

Zachary D. Asher, PhD | Curriculum Vitae

Mechanical and Aerospace Engineering – Western Michigan University – Kalamazoo, MI 49008

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Professional Summary

I am actively pursuing the realization of safe and sustainable automotive transportation in a variety of global locations through collaborations with academic, industry, and government entities. I have been awarded 15 grants totaling \$4.2 million and I have co-founded the inclement weather vehicle automation company Revision Autonomy. I have 49 peer-reviewed publications with an h-index of 13 from 487 citations. My research efforts have informed existing and new mechanical engineering courses and I have an average overall instructor rating of 4.4/5. My research has been featured in 15+ TV, radio, and print articles from local news outlets.

Education

Colorado State University <i>Doctor of Philosophy in Mechanical Engineering</i> Dissertation: Enabling Hybrid Electric Vehicle Optimal Energy Management	<u>Fort Collins, CO</u> 2018
University of Colorado at Colorado Springs <i>Master of Science in Mechanical and Aerospace Engineering</i> Thesis: Orbital Analysis of Space Debris Removal Using Tether Momentum Exchange	<u>Colo. Springs, CO</u> 2012
Colorado State University <i>Bachelor of Science in Mechanical Engineering, Minor in Mathematics</i>	<u>Fort Collins, CO</u> 2009

Academic & Professional Experience

Co-Founder and Technology Advisor <i>Revision Autonomy LLC</i>	<u>Kalamazoo, MI</u> 2020-Present
Assistant Professor of Mechanical and Aerospace Engineering & Director of the Energy Efficient and Autonomous Vehicles (EEAV) Lab <i>Western Michigan University</i>	<u>Kalamazoo, MI</u> 2018-Present
Postdoctoral Researcher <i>University of Michigan, Advisor: Dr. Ilya Kolmanovsky</i>	<u>Ann Arbor, MI</u> 2018
PhD Research Assistant <i>Colorado State University, Advisor: Dr. Thomas H. Bradley</i>	<u>Fort Collins, CO</u> 2015-2018
Research Scientist <i>Colorado State University, Center for Electric Propulsion and Power Eng. (CEPPE) Lab</i>	<u>Fort Collins, CO</u> 2014-2015
Design Engineer <i>Dual Position at Birdon America, Inc. and NAMJet LLC</i>	<u>Denver, CO</u> 2013-2014

Mechanical Engineer <i>Harris Corporation</i>	<u>Colo. Springs, CO</u> 2009–2013
Undergraduate Research Assistant <i>Colorado State University, Engines and Energy Conversion Lab (EECL)</i>	<u>Fort Collins, CO</u> 2007-2009

Funded Proposals

National Science Foundation - Partnerships for Innovation (PI) <i>Commercialization of Autonomous Vehicle Software for Perception in Snow</i>	<u>\$550,000</u> 2022 (3 years)
U.S. Department of Energy - Vehicle Technologies Office (PI) <i>Energy Efficient Autonomous Vehicles Enabled Through Infrastructure</i>	<u>\$2,500,000</u> 2021 (3 years)
Michigan State Police (Co-PI) <i>Driver Shortage/Retention Research and Solutions</i>	<u>\$106,868</u> 2021 (1 year)
Michigan Translational Research & Commercialization (PI) <i>Vehicle Automation in Inclimate Weather</i>	<u>\$115,000</u> 2021 (1 year)
Allison Transmission Incorporated (PI) <i>Energy Efficiency Through Improved Shift Scheduling</i>	<u>\$50,000</u> 2021 (6 mon.)
Michigan Economic Development Center ADVANCE Fund (PI) <i>Sensor Fusion for Vehicle Automation</i>	<u>\$50,000</u> 2020 (1 year)
National Science Foundation (PI) <i>I-Corps: Vehicle Automation in Inclimate Weather</i>	<u>\$50,000</u> 2020 (1 year)
Michigan Translational Research & Commercialization (PI) <i>Vehicle Automation in Inclimate Weather</i>	<u>\$44,898</u> 2020 (1 year)
WMU Technology Development Fund (PI) <i>Vehicle Automation in Inclimate Weather</i>	<u>\$25,000</u> 2020 (1 year)
Michigan Department of Transportation (subaward) <i>Autonomous Airport Shuttle (for) 2020 North American International Auto Show</i>	<u>\$232,309</u> 2019 (6 mon.)
WMU Faculty Research and Creative Activities Award (PI) <i>Analysis of In-Motion Wireless Power Transfer</i>	<u>\$10,000</u> 2019 (1 year)
Michigan Department of Transportation (subaward) <i>Deploying Autonomous Low Speed Vehicles for students w/disabilities on WMU's campus</i>	<u>\$201,459</u> 2018 (6 mon.)
U.S. Department of Energy - Vehicle Technologies Office (+ funded ext., Co-PI) <i>Mobility and Energy Improvements (for) Vehicles</i>	<u>\$250,000</u> 2018 (3 years)
NVIDIA (PI) <i>GPU Grant Request - DRIVE PX2 for Vehicle Applications</i>	<u>\$20,000</u> 2018 (1 year)

