BINGHAMTON UNIVERSITY
STATE UNIVERSITY OF NEW YORK | Computer Science

THE DEPARTMENT OF COMPUTER SCIENCE, THE CENTER OF IMAGING, ACOUSTICS, AND PERCEPTION SCIENCE (CIAPS), AND THE CS GRADUATE STUDENT ORGANIZATION (GSOCS) PRESENT

INVITED SPEAKER SERIES

Professor Qiang Ji
Rensselaer Polytechnic Institute

Monday, November 6th at 12 noon, UU 206

Integrating Prior Knowledge and Data for Efficient Visual Learning

Abstract: Substantial progresses have been made in computer vision recently as a result of the latest developments in deep learning. Despite these developments, computer vision still cannot match the performance of human vision for many tasks. One factor contributing to this performance gap is the data-driven nature of the machine learning methods. The data-driven approaches are purely bottom-up, inefficient, and do not generalize well beyond their training data. Parallel to data, there often exists significant prior knowledge. Such knowledge, if utilized properly, can not only improve visual recognition performance but also reduce our dependence on data. Unfortunately, the existing data-driven machine learning algorithms do not have an effective mechanism to capture and encode the prior knowledge. To address this problem, we propose a framework to integrate prior knowledge with image data so that visual recognition can be formulated as a joint top-down and bottom-up inference. Placed on equal footing, top-down inference comprises prediction based on the prior knowledge, while bottom-up inference includes estimation from the image data. Specifically, the proposed framework consists of three thrusts: knowledge identification, knowledge representation, and knowledge encoding. To demonstrate the proposed framework, we apply it to different computer vision tasks, including facial action recognition, 3D reconstruction, 3D body pose estimation, and object recognition.

Bio: Qiang Ji received his Ph.D degree in Electrical Engineering from the University of Washington. He is currently a Professor with the Department of Electrical, Computer, and Systems Engineering at Rensselaer Polytechnic Institute (RPI). From 2009 to 2010, he served as a program director at the National Science Foundation (NSF), where he managed NSF's computer vision and machine learning programs. He also held teaching and research positions with the Beckman Institute at University of Illinois at Urbana-Champaign; the Robotics Institute at Carnegie Mellon University; the Dept. of Computer Science at University of Nevada, Reno; and the Air Force Research Laboratory. Prof. Ji currently serves as the director of the Intelligent Systems Laboratory (ISL) at RPI. Prof. Ji's research interests are in computer vision, probabilistic graphical models, machine learning, and their applications in various fields. He has published over 200 papers in peer-reviewed journals and conferences, and has received multiple awards for his work. Prof. Ji is an editor on several related IEEE and international journals and he has served as a general chair, program chair, technical area chair, and program committee member for numerous international conferences/workshops. Prof. Ji is a fellow of the IEEE and the IAPR.