SAFER-SIM Accomplishments

April 1, 2020 – September 30, 2020

1. Accomplishments

1.1 Research Accomplishments

1.1.1 Peer-reviewed journal publications

Published

1. Cai, Q., Abdel-Aty, M., Castro, S., 2020. Explore effects of bicycle facilities and exposure on bicycle safety at intersections. International Journal of Sustainable Transportation, 1-12. https://doi.org/10.1080/15568318.2020.1772415
2. Abdel-Aty, M., Wu, Y., Saad, M., & Rahman, M. S. (2020). Safety and operational impact of connected vehicles' lane configuration on freeway facilities with managed lanes. Accident Analysis & Prevention, 144, 105616. https://doi.org/10.1016/j.aap.2020.105616
3. Yue, L., Abdel-Aty, M., Wu, Y., Yuan, J., & Morris, M. (2020). Influence of pedestrian-to-vehicle technology on drivers' response and safety benefits considering pre-crash conditions. Transportation Research Part F: Traffic Psychology and Behaviour, 73, 50-65. https://doi.org/10.1016/j.trf.2020.06.012
4. Yue, L., Abdel-Aty, M., Wu, Y., Zheng, O., & Yuan, J. (2020). In-depth approach for identifying crash causation patterns and its implications for pedestrian crash prevention. Journal of Safety Research, 73, 119-132. https://doi.org/10.1016/j.jsr.2020.02.020
5. Chung, W., Abdel-Aty, M., Park, H. C., Cai, Q., Rahman, M. H., Gong, Y., & Ponnaluri, R. (2020). Development of Decision Support System for Integrated Active Traffic Management Systems Considering Travel Time Reliability. Transportation Research Record, 0361198120905591. https://doi.org/10.1177%2F0361198120905591
6. O'Neal, E. E., Zhou, S., Jiang, Y., Kearney, J. K., & Plumert, J. M. (2020). Let's cross the next one: Parental scaffolding of prospective control over movement. Child Development. https://doi.org/10.1111/cdev.13457
7. Pradhan, A. K., Pai, G., Radadiya, J., Knodler Jr, M. A., Fitzpatrick, C., & Horrey, W. J. (2020). Proposed Framework for Identifying and Predicting Operator Errors When using Advanced Vehicle Technologies. Transportation Research Record: Journal of the Transportation Research Board. https://doi.org/10.1177%2F0361198120938778
8. Ganesh Pai, Sarah Widrow, Jaydeep Radadiya, Cole D. Fitzpatrick, Michael Knodler & Anuj K. Pradhan (2020) A Wizard-of-Oz experimental approach to study the human factors of automated vehicles: Platform and methods evaluation, Traffic Injury Prevention, https://doi.org/10.1080/15389588.2020.1810243
9. Renski, H. C., Smith-Doerr, L., Wilkerson, T., Roberts, S. C., Zilberstein, S., & Branch, E. H. (2020) Racial Equity and the Future of Work. Technology | Architecture + Design. https://doi.org/10.1080/24751448.2020.1705711
10. A Elmquist, D Negrut, "Methods and Models for Simulating Autonomous Vehicle Sensors", IEEE Transactions on Intelligent Vehicles, 2020. https://doi.org/10.1109/TIV.2020.3003524

Accepted for publication

1. Rahman, M. H., Abdel-Aty, M. Application of Connected and Automated Vehicles in a Large-Scale Network by Considering V2V and V2I Technology' accepted at Transportation Research Record (TRR), 2020.
2. Yingxue Zhang, Yanhua Li, Xun Zhou Xiangnan Kong, Jun Luo. Off-Deployment Traffic Estimation --- A Traffic Generative Adversarial Networks Approach. IEEE Transactions on Big Data (TBD) (accepted).
3. H. Nassereddine, K. R. Santiago-Chaparro, and D. A. Noyce, "Modeling Vehicle-Pedestrian Interactions Using a Non-Probabilistic Regression Approach," Accepted for Publication in TRR, Washington, DC, 2020.
4. Jiang, Y., O'Neal, E. E., Zhou, S., Plumert, J. M., & Kearney, J. K. (2020). Crossing roads with a computer-generated agent: Persistent effects on perception-action tuning. Transactions in Applied Perception. Manuscript accepted for publication pending minor revisions.

Submitted

1. Yue, L., Abdel-Aty, M., Wu, Y., Jorge U., Yuan, C, 2020. Effects of Forward Collision Warning In Different Pre-Crash Scenarios (under review by Transportation Research Part F)
2. Ebadi, Y., Roberts, S. C., Knodler, M. A., & Fisher, D. L. (under review). Designing an informative interface for transfer of control in Level 2 Automated Driving Systems. Applied Ergonomics.
3. Di Napoli Parr, M. Tang, H., Mallaro, S., Kearney, J.K., Plumert, J.M. (2020). Relations Between Attention-Deficit Hyperactivity Disorder Symptomatology and Performance on Simple and Complex Timing Tasks. Journal of Pediatric Psychology. Manuscript submitted for publication.
4. Subramanian, L.D., O'Neal, E.E., Roman, A.K., Sherony, R., Plumert, J.M., and Kearney, J.K. (2020). How Do Pedestrians Respond to Adaptive Headlamp Systems in Vehicles? A Road-Crossing Study in an Immersive Virtual Environment. Accident Analysis & Prevention. Manuscript submitted for publication.

1.1.2 Book chapters

Nothing to report

1.1.3 Edited books

Nothing to report

1.1.4 Conference papers, posters, and symposia

Presented

1. Christofa, E., Deliali, A., and Knodler, M. 2020. Driver Performance in the Presence of Bicycle Infrastructure. 20th Swiss Transport Research Conference, 13–14 May [online].
2. Subramanian, L. D., O'Neal, E., Plumert, J. M., & Kearney, J. K. (2020). Using Simulation to Assess Right-Hook Conflicts Between Bicycles and Cars at Protected and Unprotected Intersections. Proceedings of the 2020 EUROPE VR Driving Simulation Conference. September 2020
3. Benjamín Colucci. Technical Poster entitled Lessons Learned and Future of the Decade of Action for Road Safety 2011-2020, Strategic Highway Safety Plans and Vision Zero Initiatives presented with Eng. Lynnette Alicea from CSA Group during the ITE 2020 Virtual Annual Meeting. August 13, 2020.
4. J. Taves, A. Elmquist, A. Young, R. Serban, D. Negrut, "Synchrono: A Scalable, Physics-Based Simulation Platform for Testing Groups of Autonomous Vehicles and/or Robots", ASME-MSNDC, St.Louis, MO, Aug 2020
5. D. Negrut, R. Serban, A. Elmquist, J. Taves, A. Young, A. Tasora, S. Benatti, "Enabling Artificial Intelligence Studies in Off-Road Mobility Through Physics-Based Simulation of Multi-Agent Scenarios." NDIA Ground Vehicle Systems Engineering and Technology Symposium. Aug 2020.

