Welcome to the Transportation Day at UMD

August 28, 2014
NTC@Maryland Consortium

Led by the University of Maryland, the National Transportation Center @ Maryland consortium includes

http://ntc.umd.edu

- Arizona State University (ASU)
- Louisiana State University (LSU)
- Morgan State University (MSU)
- North Carolina State University (NCSU)
- Old Dominion University (ODU) and the
- University of New Orleans (UNO)
One of the Five National UTCs

Authorized by the Congress through national competition, and managed by the USDOT Office of the Assistant Secretary for Research and Technology.

Additional funding and support comes from local and state entities.

$6m/year budget
The theme of the Center is “Strategic Transportation Policies, Investments and Decisions for Economic Competitiveness”.

The Center directly support the US DOT’s strategic goal of economic competitiveness through:

- Advanced & Applied Research Promoting Economic Competitiveness
- Education, Workforce Development, Technology Transfer, & Diversity
Praise for NTC@Maryland

“I congratulate the University of Maryland on being selected to lead a new National Center…and given their excellent civil and environmental engineering transportation program, I’m confident the University is strongly positioned to lead the consortium.”

Dr. Wallace Loh
President, University of Maryland

“With the growing volume of traffic, an aging infrastructure and a need for smarter, more seamless movement of freight, this new UMD-led center will offer informed guidance on how best to invest precious transportation dollars. I am very proud that our engineering expertise and leadership has been recognized in this tangible way.”

Congressman Steny Hoyer
Major Research Areas

Economic Development
Congestion Mitigation
Freight Efficiency and Reliability
Safety Improvement
Emergency Preparedness
Sustainable Urban Development
FY2014 Research Projects

Research Features

- Support the U.S. DOT strategic goal of Economic Competitiveness, and related strategic goals, e.g. Safety and Sustainable Environment
- Multimodal/intermodal and multidisciplinary in scope
- Cover a wide spectrum of transportation-related topics including system mobility, safety, reliability, security, sustainability, livability, and economics.
# Economic Development Projects

<table>
<thead>
<tr>
<th>P.I. Names</th>
<th>Project Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lei Zhang</td>
<td>U.S. National and Inter-Regional Travel Demand Analysis: Person-Level Microsimulation Model and Application to High-Speed Rail Demand Forecasting</td>
</tr>
<tr>
<td></td>
<td>Effectiveness and equity of future transportation financing options at the federal and state levels</td>
</tr>
<tr>
<td></td>
<td>An integrated economic, land use, and network growth model for transportation management and policy analysis</td>
</tr>
<tr>
<td>Cinzia Cirillo</td>
<td>Revenue Management &amp; Operations Optimization for HSR</td>
</tr>
<tr>
<td>Cinzia Cirillo</td>
<td>Demand Model for Railway Revenue Management</td>
</tr>
<tr>
<td>Cinzia Cirillo</td>
<td>Modeling Vehicle Ownership Decisions for the State of Maryland</td>
</tr>
<tr>
<td>Qingbin Cui</td>
<td>Innovative Public-Private Partnerships and Contracting Methods for Transportation Project Delivery</td>
</tr>
<tr>
<td>Mikhail V. Chester</td>
<td>Long-Distance Transportation Infrastructure in a Climate Constrained Future: Reliable HSR Service for Economic Growth</td>
</tr>
</tbody>
</table>
Featured Research

Impact of Highway Investment on the Economy and Employment across U.S. Industrial Sectors: A Simultaneous Equations Analysis at the Metropolitan Level

P.I. Prof. Lei Zhang, University of Maryland

Direct Impact
- Increase Productivity
- Reduce Travel Cost
- Improve Accessibility
- Transportation and Manufacturing Sectors
- Create Jobs
- Improve connectivity
- Expand Market Size

Indirect Impact
- Increase Consumption
- Boost Business and Leisure Travel

Transportation Investment
U.S. Industry Analysis: Statistics

Employment by Industrial Sectors for U.S.
National-Level Travel Model: Driving

Car Trips from D.C.
- 0 - 21247
- 21248 - 63796
- 63797 - 148161
- 148162 - 290935
- 290936 - 465046
National-Level Travel Model: Air
National-Level Travel Model: Train

