Mingxing Xu

Rm. 304, No.1 SEIEE Building, 800 Dongchuan Rd. Email: xumingxing@sjtu.edu.cn

Shanghai, 200240, P. R. China Phone number: (+86) 18829236935

EDUCATION

Ph.D. in Information and Communication Engineering Sep. 2017 - Present

Shanghai Jiao Tong University (SJTU), Shanghai, China

Advisor: Prof. Hongkai Xiong (Yangtze River Scholar Distinguished Professor)

B.Eng. in Communication Engineering Sep. 2013-Jul. 2017

Northwestern Polytechnical University (NPU), Xi'an, Shaanxi, China

Rank:1/68

Excellent Graduate Award of Northwestern Polytechnical University

RESEARCH INTERESTS

The theory and design of graph convolutional neural networks

Graph signal processing

Graph representation learning

The analysis and design of interpretable deep networks

3D computer vision

PUBLICATION

[1] Mingxing Xu, Wenrui Dai, Yangmei Shen and Hongkai Xiong, "Msgcnn: Multi-scale Graph Convolutional Neural Network for Point Cloud Segmentation," in *IEEE International Conference on Multimedia Big data* (BigMM'19), Singapore, Oct. 2019.

[2] Mingxing Xu, Wenrui Dai, Chunmiao Liu, Weiyao Lin, Guo-Jun Qi, Hongkai Xiong, "Spatial-Temporal Transformer Networks for Traffic Flow Forecasting," submitted to *Thirty-Fourth AAAI Conference on Artificial Intelligence* (AAAI'20)

[3] Mingxing Xu, Wenrui Dai, Junni Zou Hongkai Xiong, "Graph Wavelet Neural Networks via Lifting Structures for Semi-Supervised Classification," Prepared for *IEEE International Conference on Multimedia and Expo* (ICME'20).

PROJECT

- **Accurate Long Term Prediction in Traffic Networks, SJTU- Huawei 2019.**

This is a three years' project, our lab collaborates with Huawei and helps them to solve some key problems related to their ongoing projects. I was an intern in Huawei from March

2019 to September 2019, helping them to develop an effective long term prediction model for traffic networks, which is the fundamental part of their Intelligent Transportation System Project.

SELECTED HONOR AND AWARD

Excellent Graduate Award of Northwestern Polytechnical University 2017
China National Scholarship 2016
Excellence Scholarship of Northwestern Polytechnical University 2014 &2015&2016
Meritorious Winner of Mathematical Contest in Modeling (MCM &ICM) 2016
Huawei Special Scholarship 2015
First Prize of China Robot Competition 2015
First Prize in Shaanxi' Division of National Mathematical Contest in Modeling 2015

ACADEMIC ACTIVITY

Reviewer for ***Signal Processing: Image Communication, Pattern Recognition***, ***Transactions on Knowledge Discovery from Data***, ***NeurIPS, ICIP, ICASSP***
TA for ***Wavelets and Sparse Signal Processing*** in 2019
Volunteer for the 9th ***International Conference on Image and Graphics***

RESEARCH EXPERIENCE

- **MSGCNN: Multi-Scale Graph Convolutional Neural Networks for Point Cloud Segmentation**
  - We propose a novel graph convolutional neural networks based model, namely MSGCNN, to hierarchically process point cloud to aggregate multi-scale structure-aware point features without pre-processing to voxels or images.
  - We develop a multi-scale graph convolution (MSGConv) with grounded geometrical interpretation to achieve efficient multi-scale feature extraction over lattice based partition of point clouds. MSGConv is demonstrated to support learnable graph filter design based on gradient descent.
  - We conduct extensive experiments to evaluate MSGCNN with the state-of-the-art models in terms of segmentation accuracy and robustness and show that our model makes a good trade-off between accuracy and robustness without increasing model complexity. Furthermore, we show that our model is better in segmenting **border area** contributing to fine-grained segmentation results.
- **Spatial-Temporal Transformer Networks for Traffic Flow Forecasting**
  - We propose a novel paradigm of Spatial Temporal Transformer Networks (STTNs) that can dynamically model long-range spatial-temporal dependencies.
  - A new variant of graph neural network named **spatial transformer** is developed to model the time-varying spatial dependencies by dynamically attending to hidden spatial patterns of traffic flows.

- A temporal transformer that enables an efficient parallelization of long-range temporal dependencies is also developed.

- **Graph Wavelet Neural Networks via Lifting Structures for Semi-Supervised Classification**
  - We propose a lifting structure for graph wavelet neural networks to enhance the model flexibility and capacity with data-driven graph wavelets while preserving the locality and sparsity of graph wavelets.
  - We formulate a max-cut problem to divide the graph wavelet coefficients into two mutually correlated subsets. A greedy algorithm is developed to maximize the incoherence of coefficients within each subset by minimizing the accumulated edge loss for lifted graph wavelets.
  - The proposed graph wavelet neural networks allow a realization fully resided in the spectral domain via the lifting structure and achieve comparative results with state-of-the-arts.