2021
The 4th International Symposium on Multimodal Transportation (ISMT)

Conference Program
Dec 4-5, 2021
Nanjing
Symposium Committee

International Advisory Committee (ordered by initials)

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
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<tr>
<td>Moshe Ben-Akiva</td>
<td>Massachusetts Institute of Technology</td>
</tr>
<tr>
<td>Anthony Chen</td>
<td>The Hong Kong Polytechnic University</td>
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<tr>
<td>Dongtao Fan</td>
<td>China Design Group Co. Ltd.</td>
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<tr>
<td>Xiaomei Han</td>
<td>Nanjing University of Science and Technology</td>
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<td>Haijun Huang</td>
<td>Beihang University</td>
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<td>Haibo Kuang</td>
<td>Dalian Maritime University</td>
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<tr>
<td>Samuel Labi</td>
<td>Purdue University</td>
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<td>William H.K. Lam</td>
<td>The Hong Kong Polytechnic University</td>
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<td>Zhichun Li</td>
<td>Huazhong University of Science and Technology</td>
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<td>Robin Lindsey</td>
<td>University of British Columbia</td>
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<td>Hong K. Lo</td>
<td>The Hong Kong University of Science and Technology</td>
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<td>Elise Miller-Hooks</td>
<td>George Mason University</td>
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<td>Patricia L. Mokhtarian</td>
<td>Georgia Institute of Technology</td>
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<tr>
<td>Gang Ren</td>
<td>Southeast University</td>
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<tr>
<td>Huijun Sun</td>
<td>Beijing Jiaotong University</td>
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<tr>
<td>Chung-Piaw Teo</td>
<td>National University of Singapore</td>
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<tr>
<td>S. Travis Waller</td>
<td>University of New South Wales</td>
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<tr>
<td>Wei Wang</td>
<td>Southeast University</td>
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<td>S.C. Wong</td>
<td>The University of Hong Kong</td>
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<td>Hai Yang</td>
<td>The Hong Kong University of Science and Technology</td>
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<td>Min Yang</td>
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<td>Yafeng Yin</td>
<td>University of Michigan</td>
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<tr>
<td>Michael Zhang</td>
<td>University of California, Davis</td>
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<td>Jing Zhou</td>
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Conference Chairs

Dr. Qiang Meng, Professor, National University of Singapore, Singapore
Dr. Pan Liu, Professor, Vice President of Southeast University, China

Executive Chairs

Dr. Jun Chen, Dean, Professor, School of Transportation, Southeast University, China
Dr. Zhiyuan Liu, Vice Dean, Professor, School of Transportation, Southeast University, China
Dr. Xiao Fu, Associate Professor, School of Transportation, Southeast University, China
Dr. Wei Xu, Associate Professor, School of Management & Engineering, Nanjing University, China
Dr. Yadong Wang, Professor, School of Economics & Management, Nanjing University of Science & Technology, China
Organizing Committee Members

Dr. Jie Ma, Post-doctoral Research Fellow, School of Transportation, Southeast University, China. Email: majie@seu.edu.cn.

Dr. Ziyuan Gu, Associate Professor, School of Transportation, Southeast University, China. Email: gzysqy@163.com.

Dr. Jingxu Chen, Associate Professor, School of Transportation, Southeast University, China. Email: shenqiudeliming@163.com.

Dr. Qixiu Cheng, Post-doctoral Research Fellow, Department of Logistics and Maritime Studies, The Hong Kong Polytechnic University, China. Email: qixiu.cheng@polyu.edu.hk.

Dr. Peng Jia, Executive Director, Professor, Collaborative Innovation Center for Transport Studies, Dalian Maritime University, China. Email: jiapeng@dlmu.edu.cn.

Dr. Xin Yang, Associate Professor, State Key Laboratory of Rail Traffic Control and Safety, Beijing Jiaotong University, China. Email: xiny@bjtu.edu.cn.

Organized by

School of Transportation, Southeast University, China

Co-organized by

Jiangsu Key Laboratory of Intelligent Perception and Control of Integrated Transportation, China Design Group Co., Ltd., China

School of Management and Engineering, Nanjing University, China

School of Economics and Management, Nanjing University of Science and Technology, China

Multimodal Transportation Branch of China Society of Optimization, Strategic Planning and Economical Mathematics

Institute of Transportation System Science and Engineering, Beijing Jiaotong University, China

A New Initiative Linked with ISMT: Multimodal Transportation

ISSN: 2772-5863

Co-Editors-in-Chief: Qiang Meng, PhD & Pan Liu, PhD
## Schedule at a Glance

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<th>SATURDAY, DEC 4, 2021</th>
<th>SUNDAY, DEC 5, 2021</th>
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<tbody>
<tr>
<td>Morning</td>
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<tr>
<td></td>
<td>Opening Ceremony</td>
<td>Keynote Session IV</td>
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<td></td>
<td>08:30 – 08:40</td>
<td>08:30 – 10:30</td>
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<td></td>
<td>Keynote Session I</td>
<td>Technical Sessions</td>
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<tr>
<td></td>
<td>08:40 – 10:40</td>
<td>09:00 – 10:20</td>
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<td></td>
<td>Break</td>
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<td>10:40 – 10:50</td>
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<td></td>
<td>Keynote Session II</td>
<td>Technical Sessions</td>
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<td>10:50 – 12:10</td>
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<td>Noon</td>
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<tr>
<td>Afternoon</td>
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<td>Keynote Session III</td>
<td>Technical Sessions</td>
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<td>13:30 – 14:50</td>
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<td>Break</td>
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<td>14:50 – 15:00</td>
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<td>Technical Sessions</td>
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<td>15:00 – 17:30</td>
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<td></td>
<td>Closing Ceremony</td>
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<td>17:30 – 17:45</td>
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# Program Schedule

**Venue of Opening/Closing Ceremony & Keynote Sessions**

VooV Meeting ID: 295216446 (Saturday) and 456756026 (Sunday)

