

National Radio Science Meeting

◆ January 4-9, 2021

Plenary Talk, January 7, 2021

Embodied Intelligence in Electronics: A New Era in High Frequency Circuit Design

Linda P. B. Katehi

Texas A&M University, College Station, TX

Abstract: The future of electronic systems lies in our ability to include intelligence in their design specifications. Incorporating intelligence will demand a change in the way we design electronics. Recent studies on cognition and intelligence have demonstrated that cognitive processes are not disconnected from motor-sensory processes but are directly influenced by the body's interactions with its environment. Intelligence cannot be achieved without a body that can interact with its environment and learn from these interactions. The design of an autonomous system is based on its ability to acquire data via its physical and social interactions with its environment, making mobility and adaptability important physical aspects. An intelligent wireless network of sensors and actuators is a concept that requires a co-design of computer architectures, learning algorithms, materials, robotics, and electronics for sensing and communication. This co-design is not available today but will be needed for the successful implementation of intelligence in systems that will be part of 5G and beyond. This presentation will discuss all the opportunities for bringing intelligence into design of electronics along with the impacts on existing traditional approaches.



Biography: Linda Katehi is a distinguished TEES chair professor at Texas A&M in the electrical and computer engineering department. She is a member of the National Academy of Engineering (NAE), The American Academy for Arts and Sciences and the National Academy of Innovators (NAI). She chaired the President's Committee for the National Medal of Science and was the chair of the Secretary of Commerce's committee for the National Medal of Technology and Innovation. She is a fellow and served as a board member of the American Association for the Advancement of Science (AAAS) and President for the Engineering Section of AAAS, a member of the National Security Higher Education Board, a member of the Higher Education Business Board and many other national and international boards and committees.

Prof. Katehi is an expert in the following areas: development and characterization (theoretical and experimental) of microwave, millimeter-wave printed circuits; computer-aided design of VLSI interconnects; development and characterization of micromachined circuits for microwave, millimeter-wave, and submillimeter-wave applications including MEMS switches, high-Q evanescent mode filters, and MEMS devices for circuit reconfigurability; development of low-loss lines for submillimeter-wave and terahertz frequency applications; theoretical and experimental study of uniplanar circuits for hybrid-monolithic and monolithic oscillator, amplifier, and mixer applications; and theoretical and experimental characterization of photonic bandgap materials. Some of her research projects that have created new directions in high-frequency frequency design include: W-band power cube; novel packaging

approaches for high-density three-dimensional ICs; device and circuit approaches for next-generation wireless communications; MEMS for microwave and millimeter-wave applications; study of photonic bandgap substrates for use in frequency-selective structures; silicon-based on-wafer packaging for high isolation in high-density circuits; high-Q micromachined resonators for RF filters/diplexers; and MEMS switches. Her work in electronic circuit design has led to numerous national and international awards both as a technical leader and educator, 19 U.S. patents, and an additional 5 U.S. patent applications. She is the author or co-author of 10 book chapters and about 650 refereed publications in journals and symposia proceedings.

Professor Katehi served as the Chancellor (2009-2016) and Distinguished Professor of Electrical and Computer Engineering at UC Davis (2009-2019). From 2006 to 2009, she served as the Provost of the University of Illinois at Urbana Champaign and Distinguished Professor of Electrical and Computer Engineering. From 2002 to 2006 she served as the Dean of Engineering at Purdue University and Distinguished Professor of Electrical Engineering. While at the University of Michigan she served as a Professor of Electrical Engineering and Computer Science, and Associate Dean for Academic Affairs (1998-2001). She earned her bachelor's degree in Electrical Engineering from the National Technical University of Athens, Greece, in 1977, and her master's and doctoral degrees in electrical engineering from UCLA in 1981 and 1984, respectively.