<u>Accepted/Not yet presented</u>

1. Rahman, M. H., Abdel-Aty, M. Application of Connected and Automated Vehicles in a Large-Scale Network by Considering V2V and V2I Technology' accepted at Transportation Research Board (TRB), 2020.
2. J.Taves, A. Elmquist, A. Young, S. He, Y. Li, C. Villarreal, R. Serban, D. Negrut, "Synchrono: A physics-based simulation platform for testing autonomous vehicles and robots", ICTAM, Milan, Italy, 2021
3. J. Taves, A. Elmquist, R. Serban, D. Negrut, "Synchronization and Scalability of the Multi-Agent Dynamics Environment Synchrono", IMSD, New Delhi, India, 2021
4. Yichen Ding, Xun Zhou, Han Bao, Yanhua Li, Cara Hamann, Steven Spears and Zhuoning Yuan. Cycling-Net: A Deep Learning Approach to Predicting Cyclist Behaviors from Geo-Referenced Egocentric Video Data. In Proc. 28th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (SIGSPATIAL'20). November 2020
5. Xin Zhang, Yanhua Li, Xun Zhou, Ziming Zhang, and Jun Luo. TrajGAIL: Trajectory Generative Adversarial Imitation Learning for Long-term Decision Analysis. In Proc. 20th IEEE International Conference on Data Mining (ICDM'20). Nov 2020
6. Yingxue Zhang, Yanhua Li, Xun Zhou and Jun Luo. cST-ML: Continuous Spatial-Temporal Meta-Learning for Traffic Dynamics Prediction. In Proc. 20th IEEE International Conference on Data Mining (ICDM'20). November 2020
7. Radadiya, Pai, Pradhan (2020) Are Limitations of Advanced Vehicle Technologies Described Consistently for Different Vehicle Models: An Examination for Adaptive Cruise Control, Annual Meeting of the Association for the Advancement of Automotive Medicine. October 2020.
8. J. Taves, A. Elmquist, A. Young, R. Serban, D. Negrut, "Synchrono: A Scalable, Physics-Based Simulation Platform For Testing Groups of Autonomous Vehicles

and/or Robots", IROS, Las Vegas, NV, October 2020

9. J. Taves, S. Benatti, A. Young , A. Elmquist, R. Serban, A. Tasora, D. Negrut, "SynChrono: An MPI-Based, Scalable Physics-Based Simulation Framework for Autonomous Vehicles Operating in Off-Road Conditions", Supercomputing, Atlanta, GA, November 2020

Submitted

1. Evaluation of a warning system communicating non-connected red-light-running vehicles to connected vehicles using a driving simulator for some submissions. Jon Riehl. ASCE ICTD 2020 (as paper and presentation)
2. Malik, J., Di Napoli Parr, M., Flathau, J., Tang, H., Kearney, J.K., Plumert, J.M., Rector, K.K. (2020). Determining the Effect of Smartphone Alerts and Warnings on Street-Crossing Behavior in Non-Mobility-Impaired Older and Younger Adults. Submitted to CHI 2021.

1.1.5 Paper/poster awards

1. Aaron Young and Dan Negrut have been co-authors on a first prize poster at the Computing in Engineering event organized at the University of Wisconsin-Madison (September 29 – October 1, 2020). The poster had to do with model predictive control for autonomous vehicles.
2. Jay Taves, Aaron Young, Asher Elmquist, Radu Serban and Dan Negrut have received the third prize for a poster in the same competition. The poster had to do with the SynChrono simulation framework.

1.1.6 External grants related to SAFER-SIM

Awarded

1. UCF – The Statewide Regional Evacuation Study Program (SRESP) -Update: Phase 1 Florida Behavioral Study
   -Funding Agency: Northeast Florida Regional Council
   -Amount: $100,000
   -Duration: October 15, 2020-March 15, 2021.
   -Traffic data analysis done under the SAFER-SIM project significantly helped to understand certain aspects of hurricane evacuation and associated congestion that will be investigated in the above project
2. UCF – Impacts of Electrified Sharing Economy on Transportation and Energy Systems, EERE, DOE (subcontracted from Argonne National Laboratory), $90k
   -This project builds off previous SAFER-SIM work
3. Multisensory Integration in Collision Judgments with Central Vision Loss"
   -National Institutes of Health, National Eye Institute
   -Joseph K Kearney (PI)
   -10/1/2020 – 9/31/2023
   -$181,827 UI portion total costs
   -External funding builds off lessons learned from past SAFER-SIM project

4. UM – Anuj Pradhan - A field study to examine driver use of Adaptive Cruise Control. This project involves a field study on an instrumented vehicle to examine drivers use of Adaptive Cruise control and errors committed under varying system conditions. This work aligns with a past SAFER-SIM project.
5. UW – Dan Negrut - The National Science Foundation awarded a $1.2 million, four-year project to University of Wisconsin-Madison. Negrut is a co-PI on that project. The project title is "CPS: TTP Option: Medium: Identifying, characterizing, and shaping multi-scale cyber-human interactions in mixed autonomous/conventional vehicle traffic" and the PI is Professor Soyoung Ahn. The very infrastructure that was funded by the SAFER-SIM project will be augmented under the NSF project to anchor the simulation component of the NSF project led by Professor Soyoung Ahn.

Submitted

1. K99/R00 Career Development Award, "Improving Novice Driver Roadway Hazard Identification Through a Parent-Focused Intervention" resubmitted to the National Institute for Child Health and Development (NICHD) on July 12, 2020
   O'Neal (PI); Peek-Asa (Primary Mentor); Plumert (co-mentor)
   $949,469.00 in total costs
2. How Do Children with and without Developmental Coordination Disorder Synchronize Self and Object Movement?
   Jodie M Plumert (PI), Joseph K Kearney (Co-I), Kyle K Rector (Co-I), Elizabeth E O'Neal (Co-I)
   US Department of Health & Human Services, National Institutes of Health
   $2,988,258
3. "Parental Scaffolding of Children's Prospective Control in Dynamic Perception-Action Tasks"
   Jodie M Plumert (PI), Joseph K Kearney (Co-I), Kyle K Rector (Co-I)
   National Science Foundation
   $625,652 in total costs
4. Shannon Roberts submitted two proposals that uses knowledge gained from this Safer-Sim project:
   Delivery Timing and Modality of System State Information to Support Occupant Understanding of ADS Functionality, NHTSA Human Factors IDIQ (subcontracting to Battelle), $250,000, 10/01/2020-09/30/2021, co-PI.
5. Methods to Transfer System Knowledge to Driver/Operators to Enhance and/or Accelerate Situational Awareness During Handoff, NHTSA Human Factors IDIQ (subcontracting to Battelle), $125,000, 10/01/2020-09/30/2021, co-PI.
6. Christofa - US DOT University Transportation Center, Tier 1 Center, Topic Area 4: Strategic Implications of Changing Public Transportation Travel Trends, FAST Act Research Priority Area: Improving Mobility of People and Goods
7. Christofa - National Science Foundation SCC-CIVIC-PG Track A: Enhancing Mobility in Under-served Rural Western Massachusetts Communities Using Smart Multi-Modal Transportation
8. Negrut - Drawing on the SAFER-SIM work, Negrut participated into a $2 million NSF proposal on the topic of using AV simulation for understanding expectancy

violation maneuvers in mixed AV-conventional vehicle traffic. The proposal is under NSF review.