Train Trips from D.C

- 0 - 6037
- 6038 - 23786
- 23787 - 54864
- 54865 - 135554
- 135555 - 213518
## Economic Analysis: 1.73M Jobs

<table>
<thead>
<tr>
<th>Industry</th>
<th>Share of EMP (%)</th>
<th>Job Creation (1,000)</th>
<th>Industry</th>
<th>Share of EMP (%)</th>
<th>Job Creation (1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm (S1)</td>
<td>1.51</td>
<td>29.48</td>
<td><strong>Professional &amp; Technical Services (S13)</strong></td>
<td>7.06</td>
<td>-548.54</td>
</tr>
<tr>
<td>Forestry, Fishing, related activities, &amp; other (S2)</td>
<td>0.55</td>
<td>-107.76</td>
<td><strong>Management of Companies &amp; Enterprises (S14)</strong></td>
<td>1.10</td>
<td>-648.45</td>
</tr>
<tr>
<td>Mining (S3)</td>
<td>0.54</td>
<td>-25.20</td>
<td>Administrative &amp; Waste Services (S15)</td>
<td>6.09</td>
<td>157.60</td>
</tr>
<tr>
<td>Utilities (S4)</td>
<td>0.33</td>
<td>-24.56</td>
<td>Educational Service (S16)</td>
<td>2.38</td>
<td>Insignificant</td>
</tr>
<tr>
<td><strong>Construction (S5)</strong></td>
<td><strong>5.88</strong></td>
<td><strong>511.49</strong></td>
<td>Health Care &amp; Social Assistance (S17)</td>
<td>11.10</td>
<td>196.31</td>
</tr>
<tr>
<td><strong>Manufacturing (S6)</strong></td>
<td><strong>7.31</strong></td>
<td><strong>405.75</strong></td>
<td>Arts, Entertainment &amp; Recreation (S18)</td>
<td>2.17</td>
<td>-82.23</td>
</tr>
<tr>
<td>Wholesale Trade (S7)</td>
<td>3.64</td>
<td>Insignificant</td>
<td><strong>Accommodation &amp; Food Services (S19)</strong></td>
<td><strong>6.83</strong></td>
<td><strong>347.98</strong></td>
</tr>
<tr>
<td>Retail Trade (S8)</td>
<td>10.21</td>
<td>536.76</td>
<td>Other Services, except Public Admin (S20)</td>
<td>5.76</td>
<td>172.39</td>
</tr>
<tr>
<td>Transportation &amp; Warehousing (S9)</td>
<td>3.17</td>
<td>180.69</td>
<td><strong>Federal Civilian Government (S21)</strong></td>
<td>1.51</td>
<td>-6.13</td>
</tr>
<tr>
<td>Information (S10)</td>
<td>1.99</td>
<td>-62.68</td>
<td><strong>Federal Military Government (S22)</strong></td>
<td>1.08</td>
<td>-22.17</td>
</tr>
<tr>
<td>Finance &amp; Insurance (S11)</td>
<td>4.43</td>
<td>200.52</td>
<td><strong>State &amp; Local Government (S23)</strong></td>
<td>11.24</td>
<td>265.65</td>
</tr>
<tr>
<td>Real Estate &amp; Rental &amp; Leasing (S12)</td>
<td>4.15</td>
<td>28.64</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Other Major Findings

In the long run, doubling highway capacity would produce an additional $3.5 trillion of GDP for the U.S.

Over all, doubling current transportation assets and capacity would create 15 million jobs in the long run.

The impact of highway investment on employment varies across industrial sectors:

- Employment in 12 out of the 23 industrial sectors would increase in response to highway investment.
- The four sectors—retail trade, construction, manufacturing and accommodation services account for around 30% of the total employment, while they capture about 60% of the benefits from highway investment.
## Congestion Mitigation Projects

