Motion Control, Planning and Manipulation of Nanowires under Electric-Fields in Fluid Suspension with Applications to Nanodevice Fabrication

Dr. Kaiyan Yu
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Monday, May 13 @ 11:00am
JEC 3117

Abstract:
The automated manipulation of nanowires and nanotubes would enable the scalable manufacturing of nanodevices for a variety of applications, including micro- and nanoelectronics and biomedical applications. Precisely placement of nanostructures such as nanowires or nanotubes and automated scalable characterization, manipulation and assembly of nanostructures are among technological challenges to fabricate these nanodevices. In this presentation, I will first present an electric-field-based autonomous system to motion plan and control of individual and simultaneous multiple nanowires in liquid suspension with a simple, generic set of electrodes. The proposed robust motion control has been proved to be stable for precisely drive multiple various types of nanowires. The motion planning algorithms significantly reduce the computational complexity while maintain suboptimal performance in both the travel time and distances. Next I will demonstrate an integrated, electric-field based method for the simultaneous automated characterization, manipulation, and assembly of nanowires (ACMAN) with selectable electrical conductivities into functional nanodevices. The ACMAN design is validated by precise control and assembling silicon nanowires into field-effect transistors (FETs) with desired electrical properties.

Bio:
Kaiyan Yu is an Assistant Professor in Mechanical Engineering Department at Binghamton University, NY, USA. She received the B.S. degree in Intelligent Science and Technology from Nankai University in Tianjin, China in 2010, and the Ph.D. degree in Mechanical and Aerospace Engineering from Rutgers University in Piscataway, NJ, USA in 2017. She joined Binghamton University in 2018. Her current research interests include autonomous robotic systems, motion planning and control, mechatronics, automation science and engineering with applications to nano/micro particles control and manipulation, Lab-on-a-chip and biomedical systems.
Focused Hierarchical RNNs for Conditional Sequence Processing

Monday, May 13, 2019
2:00 PM EDT / 1800 GMT
https://ibm.webex.com/join/aihn

Speaker: Nan Rosemary Ke
MILA

Abstract: Recurrent Neural Networks (RNNs) with attention mechanisms have obtained state-of-the-art results for many sequence processing tasks. Most of these models use a simple form of encoder with attention that looks over the entire sequence and assigns a weight to each token independently. We present a mechanism for focusing RNN encoders for sequence modelling tasks which allows them to attend to key parts of the input as needed. We formulate this using a multi-layer conditional sequence encoder that reads in one token at a time and makes a discrete decision on whether the token is relevant to the context or question being asked.

from ICML 2018

Bio: Rosemary is a third-year PhD student at the Mila institute. Her primary research interests center around sequence modeling, credit assignment and causal inference. Some of her work has been focused on utilizing variational methods and auxiliary losses to help overcome these issues for supervised, unsupervised, and model-based reinforcement learning tasks. She has also been working on alternative ways of training RNNs that can correctly assign credit while retaining a biologically plausible training procedure. She has recently spent time at Microsoft Research, Facebook AI research and she is a recipient of the Facebook fellowship for 2019. For links to papers, open-sourced codes, please visit her website https://nke001.github.io.

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Towards Efficient, Interpretable, and Robust Deep Learning

Deep learning has been achieving very impressive improvement in many applications such as computer vision. In the literature, however, many theoretical and empirical questions still remain elusive. Why does deep learning work so well? How should we design a network for a specific task (in a principal way)? Can we train a network better and faster? Can we learn a network that can be deployed in embedded systems?

To answer such questions, in this talk I will provide some insight on three important issues in deep learning, i.e., efficiency, interpretability, and robustness, from the perspective of optimization. Specifically in my talk, efficiency aims to accelerate the computation of deep models as well as preserving their high accuracy. Interpretability aims to understand the physical meaning of the training objectives in deep learning (including the network architectures). Robustness aims to analyze the convergence and generalization of deep models. I will present some algorithms and results from my recent works on deep learning, some of which have been applied to real products in computer vision and geoscience, and I hope that my works can continue to contribute to other communities.

Biography: Dr. Ziming Zhang is currently a Principal Research Scientist at Mitsubishi Electric Research Laboratories (MERL). Before joining MERL he was a Research Assistant Professor at Boston University in 2015-2016. He completed his PhD from Oxford Brookes University, U.K., in 2013 under the supervision of Prof. Philip Torr (now a professor at University of Oxford). His research interest lies in computer vision and machine learning, including object recognition and detection, person re-identification, zero-shot learning, optimization, deep learning, etc. His works have appeared in TPAMI, CVPR, ICCV, ECCV and NIPS. He serves as a reviewer/PC member in the top-tier conferences such as CVPR, ICML, NIPS, AAAI, AISTats, IJCAI, UAI and ICLR. He won R&D100 Award, 2018.

Wednesday, May 15th, 2019
CII 4050 – 11:00 am
Refreshments at 10:30 am