1.2 Leadership Development Accomplishments

1.2.1 Invited presentations

1. Kearney, J.K. Pedestrian and Bicycling Simulation at the University of Iowa, 33rd Congress of Research and Education in Transport, ASSOCIAÇÃO NACIONAL DE PESQUISA E ENSINO EM TRANSPORTES, Balneário Camboriú, Santa Catarina, Brazil, November 12, 2019. (**Not reported last period**)
2. Guo, Z. (2020). Paving the way for an electrified mobility system. Presentation at the Argonne National Laboratory Energy Systems Division Weekly Seminar, Argonne, IL. (Virtual Presentation)
3. Reyes, M.L. Effect of COVID-19 Pandemic on Young Driver Crashes in Iowa. Presentation at the mid-year meeting of the Transportation Research Board Young Driver Subcommittee. July 15, 2020.
4. Kearney, J.K. The Effectiveness of Smartphone Warnings and Alerts on Pedestrian Road Crossing, 2020 Texas Statewide Pedestrian Safety Forum, Texas Pedestrian Safety Coalition, Austin, Texas, United States, August 6, 2020.
5. O'Neal, E.E. Parent's Role in Preventing Childhood Injury. 2020 Preventing Childhood Injury Conference. Virtual conference. September 15, 2020.
6. Presentation "Leveraging UAS Technology: From First flight to Speed Data Collection." North/West Passage Pooled Fund Study Annual Technician's Webinar. August 26th.
7. Presentation, seminar "Leveraging Drone Technology as Transportation Professionals." UMass Amherst Transportation Seminar Series. September 3rd.
8. Benjamín Colucci, Speaker with D. Valdés; C. López del Puerto; A. Figueroa Medina & R. Sotomayor-Irizarry from Safer-SIM Project, presentation entitled Educational Module to Increase Engineering Students' Knowledge of Highway Work Zone's TTC Plans, 2020 American Society for Engineering Education (ASEE) Virtual Conference. June 22-26, 2020.
9. Benjamín Colucci, technical presentation entitled A Sustainable, Safe and Resilient Transportation System Vision 2030 in Puerto Rico in the 2020 Virtual Mega Civil Friday Mega with Eng. Juan Carlos Rivera, Transportation Specialist from the Federal Highway Administration-Puerto Rico and US Virgin Islands Division, and Eng. Lynnette Alicea, from CSA Group. July 16, 2020.
10. Benjamín Colucci, invited as Moderator, in the 18th LACCEI International Multi-Conference for Engineering, Education, and Technology, Pan American Academy of Engineering Session. July 27, 2020.
11. Benjamín Colucci, to present the technical Poster entitled Lessons Learned and Future of the Decade of Action for Road Safety 2011-2020, Strategic Highway Safety Plans and Vision Zero Initiatives with Eng. Lynnette Alicea from CSA Group during the ITE 2020 Virtual Annual Meeting. August 13, 2020.
12. Benjamín Colucci, invited speaker to offer the technical presentation entitled A Safe, Sustainable and Resilient Urban Transportation System Vision 2030 in the Americas

sponsored by the Historical Heritage and Urban Development Committee of Mexico, Pan-American Union of Engineering Associations (UPADI). August 27, 2020.
13. Benjamín Colucci, invited as speaker by the Institute of Transportation Engineers (ITE) in the Vision Zero and Liability webinar. September 1, 2020.
14. A. Elmquist, "Chrono::Sensor for Robotics & Autonomous Vehicle Simulation," Machine-Ground Interaction Consortium, 2020
15. A. Elmquist, "Chrono::Sensor Tutorial," Machine-Ground Interaction Consortium, 2020
16. J. Taves, "SynChrono for Multi-agent Autonomous Vehicle Simulation," Machine Ground Interaction Consortium, 2020
17. J. Taves, A. Young, Y. Xiao, "SynChrono: Support for Multi-Agent Simulations for on/off-road Autonomy," Machine Ground Interaction Consortium, 2020
18. D. Negrut "Off-road autonomous Vehicle Simulation in Chrono" Machine Ground Interaction Consortium, 2020
19. D. Negrut "On the Modeling and Simulation of Autonomous Vehicles", University of Iowa, 2020
20. D. Negrut "On the Modeling and Simulation of Autonomous Vehicles", University of Wisconsin-Madison, Division of Engineering Professional Development, 2020
21. Association of Transportation Safety Professionals Traffic Records Forum Presentation on CAV data for safety and law enforcement – (August 14, 2020)
22. Virtual Electric Vehicle Series: Autonomous Vehicle Webinar (September 2, 2020)
23. Wisconsin Automated Vehicle External Committee - Update on Wisconsin CAV (September 8, 2020)

1.2.2 Invited papers

Nothing to report

1.2.3 Invited workshops

1. Xun Zhou Co-organized the 1st Workshop on Deep Learning for Spatial Data, Applications and Systems (DeepSpatial) at ACM SIGKDD Conference 2020.
2. Negrut and Serban organized the Machine-Ground Interaction Consortium meeting at the University of Wisconsin-Madison. The meeting was attended by the following organizations (54 of them): 360 Med Care, Aarhus University, Advanced Science and Automation Corp., Akamai Technologies, Amazon, Arizona State University, Advanced Solutions Incorporated, ATA Engineering, BAE Systems, Blue River Tech., Caterpillar Inc., Clemson University, CM Labs, Simulations Inc., DSIM TECH, Dynamic Dimension Technologies, LLC, FunctionBay/SolverTeam, Georgia Tech University, Harley Davidson Motor Company, Herman Design Works, Hong Kong University of Science and Technology, Illinois Institute of, Technology, Indiana University Purdue University Indianapolis, ISAE Supaero, Jet Propulsion Laboratory, John Deere, Johns, Hopkins University, KPIT Technologies, Lappeenranta Technical University, MathWorks, McGill University, Michigan Technological, University, Mississippi State University, MIT, Mitsubishi Electric Research Labs, Motesque Inc., MSC Software, Corp., National Science Foundation, Nevada Automotive Test Center,

Northwestern University, Ohio State University, OPPO US, Research Institute, Oshkosh Corporation, RAMDO Solutions, Sanikommu, Simertis GmbH, Software Cradle Co., Ltd., South Africa, Council of Scientific and Industrial Research, Tesla, Texas A&M University, University of Iowa, University of Parma, University of Wisconsin-Madison, US Army CCDC GVSC, US Army Engineering Research and Development Center.
At this meeting, Negrut gave a talk on the topic of autonomous vehicle simulation. SAFER-SIM was listed as a project sponsor. Agenda for the event is here: https://graingerinstitute.engr.wisc.edu/computing-in-engineering-forum-2020-agenda/#track-1

1.2.4 Grant review panels

1. NSF Civil Infrastructure Systems ad hoc reviewer (Guo)
2. National Science Foundation, Developmental Sciences Panel (Plumert)
3. National Science Foundation SBIR (Kearney)
4. NSF Panel Reviewer (Rector)
5. BTSCRP panel for BTS-01: Guidance for Employer-Based Behavioral Traffic Safety Programs for Drivers in the Workplace (Roberts). For the panel, she provides guidance for the contractor in terms of how drivers will respond to traffic safety programs
6. Freight Mobility Research Institute (FMRI) (Christofa)
7. FHWA Highway Safety Information System (HSIS) Excellence in Highway Safety Data Award Student Research Paper Competition, Institute of Transportation Engineers (ITE). (Colucci)

1.2.5 Advisory committees

1. Dr. Samiul Hasan: Transportation Safety Committee of ASCE's Transportation & Development Institute (T&DI)
2. Dr. Samiul Hasan: Artificial Intelligence (AI) Committee of ASCE's Transportation & Development Institute (T&DI)
3. Dr. Mohamed Zaki: 2020 FAV (Florida autonomous vehicle) symposium in Orlando (Dec 2020)
4. Dr. Mohamed Abdel-Aty: Member, TRB Committee on Highway Safety Performance (2014-ongoing)
5. Dr. Mohamed Abdel-Aty: Member, TRB Committee on User Information Systems (2014-ongoing)
6. Dr. Mohamed Abdel-Aty: Member, TRB Committee on Data, Analysis and Evaluation (2017 – ongoing)
7. Dr. Yina Wu: Member, TRB Committee on Surface Transportation Weather (AH010) (2020 – ongoing)
8. Dr. Qing Cai: Member, TRB committee on Data visualization (2019-ongoing)
9. Dr. Chris Schwarz: TRB committee on vehicle automation
10. Dr. Chris Schwarz: SAE On Road Automated Driving Simulation Task Force
11. Michelle Reyes: UI Injury Prevention Research Center Executive Committee
12. Michelle Reyes: UI Great Plains Center for Agricultural Health Internal Advisory