<table>
<thead>
<tr>
<th>P.I. Names</th>
<th>Project Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ali Haghani</td>
<td>Bluetooth Travel Time</td>
</tr>
<tr>
<td>Ali Haghani</td>
<td>HOV lane performance monitoring system</td>
</tr>
<tr>
<td>Gang-Len Chang</td>
<td>Integration of Variable Speed Control and Travel Time Information to Minimize Recurrent Highway Congestion</td>
</tr>
<tr>
<td>Paul Schonfeld</td>
<td>Integrated Management of Maintenance and Traffic</td>
</tr>
<tr>
<td>Elise Miller-Hooks</td>
<td>Quantifying the Cost Effectiveness of Freeway Service Patrol Programs</td>
</tr>
<tr>
<td>Billy M. Williams</td>
<td>Validation of Travel Time Reliability Prediction from Probe Data</td>
</tr>
<tr>
<td>Nagui M. Roupail</td>
<td>Vehicle Trajectory Tool: Application Pilot for AMS Test Bed</td>
</tr>
<tr>
<td>Mecit Cetin</td>
<td>The Open Toll Lanes in a Connected Vehicle Environment</td>
</tr>
<tr>
<td>Yingyan Lou</td>
<td>Behavioral Study for Managed Lane Pricing Refund Option</td>
</tr>
<tr>
<td>Ram M. Pendyala</td>
<td>Congestion Mitigation Potential of Autonomous (Driverless) Vehicles: A Scenario-Based Approach</td>
</tr>
<tr>
<td>Xuesong Zhou</td>
<td>Evaluating and Calibrating Emission Impacts of Traffic Management Strategies</td>
</tr>
<tr>
<td>Brian Wolshon</td>
<td>Quantifying the Effects of Manual Traffic Control on Evacuation Corridors</td>
</tr>
<tr>
<td>Brian Wolshon</td>
<td>Development of a Simulation Test Bed for Connected Vehicles using the LSU Driving Simulator</td>
</tr>
</tbody>
</table>
Featured Research

Travel Time Validation in Vehicle Probe Project
- P.I. Prof. Ali Haghani, University of Maryland

Data Validation Effort Summary
- Validation of Travel Time data provided by INRIX to I-95 member states since July 2008
- Experts in both public and private sector refer to this project as the most comprehensive effort for validation of traffic data in the ITS industry
- Participating states:
  - Delaware, Maryland
  - New Jersey (entire limited access road network)
  - North Carolina (entire interstate system)
  - South Carolina
  - Virginia
  - Pennsylvania
  - Florida, Rohde Island
On-going Validation

- Nine states
- 34 evaluation reports
- 35 deployments, 521 days sensors on the road
- 930 centerline mile (827 mile freeway, 103 mile arterial)
- 60,102 hour worth of ground truth data resulting from 8 million Bluetooth observations
Validation Framework Architecture

Bluetooth Sensor 1 → Matching → Filtering → Aggregation

Bluetooth Sensor 2

Vehicle Probe Data Archive

- Equivalent Travel Time Record Calculation
- Aggregation of Equivalent Records

Record spans more than 5 minute interval?

Bluetooth Data → Comparison → Validation → Graphs and Reports

Vehicle Probe Data
Report Generator

The image shows a user interface for the Report Generator, which is part of the National Transportation Center at Maryland. The interface includes options for selecting TMC types, setting time ranges, and viewing various reports and statistics related to Bluetooth and Inrix data. The interface also displays a map with data points and a table with details such as state, type, start time, and end time for different TMCs.
## Freight Efficiency/Reliability Projects

<table>
<thead>
<tr>
<th>P.I. Names</th>
<th>Project Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paul Schonfeld</td>
<td>Efficiency and Reliability in Freight Transportation System</td>
</tr>
<tr>
<td>Elise Miller-Hooks</td>
<td>Economic Impact Study of Intercounty Connector: Logistics and Freight Impact Assessment</td>
</tr>
<tr>
<td>Shane Underwood</td>
<td>Impact of Freight Movement Trends on Highway Pavement Infrastructure</td>
</tr>
<tr>
<td>Hyeonshic Shin</td>
<td>Multi-layered Integrated Urban Freight Delivery Network</td>
</tr>
<tr>
<td>George F. List</td>
<td>Efficiency and Reliability in Freight Transportation</td>
</tr>
<tr>
<td>Mecit Cetin</td>
<td>Combining Different Data Sources to Predict Origin-Destinations and Flow Patterns for Trucks in Large Networks</td>
</tr>
<tr>
<td>Bethany M. Stich</td>
<td>Port City Challenges</td>
</tr>
<tr>
<td>Qingbin Cui</td>
<td>Ex-Post Value for Money Analysis of Public Private Partnerships in Freight Transportation Infrastructure</td>
</tr>
</tbody>
</table>
Featured Research

