

Semi Annual Progress Report for
**Center for Freight Transportation for Efficient &
Resilient Supply Chains**



US DOT Tier 1 University Transportation Center

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FERSC List of Projects

Project	PI	Secondary PIs
#1: U.S. Freight network resiliency analysis	Yunlong Zhang	B. Wang, L. Han, B. Zou
#2: Intermodal solutions for freight flows in Southwest U.S., Phase I	Mingzhou Jin	S. Chandra
#3: Generating reliable freight disruption measures with freight telematics data	Sal Hernandez	L. Han, F. Alkaabneh
#4: Impact of Multimodal Freight Network on Private Sector Global Distribution	H. Vergara	S. Hernandez
#5: Comprehensive Shippers' Behavior/Choice Model Study	Lee Han	B. Wang, Y. Zhang, K. Mohammadian
#6: Understanding and Modeling Middle-Mile Logistics Automation	Bo Zou	K. Kawamura, P. Sriraj, J. Lin, M. Jin
#7: Impact of automated port operations on landside freight corridor performance: Opportunities, barriers, and future directions with Port of Long Beach, Phase I	Shailesh Chandra	K. Heaslip
#8: Innovative scheduling algorithms to improve port operations	Luca Quadrofiglio	B. Wang



FERSC Semi Annual Progress Report #1

1. Accomplishments

What are the major goals and objectives of the program?

FERSC has three research thrusts: Freight System of Systems (RT1), Stakeholder Behavior Research (RT2), and Freight Innovations for Supply Chain (RT3). RT1 addresses freight as a system and treats freight as part of the larger supply chain system by developing system-level methodologies for optimal performance in the short, medium, and long runs. RT2 recognizes that shipper behavior is critical to freight movement, and it studies behavioral interactions between freight and the supply chain through shipper behavior, considering the best interests of shippers, carriers, and other stakeholders and how the behavioral interactions can be guided and shaped from the system perspective. RT3 aims to exploit the maximum potential technological innovations can achieve in helping freight and supply chains, particularly for under-represented populations and under-served regions.

Our goal is to produce results that will be transformative and long lasting. First, the proposed research aligns freight research with supply chain efficiency and resiliency to better support the economy and serve stakeholders. Secondly, the proposed research treats the system as inherently multimodal, seeking new and better methodologies to design, operate, and assess the multimodal transportation system. Third, recognizing that transformative changes in transportation history almost always started with new, innovative technologies, FERSC proposes to examine, promote, and operate new technologies such as drones in freight for improved mobility and better societal benefits.

Our education and workforce development plan builds on accumulated educational resources within the consortium. It covers an array of elements ranging from early career outreach—mainly through K-12 outreach, professional development, and education programs—to regular workshops and seminars.

The driving goal of FERSC's technology transfer and commercialization (T2C) program is to encourage and facilitate the implementation of results from FERSC-funded research. FERSC universities have moved research results into practice through partnerships with state DOTs, local governments, private enterprise, and non-profits.

What were your greatest accomplishments during this period?

University of Tennessee, Knoxville, Mingzhou Jin PI

- Subcontracts have been issued to all consortium members.
- Eight research projects have been selected and launched. All projects have multi-institution collaboration.
- Data management plan has been developed and improved.
- The international network data have been collected. The initial optimization model has been established.
- FERCS has its operational structure established.
- Visit Tennessee DOT for possible collaboration to study automotive supply chain network design in the State of Tennessee.
- Project 5, Lee Han PI
 - Project Management: Completed a review on the various details of the project #5 including



funding/matching issues, priorities, data management plans, etc. at the participating research institutions.

- Technical Progress: Each school has received green light to move forward with their research components. UT has begun using 2012/2017 CFS records for ML-based shipper decision analysis. New tools that analyze statistical causal relationships will be employed to discern decision logics from ML-based results.
- Technical Progress: TAMU and UIC are moving forward with their parts also.

Texas A&M, Bruce Wang PI

- Getting sub award Contracts completed with FERSC; coordinated proposal review and selected projects to fund for year one; took TAMUite student chapter to the international competition of Traffic Bowl in Portland OR in July, -- the TAMUite student chapter broke out of the Texas region as the champion for the final competition of Traffic Bowl internationally.
- Working with the team members on the scope of the research projects; getting to know the team members.

Oregon State, Salvador Hernandez PI

- Project 3
 - Project Kick off
 - Workplan Completion
 - Began Task 1 Lit Review

California State, Long Beach, Shailesh Chandra PI

- Project 7
 - A paper written by an undergraduate student funded by the FERSC UTC has been selected for presentation in the upcoming TRB Annual meeting to be held in January in DC.
 - An undergraduate student supported by the FERSC UTC has been selected as a Fellow to the Transportation Research Board Minority Student Fellows Program. The student will present his research during this meeting.

University of Illinois, Chicago, Bo Zou PI

- Started the project led by UIC.
- Set up regular meeting schedules among UIC team members.
- Made significant progress in getting matching fund from IDOT.
- Project 6
 - Started doing literature review on middle-mile logistics automation.
 - Started developing an optimization model for drayage operations.
 - Started drafting the survey questions.