Committee

13. Michelle Reyes: Transportation Research Board of the National Academies: Standing Committee on Vehicle User Education, Training, and Licensing; and Young Driver Subcommittee, Member
14. Michelle Reyes: Engineering Staff Advisory Council
15. Jacob Heiden: Engineering Staff Advisory Council, President
16. Dawn Marshall: Engineering Staff Advisory Council
17. Dawn Marshall: ACH40 Human Factors of Infrastructure Design and Operations
18. Dawn Marshall: ACH40 Joint Subcommittee on Human Factors of In-Vehicle Systems (with ACH30)
19. Elizabeth O'Neal: Scientific Committee, Society for Advancement of Violence and Injury Research, Member
20. Shannon Roberts: Center for Research on Families Steering Committee.
21. Eleni Christofa: Scientific Committee of the 3rd Symposium on Management of Future Motorway and Urban Traffic Systems, 6–8 July, Luxembourg, Luxembourg
22. Eleni Christofa: TRR Editorial Board Working Group
23. Eleni Christofa: TRB ACP25 Traffic Signal Systems Committee Member and Paper Review Coordinator
24. Eleni Christofa: TRB AME70 Transportation and Public Health Committee Member
25. Eleni Christofa: Member of the Phasing Subcommittee for New England Institute of Transportation Engineers (ITE) Technical Committee Project "Guidelines for Design & Implementation of Advanced Traffic Signal Functions."
26. Didier Valdés: Applied Human Factors and Ergonomics (AHFE 2017-Present) Scientific Advisory Board.
27. Benjamín Colucci: Applied Human Factors and Ergonomics (AHFE 2017-Present) Scientific Advisory Board.
28. Benjamín Colucci: Member TRB Committee AHB55 Work Zone Traffic Control.
29. Benjamín Colucci: Member Best Paper Award TRB Committee AHB55 Work Zone Traffic Control.
30. Benjamín Colucci: Member of the Advisory Committee of the Puerto Rico - State Transportation Innovation Council (STIC).
31. Benjamín Colucci: Member of the Advisory Committee of the US Virgin Islands - State Transportation Innovation Council (STIC).
32. Benjamín Colucci: 2020 Latin American and Caribbean Consortium of Engineering Institution (LACCEI) International Multi-Conference for Engineering, Education, and Technology Scientific Advisory Board.
33. Benjamín Colucci: Member, TRB Standing Committee AND30 Simulation and Measurements of Vehicle and Operator Performance, 2019-2022.
34. Benjamín Colucci: Co-Chair of the Traffic Enforcement Committee, International Road Federation (IRF).
35. Benjamín Colucci: Member, Transportation Forensics and Risk Management (T-FARM), Institute of Transportation Engineers (ITE), 2018 – Present.
36. Benjamín Colucci: Member, Transportation Education Council, Institute of Transportation Engineers (ITE), 2017 – Present.
37. Benjamín Colucci: Member, Transportation Safety Council, Institute of Transportation Engineers (ITE), 2019 – Present.

38. Benjamin Colucci: Member of the Executive Committee of the National Institute for Congestion Reduction (NICR), University Transportation Center (UTC). January 2020 - Present.
39. Benjamin Colucci: American Association of State Highways and Transportation Officials (AASHTO) Co-Liaison representing the National Local Technical Assistance Program Association (NLTAPA). August 2019 - Present.
40. Benjamin Colucci: Partnership Workgroup, representing the National Local Technical Assistance Program Association (NLTAPA). July 2018 - Present.
41. Benjamin Colucci: Safety Workgroup representing the National Local Technical Assistance Benjamin Colucci, Innovation, and Implementation Workgroup representing the National Local Technical Assistance Program Association (NLTAPA). July 2018 -Present.
42. Benjamin Colucci: Innovation, and Implementation Workgroup representing the National Local Technical Assistance Program Association (NLTAPA). July 2018 - Present.
43. Benjamin Colucci: Strategic Highway Safety Plan (SHSP) - Puerto Rico, stakeholder representing Puerto Rico LTAP - T2; Traffic Incident Management (TIM) workgroup, 2013 - Present.
44. Alberto M. Figueroa-Medina: Standing Committee on Performance Effects of Geometric Design AKD-10 (formerly known as Operational Effects of Geometrics AHB-65), Transportation Research Board, 2013-Present.
45. Alberto M. Figueroa-Medina: Transportation Education Council, Institute of Transportation Engineers (ITE).
46. Alberto M. Figueroa-Medina: Transportation Safety Council, Institute of Transportation Engineers (ITE).
47. Alberto M. Figueroa-Medina: Executive Committee of the National Institute for Congestion Reduction (NICR), University Transportation Center (UTC). Nov. 2019 - Present.
48. Alberto M. Figueroa-Medina: Technical Committee of the Pan American Federation of Engineers Societies (UPADI), 2020-Present.
49. Kelvin Santiago: Member of the City of Sun Prairie Public Works Committee
50. David A. Noyce: Board of Governors (elected), Vice President 2020-2021, President 2021-2022. Transportation & Development Institute, American Society of Civil Engineers.
51. David A. Noyce: Mentor, Chancellor's Scholarship Program, Merit-Based Scholarships for Undergraduate Students from Underrepresented Groups. University of Wisconsin-Madison.
52. David A. Noyce: Chair, Associate Dean for Research Search & Screen Committee. College of Engineering, University of Wisconsin-Madison.
53. David A. Noyce: Member, Undergraduate Student Progression Committee. College of Engineering, University of Wisconsin-Madison.
54. David A. Noyce: Member, Dean's Leadership Council. College of Engineering, University of Wisconsin-Madison.
55. Jon Riehl: MMITSS (Multi-Modal Intelligent Traffic Signal Systems) in Madison
56. Jon Riehl: Park Street Connected Corridor Group

1.2.6 Journal editing

1. Dr. Mohamed Abdel-Aty: Editor-in-Chief (July 2013 – present), Accident Analysis and Prevention, Elsevier
2. Samiul Hasan, Trial Editor (Engineering), Natural Hazards Review
3. Samiul Hasan, Associate Editor, Highway Transportation System Security and Emergency Response, Journal of Transportation Safety and Security (JTSS)
4. Samiul Hasan, Associate Editor, Journal of Advanced Transportation
5. Jodie Plumert: Spatial Cognition and Computation, editorial board
6. Jodie Plumert: Journal of Experimental Psychology: Applied, editorial board
7. Jodie Plumert: Journal of Experimental Child Psychology, editorial board
8. Jodie Plumert: Accident Analysis and Prevention, reviewer
9. Joe Kearney: IEEE Access, reviewer
10. Joe Kearney: IEEE Virtual Reality Conference
11. Joe Kearney: Journal of Intelligent Transportation Systems: Technology, Planning, and Operations, reviewer
12. Joe Kearney: Accident Analysis and Prevention, reviewer
13. Elizabeth O'Neal: TRF: Traffic Psychology and Behaviour
14. Elizabeth O'Neal: Safety Science
15. Elizabeth O'Neal: Journal of Pediatric Psychology
16. Elizabeth O'Neal: Journal of Clinical Psychology
17. Elizabeth O'Neal: Accident Analysis and Prevention
18. Kyle Rector: 22nd International ACM SIGACCESS Conference on Computers and Accessibility, reviewer
19. Kyle Rector: ACM CHI Conference on Human Factors in Computing Systems, reviewer
20. Kyle Rector: The Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), associate editor
21. Michelle Reyes: Accident Analysis and Prevention
22. Anuj K. Pradhan: Frontiers in Neuroergonomics, Editorial Board
23. Eleni Christofa: Handling Editor, Transportation Research Record
24. Eleni Christofa: Associate Editor for the 23rd IEEE International Conference on Intelligent Transportation Systems, September 20-23, Rhodes, Greece.
25. Didier Valdés: Applied Human Factors and Ergonomics (AHFE), Scientific Advisory Board, 2017-Present.
26. Didier Valdés: 18th LACCEI International Multi-Conference for Engineering, Education, and Technology.
27. Didier Valdés: 100th TRB Annual Meeting, January 2021, Washington DC.
28. Didier Valdés: Editorial Board Member of International Journal of Natural Disasters, Accidents and Civil Infrastructure (RIDNAIC), Scipedia, August 2020 - Present.
29. Benjamín Colucci: Applied Human Factors and Ergonomics (AHFE 2017-Present) Scientific Advisory Board.
30. Benjamín Colucci: Member, TRB Committee AHB55 Work Zone Traffic Control; 2017-2020
31. Benjamín Colucci: Member Best Paper Award TRB Committee AHB55 Work Zone Traffic Control.
32. Benjamín Colucci: Member, TRB Standing Committee AND30 Simulation and

Measurements of Vehicle and Operator Performance, 2019-2022.