Evasive Flow Capture

- P.I. Prof. Paul Schonfeld, UMD
- Flow-capturing problem (FCP) aims to locate facilities to capture as many flows as possible

Benefits to Society

- Improve the current practice in locating weigh-in-motion systems and thereby provide more cost effective solutions
- Improve safety management in transport of hazardous materials through optimal location of inspection stations
- Improve toll collection for transportation agencies through optimal allocation of tollbooths
Background

FCPs assume that if a facility is located along a predetermined path of a flow, the flow is captured. This is a serious issue in applications where flows have an incentive to avoid the facilities (weigh-in-motion, tollbooths, checkpoints).
Example Application

Overweight trucks are a major problem because they damage pavements, produce GHG and noise, and reduce traffic safety.

Weigh-In-Motion systems can detect and fine overweight trucks.

However, their location soon becomes available online and overweight trucks start avoiding them. EFCP is needed!
EFCP vs. Real-World Network

Nevada STAA Network

Real-world allocation implies damage of $925,640/year

EFCP-based allocation implies damage of $248,941/year
Multi-Stage Stochastic EFCP

Vermont Example

10-stage investment plan

1) No implementation
2) No implementation
3) 88
4) 26
5) 157
6) 88
7) 26
8) 37, 82, 115
9) 88
10) 26
## Emergency Preparedness Projects

<table>
<thead>
<tr>
<th>P.I. Names</th>
<th>Project Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ali Haghani</td>
<td>Optimal Scheduling of Evacuation Operations</td>
</tr>
<tr>
<td>Elise Miller-Hooks</td>
<td>Improving Traffic Signal Timing for Evacuation</td>
</tr>
<tr>
<td>Elise Miller-Hooks</td>
<td>Resilience in Rail-Based Intermodal Transportation Systems</td>
</tr>
</tbody>
</table>
Featured Research

Resilience in Rail-Based Intermodal Transportation Systems: Performance Measurement and Decision Support

- P.I. Prof. Elise Miller-Hooks, University of Maryland

Summary

- Intermodal, Rail-Based Goods Transport
- Ports and Intermodal Facilities
- Airport Taxiway and Runway Systems
- Drivers – Roadway
- Deterioration and Maintenance
Two Components of Resilience

Should reflect network’s inherent ability to cope with disruption via its topological and operational attributes and potential immediate actions that can be taken in disaster aftermath

Inherent

- Inherent capability to absorb or cushion effects of disaster

Adaptive

- Potential cost-effective actions that can be taken to preserve or restore system’s ability to perform its intended function in disaster’s aftermath
Application: Airport

Airport Taxiway & Runway Pavement Networks

Assess airport readiness to cope with damage under meteorological-damage scenarios
Modeling Results

Resilience indifference curves

![Graph showing resilience indifference curves with budget and repair allowed time as variables.](image)
Disaster Resilience

Quantifying Disaster Resilience of Critical Infrastructure-based Societal Systems with Emergent Behavior and Dynamic Interdependencies

Interdependent critical infrastructure-based societal systems
## Safety Projects

<table>
<thead>
<tr>
<th>P.I. Names</th>
<th>Project Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elise Miller-Hooks</td>
<td>Simulation-Based Secondary Incident Filtering Method</td>
</tr>
<tr>
<td>Gang-Len Chang</td>
<td>Effects of Automated Speed Enforcement in Maryland Work Zones</td>
</tr>
<tr>
<td>Gang-Len Chang</td>
<td>Design &amp; Evaluation of a Dynamic Dilemma Zone Protection System for a High Speed Rural Intersection</td>
</tr>
<tr>
<td>Gang-Len Chang</td>
<td>Maryland Unconventional Intersection Design (MUID)</td>
</tr>
</tbody>
</table>
## Sustainable Development Projects

