



**IEEE GREECE CASS/SSCS  
JOINT CHAPTER**

## **Invited Lecture**

The IEEE Greece CAS/SSC joint Chapter, in the frame of the IEEE Circuits and System Society **Distinguished Lecturer Program**, is inviting you in the lecture of:

**Dr. Hai “Helen” Li \***

Associate Professor at Duke University, North Carolina, USA

**entitled:**

**“Deep Learning and Neuromorphic Computing -  
Technology, Hardware and Implementation”**

The lecture will be given on **Tuesday, October 9, 2018, at: 12:00,**  
**in the Amphitheater I of KEDEA, Aristotle University of Thessaloniki.**

**(There will be live webcasting and recording of the event)**

**Information:** Prof. Alkis Hatzopoulos, tel. +302310-996305, 2310-996221, [alkis@eng.auth.gr](mailto:alkis@eng.auth.gr)

*\*Abstract and lecturer’s short bio are following.*

# Deep Learning and Neuromorphic Computing - Technology, Hardware and Implementation

by

**Dr. Hai “Helen” Li**

Associate Professor at Duke University, North Carolina, USA

## **Abstract:**

As big data processing becomes pervasive and ubiquitous in our lives, the desire for embedded-everywhere and human-centric information systems calls for an intelligent computing paradigm that is capable of handling large volume of data through massively parallel operations under limited hardware and power resources. This demand, however, is unlikely to be satisfied through the traditional computer systems whose performance is greatly hindered by the increasing performance gap between CPU and memory as well as the fast-growing power consumption. Inspired by the working mechanism of human brains, a neuromorphic system naturally possesses a massively parallel architecture with closely coupled memory, offering a great opportunity to break the "memory wall" in von Neumann architecture. The tutorial will start with the evolution of neural networks, followed by the acceleration on conventional platform. I will then introduce the neuromorphic system designs including the approaches based on CMOS and emerging nanotechnologies. The latest research outcomes on hardware implementation optimization, the reliability and robustness control schemes, and new training methodologies by taking the hardware constraints into the consideration will then be presented. At last, new applications and challenges raised in deep learning and neuromorphic computing will be discussed.



**Bio:** Dr. Hai “Helen” Li received the B.S. and M.S. degrees from Tsinghua University, Beijing, China, and the Ph.D. degree from the Department of Electrical and Computer Engineering, Purdue University, West Lafayette, IN, USA, in 2004. She is currently Clare Boothe Luce Associate Professor with the Department of Electrical and Computer Engineering at Duke University, Durham, NC, USA. She was with Qualcomm Inc., San Diego, CA, USA, Intel Corporation, Santa Clara, CA, Seagate Technology, Bloomington, MN, USA, the

Polytechnic Institute of New York University, Brooklyn, NY, USA, and the University of Pittsburgh, Pittsburgh, PA, USA. She has authored or co-authored over 200 technical papers published in peer-reviewed journals and conferences and holds 70+ granted U.S. patents. She authored a book entitled Nonvolatile Memory Design: Magnetic, Resistive, and Phase Changing (CRC Press, 2011). Her current research interests include memory design and architecture, neuromorphic architecture for brain-inspired computing systems, and architecture/circuit/device cross-layer optimization for low power and high performance. Dr. Li serves as an Associate Editor of TVLSI, TCAD, TODAES, TMSCS, TECS, CEM, and the IET Cyber-Physical Systems: Theory & Applications. She has served as organization committee and technical program committee members for over 30 international conference series. She received the NSF CAREER Award (2012), the DARPA YFA Award (2013), TUM-IAS Hans Fisher Fellowship (2017), seven best paper awards and another seven best paper nominations. Dr. Li is a senior member of IEEE and a distinguished member of ACM.