Bilibili: https://live.bilibili.com/23816872

## Opening Ceremony

**Moderator:** Prof. Zhiyuan Liu, Executive Co-Chair

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<tr>
<th>TIME</th>
<th>PROGRAM</th>
<th>SATURDAY, DEC 4</th>
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<tbody>
<tr>
<td>08:30 – 08:35</td>
<td>Opening Speech</td>
<td>08:30 – 08:40</td>
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<tr>
<td>08:35 – 08:40</td>
<td>Introduction of MULTRA</td>
<td>Managing Editor: Prof. Zhiyuan Liu</td>
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## Keynote Session I

**Moderator:** Prof. Zhiyuan Liu, Southeast University

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<tr>
<th>TIME</th>
<th>PROGRAM</th>
<th>SATURDAY, DEC 4</th>
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<tbody>
<tr>
<td>08:40 – 09:20</td>
<td>Using the Bottleneck Model to Investigate Various Transport/Traffic Problems</td>
<td>08:40 – 10:40</td>
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<td></td>
<td>Prof. Hai-Jun Huang, Beihang University</td>
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<tr>
<td>09:20 – 10:00</td>
<td>Overview of Transportation Research Experience of Prof. William Lam in the Past 40 Years</td>
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<td>Prof. William H.K. Lam, The Hong Kong Polytechnic University</td>
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<tr>
<td>10:00 – 10:40</td>
<td>System Optimal Routing of Autonomous Vehicles in a Cyclic Manner</td>
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<td>Prof. Hong K. Lo, The Hong Kong University of Science and Technology</td>
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## Keynote Session II

**Moderator:** Prof. Zhiyuan Liu, Southeast University

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<tr>
<th>TIME</th>
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<th>SATURDAY, DEC 4</th>
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<tbody>
<tr>
<td>10:50 – 11:30</td>
<td>Effects of Air Quality on Housing Location: A Predictive Dynamic Continuum User-Optimal Approach</td>
<td>10:50 – 12:10</td>
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<td></td>
<td>Prof. S.C. Wong, The University of Hong Kong</td>
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<tr>
<td>11:30 – 12:10</td>
<td>A General Matching Function for Ride-Sourcing Services</td>
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<td>Prof. Hai Yang, The Hong Kong University of Science and Technology</td>
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## Keynote Session III

**Moderator:** Prof. Xiao Fu, Southeast University

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<tr>
<th>TIME</th>
<th>PROGRAM</th>
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<tbody>
<tr>
<td></td>
<td>Prof. Yang Liu, National University of Singapore</td>
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<tr>
<td>14:10 – 14:50</td>
<td>Recent Advances in Large Scale Traffic Model Calibration</td>
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<td>Prof. Constantinos Antoniou, Technical University of Munich</td>
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</table>
### Keynote Session IV

**Moderator:** Prof. Xiao Fu, Southeast University  
**08:30 – 10:30**

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<tr>
<th>TIME</th>
<th>PROGRAM</th>
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</table>
| 08:30 – 09:10 | **Modeling and Analyzing a Taxi Market with a Monopsony Taxi Owner and Multiple Rentee-Driver**  
|           | Prof. W.Y. Szeto, The University of Hong Kong                          |
| 09:10 – 09:50 | **Prescriptive Analytics for Transport System Management: State-of-the-art Development**  
|           | Prof. Shuaian Wang, The Hong Kong Polytechnic University               |
| 09:50 – 10:30 | **CAV Modeling Rising Up with Digital Twin: Transforming the Interconnection between Open Data, Multi-resolution Models and City Planners**  
|           | Prof. Xuesong Zhou, Arizona State University                           |

### Closing Ceremony

**Moderator:** Prof. Xiao Fu, Executive Co-Chair  
**17:30 – 17:45**

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<tr>
<th>TIME</th>
<th>PROGRAM</th>
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| 17:30 – 17:35 | **Best Student Paper/Presenter Awards**  
|           | Prof. Xiao Fu                       |
| 17:35 – 17:45 | **Introduction of the 5th ISMT**  
|           | Prof. Peng Jia                      |
## Technical Sessions

### Technical Session (1)
**Multimodal Transportation I**  
Chair: Dr. Xinyuan Chen  
Nanjing University of Aeronautics and Astronautics  
**VooV ID:** 653866454  
**SATURDAY, DEC 4**  
**TIME** | **PROGRAM**
--- | ---
15:00 – 15:20 | Multi-mode passenger flow characteristics and travel supply-demand matching evaluation of comprehensive urban external transportation hub  
Xurui Chen, Beijing University of Technology
15:20 – 15:40 | Large-scale multi-modal transportation network models and algorithms Part I: Traffic assignment problem  
Yinchao Fan, Hefei University of Technology
15:40 – 16:00 | Large-scale multi-modal transportation network models and algorithms Part II: Network capacity and network design problem  
Yu Wang, Hefei University of Technology
16:00 – 16:20 | Space-time prisms in multimodal transportation networks  
Jing Qin, Eindhoven University of Technology

### Technical Session (2)
**Public Transit I**  
Chair: Dr. Jingxu Chen, Southeast University  
**VooV ID:** 813313433  
**SATURDAY, DEC 4**  
**TIME** | **PROGRAM**
--- | ---
15:00 – 15:20 | A terminal-based zone routing scheme for demand-responsive customized bus  
Yiran Wang, Southeast University
15:20 – 15:40 | Optimization of demand-responsive feeder transit vehicle scheduling in the era of mobility as a service  
Yiqi Hou, Southwest Jiaotong University
15:40 – 16:00 | Bus frequency optimization in a large-scale multi-modal transportation system: integrating 3D-MFD and dynamic traffic assignment  
Dandan Cui, Hefei University of Technology
16:00 – 16:20 | An activity-based model for transit network design and land use planning in a three-party game framework  
Youqi Wu, Shanghai Jiao Tong University
16:20 – 16:40 | The impact of built environment and travel conditions on the propensity to change travel decisions: Case study in a multi-modal transit-oriented city  
Xintao Liu, The Hong Kong Polytechnic University
## Technical Sessions

