Transportation Research in the CSU

Moderated by:
Dr. Frank A. Gomez
Executive Director, STEM-NET
Office of the Chancellor

STEM-NET

https://www2.calstate.edu/impact-of-the-csu/research/stem-net

Speakers

Karen Philbrick, Mineta Transportation Institute
Improving Mobility for People and Goods: An Introduction to the California State University Transportation Consortium

Aly Tawfik,, Fresno State
The Transportation [R]Evolution: Opportunities and Needs for Collaboration

Mehran Mazari, Cal State LA
Sustainable and Resilient Transportation Infrastructure

Daniel Whisler,, Cal State Long Beach
Composites for Improved CA Road Surfaces

Serena Alexander, San Jose State
Local Climate Action Planning as a Tool to Harness the Greenhouse Gas Emissions Mitigation and Equity Potential of Autonomous Vehicles and On-Demand Mobility

Hovannes Kulhandjian, Fresno State
Intelligent Transportation Systems using Visible Light Communications and Machine Learning

Shadi Saadeh, Cal State Long Beach
Transportation Materials Research at CSULB, Fundamental, Practical and Workforce Development

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Improving Mobility for People and Goods: An Introduction to the California State University Transportation Consortium

Karen E. Philbrick, PhD - Mineta Transportation Institute, SJSU

Karen E. Philbrick, PhD Executive Director

San Jose State University, Mineta Transportation Institute

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Project Overview

- The Mineta Transportation Institute (MTI) at San Josè State University is a federally funded, *competitively selected,* university transportation center in the heart of Silicon Valley.

  MTI leads the California State University Transportation Consortium (CSUTC) which unifies the surface transportation research and workforce development efforts of the 23-campus California State University system. MTI focuses the efforts of our outstanding institutions and faculty that represent and support the geographical, cultural, racial, and socioeconomic diversity that makes California and our nation strong. *Funded by the California State University Office of the Chancellor via **Senate Bill 1**, the Road Repair and Accountability Act of 2017.*
- Named partners: CSU Chico, Fresno, and Long Beach
- Annual competitive CSU-wide RFP

Activities

- CSUTC conducts surface transportation research, education, workforce development, and technology transfer activities.

- **Research**: MTI/SJSU directs a competitive CSU-wide RFP process to identify specific research projects aligned with SB 1 priorities. Annually, approximately $800,000 is distributed through this competitive process. To date, 13 of the 23 campuses have been engaged in the CSUTC research portfolio.

- **Education**: It is critical that we develop a new cohort of transportation professionals who are ready to lead a more diverse, inclusive, and equitable transportation industry. Our campuses provide a robust and multidisciplinary program of undergraduate and graduate degrees.

Activities Continued

- **Workforce Development**: CSUTC leads the delivery of a suite of programs for elementary, middle, and high-school students to stimulate interest in careers in transportation. With an emphasis on engaging historically underrepresented youth, CSUTC works with Title 1 schools—with high percentages of children from low-income families—to deliver these innovative programs.

- **Technology Transfer**: Research without implementation is not useful. As such, CSUTC has a robust dissemination method that includes professional presentations, peer-reviewed articles, congressional briefings, webinars, and other outreach efforts.

Karen E. Philbrick *San Jose State University, Mineta Transportation Institute* *Karen.Philbrick@sjsu.edu*

Results

- CSUTC has funded 99 research projects that have engaged:
  - Approximately 200 CSU faculty, researchers and staff (67 PIs and 131 other CSU faculty/research staff)
  - More than 250 students
  - 13 of 23 campuses
  - Since conception, CSUTC researchers (including students) have presented CSUTC-funded research at **81 conferences or briefing events**.
  - In addition to CSUTC's broad research portfolio, we negotiated a CSU-UC partnership with the City & County Pavement Improvement Center (CCPIC), which has trained more than 670 pavement professionals.

Lessons Learned

- A primary goal of CSUTC is to ensure that research is meaningful and provides tangible benefits to Californians. To that end, collecting high-priority research needs statements from key stakeholders ensures that our research is responding to a critical need and that the results will be used by those responsible for managing change.
  Lesson: Each proposal requires a letter of support from an external stakeholder confirming the value of the research.

- A clear understanding of the research need is imperative for scoping the project correctly.
  Lesson: CSUTC now holds FAQ sessions with the external stakeholder submitting the need and faculty interested in responding. This improves efficiency and leads to stronger proposals.

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Next Steps/Long-Term Plans

- California faces significant challenges to improve mobility of people and goods and ensure the State's transportation system is safe, efficient, accessible and convenient for all. To tackle the pressing, high-priority research needs of our stakeholders CSUTC plans to increase CSU representation. To date, 57% of CSU campuses have received competitively awarded research grants: Bakersfield, Chico, Dominguez Hills, East Bay, Fresno, Long Beach, Los Angeles, Pomona, San Diego, San Jose, San Luis Obispo, Sonoma, and Stanislaus.
- For faculty, engaging in research allows them to contribute to the discovery of new knowledge or transform existing understanding. They can bring this practical knowledge into their teaching, increase the CSU system's institutional reputation, secure additional external funding, and provide opportunities for students.
- CSUTC plans to continue leveraging the initial investment for expanded opportunities.

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Summary

It is not an overstatement to say that transportation of people and goods is the linchpin of our economy. Where human beings are concerned, the difference between having and lacking mobility is no less than the difference between having and lacking opportunity. To that end, CSUTC uses a multidisciplinary approach that addresses the complex nature of today's mobility challenges to advance the body of usable transportation knowledge.

We invite each and every CSU faculty member to reach out to the MTI team for more details about becoming involved!

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The Transportation [R]Evolution: Opportunities and Needs for Collaboration

Aly Tawfik– Fresno State

Aly Tawfik, Associate Professor

Fresno State, Department of Civil and Geomatics Engineering

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Sustainable and Resilient Transportation Infrastructure

Mehran Mazari – Cal State LA

Mehran Mazari, Assistant Professor

Cal State LA, Department of Civil Engineering

mmazari2@calstatela.edu

Sustainable Development

Source: UN

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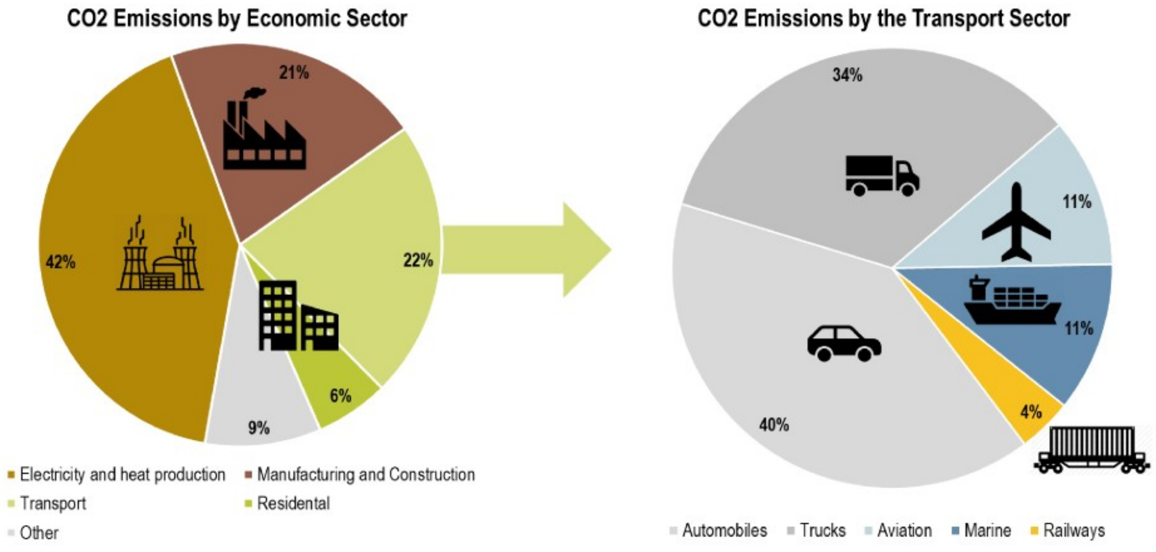
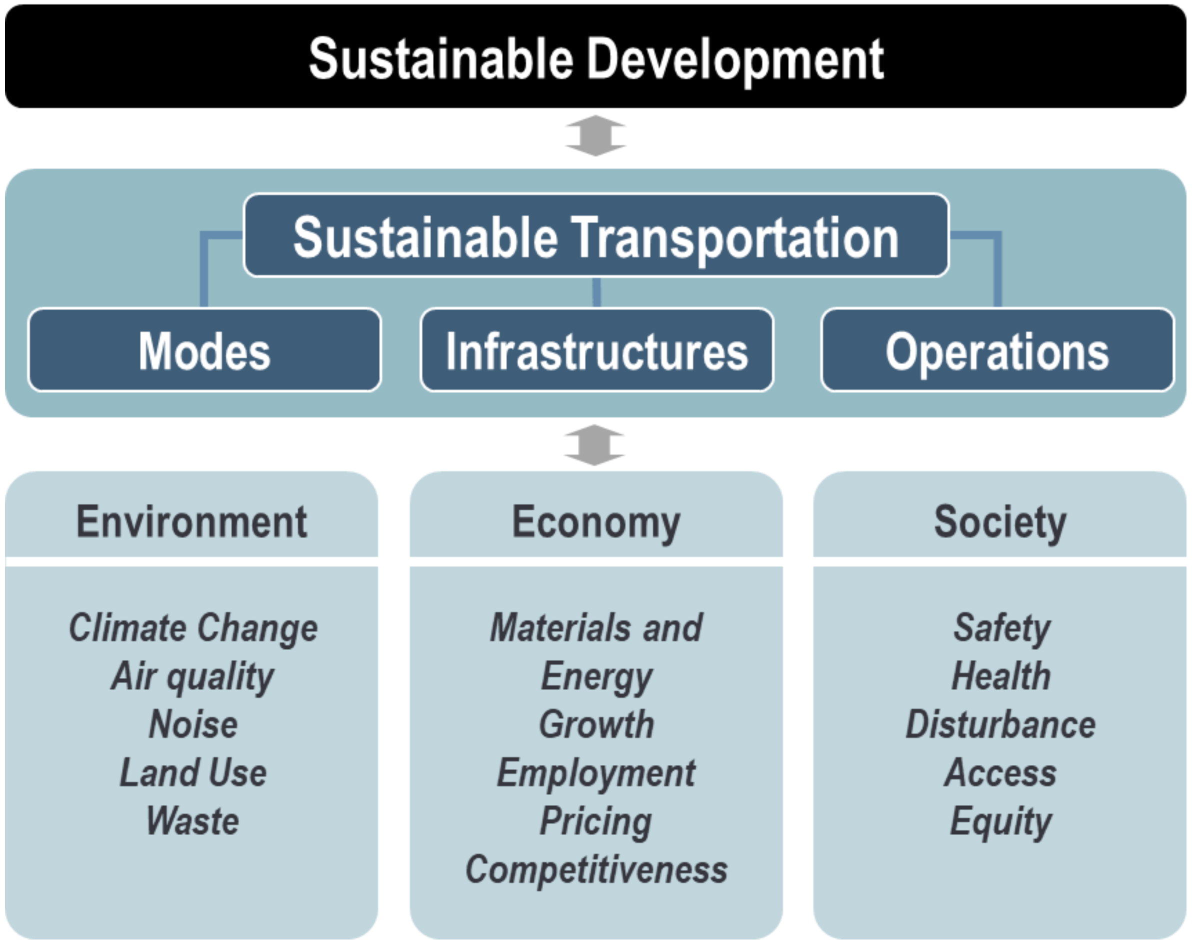
Sustainable Transportation



