Integrated Traffic Flow Prediction and Congestion Analysis: Exploring Physics-Informed Multi-View Clustering and Group Sparse Optimization

报告人： 罗自炎 教授（北京交通大学）

时　间： 2024年12月12日 上午9:50--10:40

地　点： 良乡校区 文萃楼 I101

邀请人： 李庆娜 教授

摘　　要： Traffic flow prediction is critical to Intelligent Transportation Systems. Neural network-based methods have been widely applied but with high computational costs and the "black-box" nature. In this talk, we propose an interpretable and scalable hierarchical clustering method integrating Physics-Informed Multi-View Clustering and Group Sparse Optimization for traffic flow prediction and traffic congestion analysis. Based on different traffic conditions, the data is divided into subsets. Moreover, we utilize a new multi-view structure that combines the stepwise common principal component with the k-means method by further partitioning every subset into smaller ones to identify the spatial heterogeneity. For each subset, a regularized optimization with ridge regression loss is built up and is solved by a subspace Newton method. Then a physics-informed approach is used for traffic congestion analysis. Numerical results demonstrate that our method is superior to several state-of-the-art prediction methods in terms of prediction accuracy and interpretability.

报告人简介： 罗自炎，北京交通大学数学与统计学院教授、博士生导师，中国运筹学会数学规划分会副秘书长，中国运筹学会女性工作委员会委员，中国运筹学会算法软件与应用分会理事。曾访问美国斯坦福大学、新加坡国立大学、香港理工大学、英国南安普顿大学等。主要从事张量优化、稀疏优化及统计优化的理论、算法及应用研究，在SIOPT、MP、MOR、IEEE TSP、JMLR等顶级期刊发表学术论文，合著SIAM出版社英文专著1部，曾获教育部自然科学奖二等奖、中国运筹学会青年科技奖提名奖、2023年入选国家级青年人才计划。