### Technical Session (3)

**Transportation Network Modeling I**  
**VooV ID:** 267633079  
**Chair:** Dr. Ziyuan Gu, Southeast University  
**TIME:** 15:00 – 16:20

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<th>TIME</th>
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| 15:00 – 15:20 | Application of quantum model to travel choice behavior prediction  
Yuhan Wang, Beijing University of Civil Engineering and Architecture |
| 15:20 – 15:40 | A generic calibration framework within a realistic traffic simulation using Kalman filter  
Xin Liu, Southeast University |
| 15:40 – 16:00 | Modeling the capacity of multimodal and intermodal urban transportation networks  
Muqing Du, Hohai University |
| 16:00 – 16:20 | A simulation-based method for second-best network capacity analysis  
Ruyang Yin, Monash University |

### Technical Session (4)

**Shared Mobility**  
**VooV ID:** 559589366  
**Chair:** Dr. Kai Huang, Southeast University  
**TIME:** 16:30 – 17:30

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| 16:30 – 16:50 | Real-time vehicle relocation and staff rebalancing in one-way electric carsharing systems considering demand uncertainty and nonlinear charging profile  
Ting Wu, The Hong Kong Polytechnic University |
| 16:50 – 17:10 | Travel pattern analysis and demand prediction for personal mobility sharing: A case study of Toronto  
Yitian Du, Hwa Chong Institution |
| 17:10 – 17:30 | Analysis of incentivized user-based relocations in one-way car-sharing services  
Dong Wang, Beijing Jiaotong University |
## Technical Sessions

### Technical Session (5)  
**Electrification of Transportation I**  
**Chair:** Dr. Jie Ma, Southeast University  
**VooV ID:** 895795174  
**SARATURDAY, DEC 4**  
**TIME** | **PROGRAM**  
---|---  
16:30 – 16:50 | **Cooperative scheduling method for multiple electric bus routes with the same departure station**  
Yuan Cong, Jilin University  
16:50 – 17:10 | **Battery electric bus infrastructure planning and scheduling with consideration to on-route fast charging and conflicts**  
Xuedong Wang, Nanjing University  
17:10 – 17:30 | **Power consumption characteristics analysis and energy consumption model establishment of pure electric bus based on route characteristics**  
Zixin Liu, Southeast University  
17:30 – 17:50 | **Strategic collaboration between land owners and charging station operators: Lease or outsource?**  
Yanyan Ding, The Hong Kong University of Science and Technology  

### Technical Session (6)  
**Maritime Transportation and Port Operations I**  
**Chair:** Dr. Yadong Wang  
**Nanjing University of Science and Technology**  
**SARATURDAY, DEC 4**  
**TIME** | **PROGRAM**  
---|---  
16:30 – 16:50 | **A two-stage stochastic programming model for seaport berth and channel planning with uncertainties in ship arrival and handling times**  
Baoli Liu, Huazhong University of Science and Technology  
16:50 – 17:10 | **Optimizing trajectory and speed of coastal liner ship with unpunctual arrival penalty under emission regulation**  
Ming Zhang, Dalian Maritime University  
17:10 – 17:30 | **A multimodal multicommodity network equilibrium model with service capacity and bottleneck congestion for China-Europe containerized freight flows**  
Xinyan Li, Tongji University
## Technical Sessions

### Technical Session (7)
**Transportation Network Modeling II**  
**Chair:** Dr. Qixiu Cheng  
**The Hong Kong Polytechnic University**  
**SUNDAY, DEC 5**  
**VooV ID:** 694389002  
**TIME** | **PROGRAM**
---|---
09:00 – 09:20 | A point queue model in general networks: Analytic solution and properties  
Sijie Long, Hefei University of Technology

09:20 – 09:40 | A novel flow update policy in solving traffic assignment problems: Successive over relaxation iteration method  
Honggang Zhang, Southeast University

09:40 – 10:00 | A new network equilibrium flow model: User-equilibrium with quantity adjustment  
Ruqing Huang, University of Tennessee, Knoxville

10:00 – 10:20 | A decision support system framework for synchromodal transport planning  
Sekar Sakti, The University of Melbourne

### Technical Session (8)
**Electrification of Transportation II**  
**Chair:** Dr. Wei Xu, Nanjing University  
**SUNDAY, DEC 5**  
**VooV ID:** 253103201  
**TIME** | **PROGRAM**
---|---
09:00 – 09:20 | Optimizing the charging plan and fleet size of electric buses with energy consumption variations  
Qiuzi Chen, Southeast University

09:20 – 09:40 | Collaborative optimization of vehicle scheduling and charging management for an electric bus route with shared charging facilities  
Jinhua Ji, Jilin University

09:40 – 10:00 | Charging scheduling for electric bus charging station with energy storage system  
Yuefeng Huang, Nanjing University

10:00 – 10:20 | Periodic electric vehicle routing problem with time window considering battery state of charge under time-dependent networks  
Hao Fan, Dalian University of Technology
### Technical Session (9)
**Transportation Systems under Covid-19 Pandemic**
VooV ID: 478240764  
Chair: Dr. Jie Ma, Southeast University  
**SUNDAY, DEC 5**  
**09:00 – 10:00**

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| 09:00 – 09:20 | **Import and export risk of COVID in urban public transportation system: models, sensitivity analysis and control**  
Yuyan Ying, Zhejiang University |
Rui Wang, Beihang University |
| 09:40 – 10:00 | **Optimization of customized bus scheduling considering the impacts of COVID-19**  
Yiyang Peng, Southwest Jiaotong University |

### Technical Session (10)
**Autonomous Vehicles**
VooV ID: 616242063  
Chair: Dr. Ziyuan Gu, Southeast University  
**SUNDAY, DEC 5**  
**10:40 – 12:20**