Source: J P Rodrigue



Source: UK Department of the Environment, Transport and the Regions, 1999

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Resilient Infrastructure

Components of resilient infrastructure:

- **Flexibility**
- **Responsiveness**
- **Redundancy**
- **Coordination**
- **Robustness**

Source:Siemens

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Multidisciplinary Transportation Research at Cal State LA

Structures and Earthquake Resiliency
Tonatiuh Rodriguez-Nikl


Hydrology and Water Resources
Sonya Lopez


Transportation Infrastructure and Materials
Mehran Mazari


Transportation, City Planning
Hassan Hashemian


Data Science and Artificial Intelligence
Mohammad Pourhomayoun


Construction Management
Michael Ibrahim


Advanced Materials and Manufacturing
Mohsen Eshraghi


Electric Vehicles
Masood Shahverdi


Hydrogen Vehicles and Fleet
David Blekhman

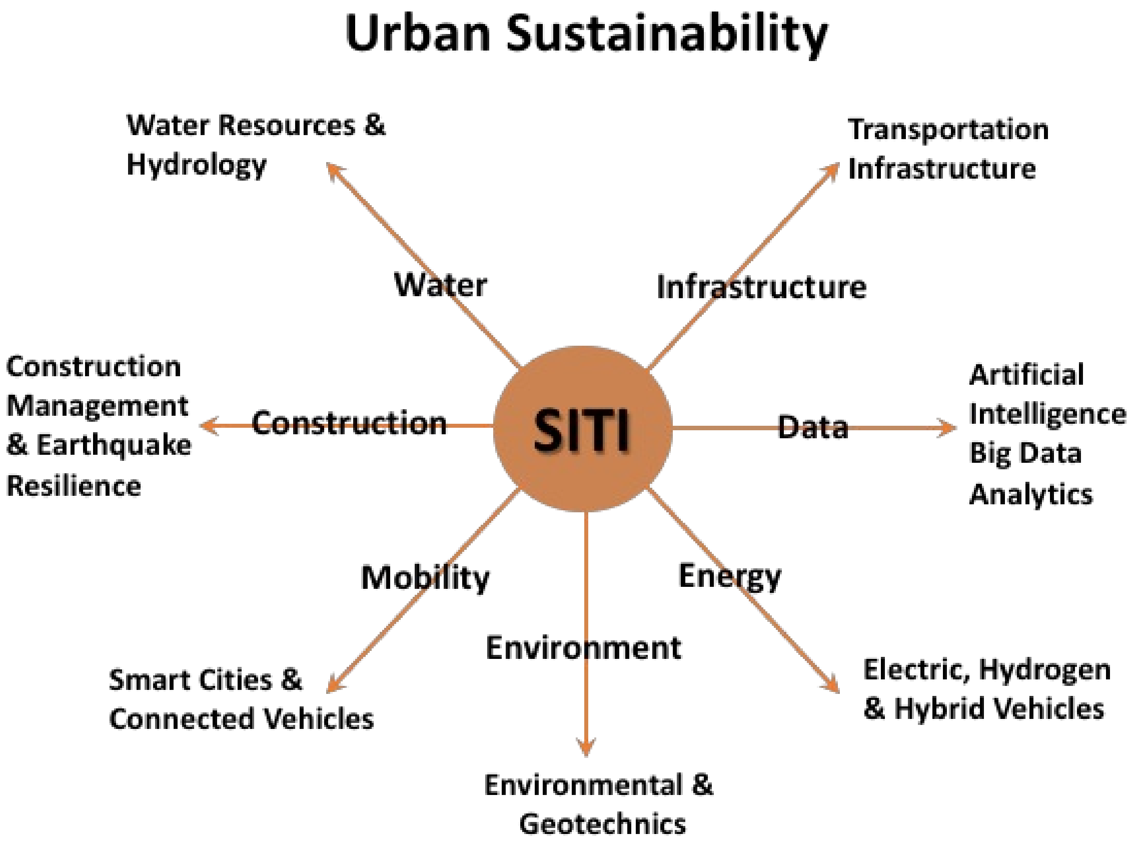

High performance Computing, ADAS, UAV
Charles Liu


Centers and Labs

Sikand Center for Sustainable and Intelligent Infrastructure (SITI Center)

- The mission of the Sikand SITI-Center is to support the advancement of multidisciplinary research, education, and professional development focusing on **Urban Sustainability** and its components.
- Annual **Urban Sustainability Symposium** at Cal State LA
- For more information: www.calstatela.edu/sikand

SIKAND SITI CENTER
SUSTAINABLE AND INTELLIGENT INFRASTRUCTURE



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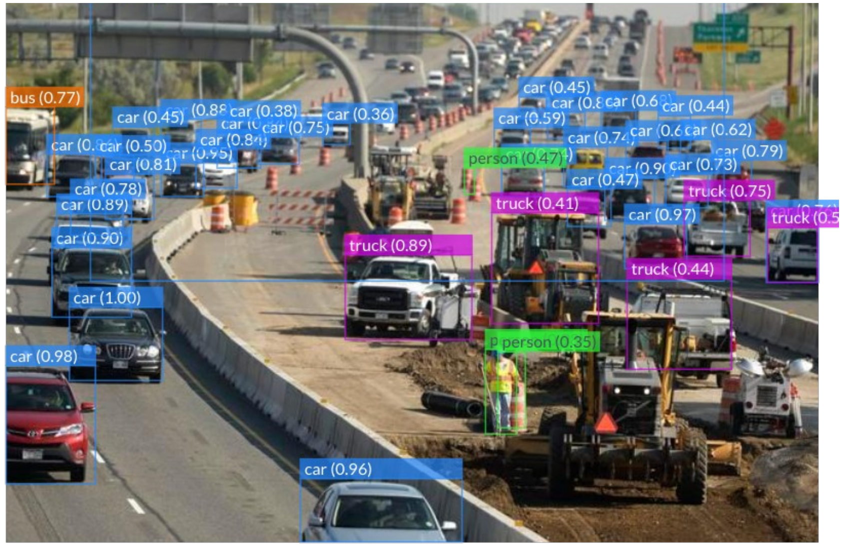
Centers and Labs

Sustainable Infrastructure Materials Lab (SIM-Lab)

- Additive manufacturing (3D printing) of concrete materials
  - Mechanical Engineering
  - Civil Engineering
- Pavement and Concrete Materials
- Applied AI and Computer Vision
- Highway Construction
  - Intelligent construction
  - Application of AI/ML in highway construction



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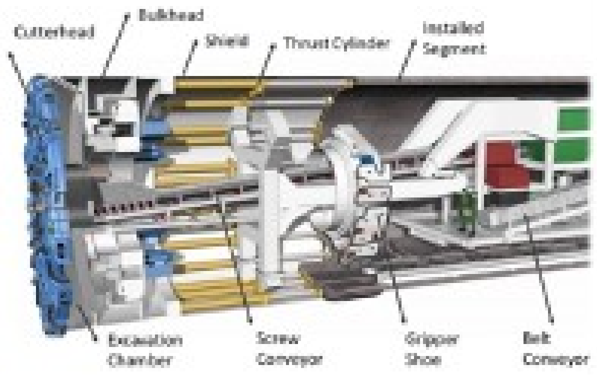
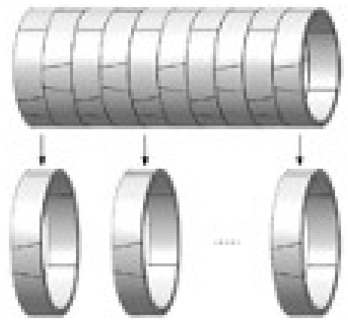
Sustainable and Resilient Transportation Infrastructure