33. Benjamín Colucci: Member of the National Cooperative Highway Research Program (NCHRP) Project Panel on Practices in One Lane Traffic Control on a Two-Lane Rural Highway (SN4811), 2016 to Present.
34. Benjamín Colucci: Member, TRB Standing Committee on Road User Measurement and Evaluation (ACH50); 2020-2022.
35. Benjamín Colucci: Member, TRB Standing Committee on Traffic Control Devices (ACP55); 2020.
36. Benjamín Colucci: Member of the Advisory Committee of the Puerto Rico - State Transportation Innovation Council (STIC).
37. Benjamín Colucci: Member of the Advisory Committee of the US Virgin Islands - State Transportation Innovation Council (STIC).
38. Benjamín Colucci: 2020 Latin American and Caribbean Consortium of Engineering Institution (LACCEI) International Multi-Conference for Engineering, Education, and Technology Scientific Advisory Board.
39. Benjamín Colucci: Co-Chair of the Traffic Enforcement Committee, International Road Federation (IRF).
40. Benjamín Colucci: Member, Transportation Forensics and Risk Management (T-FARM), Institute of Transportation Engineers (ITE), 2018 – Present.
41. Benjamín Colucci: Member, Transportation Education Council, Institute of Transportation Engineers (ITE), 2017 – Present.
42. Benjamín Colucci: Member, Transportation Safety Council, Institute of Transportation Engineers (ITE), 2019 – Present.
43. Benjamin Colucci: Member of the Executive Committee of the National Institute for Congestion Reduction (NICR), University Transportation Center (UTC). January 2020 - Present.
44. Benjamin Colucci: American Association of State Highways and Transportation Officials (AASHTO) Co-Liaison representing the National Local Technical Assistance Program Association (NLTAPA). August 2019 - Present.
45. Benjamin Colucci: Partnership Workgroup, representing the National Local Technical Assistance Program Association (NLTAPA). July 2018 - Present.
46. Benjamin Colucci: Safety Workgroup representing the National Local Technical Assistance Program Association (NLTAPA). July 2018 - Present.
47. Benjamin Colucci: Innovation, and Implementation Workgroup representing the National Local Technical Assistance Program Association (NLTAPA). July 2018 - Present.
48. Benjamín Colucci: American Public Works Association (APWA) representing the Puerto Rico Local Technical Assistance Program (LTAP) Center. June 1, 2020-May 31, 2021.
49. Benjamin Colucci: Strategic Highway Safety Plan (SHSP) - Puerto Rico, stakeholder representing Puerto Rico LTAP - T2; Traffic Incident Management (TIM) workgroup, 2013 - Present.
50. Alberto M. Figueroa-Medina: 100th Transportation Research Board (TRB) Annual Meeting, January 2021, Washington, DC.
51. Alberto M. Figueroa-Medina: Transportation Research Record, TRB Journal.
52. Alberto M. Figueroa-Medina: Accident Analysis and Prevention Journal, Elsevier.

53. Alberto M. Figueroa-Medina: Dimension Journal of the College of Engineers and Surveyors of Puerto Rico, 2019 - Present.
54. Alberto M. Figueroa-Medina: International Journal of Natural Disasters, Accidents and Civil Infrastructure (RIDNAIC), Scipedia, September 2020 - Present.
55. Alberto M. Figueroa-Medina: 6th International Symposium on Highway Geometric Design, Transportation Research Board, Amsterdam, June 23-26, 2021.
56. Alberto M. Figueroa-Medina: 6th Urban Street Symposium, Transportation Research Board, Amsterdam, June 23-26, 2021.
57. Dan Negrut: Special issue of the ASME Journal of Computational and Nonlinear Dynamics
58. David A. Noyce: Journal of Transportation Engineering (ASCE). Associate Editor.
59. David A. Noyce: International Journal on Sustainable Transportation. Editorial Board.
60. David A. Noyce: Accident Analysis and Prevention Journal. Editorial Board.

1.2.7 Leadership positions in professional organizations

1. Dr. Mohamed Abdel-Aty: Department of Civil, Environmental & Construction Engineering at the University of Central Florida, Department Chair
2. Joe Kearney: ACM Symposium on Applied Perception, Steering/Program Committee Virtual Conference, September 18-19, 2020
3. Elizabeth O'Neal: Scientific Committee, Society for Advancement of Violence and Injury Research, Member
4. Kyle Rector: 22nd International ACM SIGACCESS Conference on Computers and Accessibility, Program Committee
5. Kyle Rector: ACM CHI Conference on Human Factors in Computing Systems, Program Committee and Organizing Committee
6. Anuj Pradhan: TRB Committee on Vehicle User Education, Training, and Licensing – Paper Coordinator
7. Anuj Pradhan: AutoUI 2020 – Work in Progress Committee Co-chair
8. Shannon Roberts: Program Chair Elect for Surface Transportation Technical Group of the Human Factors and Ergonomics Society.
9. Didier Valdés: Technical Committee, Pan American Federation of Engineering Associations (UPADI), 2020-Present.
10. Benjamín Colucci: Member, Board of Directors of the Pan-American Academy of Engineering (PAE), 2018-2020.
11. Benjamín Colucci: Member Board of Trustees of the Society of Engineers of Puerto Rico, Scholarship Committee 2019 - Present.
12. Benjamín Colucci: President of the Pan-American Transport Systems Committee (UPADI), 2017-2020.
13. Benjamín Colucci: Vice-President of the International Society for Maintenance and Rehabilitation of Transport Infrastructures (ISMARTI).
14. Benjamin Colucci: Dimension Journal of the College of Engineers and Surveyors of Puerto Rico, Member of Editorial Commission, 2019 - Present.
15. Alberto M. Figueroa-Medina: Editorial Commission, Dimension Journal of the College of Engineers and Surveyors of Puerto Rico, 2019 - Present.
16. Alberto M. Figueroa-Medina: Technical Committee, Pan-American Federation of Engineering Associations (UPADI), 2020-Present.