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| 10:40 – 11:00 | **Multi-rhythmic control for relieving heterogeneity in connected and automated traffic**  
Xiangdong Chen, Tsinghua University |
| 11:00 – 11:20 | **Impact of connected and autonomous vehicle technology on market penetration and route choices**  
Tingting Xie, National University of Singapore |
| 11:20 – 11:40 | **Optimization research of autonomous shuttle bus route with the consideration of vehicle platooning**  
Ziqi Wen, Nanjing University |
| 11:40 – 12:00 | **Optimal deployment of autonomous buses into a transit service network**  
Qingyun Tian, Nanyang Technological University |
| 12:00 – 12:20 | **Time-dependent on-street parking planning under the connected and automated environment**  
Huimin Yan, Tsinghua University |
## Technical Sessions

### Technical Session (11)  
**Machine/Deep Learning in Transportation**  
**VooV ID:** 584355130  
**Chair:** Dr. Xinyuan Chen  
**Nanjing University of Aeronautics and Astronautics**  
**SUNDAY, DEC 5**  
**10:40 – 12:20**

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| 10:40 – 11:00 | Short-term forecast of bicycle usage in bike sharing systems: A spatial-temporal memory network  
Xinyu Li, The Hong Kong Polytechnic University |
| 11:00 – 11:20 | Exploring variabilities of multi-week activity-travel patterns: An image deep clustering approach  
Zhoujian Yao, Southeast University |
| 11:20 – 11:40 | Few-shot traffic prediction with graph relational inductive biases  
Wei Ma, The Hong Kong Polytechnic University |
| 11:40 – 12:00 | A Gaussian process-based model for transport network flow estimation  
Yuan Zhang, Southeast University |
| 12:00 – 12:20 | Performance estimation of machine learning models in predicting short-term travel speeds using microscopic traffic simulation data  
Rajarshi Chattopadhyay, National University of Singapore |

### Technical Session (12)  
**Transportation Network Modeling III**  
**VooV ID:** 673860151  
**Chair:** Dr. Jie Ma, Southeast University  
**SUNDAY, DEC 5**  
**13:30 – 14:50**

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| 13:30 – 13:50 | A stochastic formulation of the two-level vehicle routing and loading bay reservation problem  
Pengyuan Ding, The University of Melbourne |
| 13:50 – 14:10 | Bi-level programming for selecting optimal transfer site on commuter routes  
Kai Zhang, Southeast University |
| 14:10 – 14:30 | Collaborative road pricing scheme for coupled transportation and power distribution systems with emission considerations  
Niuniu Xu, Nanjing University |
| 14:30 – 14:50 | Dynamic Optimization for Elevator Group System as Stochastic Demand Vehicle Routing Problem with Heuristic Algorithm  
Yi Zhang, Southeast University |
# Technical Sessions

## Technical Session (13)
### Public Transit II
**Chair:** Dr. Jingxu Chen, Southeast University  
**Schedule:** 13:30 – 14:50  
**VooV ID:** 472844489  
**SUNDAY, DEC 5**

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<tbody>
<tr>
<td>13:30 – 13:50</td>
<td>Quality perception model of cycling environment based on cyclists’ physiology and psychology</td>
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<td>Le Zhou, Xi’an University of Architecture and Technology</td>
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<td>13:50 – 14:10</td>
<td>Critical stations identification for operation of urban rail transit network</td>
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<td>Jinyi Chen, Southeast University</td>
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<td>14:10 – 14:30</td>
<td>Adaptive dynamic bicycle relocation with broken bikes</td>
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<td>Yutong Cai, National University of Singapore</td>
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<tr>
<td>14:30 – 14:50</td>
<td>Integrated optimization of train stopping planning and seat allocation scheme for railway systems under equilibrium travel choice and elastic demand</td>
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<td>Yihan Liu, Central South University</td>
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## Technical Session (14)
### Multimodal Transportation II
**Chair:** Dr. Wei Xu, Nanjing University  
**Schedule:** 13:30 – 14:50  
**VooV ID:** 406367318  
**SUNDAY, DEC 5**

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<th>TIME</th>
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<tbody>
<tr>
<td>13:30 – 13:50</td>
<td>The role of freight distance in choice behavior model</td>
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<td>Lichao Zhu, Zhejiang University of Finance &amp; Economics</td>
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<td>13:50 – 14:10</td>
<td>Analysis of social acceptability in the implementation of a congestion pricing area in Senegal</td>
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<td>Anna Ndiaye Fall, Dalian University of Technology</td>
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<td>14:10 – 14:30</td>
<td>Research on evaluation of high-quality development of logistics industry</td>
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<td>Xinran Ju, Southeast University</td>
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<td>14:30 – 14:50</td>
<td>The influence of real- and video-based experiences on subjective acceptance of the new transportation environment: A case from Hiroshima, Japan</td>
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<td>Namgung Hyewon, Hiroshima University</td>
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### Technical Sessions

#### Technical Session (15)
**Multimodal Transportation III**  
Chair: Dr. Xinyuan Chen  
Nanjing University of Aeronautics and Astronautics  
**SUNDAY, DEC 5**  
**15:00 – 16:20**

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| 15:00 – 15:20 | Research and application of highway traffic video recognition using artificial intelligence  
Jian Wan, JiangSu Key Laboratory of Intelligent Perception and Control of Integrated Transportation, China Design Group Co., Ltd. |
| 15:20 – 15:40 | The impact of integrated airline and high-speed rail on the existing transportation market: A case study of Beijing-Shanghai corridor, China  
Zhenghao Ye, Southeast University |
| 15:40 – 16:00 | A comparative study on the route redundancy of the major city cluster freeway networks in China  
Zijian Wang, Tongji University |
| 16:00 – 16:20 | Impacts of intercity commuting on travel characteristics and urban performances in a two-city system  
Tao Dong, Tianjin University |

#### Technical Session (16)
**Reinforcement Learning in Transportation**  
Chair: Dr. Kai Huang, Southeast University  
**SUNDAY, DEC 5**  
**15:00 – 16:40**