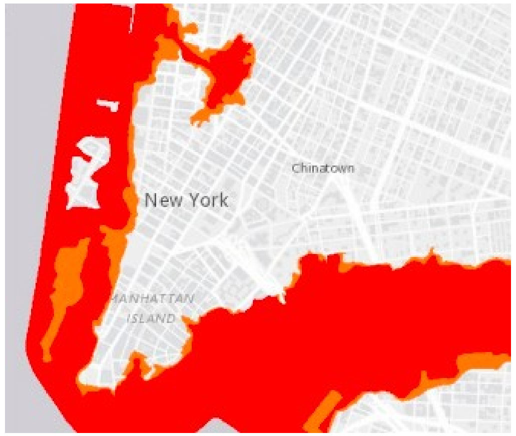
Centers and Labs

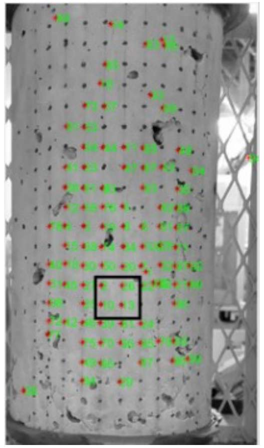
University Transportation Center for Underground Transportation Infrastructure (UTC-UTI)

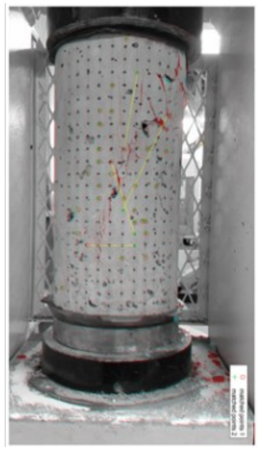
- Tier1 UTC with Colorado School of Mines and Lehigh University
- Projects:
  - Use of sustainable and recycled materials in self-consolidating concrete (SCC) for underground infrastructure (with Tonatiuh Rodriguez-Nikl)
  - Artificial intelligence and machine learning for prediction of tunnel boring machine (TBM) data (with Mohammad Pourhomayoun)
  - Resilience and sustainability of underground transportation infrastructure (with Tonatiuh Rodriguez-Nikl)











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Centers and Labs

Connected and Automated Vehicles Lab (CAV-Lab)

- Multidisciplinary
  - Information systems (Arun Aryal)
  - Computer science (Pourhomayoun)
  - Technology (Blekhman)
  - Civil engineering (Mazari)
  - Electrical engineering (Liu)
- Focus areas
  - Autonomous shuttles
  - Roadway electrification for EVs

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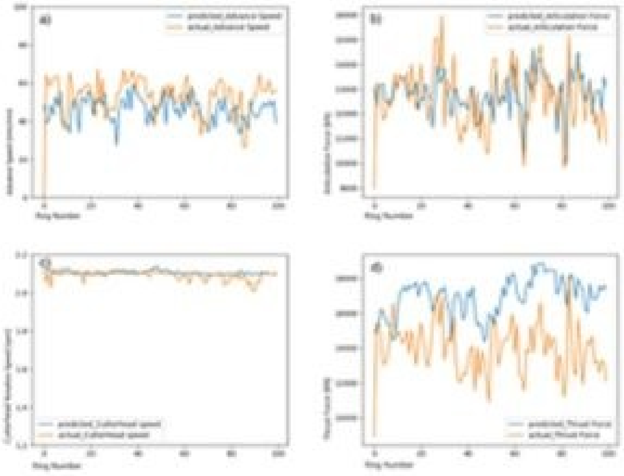
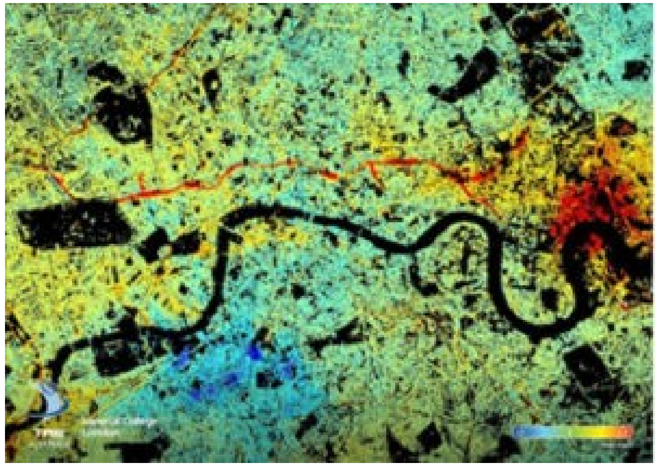
Centers and Labs





NSF-REU Site for Underground Infrastructure (2020-2023)

- Summer research experience for undergraduates (REU)
- Supporting 12 undergraduate students from across the US
- Multidisciplinary research areas
  - Geosciences and Remote Sensing (Jingjing Li)
  - Civil Engineering (Mazari, Rodriguez-Nikl)
  - Computer Science (Pourhomayoun)

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Collaboration Opportunities

- Multi-Campus Transportation Infrastructure Research Collaborations
  - NSF, USDOT, DOE, etc.
- Multidisciplinary research collaboration opportunities:
  - Nondestructive Testing/Evaluation (NDT/NDE) and Geophysical solutions
  - Infrastructure Resilience and Sustainability
  - Data Visualization and Big Data Analytics
  - Innovative and Sustainable Infrastructure Materials
- Collaborative workshops, training and certificate programs

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Let's connect:

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Composites For Improved CA Road Surfaces

Daniel Whisler – Long Beach

Collaborators (if any): Rafael Gomez Consarnau
Ryan Coy

Daniel Whisler, Assistant Professor

Long Beach, Department of Mechanical & Aerospace Engineering

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Project Overview

Composites for improved CA road surfaces

- Examine waste composites from aerospace, wind, other industry for use within CA for road surfaces
  - Random orientation, relatively low strength for reuse in aerospace
  - Cost per ton to dispose on part with cost per ton of procuring new asphalt
  - Modulus and strength in tension much higher than asphalt, would improve lifespan
- Provide experimental and numerical validation of performance compared to traditional asphalt in small-scale material development tests

Daniel Whisler *Long Beach/MAE* *daniel.whisler@csulb.edu*

https://www.owi-lab.be/news/discarding-composite-structures-requires-holistic-approach
https://www.innovationintextiles.com/composites/uk-to-lead-development-of-next-generation-sustainable-composites/
https://baxcompany.com/insights/beyond-bax-wind-energy-addressing-the-challenges-of-tomorrow-today/
https://alpineadvancedmaterials.com/solutions/aerospace/

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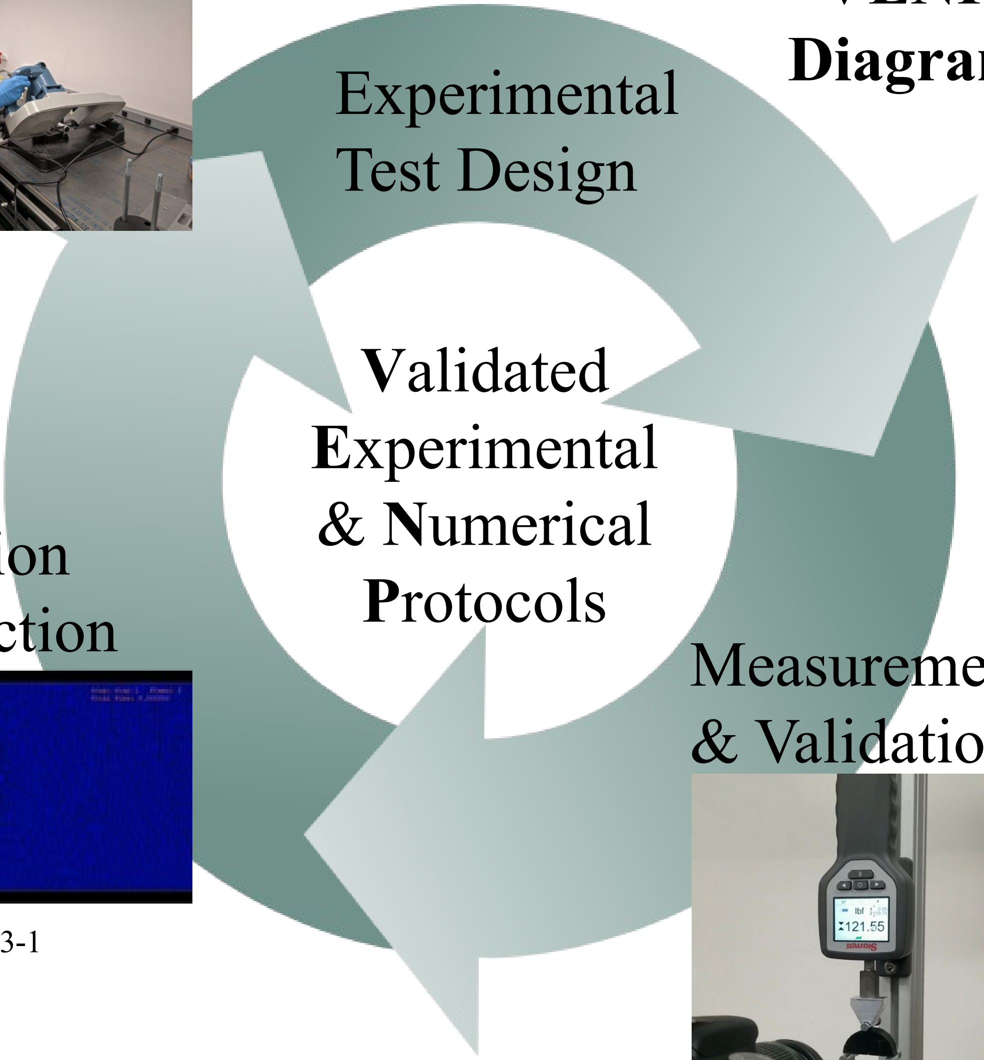
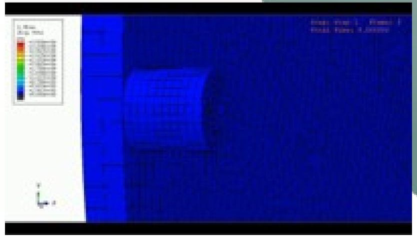
Activities

