Title: Learning Semantics and Activities from 2D/3D Data with Minimal Annotations for Smart Transportation Digital Twins.

Abstract: Digital Twins are digital copies of physical infrastructures. The ability to monitor and analyze both the spatial semantics of large facilities and the statistics of the activities (crowd, vehicles, etc.) within is an essential component for efficiently and safely managing the facilities serving the public, such as transportation hubs, sports arenas and exhibition halls. Supported by both the National Science Foundation and Bentley, our joint-team of CUNY, Rutgers and Lighthouse Guild aims to provide better location-aware services to traveling public, especially for underserved populations including those with visual impairment, Autism Spectrum Disorder (ASD), or simply navigation challenges, with minimal infrastructure changes in a large transportation bub such as Port Authority Bus Terminal. While huge amounts of multimodal data have been collected via various sensors, learning semantics and activities typically require the annotations of large amounts of the data, which is a daunting and expensive task. In this talk, we will present two pieces of work, done by two graduate students for their theses at CUNY, in learning scene semantics and crowd statistics, from 3D or 2D data respectively, with minimal annotations, using deep learning approaches:

(1) Unsupervised Feature Learning for Point Cloud Understanding by Contrasting and Clustering with Graph Convolutional Neural Network by Ms Ling Zhang, Master's in Computer Engineering, Grove School of Engineering, The City College, The City University of New York (Thesis Advisor: Professor Zhigang Zhu).
(2) Learning to Monitor Crowds with Minimal Data Using Semi-supervised GANs by Gregory Olmschenk, PhD in Computer Science, The Graduate Center, The City University of New York (Thesis Advisors: Professor Zhigang Zhu, Professor Hao Tang).

Bio: Dr. Zhigang Zhu is Herbert G. Kayser Chair Professor of Computer Science, at City College and Graduate Center, The City University of New York. He is Director of the City College Visual Computing Laboratory (CCVCL), and Co-Director of the Master's Program in Data Science and Engineering at CCNY. Previously he was Associate Professor at Tsinghua University, Beijing and a Senior

Research Fellow at the University of Massachusetts, Amherst. Dr. Zhu obtained his BS, MS and PhD degrees, all in Computer Science from Tsinghua University. His research interests include computer vision, multimodal sensing, human-computer interaction, and various applications in assistive technology, robotics, surveillance and transportation. Among other honors, he is a recipient of the President's Award for Excellence (CCNY, 2013) and his PhD thesis was selected into the Hundred National Excellent Doctoral Theses (China, 1999). He is an Associate Editor of Machine Vision Applications, Springer.