<table>
<thead>
<tr>
<th>P.I. Names</th>
<th>Project Titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lei Zhang</td>
<td>No More Freeways: Urban Land Use-Transportation-Environment Dynamics without Freeway Capacity Expansion</td>
</tr>
<tr>
<td>Lei Zhang</td>
<td>Impact of Air Quality Control and Land Use Policies on Vehicle Miles Traveled, Energy Consumption, and Pollution/Green House Gas Emissions</td>
</tr>
<tr>
<td>Lei Zhang</td>
<td>Comprehensive Highway Corridor Planning With Sustainability Indicators</td>
</tr>
<tr>
<td>Elise Miller-Hooks</td>
<td>Objective Decision-Making Tools for Infrastructure Investments to Combat Sea Level Rise</td>
</tr>
<tr>
<td>Elise Miller-Hooks</td>
<td>Greenhouse Gas Emissions Tool to Support Emissions Estimation in On-Road Transport Along Freeways and Arterials</td>
</tr>
<tr>
<td>Elise Miller-Hooks</td>
<td>Smart Algorithms For Managing Ridesharing Services</td>
</tr>
<tr>
<td>Paul Schonfeld</td>
<td>Integration of Fixed and Flexible-Route Public Transportation Services</td>
</tr>
<tr>
<td>Cinzia Cirillo</td>
<td>Feasibility and Benefit of an Activity-Based Travel Demand Model for Maryland: An Exploratory Analysis</td>
</tr>
<tr>
<td>Ahmet Aydilek</td>
<td>Quantification of System-wide Life Cycle Benefits of Recycled Materials in Highways</td>
</tr>
</tbody>
</table>
Featured Research

Emerging vehicle technologies

- P.I. Prof. Cinzia Cirillo, University of Maryland

- The culmination of new vehicle technology, greater competition in energy markets, and government policies to reduce pollution and energy consumption will result in changes to the personal vehicle marketplace.

- This project analyze vehicle purchasing behavior in a dynamically changing marketplace through the use of dynamic attributes and a six-year hypothetical time window.

- The designs correspond to changing vehicle technology, fueling options, and taxation policy.

- Respondents were able to depreciate their vehicles over the five-year hypothetical period and place tradeoffs on the features of vehicles and fuel types.
Green House Gas Emission (GHGE)

- This study proposes a model system to forecast GHGEs. The model system contains four sub-models: vehicle type and vintage, quantity, usage, and greenhouse gas emission rates.
- The vehicle GHGERs are calculated using MOVES (developed by EPA).
- Two tax schemes, vehicle purchase tax and fuel tax, have been proposed and their effects on vehicle GHGEs reduction calculated.
- Currently in DC area the average annual GHGEs per vehicle is 6.71 tons carbon dioxide-equivalent (CO2E) gas.
- Results show that: (1) The impacts on reducing GHGEs from fuel taxes are more significant than those from purchase taxes; (2) Purchase taxes mainly reduce GHGEs by decreasing the car quantity for households with a high number of vehicles; (3) Fuel taxes successfully reduce GHGEs by decreasing car usage of households with fewer vehicles.
This study conducted in the Washington Metropolitan is aiming at understanding and quantifying access to jobs of the resident low income population.

The quantitative analysis undertaken identifies spatial distribution of both low income households and job growth.

Results provide strong evidence of spatial mismatch between low income population residing in Washington DC, nearby zones in Maryland and locations where low-skill jobs are expected to grow.

The transportation analysis attests that low income workers do rely on public transportation and that their accessibility to opportunities is very limited when compared to higher classes of income earners.
Real Life Applications

- Statewide Transportation models (for the State of Maryland and possibly to the State of Qatar).
- Access to private and public transportation (low income access to jobs in the Washington Metropolitan Region).
- Travel behavior in emergency (flood or terrorist attack).
- Car ownership and use model and GHG’s emission for the US (policies for climate change and dependency on fossil fuel).
- Emerging technology vehicles: Electric and Hybrid cars.
- Congestion and toll roads.
- Social network and social media influence on travel behavior.
### Courses Offerings and Resources

<table>
<thead>
<tr>
<th>University</th>
<th>Faculty</th>
<th>Research Staff</th>
<th># Degree-granting programs</th>
<th># Transportation Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMD</td>
<td>23</td>
<td>20</td>
<td>5</td>
<td>42</td>
</tr>
<tr>
<td>ASU</td>
<td>20</td>
<td>1</td>
<td>8</td>
<td>45</td>
</tr>
<tr>
<td>NCSU</td>
<td>13</td>
<td>33</td>
<td>4</td>
<td>34</td>
</tr>
<tr>
<td>MSU</td>
<td>12</td>
<td>5</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>ODU</td>
<td>13</td>
<td>4</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>UNO</td>
<td>16</td>
<td>5</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>LSU</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>103</td>
<td>69</td>
<td>34</td>
<td>204</td>
</tr>
</tbody>
</table>
## Career Development