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| 15:00 – 15:20 | Coordinating ride-sourcing and public transport services with a reinforcement learning approach  
Siyuan Feng, The Hong Kong University of Science and Technology |
| 15:20 – 15:40 | Dynamic crowdshipping for on-demand urban parcel delivery: A double dueling deep Q-network approach  
Nahid Parvez Farazi, University of Illinois at Chicago |
| 15:40 – 16:00 | Deep dispatching: A deep reinforcement learning approach for vehicle dispatching on online ride-hailing platform  
Cheng Lyu, Technical University of Munich |
| 16:00 – 16:20 | Deep reinforcement learning for dynamic incident-responsive traffic information dissemination  
Jiaohong Xie, National University of Singapore |
| 16:20 – 16:40 | Multi-agent reinforcement leaning method for pickup and delivery problem  
Ke Zhang, Tsinghua University |
## Technical Sessions

**Technical Session (17)**  
**Maritime Transportation and Port Operations II**  
**Chair:** Dr. Yadong Wang  
Nanjing University of Science and Technology  
**VooV ID:** 286435690  
**SUNDAY, DEC 5**  
**15:00 – 16:20**

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| 15:00 – 15:20| Analytical comparison on two incentive policies for shore power equipment ships in berthing activities  
Wencheng Wang, Shanghai University |
| 15:20 – 15:40| Efficiency of environmental subsidy and infrastructure subsidy on capacity investment of shore power for a container port  
Xianyang Zeng, Dalian Maritime university |
| 15:40 – 16:00| Integrated berth allocation and quay crane assignment under cooperation among multiple container terminals  
Hao Hu, University of Wollongong |
| 16:00 – 16:20| A risk-averse approach for joint contract selection and slot allocation in liner container shipping  
Yuyun Gu, Nanjing University of Science and Technology |
Keynote Abstracts

Speaker: Prof. Hai-Jun Huang, Beihang University

Title: Using the Bottleneck Model to Investigate Various Transport/Traffic Problems

Abstract: The bottleneck model was first introduced by Vickrey in 1969, aiming at addressing the departure time choices of commuters on a bottleneck-constrained highway during the morning rush hours. This model is able to model the formation and dissipation of queuing behind the bottleneck in a simple and tractable way, thus making it a benchmark representation of the dynamics of traffic congestion. A lot of insights into understanding the features of traffic congestion have been obtained via the bottleneck model. These insights cover various aspects, such as behavioral analysis, demand and supply management, as well as policy evaluation. In this talk, starting with a review paper published on TR Part B last year, I shall focus on what transport/traffic problems the bottleneck model can be used to analyze, and what other issues should be reminded of when using this model.

Biography: Hai-Jun Huang is a professor at Beihang University, Beijing. He received his PhD in transport operations research from Beihang in 1992. His research interests include road traffic flow models, transport network modeling, travel behavior analysis and congested road-use pricing. He has been the principle investigator of more than 10 national research grants and published more than 240 papers in such international journals as Transportation Research series, Transportation Science, Operations Research, EJOR, PNAS, NSE, RTE, etc. In 2011, he got the national prize for Achievements in Natural Science, and in 2012, the Fudan prize for Excellent Research in Management Sciences. In 2011, he was selected as the IAC member of ISTTT, and in 2020 as the member of WCTRS Steering Committee. He is now serving as the editor-in-chief of Transport Policy, the associate editors of Transportation Research Part E and Transportation Science, the editorial board member of Transportation Research Part C.
Speaker: Ir Prof. William H.K. Lam, The Hong Kong Polytechnic University

Title: Overview of Transportation Research Experience of Prof. William Lam in the Past 40 Years

Abstract: Prof. William H.K. Lam has worked in the field of transportation for more than 40 years. In this keynote speech, Prof. Lam will share his experience in transportation research in the past four decades. It will cover three major research areas: (1) multi-modal transportation planning and network equilibrium analysis from trip-based to activity-based approach; (2) model-based data driven approaches for development of Intelligent Transportation Systems (ITS) with consideration of the uncertainties of travel times and different sources of traffic detector data; and (3) walking behaviors and pedestrian modeling for design of pedestrian facilities. The relevant on-going research projects and future research on these topics will also be discussed.

Biography: Ir Prof. William H.K. Lam 林兴强教授工程师 is a Chair Professor of Civil & Transportation Engineering and has been the Head of the Civil & Environmental Engineering Department, The Hong Kong Polytechnic University from 2013 to 2019. He is also an Honorary Professor at the Institute for Transport and Logistics Studies, The University of Sydney, Australia since 2015 and was appointed a Chair Professor at the Beijing Jiaotong University from 2010 to 2016. Ir Prof. Lam has over 40 years of professional experience in research and practice for planning and design of transport infrastructure. He is the founding Editor-in-Chief of the SCI Journal – Transportmetrica and is now one of the Co-Editors-in-Chief of Transportmetrica A: Transport Science (https://www.tandfonline.com/toc/ttra21/current). He is the Founding President of the Hong Kong Society for Transportation Studies (www.hksts.org). Currently, he is the Convenor of the International Advisory Committee of the International Symposium on Transportation and Traffic Theory (https://isttt23.sciencesconf.org/resource/page/id/6) and a member of the international scientific committee of the International Symposium on Transportation Network Reliability (INSTR) (www.instr.org). Ir Prof. Lam is the author of more than 340 SCI journal papers or book chapters, 230 conference papers and 80 consultancy reports. His research interests include transport planning and traffic forecasting, ITS technology and development, smart surveillance and traffic simulation, public transport and pedestrian studies.
Abstract: We envisage a transportation management center (TMC) for autonomous vehicles that distributes the traffic over time (a cycle) such that the average travel time (AVT) of vehicles of the same origin-destination (OD) is identical at equilibrium while the entire network achieves system optimal (SO) flows every day. Vehicles are assigned to a set of paths, with different proportions of time on different paths, but with the same AVT over the cycle. Thus, not only users gain by subscribing to this system but the overall system also gains as SO flows are followed on each day. We further model the mixed equilibrium (ME) wherein some users subscribe to the TMC and hence assist in achieving SO, while non-subscribers only minimize their own private costs and follow their user equilibrium (UE) paths. To counter this, a penalty scheme is imposed on non-subscribers, i.e. UE users, based on their value-of-time distributions (VOT). The efficiency of this system is shown through numerical studies.