1.2.8 SAFER-SIM Webinars

Webinar	**Date**	**Registrants**	**Archived Views**
Assessing the Impact of Smartphone Usage While Driving in Work Zones	4/14/2020	34	34
Enhancing School Zone Safety: Case Studies in Puerto Rico using Driving Simulation	4/28/2020	22	42
Mobile Applications to Help Older Adults Make Safe Street-Crossing Decisions	5/12/2020	32	28
Designing an Informative Interface for Transfer of Control in Level 2 Automated Driving System	6/23/2020	59	N/A
Evaluation of Safety Enhancements in School Zones with Familiar and Unfamiliar Drivers	7/7/2020	20	47
The Influence of Unmanned Aerial Systems on Driving Performance	7/21/2020	38	20
The Impact of Driver's Mental Models of Advanced Vehicle Technologies on Safety and Performance	8/4/2020	83	22
The benefits of training and interface design for Advanced Driver Assistance Systems and Partial Driving Automation	8/11/2020	25	N/A
A Wizard-of-Oz experimental approach to study the Human Factors of Automated vehicles: Platform and methods evaluation	8/18/2020	21	N/A
Physics-Based Sensor Models for Virtual Simulation of Connected and Autonomous Vehicles	9/1/2020	27	38
		361	231

1.2.9 Professional awards

Nothing to report

1.3 Education and Workforce Development Accomplishments

1.3.1 Peer-reviewed journal publications w/ student authors

1. Cai, Q., Abdel-Aty, M., Castro, S., 2020. Explore effects of bicycle facilities and

exposure on bicycle safety at intersections. International Journal of Sustainable Transportation, 1-12. https://doi.org/10.1080/15568318.2020.1772415

2. Abdel-Aty, M., Wu, Y., Saad, M., & Rahman, M. S. (2020). Safety and operational impact of connected vehicles' lane configuration on freeway facilities with managed lanes. Accident Analysis & Prevention, 144, 105616. https://doi.org/10.1016/j.aap.2020.105616
3. Yue, L., Abdel-Aty, M., Wu, Y., Yuan, J., & Morris, M. (2020). Influence of pedestrian-to-vehicle technology on drivers' response and safety benefits considering pre-crash conditions. Transportation Research Part F: Traffic Psychology and Behaviour, 73, 50-65. https://doi.org/10.1016/j.trf.2020.06.012
4. Yue, L., Abdel-Aty, M., Wu, Y., Zheng, O., & Yuan, J. (2020). In-depth approach for identifying crash causation patterns and its implications for pedestrian crash prevention. Journal of Safety Research, 73, 119-132. https://doi.org/10.1016/j.jsr.2020.02.020
5. Chung, W., Abdel-Aty, M., Park, H. C., Cai, Q., Rahman, M. H., Gong, Y., & Ponnaluri, R. (2020). Development of Decision Support System for Integrated Active Traffic Management Systems Considering Travel Time Reliability. Transportation Research Record, 0361198120905591. https://doi.org/10.1177%2F0361198120905591
6. O'Neal, E. E., Zhou, S., Jiang, Y., Kearney, J. K., & Plumert, J. M. (2020). Let's cross the next one: Parental scaffolding of prospective control over movement. Child Development. https://doi.org/10.1111/cdev.13457
7. Pradhan, A. K., Pai, G., Radadiya, J., Knodler Jr, M. A., Fitzpatrick, C., & Horrey, W. J. (2020). Proposed Framework for Identifying and Predicting Operator Errors When using Advanced Vehicle Technologies. Transportation Research Record: Journal of the Transportation Research Board. https://doi.org/10.1177%2F0361198120938778
8. Ganesh Pai, Sarah Widrow, Jaydeep Radadiya, Cole D. Fitzpatrick, Michael Knodler & Anuj K. Pradhan (2020) A Wizard-of-Oz experimental approach to study the human factors of automated vehicles: Platform and methods evaluation, Traffic Injury Prevention, https://doi.org/10.1080/15389588.2020.1810243
9. A Elmquist, D Negrut, "Methods and Models for Simulating Autonomous Vehicle Sensors", IEEE Transactions on Intelligent Vehicles, 2020. https://doi.org/10.1109/TIV.2020.3003524

1.3.2 Book chapters w/ student authors

Nothing to report

1.3.3 Conference posters and papers w/ student authors

1. Christofa, E., Deliali, A., and Knodler, M. 2020. Driver Performance in the Presence of Bicycle Infrastructure. 20th Swiss Transport Research Conference, 13–14 May [online].
2. Subramanian, L. D., O'Neal, E., Plumert, J. M., & Kearney, J. K. (2020). Using Simulation to Assess Right-Hook Conflicts Between Bicycles and Cars at Protected and Unprotected Intersections. Proceedings of the 2020 EUROPE VR Driving

Simulation Conference. September 2020

3. J. Taves, A. Elmquist, A. Young, R. Serban, D. Negrut, “Synchrono: A Scalable, Physics-Based Simulation Platform for Testing Groups of Autonomous Vehicles and/or Robots”, ASME-MSNDC, St.Louis, MO, Aug 2020
4. D. Negrut, R. Serban, A. Elmquist, J. Taves, A. Young, A. Tasora, S. Benatti, "Enabling Artificial Intelligence Studies in Off-Road Mobility Through Physics-Based Simulation of Multi-Agent Scenarios." NDIA Ground Vehicle Systems Engineering and Technology Symposium. Aug 2020.

1.3.4 Paper/poster awards w/ student authors

1. Aaron Young and Dan Negrut have been co-authors on a first prize poster at the Computing in Engineering event organized at the University of Wisconsin-Madison (September 29 – October 1, 2020). The poster had to do with model predictive control for autonomous vehicles.
2. Jay Taves, Aaron Young, Asher Elmquist, Radu Serban and Dan Negrut have received the third prize for a poster in the same competition. The poster had to do with the SynChrono simulation framework.

1.3.5 Graduate students working on and supported by SAFER-SIM related projects

Site	**Number**
University of Iowa	11
University of Wisconsin Madison	4
University of Massachusetts Amherst	14
University of Central Florida	7
University of Puerto Rico Mayaguez	7

1.3.6 Undergraduate students working on and supported by SAFER-SIM related projects

Site	**Number**
University of Iowa	7
University of Wisconsin Madison	2
University of Massachusetts Amherst	7
University of Central Florida	1
University of Puerto Rico Mayaguez	1

1.3.7 Student attendance and presentations at the SAFER-SIM symposium

Nothing to report

1.3.8 Transportation-related M.A. and PhD theses

1. Jiechao Zhang, MSC in Transportation Engineering, Thesis title: Traffic Speed Prediction and Mobility Behavior Analysis Using On-Demand Ride-Hailing Service Data

2. Md Hasibur Rahman, Evaluation of Safety and Mobility Benefits of Connected and Automated Vehicles by Considering V2V, V2I, and V2P Technologies (PhD Dissertation)
3. Yalda Ebadi successfully defended her PhD on June 19. This SaferSim project is used as preliminary research for her PhD dissertation.
4. Aikaterini Deliali's dissertation chapter titled: "Assessing driver speeding and glancing behavior in the presence of protected bicycle treatments". Title of the dissertation: "Assessing the impact of bicycle infrastructure treatments on bicycle safety: A multi-methods approach."

1.3.9 Curriculum modules developed

1. UCF - Transportation Network modeling: new module on information sharing over network
2. UPR - An Educational Module to Increase Engineering Students' Knowledge of Work Zone Safety in Highway Construction
3. UPR - An online training module about work zone safety and the design of TTC zones called WZILM was developed and administered to second-year engineering students that have not received formal road design training. WZILM included a pre-test, a mid-intervention assessment, and a post-test. WZILM was effective in increasing awareness and knowledge among engineering students on how to correctly implement TTC plans with the goal of reducing the risk of injuries and fatalities in work zones, thus improving overall safety for drivers and workers.
4. UW - Simulation techniques developed for this project will be used in the Introduction to Transportation Engineering course to explain car following models.

1.3.10 Student internships related to SAFER-SIM

1. A group of undergraduate students are developing as part of a research internship an android peer to peer mobile application. The app will be used to test the algorithm developed in a UCF SAFER-SIM project – UCF/Zaki
2. Student Research Internship – Emily Shull
3. Student Research Internship – Sarah Widrow (Spring 2020)
4. Asher Elmquist internship with Motional, Fall 2020

1.3.11 Presentations to student groups or classes

1. Walter Guo from UCF presented on microsimulation with information updates in TTE 3810: Highway Engineering
2. "Childhood Pedestrian Injury: Studies with Typically and Atypically Developing Children" – talk given in "Global Road Safety" class within the College of Public Health at the University of Iowa – April 23rd, 2020. (O'Neal) – 15 students
3. Chris Schwarz – Automated Driving in Global Road Safety class – April 2020 – 15 students
4. Shannon Roberts gave a guest lecture for the Harvard University course "Integrative Frameworks for Technology, Environment, and Society I". The lecture included discussions about equity within driving automation research.