Patents

- 1. Systems and Methods for Determining Engine Start Time During Predicted Acceleration Events**
Joshua Payne, Heraldo Stefanon, Benjamin Geller, Takanori Aoki, Thomas Bradley, **Zachary D. Asher**, David Trinko
[US Patent](#) (2021)
- 2. Systems and methods for prediction windows for optimal powertrain control**
Zachary D. Asher, David Baker, Thomas H. Bradley
[US Patent Application](#) (2019)

Peer Reviewed Journal and Book Chapter Publications

- 3. Development of Computer Vision Models for Drivable Region Detection in Snow Occluded Lane Lines**
Parth Kadav, Sachin Sharma, Farhang Motallebi Araghi, **Zachary D. Asher**
Automotive Cyber-Physical Systems
(To Appear)
- 4. Evaluation of Autonomous Vehicle Control Strategies Using Resilience Engineering**
Johan F. Rojas, Thomas H. Bradley, **Zachary D. Asher**
Automotive Cyber-Physical Systems
(To Appear)
- 5. Identifying and Assessing Research Gaps for Energy Efficient Control of Electrified Autonomous Vehicle Eco-driving**
Farhang Motallebi Araghi, Aaron Rabinowitz, Chon Chia Ang, Sachin Sharma, Parth Kadav, Richard T. Meyer, Thomas Bradley, **Zachary D. Asher**
Automotive Cyber-Physical Systems
(To Appear)
- 6. Development of an Energy Efficient and Cost Effective Autonomous Vehicle Research Platform**
Nicholas E. Brown, Johan F. Rojas, Nicholas A. Goberville, Hamzeh Alzu'bi, Qussay AlRousan, Ross Wang, Jackie Rios-Torres, Shean Huff, Tim LaClair, and **Zachary D. Asher**
Sensors
[Technical Paper](#) (2022)
- 7. Vehicle Performance Analysis of a Wheelchair Accessible Autonomous Electric Shuttle**
Johan F. Rojas, Kamolnat Tabattanon, Nicholas A. Goberville, Clive D'Souza, **Zachary D. Asher**
SAE Mobility Journal
[Technical Paper](#) (2022)
- 8. Development and Evaluation of Velocity Predictive Optimal Energy Management Strategies in Intelligent and Connected Hybrid Electric Vehicles**
Aaron Rabinowitz, Farhang Motallebi Araghi, Tushar Gaikwad, **Zachary D. Asher**, Thomas H. Bradley

Energies

[Technical Paper](#) (2021)

9. Biomass Feedstock Transport Using Fuel Cell and Battery Electric Trucks Improves Lifecycle Metrics of Biofuel Sustainability and Economy

Nawa Raj Baral, **Zachary D. Asher**, David Trinko, Evan Sproul, Carlos Quiroz-Arita, Jason C. Quinn, Thomas H. Bradley

Journal of Cleaner Production

[Technical Paper](#) (2021)

10. Real-Time Implementation of Optimal Energy Management in Hybrid Electric Vehicles: Globally Optimal Control of Acceleration Events

Zachary D. Asher, David Trinko, Joshua Payne, Benjamin Geller, Thomas Bradley

Journal of Dynamic Systems, Measurement, and Control

[Technical Paper](#) (2020)

11. Analysis of LiDAR and Camera Data in Real-World Weather Conditions for Autonomous Vehicle Operations

Nick Goberville, Mohammad El-Yabroudi, Mark Omwanas, Johan Rojas, Rick Meyer, **Zachary D. Asher**, and Ikhlas Abdel-Qader

2020 SAE International Journal of Advances and Current Practices in Mobility

[Technical Paper](#) (2020)

12. Identification and Review of the Research Gaps Preventing a Realization of Optimal Energy Management Strategies in Vehicles

Zachary D. Asher, Amol A. Patil, Andrew A. Frank, Thomas H. Bradley

SAE International Journal of Alternative Powertrains

[Technical Paper](#) (2019)

13. Economic Viability and Environmental Impact of In-Motion Wireless Power Transfer

Braden J. Limb, **Zachary D. Asher**, Thomas H. Bradley, Evan Sproul, David A. Trinko, Benjamin Crabb, Regan Zane, Jason C. Quinn

2018 IEEE Transactions on Transportation Electrification

[Technical Paper](#) (2018)

14. Increasing the Fuel Economy of Connected and Autonomous Lithium Ion Electrified Vehicles

Zachary D. Asher, David A. Trinko, and Thomas H. Bradley.