Biography: Professor Hong K. LO is Chair Professor of Civil and Environmental Engineering, and Director of GREAT Smart Cities Institute of the Hong Kong University of Science and Technology. He is Founding Editor-in-Chief of Transportmetrica B: Transport Dynamics, and Managing Editor of the Journal of Intelligent Transportation Systems. Professor Lo was awarded the prestigious triennial World Conference on Transportation Research (WCTR) Prize in 2001, and more recently, HKUST School of Engineering Research Excellence Award in 2014. He is a Fellow of the Hong Kong Institution of Engineers (HKIE), Fellow of the Chartered Institute of Logistics and Transport (CILT), Fellow of the Hong Kong Institute of Highway and Transportation (IHT), and Fellow of the Hong Kong Society for Transportation Studies.
Abstract: Recent decades have seen increasing concerns regarding air quality in housing locations. This study proposes a predictive continuum dynamic user-optimal model with combined choice of housing location, destination, route, and departure time. A traveler’s choice of housing location is modeled by a logit-type demand distribution function based on air quality, housing rent, and perceived travel costs. Air quality, or air pollutants, within the modeling region are governed by the vehicle-emission model and the advection-diffusion equation for dispersion. In this study, the housing-location problem is formulated as a fixed-point problem, and the predictive continuum dynamic user-optimal model with departure-time consideration is formulated as a variational inequality problem. The Lax-Friedrichs scheme, the fast-sweeping method, the Goldstein-Levitin-Polyak projection algorithm, and self-adaptive successive averages are adopted to discretize and solve these problems. A numerical example is given to demonstrate the characteristics of the proposed housing-location choice problem with consideration of air quality and to demonstrate the effectiveness of the solution algorithms.

Biography: Professor S.C. Wong is Chair Professor of Department of Civil Engineering and Associate Dean of Faculty of Engineering, and was conferred the Francis S Y Bong Professorship in Engineering, at the University of Hong Kong. He received his BSc (Eng) and MPhil degrees from the University of Hong Kong and a PhD in Transport Studies from University College London. Professor Wong has published extensively in reputable international journals with high impact factors. He has published more than 350 papers in refereed journals, in addition to numerous conference papers and presentations, including 90 keynote and invited talks. His journal articles have attracted more than 9,200 citations, garnering him an h-index of 53 according to the ISI Web of Science. He is currently Editor-in-Chief of International Journal of Sustainable Transportation and Transportmetrica A: Transport Science, and serves on the editorial boards of other twelve journals, including Analytic Methods in Accident Research, Transport Reviews, IEEE Transactions on Intelligent Transportation Systems, Transportation Research Part B, Travel Behaviour and Society, Accident Analysis and Prevention, Journal of Intelligent Transportation Systems, Transportmetrica B: Transport Dynamics, etc. Locally, Professor Wong is currently President of Hong Kong Society for Transportation Studies. He is a Justice of the Peace, and Member of Land and Development Advisory Committee, Advisory Council on the Environment, and Environment and Conservation Fund Committee of the Hong Kong SAR Government. In 2015, Professor Wong was awarded the Bronze Bauhinia Star by the Hong Kong SAR Government.
Title: A General Matching Function for Ride-Sourcing Services

Abstract: This talk presents a general matching function to delineate the on-demand matching process in ride-sourcing markets under various matching mechanisms with different matching time intervals and matching radius. The matching function characterizes a stationary matching equilibrium for the ride-sourcing market, in which passengers can be matched in consecutive batches, and drivers are in either an idle, pick-up, or delivery state. The function well approximates the expected driver idle time and the expected passenger matching time and pick-up time under different supply-demand conditions and platform matching strategies. It also unifies several prevailing inductive and deductive matching functions developed in the literature and demonstrates their specific application scope.

Biography: Prof. Hai Yang is currently a Chair Professor at The Hong Kong University of Science and Technology. He is internationally known as an active scholar in the field of transportation, with more than 280 papers published in SCI/SSCI indexed journals and a SCI H-index citation rate of 63. Most of his publications appeared in leading international journals, such as Transportation Research, Transportation Science and Operations Research. Prof. Yang received a number of national and international awards, including 2020 Frank M. Masters Transportation Engineering Award and 2021 Francis C. Turner Award of American Society of Civil Engineers; National Natural Science Award bestowed by the State Council of PR China (2011). He served as the Editor-in-Chief of Transportation Research (TR) Part B: Methodological from 2013 to 2018, a prestigious journal in the field of transportation. Currently, Professor Yang serves on the Distinguished Editorial Board of TR Part B, Scientific Council of TR Part C: Emerging Technologies, and also serves as an Advisory Editor of Transportation Science.
Title: Information Provision and Congestion management for a Mixed Traffic Flow of Connected Vehicles and Regular Vehicles

Abstract: Travelers often acquire traffic information and update their route choices en-route. This study examines travelers’ decision-making (regarding information acquisition and routing) and impacts of information, when travel times are uncertain in a road network with a mixed traffic flow of connected vehicles (CVs) and regular vehicles (RVs). CVs are equipped with onboard communication systems, which allows CV users to acquire en-route information efficiently at no additional cost, while RV users may choose to purchase en-route information via route-guidance systems. We examine two types of routing behaviors, i.e., the user-optimal routing and the system-optimal routing. The user-optimal routing behavior applies when road users aim to minimize their individual expected travel costs when they determine whether to acquire en-route information and what is the optimal routing policy. We characterize decisions of RV and CV users as a mixed-flow user equilibrium with recourse (MUER), which is first formulated as a policy-based variational inequality problem. To solve the problem efficiently, we further derive an equivalent convex optimization program. We propose a solution framework, where a tailored bi-conjugate Frank-Wolfe algorithm is embedded with a TS-OSP algorithm designed to find the optimal routing policy in our problem. The system-optimal routing behavior, which minimizes the expected system travel time, is also examined in the mixed traffic flow environment. We propose a linear program (LP) and prove an anonymous System Optimum (SO) toll scheme, can be obtained by solving the proposed LP. A column generation procedure is adopted to find the SO tolls. We test our model and algorithms on both the Braess network and the Sioux Falls network. The numerical results show that higher penetration of CVs does not necessarily reduce congestion. Meanwhile, improving RVs’ information technology can help to achieve SO with mild tolls.