<table>
<thead>
<tr>
<th>Government</th>
<th>Industry</th>
<th>Academia/Research</th>
</tr>
</thead>
</table>
Outreach & Technology Transfer

Conference Participation, Organization, & Sponsorship
- Organizer and Host of the 2014 TRB Innovations in Travel Modeling Conference in Baltimore, MD
- Sponsor at the International Transportation Economic Development Conference
- Maryland Quality Initiative Conference
- Patron & Exhibitor at the Innovations in Travel Modeling Conference
- Transportation Research Board Annual Conference
- Intelligent Transportation System World Congress

Technology Transfer
- Field Tours of WMATA Facilities
- Freight Academy
- Operations Academy
- International Collaborations
Thank You!

Contact Information

Lei Zhang, Ph.D.
Associate Professor
Director, National Transportation Center @ Maryland
Director, Transportation Engineering Program
Department of Civil and Environmental Engineering
University of Maryland

1173 Glenn Martin Hall, College Park, MD 20742
Email: lei@umd.edu
Phone: 301-405-2881
Supplementary Information

Part I: Faculty Research Highlights
Prof. Lei Zhang

- **Leadership and Research Interests**
  - Director, National Center for Strategic Transportation Policies, Investments and Decisions
  - Director, Transportation Engineering Program, Department of Civil and Environmental Engineering
  - Land Use, Transportation, and Environmental Planning, Transportation Economics and Policy, Systems Operations and Management, Quantitative Methods

- **Research Highlights**
  - Agent-based modeling
  - Integration of behavior model and DTA
  - Impact of air quality control
  - Effectiveness and equity of future transportation financing
  - Highway corridor planning
Prof. Ali Haghani

- **Leadership and Research Interests**
  - Former Chair of Dept. Civil and Environmental Engineering
  - Lead a Tier-I UTC Center for Integrated Transportation Systems Management
  - Transportation systems modeling, traffic management and control and real time traffic data collection, analysis and evaluation

- **Research Highlights**
  - I-95 Corridor Coalition Vehicle Probe Project
  - Anonymous vehicle detection using wireless sensor network
  - Dynamic message signs and impact
  - Traffic data assimilation, short-term travel time prediction
  - High-occupancy toll lanes
  - Dynamic rideshare optimized matching
  - Real-time travel time solutions for DC
Prof. Gang-Len Chang

- Leadership and Research Interests
  - Manager of the Applied Technology for Traffic Operations and Safety Program
  - Director of the Laboratory for Traffic Safety and Operations
  - Traffic network analysis, intelligent transportation systems control and operations, and regional network planning and development

- Research Highlights
  - Variable speed control, travel time info
  - Traffic operations, incident management
  - Web-based on-line simulation
  - Unconventional intersection design
  - Dynamic dilemma zone protection
Prof. Paul M. Schonfeld

- Leadership and Research Interests
  - 19 years as Director of Transportation Engineering Program
  - Director of its Center for Freight Mobility and Security
  - Urban public transportation systems, road networks and highway traffic management, airports and air traffic management, road networks, public transportation systems, freight logistics, ports and inland waterways

- Research Highlights
  - Transfer in intermodal freight systems
  - Evaluation/optimization highway alignments
  - Integrated management of maintenance/traffic
  - Inland waterway transportation
  - Fixed/flex-route public transportation
  - Routing algorithms for robotic vehicles
Prof. Elise Miller-Hooks

● Research Interests
  - Transportation infrastructure vulnerability and protection, emergency/disaster planning and response, intermodal freight and passenger transport optimization, incident management, workforce routing and scheduling, GHG emissions reduction, bicycle and electric vehicle sharing systems, paratransit/dial-a-ride, crowd management and modeling

● Research Highlights
  - Managing ridesharing services
  - Greenhouse gas emissions tool
  - Resilience railed-based intermodal transport
  - Concurrent flow lanes
  - REORIENT: Implementing change in European Railway system
Dr. Cinzia Cirillo

