



# 泛在计算系统研究中心学术报告会

报告题目: New Deep Learning Approaches for Brain Image Segmentation, Analysis, and Related Problems

时间: 2017年6月29日(周四) 下午3:30—4:30

地点: 计算所1101会议室

报告人: Prof. Danny Ziyi Chen, University of Notre Dame

摘要:



Recently emerging deep learning (DL) techniques have achieved remarkably high quality results for many computer vision tasks, such as image classification, object detection, and semantic segmentation, largely outperforming traditional image processing methods. In this talk, we present new approaches based on DL techniques for solving a set of brain imaging problems, such as segmentation and analysis of glial cells, analysis of the relations between glial cells and brain tumors, segmentation of neuron cells, and new training strategies for deep learning using sparse medical image data. We develop new deep learning models, based on fully convolutional networks (FCN), recurrent neural networks (RNN), and active learning, to effectively tackle the target brain imaging problems. For example, we combine FCN and RNN for 3D biomedical image segmentation; we propose a new complete

bipartite network model for neuron cell segmentation. Further, we show that simply applying DL techniques alone is often insufficient to solve medical imaging problems. Hence, we construct new methods to complement and work with DL techniques. For example, we devise a new cell cutting method based on k-terminal cut in geometric graphs, which complements the voxel-level segmentation of FCN to produce object-level segmentation of 3D glial cells. We show how to combine a set of FCNs with an approximation algorithm for the maximum k-set cover problem to form a new training strategy that takes significantly less annotation data. A key point we make is that DL is often used as one main step in our approaches, which is complemented by other main steps. We also show experimental data and results to illustrate the practical applications of our new DL approaches.

报告人简介:

Dr. Danny Ziyi Chen (陈子仪) received the B.S. degrees in Computer Science and in Mathematics from the University of San Francisco, California, USA in 1985, and the M.S. and Ph.D. degrees in Computer Science from Purdue University, West Lafayette, Indiana, USA in 1988 and 1992, respectively. He has been on the faculty of the Department of Computer Science and Engineering at the University of Notre Dame, Indiana, USA since 1992, and is currently a Professor. Dr. Chen's main research interests are in computational biomedicine, biomedical imaging, computational geometry, algorithms and data structures, data mining, and VLSI. He has published numerous journal and conference papers in these areas, and holds 5 US patents for technology development in computer science and engineering and biomedical applications. Dr. Chen is a Fellow of IEEE, and a Distinguished Scientist of ACM. He received the CAREER Award of the US National Science Foundation (NSF) in 1996, the James A. Burns, C.S.C. Award for Graduate Education of the University of Notre Dame in 2009, and a Laureate Award in the 2011 Computerworld Honors Program for developing "Arc-Modulated Radiation Therapy" (a new radiation cancer treatment approach).