Behaviour of Lithium-ion Batteries in Electric Vehicles

[Technical Paper](#) (2018)

15. Prediction Error Applied to Vehicle Optimal Fuel Economy

Zachary D. Asher, David A. Baker, and Thomas H. Bradley

IEEE Transactions on Control Systems Technology

[Technical Paper](#) (2017)

Peer Reviewed Conference Publications

- 16. Development and Evaluation of Chip-Enabled Raised Pavement Markers for Lane Line Detection**
Sachin Sharma, Ali Riza Ekti, Johan F. Rojas, Nicolas E. Brown, David Pesin, Chieh (Ross) Wang, Shean Huff, Tim J. LaClair, Zachary D. Asher, and Richard T. Meyer
IEEE Sensors 2022
(To Appear)
- 17. Tire Track Identification: Application of U-Net Deep Learning Model for Drivable Region Detection in Snow Occluded Conditions**
Parth Kadav, Nicholas A. Goberville, Farhang Motallebiaraghi, Alvis Fong, and Zachary D. Asher
Intelligent Transportation Systems World Congress 2022
(To Appear)
- 18. Model-in-the-Loop Control Strategy Evaluation Procedure for an Autonomous Parking Lot Sweeper**
Johan F. Rojas, Yifan Wei, Zachary D. Asher, Yong Sun
2022 SAE World Congress Experience
[Technical Paper](#)
- 19. Tire Track Identification: A Method for Drivable Region Detection in Conditions of Snow-Occluded Lane Lines**
Nicholas A. Goberville, Parth Kadav, Zachary D. Asher
2022 SAE World Congress Experience
[Technical Paper](#)
- 20. Performance Evaluation of an Autonomous Vehicle Using Resilience Engineering**
Johan F. Rojas, Nicholas E. Brown, Jeff Rupp, Thomas H. Bradley, Zachary D. Asher
2022 SAE World Congress Experience
[Technical Paper](#)
- 21. Higher Accuracy and Lower Computational Perception Environment Based Upon a Real-time Dynamic Region of Interest**
Nicholas E. Brown, Johan F. Rojas, Hamzeh Alzu'bi, Qussay Alrousan, Richard Meyer, Zachary D. Asher
2022 SAE World Congress Experience
[Technical Paper](#)
- 22. High-Fidelity Heavy-Duty Vehicle Modeling Using Sparse Telematics Data**
Kyle Carow, Nathaniel Cantwell, Andrej Ivanco, Jacob Holden, Chad Baker, Eric Miller, Zachary D. Asher
2022 SAE World Congress Experience
[Technical Paper](#)

- 23. Mobility Energy Productivity Evaluation of Prediction-Based Vehicle Powertrain Control Combined with Optimal Traffic Management**
Farhang Motallebiaraghi, Kaisen Yao, Aaron Rabinowitz, Christopher Hoehne, Venu Garikapati, Jacob Holden, Eric Wood, Suren Chen, **Zachary D. Asher**, Thomas H. Bradley
2022 SAE World Congress Experience
[Technical Paper](#)

- 24. Autonomous Eco-Driving with Traffic Light and Lead Vehicle Constraints: An Application of Best Constrained Interpolation**
Yara Hazem Mahmoud, Nicholas E. Brown, Farhang Motallebiaraghi, Melinda Koelling, Richard Meyer, **Zachary D. Asher**, Assen Dontchev, Ilya Kolmanovsky
6th IFAC Conference on Engine Powertrain Control, Simulation and Modeling, E-COSM 2021
[Technical Paper](#)

- 25. Techno-Economic Analysis of Fixed-Route Autonomous and Electric Shuttles**
Nicholas A. Goberville, Md Marsad Zoardar, Johan F. Rojas, Nicholas E. Brown, Farhang Motallebiaraghi, Anthony Navarro, **Zachary D. Asher**
2021 SAE World Congress Experience
[Technical Paper](#)

- 26. No Cost Autonomous Vehicle Advancements in CARLA through ROS**
Gabriel Prescinotti Vivan, Nicholas A. Goberville, **Zachary D. Asher**, Nicholas E. Brown, Johan F. Rojas
2021 SAE World Congress Experience
[Technical Paper](#)

- 27. High-Fidelity Modeling of Light-Duty Vehicle Emission and Fuel Economy Using Deep Neural Networks**
Farhang Motallebiaraghi, Aaron Rabinowitz, Shantanu Jathar, Alvis Fong, **Zachary D. Asher**, Thomas Bradley
2021 SAE World Congress Experience
[Technical Paper](#)

- 28. Observer for Faulty Perception Correction in Autonomous Vehicles**
Mark Omwansa, Rick Meyer, **Zachary D. Asher**, Nicholas A. Goberville
2020 SAE World Congress Experience
[Technical Paper](#)