Biography: Dr. Liu Yang is jointly appointed as an Assistant professor in the Department of Civil and Environmental Engineering and the Department of Industrial Systems Engineering and Management at the National University of Singapore. She received her B.S. from Tsinghua University, MPhil from Hong Kong University of Science and Technology and Ph.D. from Northwestern University. Previously, Dr. Liu worked as a consultant at Cambridge Systematics and provided modeling expertise to public agencies such as the Chicago Department of Transportation. She has worked on research projects funded by US and Singapore public agencies, including the US Federal Highway Administration, the National Science Foundation, Singapore Ministry of Education, and ST Engineering. Dr. Liu’s research focuses on future mobility and transport, which covers topics in the areas of ridesharing and carsharing systems operations and design, travel demand and congestion management, and data-driven transportation system modeling and analysis. Her work has been published in the major journals in the transportation area, including Transportation Research Part A: Policy, Transportation Research Part B: Methodological, and Transportation Research Part C: Emerging Technologies. Currently, she serves on the editorial boards of Transportation Science (Associate Editor), Transportation Research Part C, and Socio-Economic Planning Sciences (Associate Editor). She is a co-chair of WTC Shared Logistics and Transportation Systems Committee, a member of Transportation Research Board Standing Committee on Emerging and Innovative Public Transport and Technologies (AP020) and Transportation Network Modeling (AEP40), a member of the Chinese Overseas Transportation Association (COTA) Board of Directors, and a member of WCTRS Special Interest Group Transport Theory and Modelling.
Abstract: In this keynote speech, Prof. Antoniou will talk about ongoing research on the calibration of large-scale traffic simulations. Data and optimization algorithms form the backbone of traffic simulation model calibration. In the first half of his talk, he will discuss the algorithmic robustness of the PC-SPSA, which is a stochastic approximation algorithm with better convergence than the SPSA, specifically for the demand estimation problem. In the second part of his talk, he will bring out the challenges pertaining to the data availability for calibration and validation of the simulation models. In light of recent advancements in machine learning models, can we use the available data to infer the unknown information? In this context, he will introduce and discuss their ongoing work on the prediction of network wide flows using other exogenous variables, as a first step towards bridging the gap due to unavailable data.

Biography: Constantinos Antoniou is a Full Professor in the Chair of Transportation Systems Engineering at the Technical University of Munich (TUM), Germany. He holds a Diploma in Civil Engineering from NTUA (1995), a MS in Transportation (1997) and a PhD in Transportation Systems (2004), both from MIT. His research focuses on modeling and optimization of transportation systems, data analytics and machine learning for transportation systems, and human factors for future mobility systems.
Title: Modeling and Analyzing a Taxi Market with a Monopsony Taxi Owner and Multiple Rentee-Drivers

Abstract: Taxis offer round-the-clock, comfortable, and direct transportation services. In many cities, a large number (or all) of taxi drivers are rentee-drivers who rent taxis from taxi owners. Therefore, interaction exists between taxi owners and rentee-drivers. To regulate taxi markets effectively, it is necessary to model such interaction and investigate how different regulatory regimes affect stakeholders in taxi markets (e.g., taxi owners, rentee-drivers, and customers) and system performance (social welfare) in the presence of such an interaction. This study extends the classical aggregate taxi model to describe the supply of rentee-drivers and their interaction with a monopsony taxi owner. A general supply function is proposed to describe the supply of rentee-drivers in the market. A profit-maximization model is proposed to describe the decision-making process of the monopsonist and the government, respectively. Analytical and numerical studies are given to illustrate the properties of the proposed model and investigate the effects of fare adjustments and taxi rent/fleet size regulations on the monopsonist, rentee-drivers, customers, and system performance, thereby providing insights into taxi market regulations.

Biography: Dr. Wai Yuen Szeto is a Professor and an Associate Head at the Department of Civil Engineering at The University of Hong Kong, and the Deputy Director of the Institute of Transport Studies at that university. He is a Top 1% Scholar 2015-2021 (according to Clarivate Analytics’ Essential Science Indicators). His current h-index is 55 (Google Scholar). He is an author of over 155 refereed journal papers, with two papers in Operations Research and 34 papers in Transportation Research Part B. His publications have been cited over 8500 times (Google Scholar). The publications are related to shared mobility, dynamic traffic assignment, transport network design, public transport, network reliability, game theoretic approaches to transport and logistic problems, modeling land use, transport and environment interaction, and sustainable transport. He received the World Conference on Transport Research Prize (2001), the Eastern Asia Society for Transportation Studies Outstanding Paper Award (2003), the Hong Kong Society for Transportation Studies Outstanding Dissertation Paper Award and the Gordon Newell Memorial Prize (2005), the Hong Kong Institution of Engineers Outstanding Paper Award for Young Engineers/Researchers (2008), the Best Paper Award of the 10th International Workshop on Computational Transportation Science (2018), and the Outstanding Paper Award of the 2018 China Urban Transportation Planning Annual Meeting. He also received Certificate of Excellence in Reviewing from Transportation Research Part B in 2013 and Transportation Research Part C in 2013 and 2016. Currently, he is an Editor of Transportmetrica B, an Associate Editor of Transportation Research Part D and E, Journal of Intelligent Transportation Systems, Transportmetrica A, Travel Behaviour and Society, an Area Editor of Networks and Spatial Economics, and an Editorial Board Member of Transportation Research Part C and International Journal of Sustainable Transportation.
Speaker: Prof. Shuaian Wang, The Hong Kong Polytechnic University

Title: Prescriptive Analytics for Transport System Management: State-of-the-art Development

Abstract: The increased availability of data and the advancement of machine learning methods have prompted a large number of data-driven research in transportation engineering. Most of the works have employed a sequential prediction and optimization approach. That is, in step one, a machine learning model is used to predict parameters, and in step two, the predicted parameters are input into an optimization model for making decisions. However, this two-step approach generates suboptimal decisions. This seminar will present a few recent theoretical advances that overcome the sub-optimality. Hopefully, the theoretical advances can be applied by transportation engineers to solve practical problems.