- **Experimental test design** - 7 different materials following ASTM standards for examining the micro-macro behavior for finite element validation studies
  - Design tests with expected validation targets
- **Measurement and validation** - Development of new instrument for characterizing wear on materials in accelerated environment
  - If no test method exists to validate expected result, build it!
- Numerical **simulation and prediction** with advanced crushable models based on published data but fine-tuned with the experimental data

Composites for Improved CA Road Surfaces

VENP Diagram





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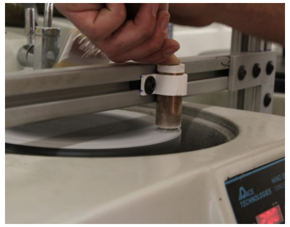
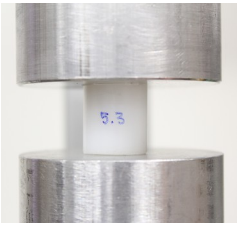
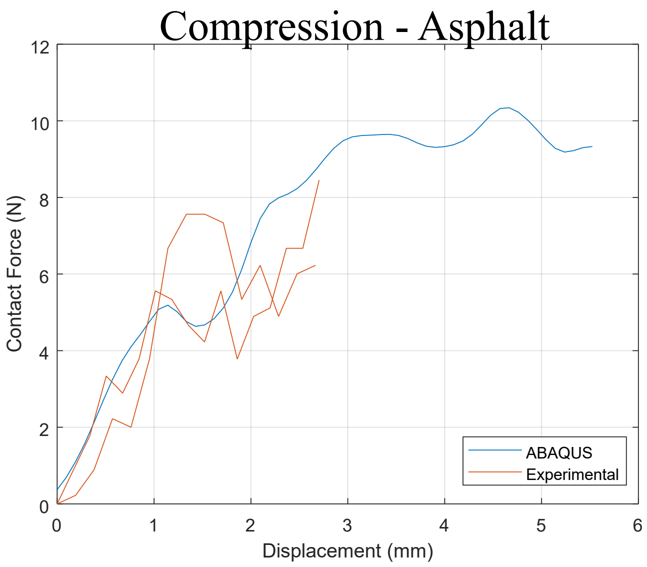
Composites for Improved CA Road Surfaces

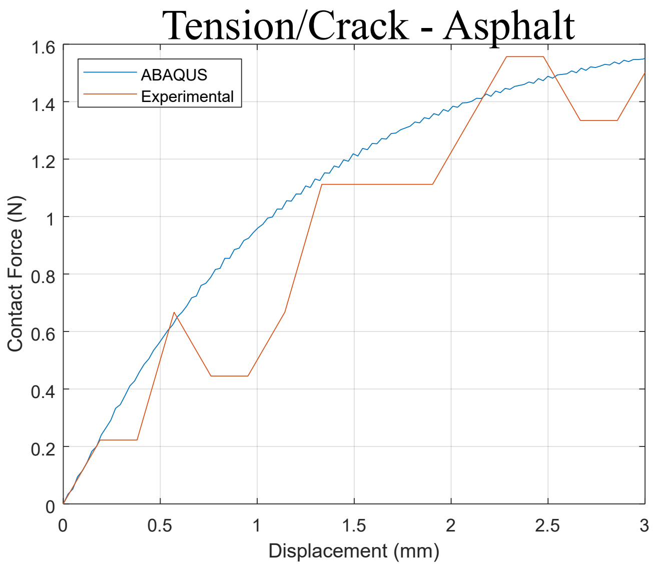
Results





- ASTM standards where available matched the experimental results
- Non-standard tests permitted additional information to be validated with numerical simulations
  - Used semi-empirical data to correct the theoretical values, e.g., modulus of composite in compression had 2.4% air voids
- Show for loads under consideration, both recycled, pristine composites are highly durable surfaces

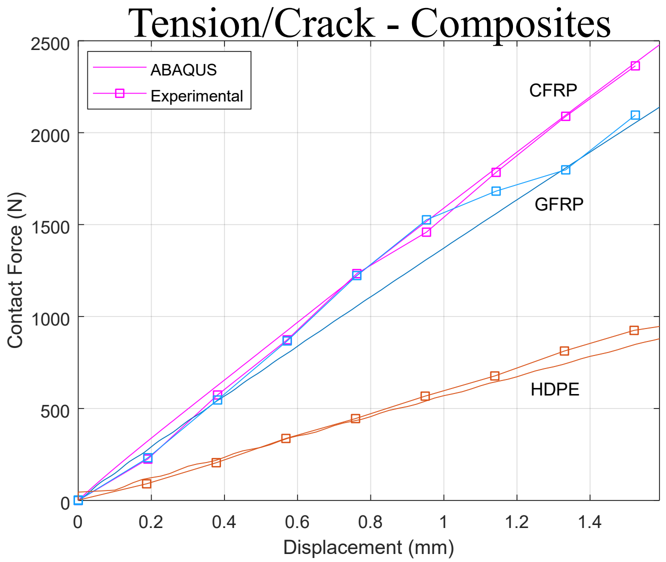




Wear

Material	Asphalt	GFRP	CFRP
Wear (mm)	2.25	0.88	1.10

Material	HDPE	RS-G	RS-C
Wear (mm)	0.26	1.31	1.36



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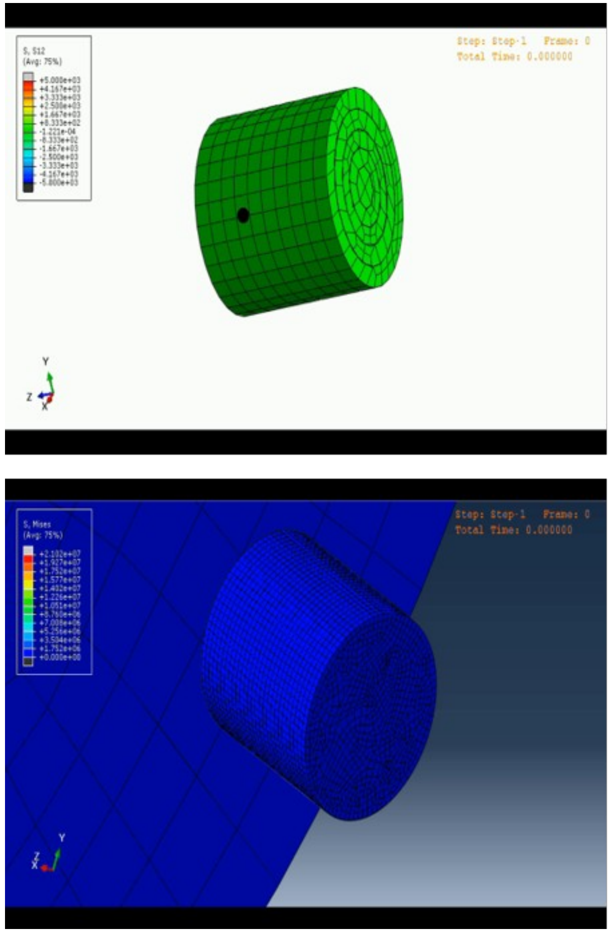
Composites for Improved CA Road Surfaces

Lessons Learned

- Asphalt can be modeled in simulation via multiple hyperelastic materials, e.g. one for tension and one for compression, to provide good validation results with experimental tests
  - We can perform simulations with high correlation faster than mechanical testing and with limited number of validation tests (less than 3-4)
- Little difference in recycled versus pristine composites for the stresses required in roadways
  - Composites may be virtually maintenance free for life
- Additional testing at next level (2’ x 2’) is required



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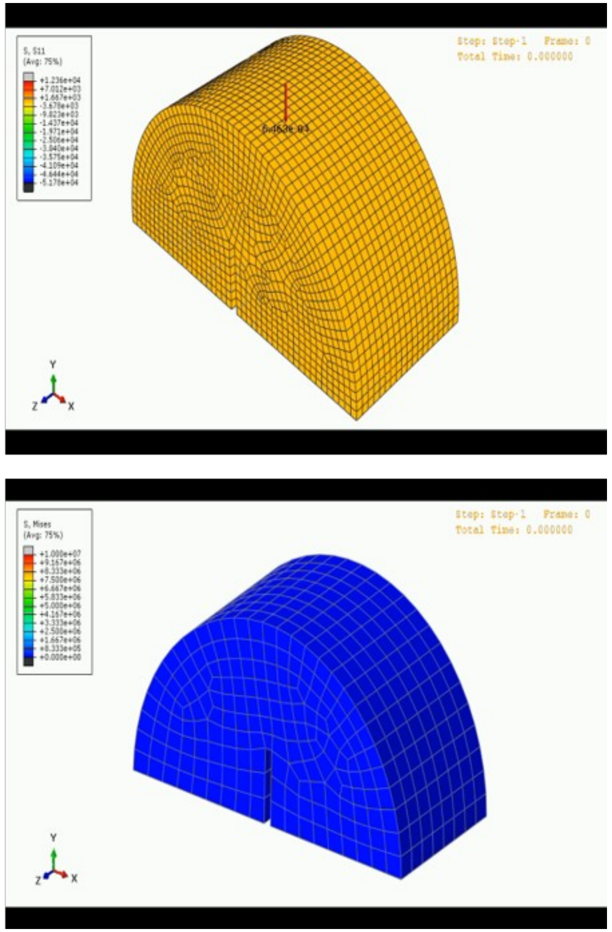

