Abstract 1: Sustainable Artificial Intelligence

Cutting-edge AI and Deep Learning technologies demonstrate outstanding performance in many important tasks requiring intelligent data processing under well-known conditions, supported by massive computational resources and big data. However, the performance of these systems may drastically deteriorate when the data are perturbed, or the environment dynamically changes, either due to natural effects or caused by manmade disturbances. A neuromorphic perspective provides crucial support under such conditions. Human brains are efficient devices using 20W power (just like a light bulb!), which is drastically less than the power consumption of today's supercomputers requiring MWs of power to solve specific learning tasks in an innovative way. Analyzing brain energy management helps developing computational and hardware implementations with drastic improvement in using resources, including energy, and provides a path towards sustainable AI. This talk overviews the challenges to intelligent systems, outlines crucial insights from brain studies, and introduces system designs combing the benefits of deep learning and neuromorphic technologies. We introduce several highly competitive solutions with applications to pattern recognition, and reinforcement Deep-Q Learning for interactive decision making and intelligent control.