- **Research Interests**
  - Transportation modeling techniques
  - Applications of advanced statistical and econometrics methods to travel demand forecasting
  - Survey techniques (travel diary and stated preference)
  - Activity based models

- **Research Highlights**
  - Dynamic choice models car ownership
  - Job access and reverse commute
  - Departure time choice of dynamic toll pricing
  - Passenger demand model for railway revenue management
Supplementary Information

Part II:
Sponsored Research Projects
NTC Sponsored Projects

- 2013-2014
  - Fund 21 research projects, 2 educational and 2 technology transfer projects
Congestion Mitigation (1/6)

- Bluetooth Travel Time
- HOV Lane Performance Monitoring System
  - P.I. Prof. Ali Haghani, University of Maryland

- Integration of Variable Speed Control and Travel Time Information to Minimize Recurrent Highway Congestion
  - P.I. Prof. Gang-Len Chang, University of Maryland
Congestion Mitigation (2/6)

- Integrated Management of Maintenance and Traffic
  - P.I. Prof. Paul Schonfeld, University of Maryland

- Quantifying the Cost Effectiveness of Freeway Service Patrol Programs
  - P.I. Prof. Elise Miller-Hooks, University of Maryland
Congestion Mitigation (3/6)

- Validation of Travel Time Reliability Prediction from Probe Data
  - P.I. Prof. Billy M. Williams, North Carolina State University

- Vehicle Trajectory Tool: Application Pilot for AMS Test Bed
  - P.I. Prof. Nagui M. Rouphail, North Carolina State University
Congestion Mitigation (4/6)

- The Open Toll Lanes in a Connected Vehicle Environment
  - P.I. Prof. Mecit Cetin, Old Dominion University

- Behavioral Study for Managed Lane Pricing Refund Option
  - P.I. Dr. Yingyan Lou, Arizona State University
Congestion Mitigation (5/6)

● Congestion Mitigation Potential of Autonomous (Driverless) Vehicles: A Scenario-Based Approach
  - P.I. Prof. Ram M. Pendyala, Arizona State University

● Evaluating and Calibrating Emission Impacts of Traffic Management Strategies
  - P.I. Prof. Xuesong Zhou, Arizona State University
Congestion Mitigation (6/6)

- Quantifying the Effects of Manual Traffic Control on Evacuation Corridors
- Development of a Simulation Test Bed for Connected Vehicles using the LSU Driving Simulator
  - P.I. Prof. Brian Wolshon, Louisiana State University
Economic Development (1/4)

- U.S. National and Inter-Regional Travel Demand Analysis: Person-Level Microsimulation Model and Application to High-Speed Rail Demand Forecasting
  - P.I. Prof. Lei Zhang, University of Maryland
Economic Development (2/4)

- Effectiveness and equity of future transportation financing options at the federal and state levels

- An integrated economic, land use, and network growth model for transportation management and policy analysis

  - P.I. Prof. Lei Zhang, University of Maryland
Economic Development (3/4)

- Revenue Management & Operations Optimization for HSR
  - P.I. Prof. Cinzia Cirillo, University of Maryland

- Long-Distance Transportation Infrastructure in a Climate Constrained Future: Reliable HSR Service for Economic Growth
  - P.I. Prof. Mikhail V. Chester, Arizona State University
Economic Development (4/4)

- Demand Model for Railway Revenue Management

- Modeling Vehicle Ownership Decisions for the State of Maryland

  - P.I. Prof. Cinzia Cirillo, University of Maryland
Freight Efficiency and Reliability (1/5)

- Efficiency and Reliability in Freight Transportation System
  - P.I. Prof. Paul Schonfeld, University of Maryland

- Dynamic Decision Making for Less-Than-Truckload Trucking Operations
  - P.I. Prof. Ali Haghani, University of Maryland
Freight Efficiency and Reliability (2/5)

- **Economic Impact Study of Intercounty Connector: Logistics and Freight Impact Assessment**
  - P.I. Prof. Elise Miller-Hooks, University of Maryland

- **Impact of Freight Movement Trends on Highway Pavement Infrastructure**
  - P.I. Prof. Shane Underwood, Arizona State University
Freight Efficiency and Reliability (3/5)

- Multi-layered Integrated Urban Freight Delivery Network
  - P.I. Dr. Hyeonshic Shin, Morgan State University