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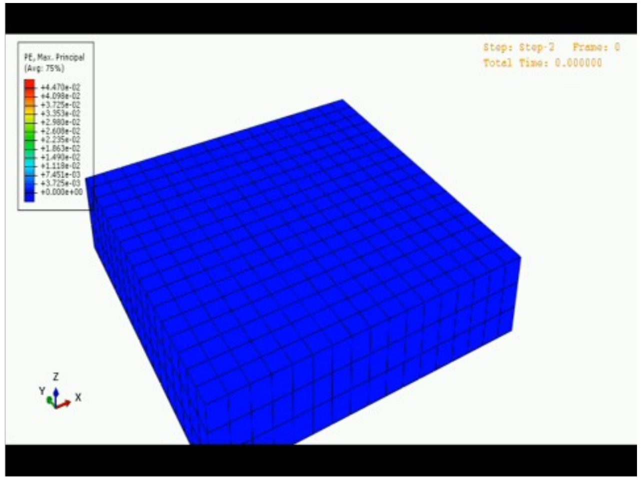
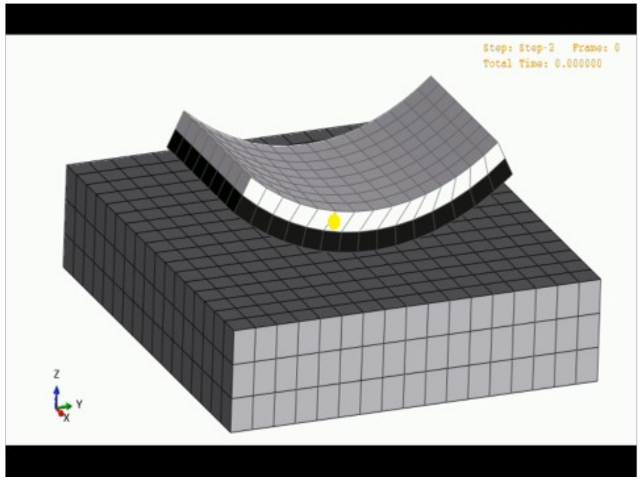
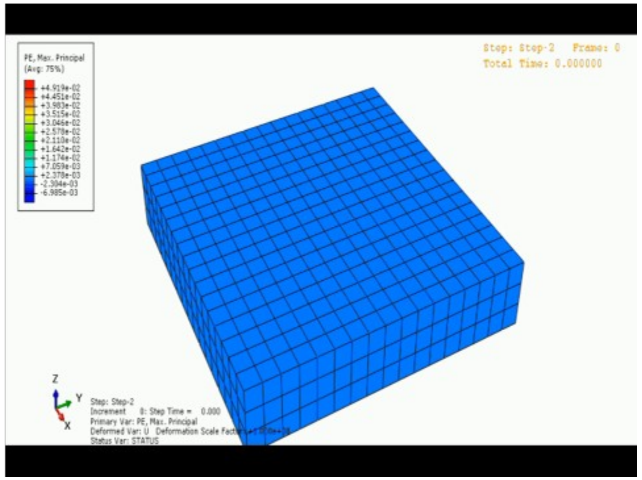
Composites for Improved CA Road Surfaces

Next Steps/Long-Term Plans

- Build, test, validate larger models with vehicle loads
  - Install test bed on-campus lot undergoing routine maintenance to study long term effects
- Examine and propose changes to ASTM/AASHTO for using calibrated simulated models to check material performance
  - E.g. wear test
- Work with aerospace manufacturers to implement recycling program with CA







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Composites for Improved CA Road Surfaces

Summary

- Possible to use crushable material model for asphalt to predict performance in accelerated simulated validation tests
- Experimental and validated numerical testing shows benefits of high tensile strength random fiber composites to survive various load conditions
- Additional testing is underway to build a realistic specimen that combines both fibers and asphalt

Research Focus

Dynamic, high strain rate impact testing and methodologies for examining novel composite, sandwich, porous, hyper/visco-elastic materials via experimental and numerical techniques

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Local Climate Action Planning as a Tool to Harness the Greenhouse Gas Emissions Mitigation and Equity Potential of Autonomous Vehicles and On-demand Mobility

Serena E. Alexander– San José State University

Collaborators (if any): Asha Weinstein Agrawal & Benjamin Y. Clark

Serena E. Alexander, Assistant Professor

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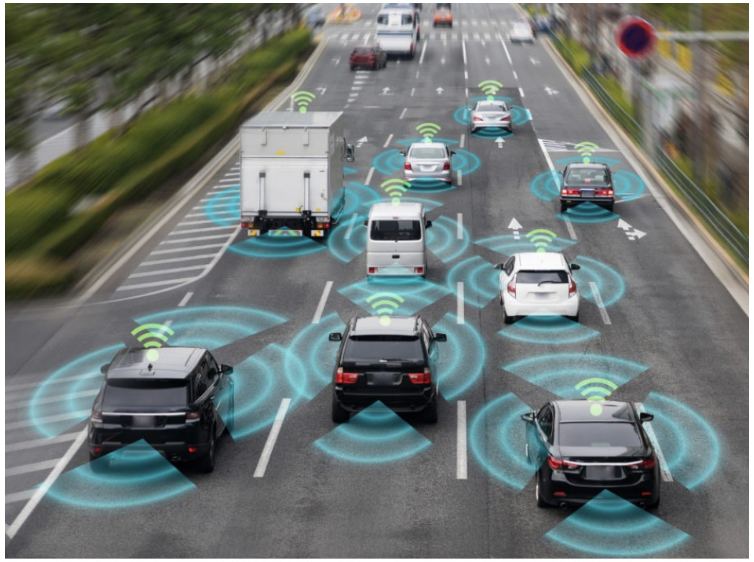
Local Climate Action Planning as a Tool to Harness the Greenhouse Gas Emissions Mitigation and Equity Potential of Autonomous Vehicles and On-demand Mobility

Project Overview

- ***Goal:*** Identify opportunities for how cities can use climate action plans (CAPs) to ensure that on-demand mobility and autonomous vehicles (AVs) help reduce, rather than increase, greenhouse gas (GHG) emissions, vehicle miles traveled (VMT), and/or inequitable impacts from the transportation system.
- ***Research Question:*** How can local governments in California use CAPs to harness the GHG emissions reduction and mobility equity potential of on-demand mobility and AVs?



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Local Climate Action Planning as a Tool to Harness the Greenhouse Gas Emissions Mitigation and Equity Potential of Autonomous Vehicles and On-demand Mobility

Activities

- An analysis of the current literature on on-demand mobility and AVs
- A systematic content analysis of 23 CAPs and general plans developed by municipalities in California
- A cross-comparison of findings from the literature and content analysis of plans to identify opportunities for GHG emissions reduction and mobility equity through adoption of on-demand mobility and AVs

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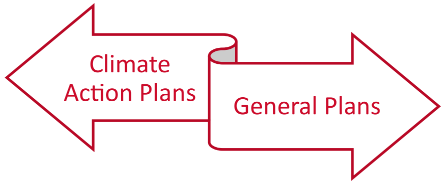
Local Climate Action Planning as a Tool to Harness the Greenhouse Gas Emissions Mitigation and Equity Potential of Autonomous Vehicles and On-demand Mobility

Results

City	Plan Date	On-demand Mobility & Autonomous Vehicle Categories: Shared Autonomous Vehicles	Shared Mobility or Shared-use Mobility	Mobility as a Service	Connected Vehicles	Mobility on Demand	Transportation Network Companies	Ride-hailing	Car-sharing	Ride -sharing	Carpooling	Vanpooling	Micro transit	TOTAL
American Canyon	2012													0
Arcata	2006													0
Berkeley	2009							✓	✓	✓				3
Emeryville	2016					✓			✓		✓			3
Fremont	2012		✓								✓			2
Hayward	2009					✓			✓	✓				3
Los Angeles	2007; 2019	✓		✓			✓		✓	✓				5
Menlo Park	2009; 2015		✓								✓	✓		3
Napa	2012									✓	✓	✓		3
Novato	2009								✓	✓				2
Oakland	2012; 2018							✓	✓	✓	✓			4
Palo Alto	2016		✓	✓						✓	✓	✓		5
Rohnert Park	2007													0
Saint Helena	2009													0
San Diego	2015													0
San Francisco	2004		✓					✓						2
San José	2018	✓	✓				✓	✓	✓					5
San Rafael	2009; 2019	✓	✓			✓		✓		✓	✓	✓		7
Santa Cruz	2012													0
Santa Monica	2013; 2019	✓									✓	✓	✓	5
Santa Rosa	2012					✓				✓	✓	✓		4
Windsor	2012													0
Yountville	2016					✓				✓		✓		3
TOTAL		4	6	3	0	5	2	5	7	10	9	7	1	



City	Plan Date	On-demand Mobility & Autonomous Vehicle Policies: Shared Autonomous Vehicles	Shared Mobility or Shared-use Mobility	Mobility as a Service	Connected Vehicles	Mobility on Demand	Transportation Network Companies	Ride-hailing	Car-sharing	Ride -sharing	Carpooling	Vanpooling	Micro transit	TOTAL
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Fremont	2012		✓							✓	✓			3
Hayward	2009					✓			✓	✓	✓	✓		5
Los Angeles	2007; 2019													0
Menlo Park	2009; 2015	✓	✓		✓						✓			4
Napa	2012										✓			1
Novato	2009													0
Oakland	2012; 2018													0
Palo Alto	2016	✓	✓			✓		✓		✓				5
Rohnert Park	2007													0
Saint Helena	2009													0
San Diego	2015													0
San Francisco	2004									✓	✓	✓		3
San José	2018		✓						✓	✓	✓			4
San Rafael	2009; 2019										✓	✓		2
Santa Cruz	2012		✓							✓				2
Santa Monica	2013; 2019								✓					1
Santa Rosa	2012								✓		✓	✓		3
Windsor	2012	✓												1
Yountville	2016													0
TOTAL		3	6	0	1	2	0	2	6	6	10	5	0	

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Results

- Municipal CAPs and general plans in California have adopted several strategies relevant to AVs and on-demand mobility.
- Cities should consider synergies between autonomous vehicles (AVs) and on-demand mobility during policy and planning discussions about either one.
- Maximizing the environmental and social benefits of AVs and on-demand mobility requires proactive and progressive planning; yet, most cities are lagging behind in this area.
- Several untapped opportunities exist to harness the GHG emissions reduction and social benefits potential of AVs and on-demand mobility.

