



## **A Cyber Physical Systems Approach to Smart Health**

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**Petroleum Room 110**

### **Abstract**

Wearables and smartphones are becoming common household items in the last decade; however, Mobile Health (mHealth) suffers two major barriers namely the lack of access to clinically acceptable physiological data collection in unsupervised settings and utilization of these large spatio-temporal multigrain data beyond individuals for the greater benefits of the community, city, and society. We propose a framework for Smart Health (sHealth) that not only spans the traditional mHealth domain, but rather extends the scope and impact on the city, community, and the society. Our research tackles the mHealth barriers by developing novel technologies using additive inkjet printing (IJP) manufacturing process that produces low-cost flexible body-worn wireless sensors and wearable devices to collect physiological data in unsupervised settings, and processing of these streaming data in real-time with edge computing using machine learning based artificial intelligence (AI) implemented in users' smartphones. We integrate these cyber physical system (CPS) elements using the human-in-the-loop approach with tightly- and loosely-coupled multilevel feedbacks. Through interdisciplinary collaborations, we seek to investigate these unprecedented access of health data to provide insights into the community-wide health status and trend monitoring towards smart cities and connected communities of the future.

### **Bio**

Dr. Morshed is an Associate Professor at the Electrical and Computer Engineering (EECE), University of Memphis. He has received the B.Sc. degree from Bangladesh University of Engineering and Technology (BUET) in 2001. He then completed the M.Sc. degree from the University of Windsor in 2004 and earned Ph.D. degree from Carleton University in 2010. He was a post-doctoral fellow at the Medical Devices Innovation Institute, the University of Ottawa, prior to his joining EECE department at the University of Memphis in 2011. He is a recipient of the prestigious Canadian Commonwealth Fellowship (2002-2004), Indira Gandhi Memorial Fellowship (2004 and 2006), Ontario Graduate Scholarship (2007), and Ontario Graduate Scholarship in Science and Technology (2008). He has published 30+ journal articles and has presented 100+ referred conference papers and posters, one of which has received the best paper award in the conference (IEEE EIT 2018). He has 2 issued patents (USPTO) and 3 more patent applications pending. He is a Senior Member of IEEE (since 2019), and currently holds Faudree Professorship (2019-2022). He has received multiple research grants from the National Science Foundation (NSF) as a Principal Investigator (PI) and other extramural and internal funds as a PI or a collaborator. His research interest is holistic cyber physical system (CPS) development for real-life health monitoring with novel technologies such as inkjet-printed body-worn flexible electronic sensors and real-time edge-computing from multimodal, multigrain physiological signals using machine learning based artificial intelligence (AI) for applications in Smart Health.