1.3.12 # Schools visited and # students present
Nothing to report

1.3.13 # Career fairs visited and # of attendees
Nothing to report

1.3.14 Summer institutes and programs and # of students participating

1. Shannon Roberts presented concepts on Industrial Engineering and Human Factors to 20 high school students who participated in the UMass Summer Engineering Institute on July 22.

1.4 Technology Transfer

1.4.1 SAFER-SIM webinars
10 webinars

1.4.2 Registrations for webinars
361 registrations

1.4.3 Views of archived webinar content
231 views

1.4.4 Press releases for SAFER-SIM related research

1. Study says parents' teaching style can be instrumental in helping children learn how to safely cross busy roads Note: this story was picked up by Radio Iowa, the Daily Iowan and NBC affiliates.

1.4.5 Media requests

Title	**Publisher**
1. U-I study finds parents key in teaching kids to safely cross streets	Radio Iowa
2. This is just a test: University of Iowa puts rural autonomous driving through its paces	The Gazette
3. We Take an $80 Million Driving Simulator for a Spin	Car and Driver

4. University of Iowa ramping up automated vehicle testing on local rural roads	ADS for Rural America
5. University of Iowa researchers study effects of cannabis on driving	The Daily Iowan
6. NADS provides national leadership on COVID-19 research protocols	Iowa Technology Institute
7. UI researchers using virtual reality to study ways children cross streets	The Daily Iowan

1.4.6 Tours of facilities

Nothing to report

1.4.7 Website traffic

Metric	This Period	Lifetime
Total Users	4,836	15,461
New Users	4,363	15,461
Sessions	10,158	29,208
Page Views	17,700	65,342

1.4.8 Patents filed

Nothing to report

1.4.9 DOT requests for presentations or proposals related to SAFER-SIM

Nothing to report

1.4.10 Practitioner attendance at events

69 industry members registered for webinars

1.4.11 Number of improved or new simulation technologies, software, methods, or processes

1. UCF – Zaki - A prototype for the pedestrian mobility behavior is developed in matlab and is being, currently, on selected real data sets
2. UCF – Managed Lane - This study has major implications for improving managed lanes (MLs) by recommending the optimal CV lane configuration and market penetration rate for each design. Hence, recommending the managed lane as connected vehicle lane might have essential benefits of the transportation road network for the expressways of United States. On the other hand, one of the biggest

issues facing CVs popularization associates it with the market penetration rate (MPR). For the policy point of view, this study provides useful insight for the management of CV MPR as managed-lane CV technologies in terms of CV transition period.

3. UCF – Infrastructure Placement – Walter Guo Currently, we are developing a new agent-based simulation framework based on Repast Simphony to better capture the dynamic decision making of vehicles and V2I.
4. UM – Visual Clutter - The research team developed a software package for eye-tracking video analysis, object identification, and integration with eye-tracking trace. The software is currently under internal testing by student interns.
5. UM – Visual Clutter - The research team is developing another software package for virtual driving scenarios using computer simulation to accommodate the disruption of COVID-19 on in-person driving simulation. This software package is related to another SaferSim project on Horizontal Curve Deflection Angle Analysis that is reported separately.
6. UPR - The VR simulation code was made in four levels: (i) Set up the VR environment to reflect an urban city context with commercial and residential buildings (ii) Include a pedestrian pathing system to add pedestrian avatars along sidewalks in the scenario (iii) Modify traffic flow patterns with different vehicle speeds and vehicle gaps between subject runs (modification to the original code supplied by Dr. Kearney from University of Iowa), and (iv) Incorporate a counter of subject runs and a counter of vehicle-pedestrian collisions and is shown on a display board for the subject to be aware of the number of runs and crashes in the experiment.
7. UW - Chrono::Sensor provided for public use within Chrono: https://github.com/projectchrono/chrono, directly developed under “Physics-Based Sensor Models for Virtual Simulation of Connected and Autonomous Vehicles”
8. UW - SynChrono provided for public use within Chrono: https://github.com/projectchrono/chrono, directly developed under “Physics-Based Sensor Models for Virtual Simulation of Connected and Autonomous Vehicles”
9. UW – Detailed Ped Vehicle Interactions - A by-product of the current research project is that the data processing methodologies developed are showing promising results in vehicle movement classifications that can be implemented on existing vehicle detection systems. Once details of the methodologies are finalized and streamlined we will explore potential implementation of the approach with an industry partner we have collaborated with in the past.

1.5 Collaboration

1.5.1 Attendance at the SAFER-SIMposium

Nothing to report

1.5.2 Interdisciplinary research projects within and across sites

1. Using Simulation to Assess and Reduce Conflicts between Drivers and Bicyclists (Computer Science/Psychological & Brain Sciences)
2. Multi-modal Distributed Simulation Combining Cars, Bicyclists, and Pedestrians (Computer Science/Psychological & Brain Sciences)

3. Using Simulation to Study Communication between Autonomous Vehicles and Vulnerable Road Users (Computer Science/Psychological & Brain Sciences)
4. Understanding Bicyclists' Behaviors Through Learning from Big Trip Data (Business/Public Health/Urban & Regional Planning)
5. Defining Safety-Critical Scenarios for Simulation-Based Automated Vehicle Evaluation - (UW-Madison Engineering/Global Health Institute)
6. Attention and Adaption of Teen Drivers to Driving Automated Systems – (UMass College of Engineering/College of Natural Sciences)

1.5.3 Collaborative research projects across SAFER-SIM or other UTC sites

1. Multi-modal Distributed Simulation Combining Cars, Bicyclists, and Pedestrians (UI/UW/UM)
2. Using Simulation to Assess and Reduce Conflicts between Drivers and Bicyclists (UI/UM/UCF)
3. Enhancing School Zone and School Bus Safety (UCF/UPR)
4. Evaluation of Safety Enhancements in School Zones with Familiar and Unfamiliar Drivers (UPR/UM)
5. The Impact of Driver's Mental Models of Advanced Vehicle Technologies on Safety and Performance (UI/UM)
6. Analyzing the Performance of Remote-Drivers on Transit Shuttle Short Routes (UW/UPR)
7. Interfacing Synchrono and NADS for Virtual Simulation of Conventional & Connected and Autonomous Vehicles (UW/UI)
8. AAAFTS/SaferSim Cooperative Research Program (UI/UM/UW/UCF)

1.5.4 Collaborations with industry partners and government agencies

Organization Name	*Location*	*Contribution*
1. Aisin Technical Center of America	Northville, MI	Financial support
2. AAA Foundation for Traffic Safety	Washington D.C.	Financial support Collaborative research
3. InSight Learning Technologies	Pacific Palisades, CA	Personnel exchange
4. Mandli Communications Inc.	Madison, WI	In-kind support Facilities Collaborative Research
5. Continental Mapping Consultants Inc	Madison, WI	In-kind support Facilities Collaborative Research
6. Council of University Transportation Centers	Washington D.C	Financial support
7. Hyundai America Technical Center Inc.	Superior Township, MI	Financial support
8. City of Orlando	Orlando, FL	Collaborative Research
9. Recreative Association of Sport	Mayaguez, PR	Facilities

Buenaventura		
10. Mayaguez Bureau of Highway Patrol	Mayaguez, PR	Facilities Personnel Exchange
11. Club de Oficinistas de Mayagüez	Mayaguez, PR	Facilities
12. Puerto Rico LTAP Center, University of Puerto Rico at Mayaguez	Mayaguez, PR	Facilities
13. VHB **New this period**	Washington D.C.	In-kind support
14. Lee Engineering **New this period**	Phoenix, AZ	In-kind support