- Efficiency and Reliability in Freight Transportation
  - P.I. Prof. George F. List, North Carolina State University
Freight Efficiency and Reliability (4/5)

- Combining Different Data Sources to Predict Origin-Destinations and Flow Patterns for Trucks in Large Networks
  - P.I. Dr. Mecit Cetin, Old Dominion University

- Port City Challenges
  - P.I. Dr. Bethany M. Stich, University of New Orleans
Freight Efficiency and Reliability (5/5)

- Ex-Post Value for Money Analysis of Public Private Partnerships in Freight Transportation Infrastructure
  - P.I. Prof. Qingbin Cui, University of Maryland
Safety Improvement (1/3)

- Simulation-Based Secondary Incident Filtering Method
  - P.I. Prof. Elise Miller-Hooks, University of Maryland

- Effects of Automated Speed Enforcement in Maryland Work Zones - P.I. Prof. Gang-Len Chang, University of Maryland
Safety Improvement (2/3)

- Integration of Variable Speed Control and Travel Time Information to Minimize Recurrent Highway Congestion
  - P.I. Prof. Gang-Len Chang, University of Maryland

![Location Map](image1)

<table>
<thead>
<tr>
<th>Control</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 LPR camera</td>
<td>• Matching two plate to calculate travel Time</td>
</tr>
<tr>
<td>4 Detector</td>
<td>• HD sensors • Data retrieved every 30 seconds</td>
</tr>
<tr>
<td>2 VSL</td>
<td>• Display VSL from VSL-1 algorithm from Lin and Chang (2004)</td>
</tr>
<tr>
<td>2 VMS</td>
<td>• Displays output Messages • Travel Time and/or “reduce speed ahead”</td>
</tr>
</tbody>
</table>
Safety Improvement (3/3)

- Design & Evaluation of a Dynamic Dilemma Zone Protection System for a High Speed Rural Intersection
  - P.I. Prof. Gang-Len Chang, University of Maryland

- Maryland Unconventional Intersection Design (MUID)
  - P.I. Prof. Gang-Len Chang, University of Maryland
Emergency Preparedness (1/2)

- Effects of Automated Speed Enforcement in Maryland Work Zones - P.I. Prof. Gang-Len Chang, University of Maryland

- Congestion Development of Traffic Simulation for I-695, I-495, for Traffic Operations and Incident Management
  - P.I. Prof. Gang-Len Chang, University of Maryland
Emergency Preparedness (2/2)

● Optimal Scheduling of Evacuation Operations
  - P.I. Prof. Ali Haghani, University of Maryland

● Improving Traffic Signal Timing for Evacuation
  - P.I. Prof. Elise Miller-Hooks, University of Maryland
Smart Growth & Sustainability (1/4)

- No More Freeways: Urban Land Use-Transportation-Environment Dynamics without Freeway Capacity Expansion
  - P.I. Prof. Lei Zhang, University of Maryland

- Objective Decision-Making Tools for Infrastructure Investments to Combat Sea Level Rise
  - P.I. Prof. Elise Miller-Hooks, University of Maryland
Smart Growth & Sustainability (2/4)

- Impact of Air Quality Control and Land Use Policies on Vehicle Miles Traveled, Energy Consumption, and Pollution/Green House Gas Emissions
- Comprehensive Highway Corridor Planning With Sustainability Indicators
  - P.I. Prof. Lei Zhang, University of Maryland
Smart Growth & Sustainability (3/4)

- Greenhouse Gas Emissions Tool to Support Emissions Estimation in On-Road Transport Along Freeways and Arterials
- Smart Algorithms For Managing Ridesharing Services
  - P.I. Prof. Ellise Miller-Hooks, University of Maryland

- Integration of Fixed and Flexible-Route Public Transportation Services
  - P.I. Prof. Paul Schonfeld, University of Maryland
Smart Growth & Sustainability (4/4)

- Feasibility and Benefit of an Activity-Based Travel Demand Model for Maryland: An Exploratory Analysis
  - P.I. Prof. Cinzia Cirillo, University of Maryland

- Quantification of System-wide Life Cycle Benefits of Recycled Materials in Highways
  - P.I. Prof. Ahmet Aydilek, University of Maryland