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Lessons Learned

- Using CAPs as a tool to ensure equitable mobility in a driverless future;
- Providing comprehensive GHG emissions reduction roadmaps for AVs and on-demand mobility to reinforce general plan mobility goals;
- Encouraging travelers to make a long-run shift to shared use of AVs and on-demand mobility
- Using a combination of transportation and land-use policies to prevent increasing sprawl due to deployment of AVs;
- Stressing the importance of energy efficiency and renewable energy in a driverless future;
- Identifying opportunities to link AVs and on-demand mobility to transit;
- Incorporating planning tools that respond to the uncertainty related to deployment of AVs and extensive use of on-demand mobility.

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Next Steps/Long-Term Plans

Future studies can focus on:

- Rapidly evolving technologies and business practices related to AVs and on-demand mobility, and their implications for climate action planning;
- Broader dimensions of equity related to AVs and on-demand mobility;
- The long-term impact of the COVID-19 pandemic on shared on-demand mobility, and its consequences for transportation emissions;
- The impact of new or updated CAPs on social equity, and a community's contribution to climate change.

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Summary

- According to CARB, California is not on track to meet the GHG emissions reduction targets expected under SB 375.
- New and innovative approaches are needed to reduce GHG emissions from transportation.
- AV and on-demand mobility technologies present an opportunity to significantly reduce GHG emissions from transportation and contribute to equitable mobility.
- Proactive and progressive strategies are required to harness the GHG emissions mitigation and equity potential of AVs and on-demand mobility.

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Intelligent Transportation Systems using Visible Light Communications and Machine Learning

Hovannes Kulhandjian– California State University, Fresno

Hovannes Kulhandjian, Assistant Professor
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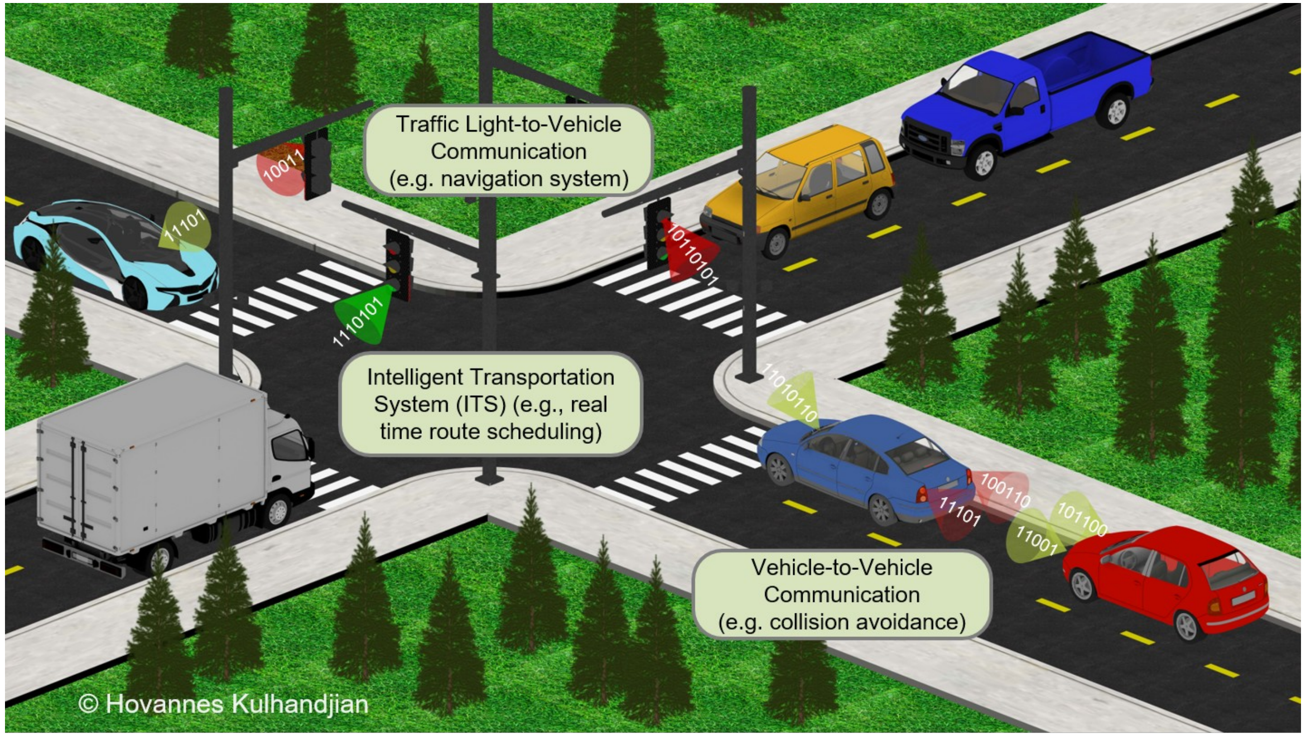
Intelligent Transportation Systems using Visible Light Communications and Machine Learning

Project 1 Overview

- Smart Transportation System through Visible Light Communications (VLC)



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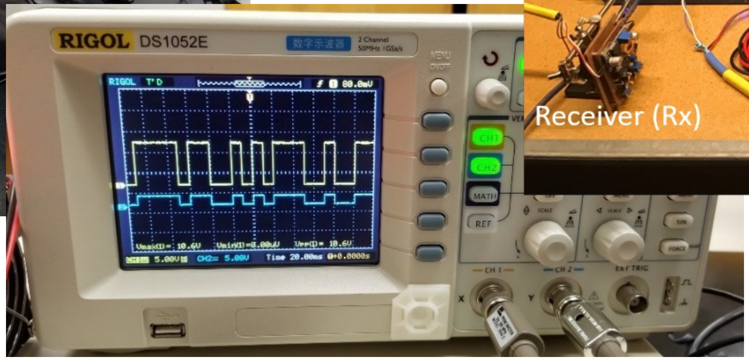
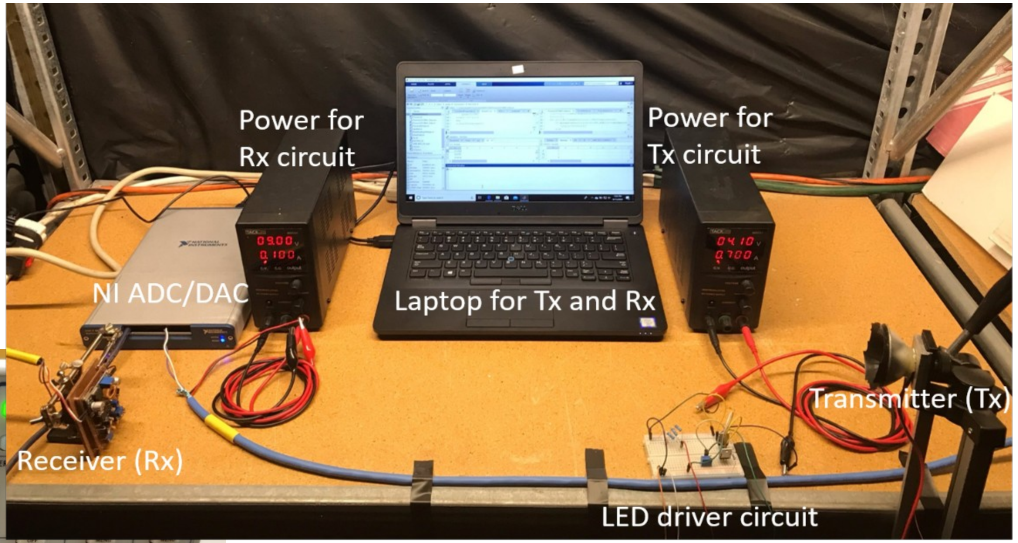
Activities Project 1

- Testbed Experimentations





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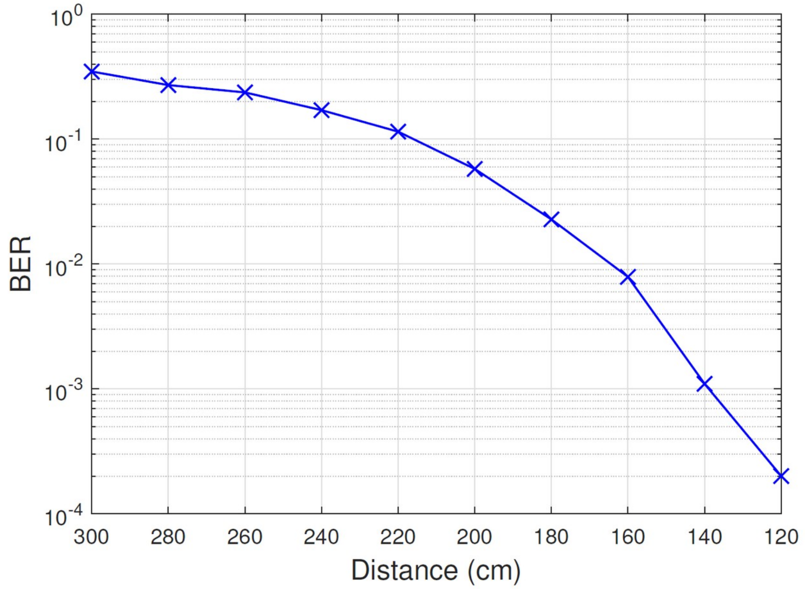
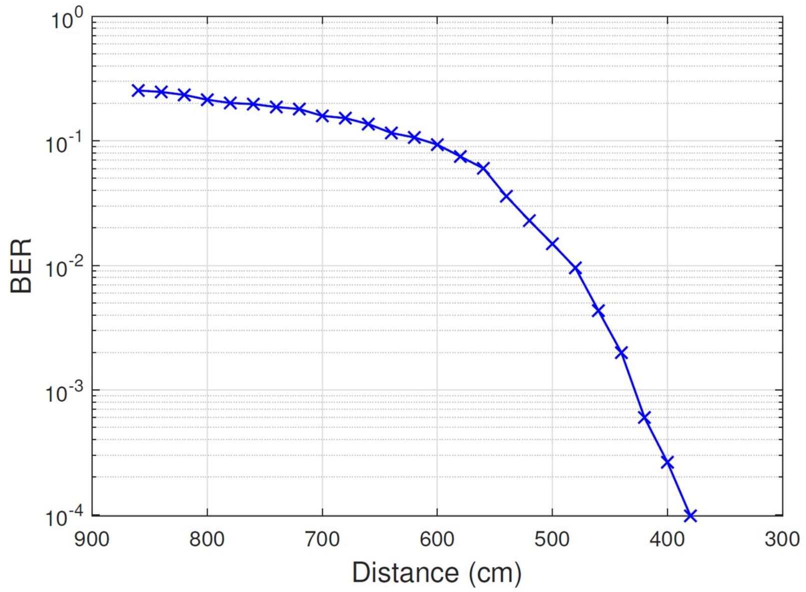
Project 1 Video Demo

