaling, adapting, and crossing the boundaries beyond those presumed settings in presence of limited or unlabeled datasets posit challenging research avenues to investigate. In this talk, I will first articulate the underpinning challenges across heterogenous IoT devices, different users and environments. I will discuss our work on addressing those challenges using deep learning-based domain adaptation and transfer learning-based techniques, and present experimental results using real datasets collected from different IoT devices such as smartphones, smartwatches, and diverse users. I will conclude this talk with our ongoing work in this area and future research directions.

## BIOGRAPHY

Dr. Nirmalya Roy is currently an Associate Professor in the Information Systems department and the director of the Mobile, Pervasive and Sensor Computing (MPSC) Lab at the University of Maryland, Baltimore County (UMBC). He has been awarded NSF CAREER 2018, Alzheimers Association, NSF CPS (Cyber-Physical Systems), NSF GCTC (Global City Team Challenge), Office of Naval Research, Constellation E2: Energy to Educate, and UMB-UMBC Research and Innovation Partnership grants. His current research interests include applied machine learning and data analytics techniques with applications to smart health, cyber-physical systems, and smart city. He is a recipient of Mark Weiser Best paper award in IEEE PerCom 2006 conference, Best paper award in QShine 2009 conference, Best paper award nomination in IEEE PerCom 2011 and IEEE SmartComp 2018 conference, and Institute for Infocomm 2011 Best Research paper award. He is currently leading the NSF CAREER project on Scalable and Adaptable Cross-Domain Autonomous Health Assessment, Alzheimer's Associations project on Functional and Cognitive Health Assessment of Older Adults with Dementia, NSF Cyber-Physical Systems project on Virtual Energy Auditing, and NSF Global City Team Challenge project on Flash Floods Detection in Smart City at



UMBC. Prior to joining UMBC, he was a Clinical Assistant Professor in the School of Electrical Engineering and Computer Science department at the Washington State University. He worked as a Research Staff Member in the Institute for Infocomm Research (I2R) in Singapore from 2010 to 2011 and as a postdoctoral fellow in the Electrical and Computer Engineering department at the University of Texas at Austin from 2008 to 2009. He received his M.S. and Ph.D. degrees in Computer Science and Engineering from the University of Texas at Arlington in 2004 and 2008, respectively. He received his B.E. degree in Computer Science and Engineering in 2001 from Jadavpur University, India. More information about him, his students and research can be found at his lab homepage <https://mpsc.umbc.edu/>.

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