The Transportation Center: Research that Moves You

Hani Mahmassani

Presentation to the BAC
October 19, 2017
Strategic Vision: A Refresher

• Pre-eminent think-tank and laboratory in the world for cutting-edge research that matters on a global scale.
• Provide the premier educational program in transportation systems.
• Essential academic partner for novel, high-impact collaborative research.
• Advance state of practice industry applications through a mix of engaged application-driven research and fundamental advances.
Progress Highlights:

BAC Membership (since last meeting)
- 5 new companies (9 new members)

Funded Research Activity
- Active: 12 projects $2.6M, 4+ faculty
- Submitted: 5 proposals $650K, 3+ faculty

Students
- 13 incoming TRN (CEE) graduate students (4 PhD track)
- 4 supported via dissertation year fellowships
- 15 Transportation & Logistics Minors (6 seniors)
- $500k (FY17) in support (travel, tuition, stipend, DYF’s)
BAC: Update on Membership

• Continued momentum in terms of recruitment, retention of companies, events, and engagement
• Active research outreach with several BAC companies
• Continue to seek more opportunities to engage individual companies and/or consortia in research support and collaboration
• Active and highly effective membership committee; continuing process of identifying and vetting new prospects
BAC: New Membership Leadership
General Motors / Maven
Sustaining AM General
EagleRail
Jeppesen
Association
American Short Line and Regional Railroad Association
BAC Contributions: FY07 – FY17

<table>
<thead>
<tr>
<th>Year</th>
<th>Contributions</th>
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<tbody>
<tr>
<td>FY07</td>
<td>$34,000</td>
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<tr>
<td>FY08</td>
<td>$41,000</td>
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<tr>
<td>FY09</td>
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<td>FY12</td>
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<td>FY13</td>
<td>$350,000</td>
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<tr>
<td>FY14</td>
<td>$340,000</td>
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<tr>
<td>FY15</td>
<td>$481,000</td>
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<tr>
<td>FY16</td>
<td>$430,000</td>
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<tr>
<td>FY17</td>
<td>$600,000</td>
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Note: Contributions are in thousands of dollars.
BAC Contributions: FY07 – FY17
Students: Our Core Mission (I)

• TC adds *value to student experience* through industry exposure, seminars by authorities in the field, travel funds for conferences, fellowship stipends—essential differentiator for recruiting top talent

• Many opportunities for *undergraduates* interested in transportation; increasing engagement in research, *internship* placement with *BAC companies*

• *Industry support is critical* to our mission and to making a Northwestern Education in Transportation the unique experience it is.
Students: Our Core Mission (II)
Direct Student Funding Through NUTC

<table>
<thead>
<tr>
<th></th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
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<tbody>
<tr>
<td>Travel/Events</td>
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<tr>
<td>Fellowships</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Tuition/Stipend</td>
<td>$200,000</td>
<td>$400,000</td>
<td>$600,000</td>
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Students: Dissertation Year Fellows

**Michael Hyland**
Civil and Environmental Engineering
*Real-time Operation of Shared-use Autonomous Vehicle Fleets: Modeling, Optimization, Simulation, and Analysis*

**Fiorella Mete**
Civil and Environmental Engineering
*Assessment of Bridge performance Through Data Science Techniques*

**John Miller**
Civil and Environmental Engineering
*Integrating Dynamic Probabilistic Profitable Tours into the Truck Assignment Problem for User Equilibrium and System Optimal Solutions*

**Saeed Rahimi-Aghdam**
Civil and Environmental Engineering
*Long Term Deformation of Concrete Infrastructures*
Students: Transportation & Logistics Seniors

Benjamin Connelly
Industrial Engineering & Management Science

Daniel Diaz
Industrial Engineering & Management Science

Bryce Halloran
Economics

Benjamin Kullavanijaya
Economics

Ben Powell
Social Policy

Keaton Tatooles
Economics
Students: Awards / Honors

Michael Hyland
Dwight David Eisenhower Transportation Fellowship

Ying Chen, Zihan Hong, Michael Hyland, and Helen Karla Ramalho de Farias Pinto
Received Runner Up in Best Student Paper Competition for “A Hybrid Cluster-Regression Approach to Forecast Ridership at Bikeshare Stations: Case Study of Chicago’s Divvy System” at The 58th Annual Transportation Research Forum
Faculty: NUTC Welcomes Visiting Professors

Yoram Shiftan  
Technion, Civil and Environmental Engineering  
*Travel behavior, freight activity models, transport economics and project evaluation*

Nikolas Geroliminis  
École polytechnique fédérale de Lausanne, Urban Transport Systems Laboratory  
*Network modeling and management; location of emergency response vehicles; smart congested cities.*
Faculty: NUTC Welcomes Visiting Professors