Project 1 Results

- Low light intensity yields a BER of 2×10^{-4} for 120cm (i.e., 2 errors out of 10,000 bits transmitted)
- Low-medium light intensity yields a BER of 9.76×10^{-5} for 380cm



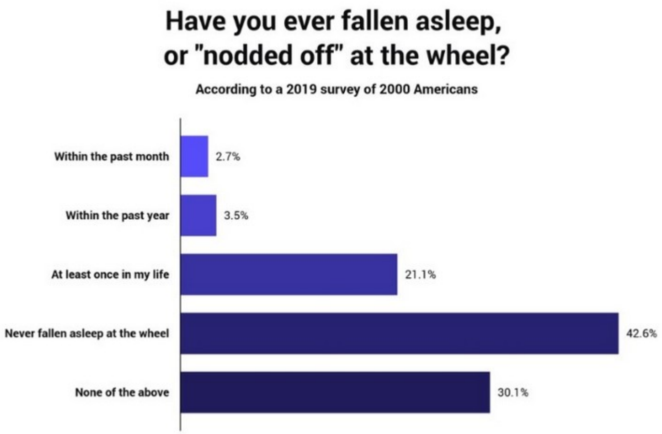
BER vs distance for low light intensity



BER vs distance for low-medium light intensity

Project 2 Overview

- Drowsy driving is one of the underlying causes of traffic accidents.
- An estimated 1 in 25 adult drivers have falling asleep while driving.
- In 2019, the NHTSA estimated 100,000 accidents occurred to due drowsy driving 71,000 resulted in an injury 1,550 were fatal.



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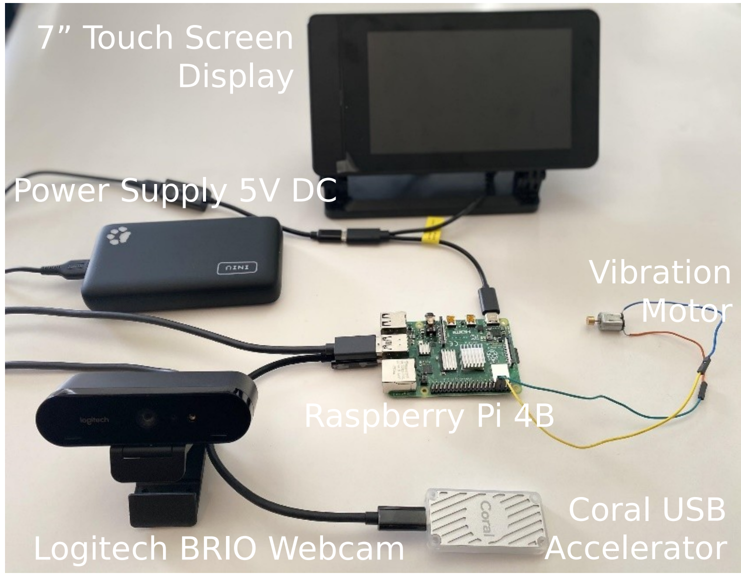
Intelligent Transportation Systems using Visible Light Communications and Machine Learning

Project 2 Activities

- Field Experimentations



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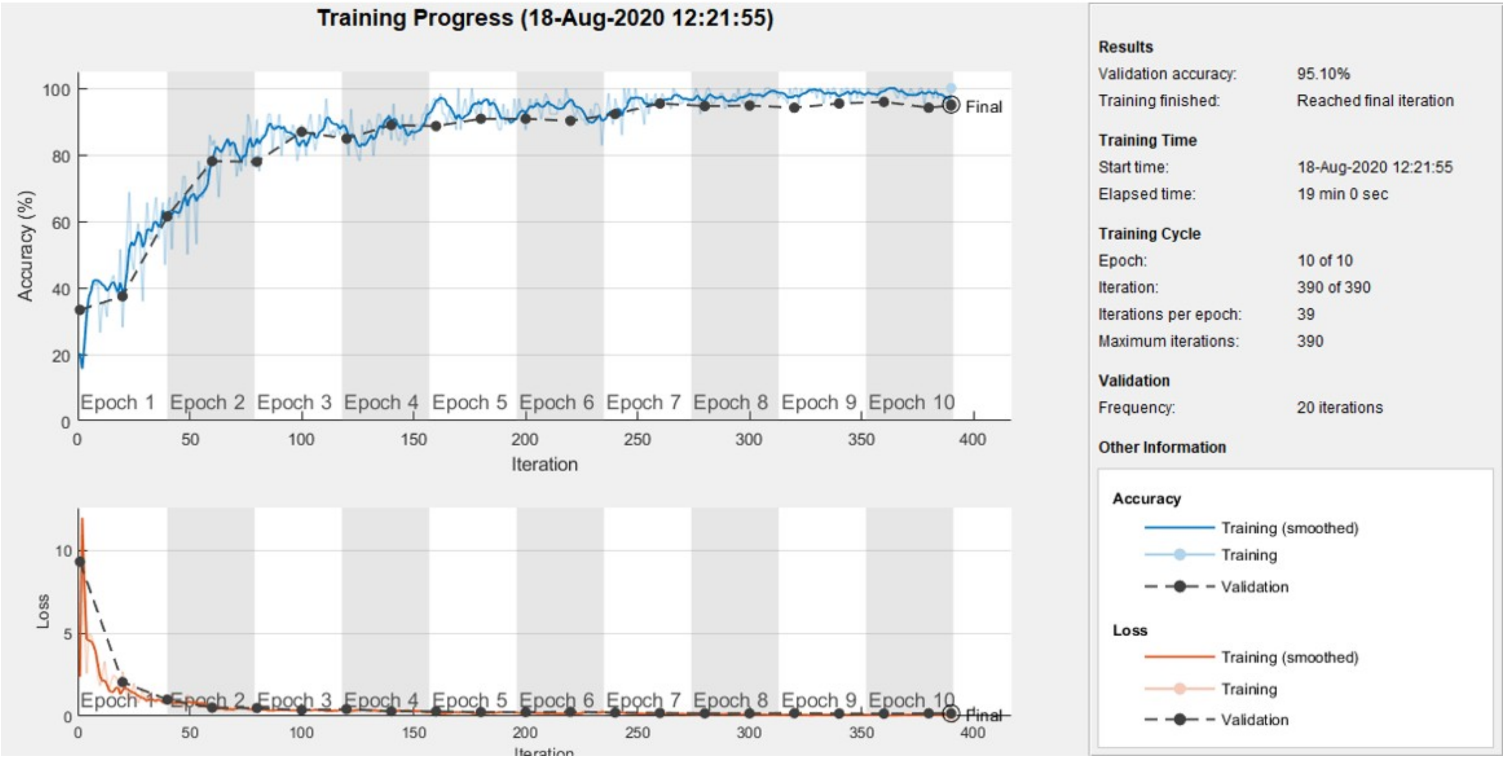
Project 2 Video Demo

Project 2 Results

- Model trained on dataset of over 3,000 images
- Validation accuracy of 95.1% achieved



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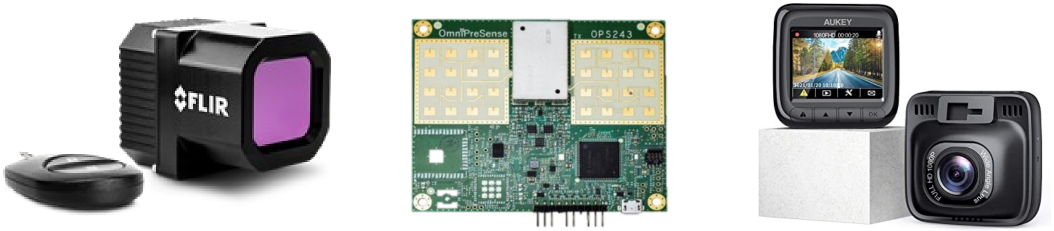
Lessons Learned

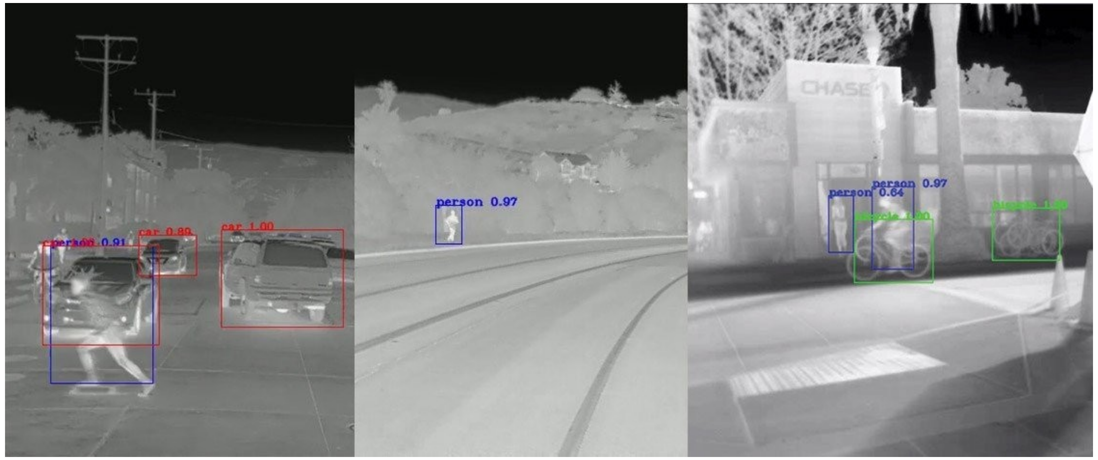
- **Project1:**
- Visible light communication has a great potential for making the traffic lights smart by allowing them to communicate with vehicles.
- Visible light communication can also be used for Vehicle-to-Vehicle communications.
- Experiments showed the correlation between transmitter-receiver distance and BER for two distinct light intensities; a BER of $9.76 \times 10{-}5$ was achieved for 50 kb/s transmission over 380 cm range.
- This are promising results, which could be extended for actual traffic light communications as well as Vehicle-to-Vehicle communications using VLC.
- **Project2:**
- Using a visible camera along with a Micro-Doppler sensor combined with Machine Learning could be used to detect a drowsy driver and prevent an accident by alerting the driver.