Biography: Dr. Wang is currently Professor at The Hong Kong Polytechnic University (PolyU). Prior to joining PolyU, he worked as a faculty member at Old Dominion University, USA, and the University of Wollongong, Australia. Dr. Wang’s research interests include big data in shipping, green shipping, shipping operations management, port planning and operations, urban transport network modeling, and logistics and supply chain management. Dr. Wang has published over 160 papers in journals such as Transportation Research Part B, Transportation Science, and Operations Research. Dr. Wang is an editor-in-chief of Cleaner Logistics and Supply Chain and Communications in Transportation Research, an associate editor of Transportation Research Part E, Flexible Services and Manufacturing Journal, Transportmetrica A, and Transportation Letters, a handle editor of Transportation Research Record, an editorial board editor of Transportation Research Part B, and an editorial board member of Maritime Transport Research. Dr. Wang dedicates to rethinking and proposing innovative solutions to improve the efficiency of maritime and urban transportation systems, to promote environmental friendly and sustainable practices, and to transform business and engineering education.
Speaker: Prof. Xuesong Zhou, Arizona State University

Title: CAV Modeling Rising Up with Digital Twin: Transforming the Interconnection between Open Data, Multi-resolution Models and City Planners

Abstract: The recently emerging trend of digital twin technology and high-performance computing is creating a revolutionary paradigm shift in the coming years. For smart city and regional mobility applications, the pairing of the virtual and physical world allows analysis of data and monitoring of systems, evaluating different CAV-oriented improvement strategies, and planning the future by using models and simulators. A long-term goal of Smart City Digital Twin (SCDT) is to create sustainable urban systems that benefit the citizens and societies at large. This talk and related interactive demonstration aim to introduce our efforts in developing an Open data hub and Open-source simulation framework for transportation-focused Open-SCDT applications. We will demonstrate how to deliver rapid prototyping of SCDT and enable smarter multimodal policy decisions. We will also discuss a cross-resolution modeling approach to enable consistency from discrete traffic simulation to continuous fluid queue-based model. This presentation aims to help researchers and planners understand a system prototype of Open-SCDT based on OpenStreetMaps and open standard of general model network specifications (GMNS) by Volpe/FHWA, for creating and sharing of macro, meso and microscopic networks, and multi-source heterogeneous traffic data. Specifically, we will demonstrate a smart community-oriented DT prototype, namely CAVLite, for metropolitan planning organizations to fully utilize available simulation platforms through open-source ecosystems. This tool could help planners work with community partners to evaluate the benefit of data-driven decision-making. The proposed open-data-based and open-source enabled framework also intends to create a user community of thought leaders in this emerging area across different geographically distributed communities. Within the Open-SCDT context, large-scale agent-based simulators such as A/B Street and GMNS based modeling tools aim to engage citizens with local transportation planning by making it as easy as possible to imagine how changes might affect a person’s commute. It could be used by city authorities to interactively communicate proposed and ongoing projects, by the general public to explore and submit ideas for improving their community, and by advocacy groups to educate people about options for reducing automobile dependency.

Biography: Dr. Xuesong (Simon) Zhou from Arizona State University (ASU) is an expert in dynamic traffic simulation and maintains an open-source mesoscopic traffic simulator DTALite and an open-source traffic visualization tool NEXTA. As a leading open-source development team for US DOT, the ASU team has been developing a broader set of seamlessly integrated open-source computational engines, e.g., OSM2GMNS and Grid2Demand tools. DTALite has been applied in Maryland State-wide model with 26 million agents, and open-source tools have been downloaded by more than 20K times.
Brief introduction of Multimodal Transportation (a.k.a. MULTRA)

MULTRA is a new international transportation journal developed by Southeast University and Elsevier, which aims to create a forum for high quality, cutting-edge research in transportation science and technology. Papers concerning multimodal integration or emerging transportation technologies are particularly welcome, as is work focusing on Intelligent Transportation Systems, Smart Transportation, or Big Data, as applied to transport planning, network modelling or traffic safety. The Co-Editors-in-Chief are Professor Qiang Meng, National University of Singapore and Professor Pan Liu, Southeast University. The managing editor is Professor Zhiyuan (Terry) Liu, Southeast University. The following is the official homepage for the journal: https://www.journals.elsevier.com/multimodal-transportation.

All the submissions to MULTRA are double-blind peer reviewed, and our editorial goal is to complete the first-round review within 3-4 weeks. All the articles accepted in the journal are published open-access. No fee is charged and authors are not paid for any of the stages of article submission, review and publication.

MULTRA covers researches associated with the primary transportation modes - road, rail, air, maritime – and their integration/combination. As an interdisciplinary journal, the journal embraces work from a wide range of disciplines, including, but not limited to, transportation, logistics, economics, operations research and urban planning. The journal primarily publishes papers in the two categories: (i) Theory and Methodology, and (ii) Empirical Research. Papers in the first category employ mathematical modeling, optimization theory, etc., to develop new concepts and technologies, rather than the refinement of established theories. Papers in the second category can either employ quantitative analysis techniques such as statistical learning and machine learning or qualitative research methods such as one-on-one interviews, focus groups and case study to identify new insights into specific aspects of transportation research.

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