1.5.5 Collaborative peer-reviewed journal publications
Nothing to report

1.5.6 Collaborative book chapters
Nothing to report

1.5.7 Student exchanges with other SAFER-SIM sites
Nothing to report

1.5.8 Students pursuing advanced degrees at other SAFER-SIM sites
Nothing to report

1.5.9 Programs involving community colleges
Nothing to report

1.5.10 Graduates hired at other SAFER-SIM or UTC sites
Nothing to report

1.6 Diversity

1.6.1 # SAFER-SIM projects involving underrepresented/minority (U/M) students
1. A Co-Simulation Study to Assess the Impacts of Connected and Autonomous Vehicles on Traffic Flow Stability during Hurricane Evacuation, UI
2. Analyzing the Performance of Remote-Drivers on Transit Shuttle Short Routes, UPR
3. Assess Highway Construction Workers Behavior while Driving through Work Zones in Comparison to General Drivers Sensitized Using Virtual Reality and a Driving

Simulator, UPR
4. Assessing the Effectiveness of Connected Vehicle Technologies based on Driving Simulator Experiments, UCF
5. Augmented Reality for Safer Pedestrian-Vehicle Interactions, UW
6. Deflection Angle Effect on Continuous Driver Performance Along Horizontal Curves, UM
7. Detailed Analysis of Roadway Users Interactions at Intersections with Flashing Yellow Arrows, UW
8. Driver Behavior in the Presence of E-Scooters within Varying Infrastructure, UM
9. Driver's Safety Assessment in Two-Lane Rural Road Work Zones, UPR
10. Drivers' Performance and Brain Workload Activities after Alcohol Consumption using Driving Simulation, UPR
11. Effect of Large Vehicles on Left Turn Gap Acceptance at Signalized Intersections, UW
12. Enhancing School Zone and School Bus Safety, UPR
13. Evaluation of Driver Workload and Training Strategies on a Diverging Diamond Interchange, UPR
14. Evaluation of Safety Enhancements in School Zones with Familiar and Unfamiliar Drivers, UPR
15. Extended Evaluation of Training Programs to Accelerate Hazard Anticipation Skills in Novice Teen Drivers, UI
16. Impact of Road Information Assistive Systems on Pedestrian Crossing Safety, UPR
17. Integrating Traffic Control Devices via Augmented Reality, UM
18. Mobile Applications to Help Older Adults Make Safe Street-Crossing Decisions, UI
19. Protected Intersection Design for Safer Cycling, UM
20. Safely and Effectively Communicating Non-Connected Vehicle Information to Connected Vehicles through Field- and Driving Simulator-Based Research, UW
21. Study of Gap Acceptance and Walking Speeds of Pedestrians using Virtual Reality Simulation, UPR
22. The Impact of Driver's Mental Models of Advanced Vehicle Technologies on Safety and Performance, UM
23. The Influence of Unmanned Aerial Systems on Driving Performance, UM
24. Understanding Bicyclists' Behaviors Through Learning from Big Trip Data, UI
25. Understanding of advanced vehicle technology: The role of system exposure and perceptions of other road users, UCF
26. Using Augmented Reality to Help Older Adults Make Safe Road-Crossing Decisions, UI
27. Using Simulation to Assess and Reduce Conflicts between Drivers and Bicyclists, UM
28. V2I Infrastructure Placement and Safety Implications of CAVs in an Interconnected Network, UCF

1.6.2 # U/M events attended

1. Shannon Roberts attended the UMass "Black in STEM" event with black professors, black undergraduate students, black graduate students, and allies on August 5. There were approximately 115 people in attendance.

2. Shannon Roberts & Jennifer McDermott both sat on a panel for the Spaulding-Smith Fellows program, which is for underrepresented graduate students in STEM, on August 18. There were approximately 20 students in attendance in addition to 5 other faculty of color.

1.6.3 # U/M students at attended events

135 students

1.6.4 Graduating U/M student placement

Nothing to report

1.7 Outcomes

1.7.1 Number of improved or new technologies, software, methods, or processes adopted

1. UCF – Zaki - A prototype for the pedestrian mobility behavior is developed in matlab and is being, currently, on selected real data sets
2. UCF – Managed Lane - This study has major implications for improving managed lanes (MLs) by recommending the optimal CV lane configuration and market penetration rate for each design. Hence, recommending the managed lane as connected vehicle lane might have essential benefits of the transportation road network for the expressways of United States. On the other hand, one of the biggest issues facing CVs popularization associates it with the market penetration rate (MPR). For the policy point of view, this study provides useful insight for the management of CV MPR as managed-lane CV technologies in terms of CV transition period.
3. UCF – Infrastructure Placement – Walter Guo Currently, we are developing a new agent-based simulation framework based on Repast Simphony to better capture the dynamic decision making of vehicles and V2I.
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aware of the number of runs and crashes in the experiment.

7. UW - Chrono::Sensor provided for public use within Chrono: https://github.com/projectchrono/chrono, directly developed under “Physics-Based Sensor Models for Virtual Simulation of Connected and Autonomous Vehicles”
8. UW - SynChrono provided for public use within Chrono: https://github.com/projectchrono/chrono, directly developed under “Physics-Based Sensor Models for Virtual Simulation of Connected and Autonomous Vehicles”
9. UW – Detailed Ped Vehicle Interactions - A by-product of the current research project is that the data processing methodologies developed are showing promising results in vehicle movement classifications that can be implemented on existing vehicle detection systems. Once details of the methodologies are finalized and streamlined we will explore potential implementation of the approach with an industry partner we have collaborated with in the past.

1.7.2 Stakeholders who adopt, implement or deploy SAFER-SIM research findings or technologies through policy, practice, regulation, rulemaking or legislation

1. UW - Hard to tell, but there were more than 50 companies that attended our consortium meeting on September 29 – October 1. They were interested, among other things, in the software infrastructure for AVs, which has been extensively developed with SAFER-SIM funding.

1.7.3 Number of projects that reach adoption, implementation or deployment

1. UW - The Chrono::Sensor simulation infrastructure has been deployed for public use.
2. UW - The SynChrono simulation infrastructure has been deployed for public use.

1.8 Impacts

1.8.1 Expected reductions in crashes from implemented policy, practice, regulation, rulemaking, or legislation

1. UCF – Hurricane Evac - Through road traffic automation and connectivity developed in this project, the interactions between vehicles will be analyzed, and possible sever conflicts and consequent collisions can be avoided through proactive safety information dissemination. We expect this approach for road safety will lead to a significant reduction in crashes during emergency events like highway evacuations.
2. UCF – Connected Veh - The estimate effectiveness of Connected Vehicle technology for fog-related crash is around 34.6%. In Florida, around 40 fatal crashes happened each year during fog. Thus, around 14 (40 *34.6%=14) fatal crashes are expected to be benefit from the technology.
3. UCF/AAAFTS - This research is going to better understand the safety perception of non-driving road users on advanced vehicle technologies. Education efforts can be better directed to improve the safety of transportation system based on this research.
4. UW - This research could help reduce certain types of crashes through supporting automated vehicle safety evaluations but we are unable to quantify the number.

1.8.2 Expected reduction in congestion and traffic conflicts from implemented policy, practice, regulation, rulemaking or legislation

1. UCF – Hurricane Evac - The proposed CAV approach will provide a mechanism for informing drivers about the safety conditions during evacuation scenarios and henceforth will guide them through the necessary information for better trip planning and thereby avoiding hazardous traffic.
2. UW - This research could help reduce certain types of traffic conflicts and help relieve congestion through supporting automated vehicle safety evaluation, but we are unable to quantify the number.