Next Steps/Long-Term Plans

- AI-based Pedestrian Detection and Avoidance at Night using IR Camera, Radar and Video Camera


(a) (b) (c)





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Summary

- We have developed Smart Transportation System through Visible Light Communications (VLC) that can by used by traffic light to send pertinent information to cars and for vehicle-to-vehicle communications.
- We have also developed and implemented a Drowsy Driver Detection and Collision Avoidance with Multi-Sensor Data Fusion combined with Machine Learning, which provides over 95% validation accuracy.
- We are currently developing AI-based Pedestrian Detection and Avoidance at Night scheme using IR Camera, Radar and Video Camera combined with Data Fusion to further improve the state-of-the-art automatic braking system for the automotive industry.

Special Thanks

CSUTC California State University Transportation Consortium
MEASURE
FRESNO STATE Transportation Institute

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Transportation Materials Research at CSULB, Fundamental, Practical and Workforce Development

Shadi Saadeh– California State University, Long Beach

Shadi Saadeh, Professor

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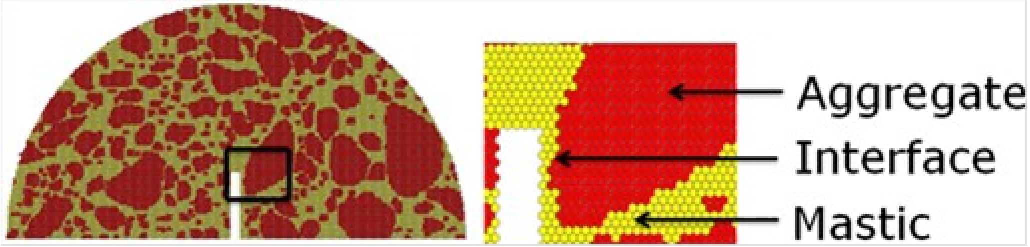
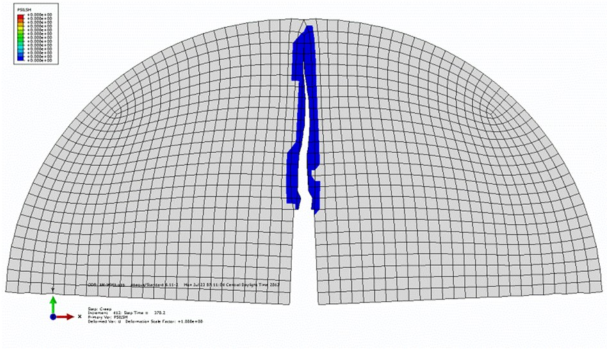
Fundamental

- Discrete Element and Finite Element Modeling of Highway Materials





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CALIFORNIA STATE UNIVERSITY
LONG BEACH

Transportation Materials Research at CSULB, Fundamental, Practical and Workforce Development

Practical

- Fully permeable pavements as a sustainable approach for mitigation of stormwater runoff

- Performance Testing of Hot Mix Asphalt Containing Biochar
- Moisture Sensitivity of Warm and Hot Mix Asphalt: Comparison of Loaded Wheel Tracking and Modified Lottman Tests

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Joint Training & Certification Program

- Innovative Caltrans Joint Training & Certification Program for materials technicians sets the standard for quality, consistency

Dr. Shadi Saadeh with CSULB kicks off the unveiling of the JTCP curriculum at a 2017 meeting of stakeholders held at California State University, Sacramento.

Dr. Shadi Saadeh, Associate Professor, Department of Civil Engineering & Construction, California State University, Long Beach and JTCP program manager, provides an update on the program at the 2018 CalAPA Spring Conference in Ontario while Caltrans Program Manager Jeremy Peterson-Self looks on.

Joint Training & Certification Program

- In 2019, **Caltrans former Director Laurie Berman** said the program is performing as expected. "Over the past year, this program has broken down barriers for more than 800 engineers and technicians in the materials testing industry, some in obtaining proficiency and others in the collaboration between state and private industry," Berman told California Asphalt magazine.

Members of the Joint Training & Certification Program Advisory Committee meeting in 2018 in Long Beach (left to right): Tim Greutert, Caltrans; Russell Snyder, CalAPA; Dr. Shadi Saadeh, CSULB; Jeremy Peterson-Self, Caltrans; Keith Hoffman, Caltrans; Charles Stewart, SWCPA; Divyesh Vora, Caltrans and Leah Budu, Caltrans.

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Joint Training & Certification Program

- **Brian Annis, secretary of the California State Transportation Agency, who replaced Brian Kelly** last year, offered similar praise. “Now that SB 1 projects are being implemented in full force across California, it’s more imperative than ever that we create innovative solutions to deliver on the promises of this critical infrastructure investment,” Annis told California Asphalt magazine.
- “Training programs like this one provide efficiency, access and opportunities, while ensuring the highest standards are met for quality materials on thousands of new construction projects statewide.”

Left: Joint Training & Certification instructors and participants at a class held at California State University, Long Beach.

Joint Training & Certification Program

- For legislators who voted for SB1, seeing innovation and accountability in action via the JTCP is gratifying. “As a member of the Assembly Transportation Committee and Chair of the Education Committee, I understand the intersection between fixing our roads and educating the employees that perform the work,” said **Assemblyman Patrick O’Donnell, D-Long Beach**. “A big part of SB 1 is accountability, and this innovative training and certification program will ensure that the workers who test construction materials are highly qualified, and taxpayers are getting what they pay for.”

Joint Training & Certification Program

- **Tracy Zubek, Quality Control Manager for CalAPA® member DeSilva Gates Materials** and a member of CalAPA®'s Technical Advisory Committee, said he was pleased with the department's announcement. "Having a joint training program for Caltrans and industry is another great leap forward in the pursuit of partnering and will have a direct correlation to improved quality of materials used to build California's transportation infrastructure," said Zubek, who is also co-chair of the Caltrans-industry

Left: Instructor Dave Aver makes a point; Middle: Student assistants preparing samples for one of the many hands-on tests that are part of the JTCP. Right: Instructor Greg Reader (left) shares a laugh with class participants as CalAPA®'s Brandon Milar (right) looks on.

Lessons Learned

- Fundamental research
  - Publication
  - Citation
  - Ranking
- Practical Research
  - Innovation
  - Forensic Investigation
  - Industry relationships
- Workforce Development
  - Community Partnership
  - Political and Institutional Support

Next Steps

- University Transportation Centers
- NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP)

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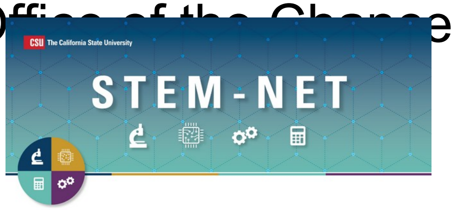
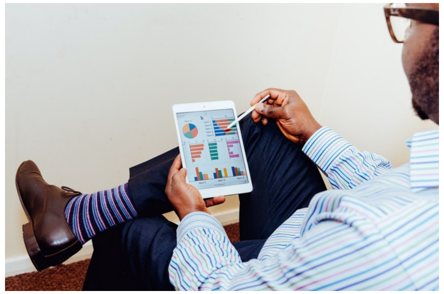
Next Steps/Closing Remarks

Dr. Frank A. Gomez
Executive Director, STEM-NET
Office of the Chancellor

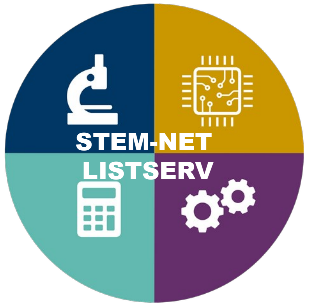


https://www2.calstate.edu/impact-of-the-csu/research/stem-net



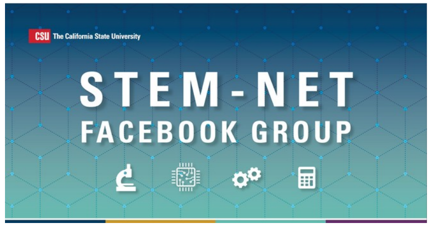
Webcast Feedback Survey

Please take a few moments to tell us about your webcast experience
https://forms.gle/xJJrY4C9yu4yfJro9



Join our CSU STEM-NET Community listserv

csustemnet@lists.calstate.edu



Begin a Conversation with Colleagues and Join our Private CSU STEM-NET Facebook Group

https://www.facebook.com/groups/2629611737269292

The California State University
OFFICE OF THE CHANCELLOR

STEM-NET Upcoming Events

Save the Dates

STEM-NET Virtual Research Café 10.0

- **April 23, 2021**
  Registration Link: https://tinyurl.com/s7kzudd8

STEM-NET May Webcast

- **CSU Department of Defense (DoD) Awardees: May 13th, 2PM- 4PM**
  Registration Link: https://forms.gle/TZTdRfoyUEz5Q7Gm9

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