Did you communicate or disseminate these accomplishments in any manner?

University of Tennessee, Knoxville, Mingzhou Jin PI

- The initial model was presented at 2023 INFORMS Annual Conference in Phoenix.
- Hired an undergraduate student researcher, Nick Eng.
- Project 5, Lee Han PI
 - Planning for future outreach activities discussed at monthly meeting.



Texas A&M, Bruce Wang PI

- The TAMUite chapter winning the Texas Region was reported through the department graduate news, an internal newsletter.

Oregon State, Salvador Hernandez PI

- Project 3
 - Story on the UTC: <https://engineering.oregonstate.edu/all-stories/looking-down-road-better-transportation-infrastructure>

What are your plans for the coming six months?

University of Tennessee, Knoxville, Mingzhou Jin PI

- We will finish the model, program it, and have initial computational results to show the economic and environmental values of having railroads connect the Long Beach port and logistics centers in Nevada and Arizona.
- Develop detailed educational, engagement, and technical transfer plans with coordinators.
- Start the development of the second-year research program.
- Project 5, Lee Han PI
 - Regular team meetings
 - Presentation of progress to team members
 - Develop manuscripts for journal publication
 - Presenting early results at TRB

Texas A&M, Bruce Wang PI

- set the projects on going
- starting to plan for the first annual meeting of the FERSC consortium members and advisory board at Texas A&M University
- do homework about the summer academy of schoolteachers
- Complete review on literature, data needs and availability, and identify core methodologies
- Attend TRB and make presentations.

Oregon State, Salvador Hernandez PI

- Project 3
 - Complete Lit Review Task and Begin the Data collection phase for the project

California State, Long Beach, Shailesh Chandra PI

- Conduct at least one seminar or a lecture talk for students in freight transportation resilience.
- Project 7
 - We have already started interviewing engineers at the Port of Long Beach assessing how automation impacts traffic outside the port. We will document and model these findings and work on a journal paper for presentation and publication.

University of Illinois, Chicago, Bo Zou PI

- Continue making progress on the project led by UIC.
- More actively participate in projects led by other consortium members that UIC is part of.
- Project 6
 - Complete developing a first version of the optimization model for drayage operation.
 - Start conducting interviews among stakeholders.



2. Participants & Collaborating Organizations

What organizations have been involved as partners?

Organization Name	Location	Contribution to project	Contact (first & last names)	University
Port of Long Beach	Long Beach CA	data	Rajeev Seetharam	CSULB-Proj 7
UTK	USA	collaborative research	Lee Han	TAMU
UIC	Chicago	collaborative research	Bo Zou	TAMU
TDOT	Nashville	financial support	Dan Pallme	UTK
OnTrack North America	USA	collaborative research	Michael Sussman	UTK
ORNL	USA	data	Hyeonsup Lim	UTK-Proj 5
TDOT	USA	data	David Lee	UTK-Proj 5

List any significant collaborations within the lead or partner universities, especially interdepartmental or interdisciplinary collaborations or contact with others outside the UTC, collaborations with other countries and contacts outside the United States, or with an international organization.

Texas A&M, Bruce Wang PI

- Collaborated with KTK and UIC to finalize research scope and tasks for each institution.

California State, Long Beach, Shailesh Chandra PI

- Project 7
 - Current project work and research undertaken in collaboration with the Port of Long Beach.

3. Outputs

Major Publications:

California State, Long Beach, Shailesh Chandra PI

- Accepted Conference paper: Valencia, R. and Chandra, S., "Invited Student Paper: Analyzing Emissions with Heavy Duty Vehicle Platooning with Route Deviations – A Study With I-710 Freeway", (TRBAM-24-00312), January 2024.

Internet sites:

University of Tennessee, Knoxville, Mingzhou Jin PI

- Set up <https://fersc.utk.edu>. This is the main site for all FERSC activities, reports, etc.

Texas A&M, Bruce Wang PI

- <https://www.instagram.com/tamu.ite/>. Some pictures were posted of the TAMUite student chapter activities from guest speaker for a seminar to adopt a highway activity.

Technologies or techniques:

- Nothing to report.



Inventions, patent applications, or licenses:

- Nothing to report.

Supporting files:

- None

4. Outcomes

- Nothing to report.

5. Impacts

Texas A&M, Bruce Wang PI

- It has provided graduate and undergraduate courses to have educated the next generation young professionals. participated in the ITE international conference in Portland OR. The TAMUite student chapter won the Texas region first place as the best student chapter.

Oregon State, Salvador Hernandez PI

- The classroom syllabus was updated to reflect the research findings related to freight and supply chain performance measures identified through this project. There are currently 50 students that have been introduced to this new chapter lesson on this.

California State, Long Beach, Shailesh Chandra PI

- The new chapters that include findings from the UTC's current research has been introduced to the students in the transportation engineering-related classes. Around 50 students have learnt how container operations function through the Port of Long Beach.

6. Changes/Problems

- No changes or problems to report.

7. Special Reporting Requirements

- None.