Alejandro Molnar
Vanderbilt University, Economics

*Industrial Organization, International Trade*

KeHu Tan
Beijing Jiaotong University, School of Economics
*(visiting Strategy Dept. @Kellogg)*

*Transportation economics, regulatory theory and policy, industrial development*
Faculty: Awards / Honors

Zdenek Bazant
American Society of Mechanical Engineers (ASME) Medal
Highest Award presented by ASME, recognizing contributions to mechanics of materials, safety

Joseph Schofer
UCLA Institute of Transportation Studies
The 10th Annual Martin Wachs Distinguished Lecture in Transportation
*When Forecasting Fails: Making Infrastructure Decisions in an Uncertain World*
https://www.youtube.com/watch?v=Ts6IEG8QGCM
Important New Synergistic Initiatives @ NU

DATA SCIENCE INITIATIVE
(under aegis of NICO)
NUTC is one of several partner centers.

CENTER FOR OPTIMIZATION AND
STATISTICAL LEARNING
Research: Private Sector

Industry Research
- Hub Group
- Fleetmatics
- UI Labs/CityDigital

Industry Teaming
- Booz Allen Hamilton
- Leidos, Inc.
- Resource Systems Group, Inc.
- SETS, Inc. (MENA)
- Various small businesses
Research: Public Sector

Public Agencies / Federal Research

- Argonne National Laboratory (DOE)
- Chicago Department of Transportation
- Chicagoland Metropolitan Agency for Planning
- Federal Highway Administration
- METRA
Research: Journal of Transportation

Transportation System Analysis for Better Policy-Making

Guest Editors: Marco Nie and Amanda Stathopolous

Scope: Special Issue Call for Papers

• Sharing, automation and electrification – three trends driving research efforts in the field of transportation in recent years.

• Focus - next generation of analytical tools tailored to these emerging conditions

• Inform public policies pertinent to design, operations and management of the future transportation systems.
Research: Proposal to USDOT

Transforming Freight Flow Data Collection

NU Principal Investigators: Hani Mahmassani and Joe Schofer
Partner: Resource Systems Group (RSG) (lead)
Sponsor: USDOT Bureau of Transportation Statistics BTS
Scope: BTS seeks new methods to collect and estimate freight flow data. Needed to capture the many changes in the transportation sector with respect to logistics and supply chain, such as the growing number of the third-party logistics providers, distribution centers, and electronic shopping.
1. **Demand:** for both freight and person travel
2. **Supply:**
   1. Emergence of new shared autonomous mobility services and business models—fleet assignment and routing.
   2. Freight and logistics impacts
3. **Operational aspects:**
   1. Mixed traffic flow, truck operations, safety, reserved lanes, infrastructure capacity, flow stability, productivity
   2. Sensor performance and wireless telecom interactions
4. **Regional Network Operations and Planning:** integrating CAVs in planning tools and models—forecasting impacts on infrastructure performance.
Research: Autonomous and Connected Vehicle Systems

1. Two ongoing FHWA projects
   Twinned with European Community project with similar scope

2. New international collaboration on CAV impacts
   1. Led by Technical University of Munich (Global Fund Initiatives)
   2. In partnership with NUTC and UC-Santa Barbara.
Research: Machine Learning / Analytics

Principal Investigator: Ying Chen, NUTC Research Assistant Professor

Example Topics:

(1) Driver Scoring and Safety Applications – using vehicle/truck trajectory data

(2) Sentiment Analysis – mining crowdsourced data/social media to identify relationship between successful shipments and expressed sentiments

(3) Traffic video processing - tool to count vehicles, pedestrians, bikes in multi-directional traffic flow and identify abnormal behaviors/conditions

New course now established on Data Analytics and Machine Learning for Transportation and Infrastructure Systems. Essential contribution to graduate students’ methodological toolkit.
Research: Outreach Activities

• The 22nd International Symposium on Transportation and Traffic Theory
  • Co-Chairs: Hani Mahmassani, Marco Nie, Karen Smilowitz
  • ISTTT22 covered all scientific aspects of transportation and traffic, spanning all modes of transport—public and private—including freight, air, and maritime modes.
  • Preconference Workshop - Getting There From Here: Traffic Modeling, Data Streams, & Prediction For Connected / Automated Vehicle Systems Planning & Operations

• INFORMS Transportation Science & Logistics (TSL) Society First Triennial Conference
  • Karen Smilowitz. President, INFORMS TSL and Co-Organizer
  • Maciek Nowack and Michael Hewitt (NUTC faculty affiliates @Loyola) -- organizers
Selected Outreach Activities (I)

Spring 2017

Industry Technical Workshop
BRIDGING THE FUTURE
INNOVATION IN LARGE-SCALE INFRASTRUCTURE DEVELOPMENT
WEDNESDAY, MAY 3, 2017 [1:00 PM]
JAMES ALLEN CENTER | MCCORMICK AUDITORIUM | 2169 CAMPUS DRIVE

