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Smart Systems for Ubiquitous-Healthcare – AI is a Key Enabler

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Abstract: Several of the grand challenges in engineering for current and future societal needs require smart systems - smart sensors, smart homes and data analytics. In the health area, we will discuss some major healthcare issues related to aging and several examples of smart systems. We will discuss the use of sensor systems to measure your walking signals and sleep quality, and their customization to an individual's needs. Smart sensors are also used for a living diary and in a smart home server that functions as the “brain” of a smart medical home. In all these applications, artificial intelligence (AI) technique is a key enabler for their user-friendly, accurate and costs effective use. Further, the use of data analytics and AI is important to provide customizable information to the users based on data collected from a variety of sensors. In addition, we will discuss some of the trends and opportunities in smart systems for healthcare. Finally, we will discuss some applications of smart systems including data analytics, and what are some important research issues in sensors, home networks, autonomic systems and healthcare in the context of a futuristic smart medical home.



Dr. M. Jamal Deen is Distinguished University Professor (**highest rank of a Professor in Canada**), Senior Canada Research Chair in Information Technology, and Director of the Micro- and Nano-Systems Laboratory, McMaster University. He served as the **elected President of the Academy of Science**, The Royal Society of Canada in 2015-2017 and is serving as the Past President (2017-2019). His current research interests are nanoelectronics, optoelectronics, nanotechnology, data analytics and their emerging applications to health and environmental sciences. Dr. Deen's research record includes more than 585 peer-reviewed articles (about 20% are invited), two textbooks on “*Silicon Photonics- Fundamentals and Devices*” and “*Fiber Optic Communications: Fundamentals and Applications*”, 12 awarded patents of which 6 were extensively used in industry, and nineteen best paper/poster/presentation awards. Over his career, he has won more than seventy-five awards and honors.

As an undergraduate student at the University of Guyana, Dr. Deen was the top ranked mathematics and physics student and the second ranked student at the university, winning the Chancellor's gold medal and the Irving Adler prize. As a graduate student, he was a Fulbright-Laspau Scholar and an American Vacuum Society Scholar. He is a Distinguished Lecturer of the IEEE Electron Device Society for more than a decade and a half. His awards and honors include the Callinan Award as well as the Electronics and Photonics Award from the Electrochemical Society; a Humboldt Research Award from the Alexander von Humboldt Foundation; the Eadie Medal from the Royal Society of Canada; McNaughton Gold Medal (**highest award for engineers**), the Fessenden Medal and the Ham Education Medal (**highest award for educators**), all from IEEE Canada. In addition, he was awarded the four honorary doctorate degrees in recognition of his exceptional research and scholarly accomplishments, professionalism and service. Dr. Deen has also been elected Fellow status in ten national academies and professional societies including The Royal Society of Canada - The Academies of Arts, Humanities and Sciences (**the highest honor for academics, scholars and artists in Canada**), the Canadian Academy of Engineering (**the highest honor for engineers in Canada**), IEEE, APS (American Physical Society) and ECS (Electrochemical Society). Most recently, he was elected to the **Order of Canada (July 2018), the highest civilian honor awarded by the Government of Canada.**