

## Joint Seminar by AIFT and Columbia University

### Network Embedding and Community Detection in Directed Networks



by Prof. Junhui WANG

Professor  
School of Data Science  
City University of Hong Kong

#### ■ Abstract

Community detection in network data aims at grouping similar nodes sharing certain characteristics together. Most existing methods focus on detecting communities in undirected networks, where similarity between nodes is measured by their node features and whether they are connected. In this talk, we will introduce a novel method to conduct network embedding and community detection simultaneously in a directed network. The network embedding model introduces two sets of vectors to represent the out and in-nodes separately, and thus allows the same nodes belong to different out and in-communities. The community detection formulation equips the negative log-likelihood with a novel regularization term to encourage community structure among the nodes representations, and thus achieves better performance by jointly estimating the nodes embeddings and their community structures. The asymptotic properties of the proposed method will be discussed in terms of both network embedding and community detection, which are also supported by numerical experiments on some simulated and real examples.

#### ■ Biography

Prof. Junhui Wang is Professor in the School of Data Science at City University of Hong Kong. He received his B.S. in Probability and Statistics from Peking University, and Ph.D. in Statistics from University of Minnesota. Before joining CityU, he was Associate Professor at University of Illinois at Chicago. His research interests include statistical machine learning and its applications in biomedicine, economics, finance and information technology. He has actively published research articles on leading statistics and machine learning journals, including Journal of American Statistical Association, Biometrika, and Journal of Machine Learning Research. He also serves as Associate Editor of Statistica Sinica, Annals of the Institute of Statistical Mathematics, and Statistics and its interface.

#### ■ Date and Time

**22 Oct 2021 (Fri) at 9-10am (HK Time)**

Venue: AIFT meeting room  
Units 1101-1102 & 1121-1123,19W  
Hong Kong Science Park

URL: <https://bit.ly/3lrVPhf>  
Meeting ID: 970 8573 1286  
Join by SIP: 97085731286@zoomcrc.com



### Distributionally Robust Subspace Clustering and Applications in Portfolio Selection



by Dr. Xiao XU

Ph.D. student  
Department of Industrial Engineering  
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Columbia University

#### ■ Abstract

We utilize clustering to identify a small set of assets that approximates the level of diversification of the whole stock universe. Based on a multi-factor asset pricing model, we develop a distributionally robust subspace clustering method to identify financial assets that load on the same set of hidden factors. Our method theoretically unifies the choices of the regularizer and its parameter in nodewise regression, a technique commonly used in subspace clustering. Through a distributionally robust formulation, we optimize the worst-case square loss of the nodewise regression within a region of distributional uncertainty around the empirical distribution. We show that this formulation naturally leads to a spectral-norm regularized optimization problem. The parameter that controls the regularization is the radius of the uncertainty region and can be determined in a data-driven way. We also design a framework for systematically selecting portfolios based on clustering. Portfolio backtesting results show promises in utilizing clustering to construct small and well diversified portfolios. This is a joint work with Kaizheng Wang and Xunyu Zhou.

#### ■ Biography

Xiao Xu is a graduating Ph.D. student in the Department of Industrial Engineering and Operations Research at Columbia University. His main research focus is network analysis, variable clustering, and their applications in economics and finance. He is also broadly interested in deep learning and quantitative investing. Xiao received his BS in Financial Engineering from Columbia University in 2016.

#### ■ Date and Time

**21 Oct 2021 (Thurs) at 9-10pm (US Eastern Time)**

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