Fall 2017

Industry Technical Workshop
MAKING THE CUSTOMER HAPPY
INNOVATION & BEST PRACTICES
WEDNESDAY, OCT. 18TH @ 1:30PM
JAMES ALLEN CENTER | MCCORMICK AUDITORIUM | 2169 CAMPUS DRIVE, EVANSTON
Selected Outreach Activities (II)

2017 LEON N. MOSES DISTINGUISHED TRANSPORTATION LECTURE

Martin Eichenbaum
Charles Moskos Professor of Economics, Northwestern
Co-Director, Center For International Macroeconomics

"Outlook for the US Economy: Is this as good as it gets?"
Selected Outreach Activities (III)

Executive Education

Freight Transportation and Logistics

Managing in a World of Rapidly Advancing Technology
May 9 - 11, 2016

– Superb speaker list included: CSCMP, CN, Echo Global, Groupon, Ruan, SEKO Logistics, Schneider, and Nippon Cargo.

Freight Transportation and Logistics ➔ 2018, To be announced

E-Fulfillment Course ➔ 2018, To be announced
2018 William A. Patterson Lecture

Mr. Dennis A. Muilenburg
Chairman, President & CEO
The Boeing Company

May 2, 2018
Closing Thoughts

• *NUTC focused on the future*
  – Pushing the limits on logistics and supply chain operations
  – Automated and connected vehicle systems, trucks
  – Last mile supply chain logistics
  – Internet of Things and smart cities
  – Technology-enabled service delivery models

• *BAC engagement and support is part of our DNA, critical to what we do, and how well we do it*
And one more thing… Diana Marek

- Celebrated 40 years at Northwestern this past year
- Retiring…. yes retiring… in January 2018, her 41st year at Northwestern
- Began her career at NUTC on February 14, 1977

- Friend to Students
- Friend to Alumni
- Friend to Faculty and Staff
- Friend to BAC members
- The core and spirit of NUTC
Thank you!
BAC: New Members, Ongoing Companies

Leadership

Frank Bush
Consulting Practice Director, Think Big Analytics, a Teradata Company

Rick Elieson
President, Cargo, American Airlines
BAC: New Members, Ongoing Companies

**Sustaining**

Chris Kettering  
*Chief Engineer, Aeromechanics Technology, The Boeing Company*

Monali Shah  
*Director, Global Intelligent Transportation, HERE*
BAC: New Members, New Companies

Sustaining
Ken Sain
CEO & VP, Digital Aviation & Analytics, Jeppesen, A Boeing Company

Mike Wychocki
Chairman & Chief Marketing Officer, EAGLERAIL Container Logistics
BAC Member Guests Here Today

- **Noam Alon**, Managing Director, Innovation and Engagement, United Airlines, Inc.
- **Susmitha Bellam**, Director, Product Management, HERE, Inc.
- **Kelley Regan Bradley**, Client Service Manager, TranzAct Technologies, Inc.
- **Brian Donnelly**, Industrial Account Manager, Rail, Uptake
- **Mason Eustis**, Fleet Optimization & Customer Service Manager, Canal Barge**
- **William Glenn**, Chief Commercial Officer, Wells Fargo Rail

**also a speaker today**
Christine Izuakor, Manager, Global Security, Strategy & Awareness, United Airlines, Inc.

Douglas Reese, Chief Strategy and Growth Officer, GE Transportation Digital Solutions

Michael, Scimeca, Chief Technology Officer, EagleRail Container Logistics

Steve Zink, EVP and Chief Operating Officer, AM General

**also a speaker today**
Guests & Speakers Here Today

- **Jason Bergman**, Senior Vice President, Enterprise Sales, Dicom Transportation Group
- **Mike Dektas**, Marketing Manager, Workhorse
- **Eric Ervin**, Vice President, Engineering & Technology, J. B. Hunt Transport, Inc.
- **James Gagne**, President, SEKO Logistics
- **Joe Hutter**, Senior Vice President, Business Development, Daifuku/Wynright
Membership Committee

- Vicki Bretthauer
- Lee Clair
- Norm Carlson
- Rob Hart
- Kathleen Ross
- Justin Zubrod

Meeting held in July 2017
- Establish metrics on membership and track (# by mode, M/F, etc.)
- ~50 companies as candidates

Target Areas:

Next meeting: January 2018
Meeting Planning Committee

- Price Blackford
- Mike Burton
- Peeter Kivestu
- Jean Regan

- Meeting held in July 2017 helped identify meeting topics
- Next meeting: November 2017

- Seeking new Committee Members
60th Fundraising Committee

- Paul Schneider, Chair
- Regg Jones
- Ben Mclean

- Report from Paul Schneider at the end of our meeting this morning