- 29. Vehicle Velocity Prediction Using Artificial Neural Network and Effect of Real World Signals on Prediction Window**
Tushar Gaikwad, Aaron Rabinowitz, Farhang Motallebiaraghi, Thomas Bradley, **Zachary D. Asher**, Alvis Fong, Richard Meyer
2020 SAE World Congress Experience
[Technical Paper](#)

- 30. Synchronous and Open, Real World, Vehicle, ADAS, and Infrastructure Data Streams for Automotive Machine Learning Algorithms Research**
Aaron I. Rabinowitz, Tushar Gaikwad, Samantha White, Thomas Bradley, **Zachary D. Asher**
2020 SAE World Congress Experience
[Technical Paper](#)
- 31. Using Reinforcement Learning and Simulation to Develop Autonomous Vehicle Control Strategies**
Anthony Navarro, Sahika Genc, Premkumar Rangarajan, Rana Khalil, Nicholas A. Goberville, Johan Fanas Rojas, **Zachary D. Asher**
2020 SAE World Congress Experience
[Technical Paper](#)
- 32. Improving the Range of Electric Vehicles**
Parth Kadav, **Zachary D. Asher**
2019 Electric Vehicles International Conference
[Technical Paper](#)
- 33. Vehicle Velocity Prediction and Energy Management Strategy Part 2: Integration of Machine Learning Vehicle Velocity Prediction with Optimal Energy Management to Improve Fuel Economy**
Tushar D Gaikwad, **Zachary D. Asher**, Kuan Liu, Mike Huang, Ilya Kolmanovsky
2019 SAE World Congress Experience
[Technical Paper](#)
- 34. Vehicle Velocity Prediction and Energy Management Strategy Part 1: Deterministic and Stochastic Vehicle Velocity Prediction Using Machine Learning**
Kuan Liu, **Zachary D. Asher**, Xun Gong, Mike Huang, Ilya Kolmanovsky
2019 SAE World Congress Experience
[Technical Paper](#)
- 35. Space Debris Field Removal Using Tether Momentum Exchange**
Zachary D. Asher, Steven Tragesser, Christian Kneubel, Jennifer Hudson, Thomas H. Bradley, Ilya Kolmanovsky
2018 Astrodynamics Specialist Conference
[Technical paper](#)
- 36. The Use of Systems Engineering Principles to Improve Learning Outcomes in a Multidisciplinary Course**
Zachary D. Asher, Nicole Ramo, and Thomas H. Bradley
2018 American Society for Engineering Education (ASEE) Summer Conference
[Technical paper](#)
- 37. Electrification of Class 8 Trucking: Economic Analysis of In-Motion Wireless Power Transfer Compared to Long-Range Batteries**
Evan Sproul, **Zachary D. Asher**, David A. Trinko, Thomas H. Bradley, and Jason C. Quinn
2018 IEEE Transportation Electrification Conference

Technical paper

38. An Adaptive Green Zone Strategy for Hybrid Electric Vehicle Control

David A. Trinko, Eric A. Wendt, **Zachary D. Asher**, Marco Peyfuss, John Volckens, Jason C. Quinn, and Thomas H. Bradley

2018 IEEE Transportation Electrification Conference

Technical paper

39. Enabling Prediction for Optimal Fuel Economy Vehicle Control

Zachary D. Asher, Jordan Tunnel, David Baker, Robert Fitzgerald, Farnoush Banaei-Kashani, Sudeep Pasricha, and Thomas Bradley

2018 SAE World Congress and Exhibition

Technical Paper

40. Economic and Efficient Hybrid Electric Vehicle Fuel Economy and Emissions Modeling Using an Artificial Neural Network

Zachary D. Asher, Abril Galang, Thomas H. Bradley, and Shantanu Jathar

2018 SAE World Congress and Exhibition

Technical Paper

41. Towards Improving Vehicle Fuel Economy with ADAS

Jordan Tunnel, **Zachary D. Asher**, Sudeep Pasricha, and Thomas H. Bradley

2018 SAE World Congress and Exhibition

Technical Paper

42. Application of Pre-Computed Acceleration Event Control to Improve Fuel Economy in Hybrid Electric Vehicles

David Trinko, **Zachary D. Asher**, and Thomas H. Bradley

2018 SAE World Congress and Exhibition

Technical Paper

43. Vehicle Electrification in Chile: A Life Cycle Assessment and Techno-Economic Analysis Using Data Generated by Autonomie Vehicle Modeling Software

Carlos Quiroz-Arita, **Zachary D. Asher**, Nawa Baral, and Thomas H. Bradley

2018 SAE World Congress and Exhibition

Technical Paper

44. V2V Communication Based Real-World Velocity Predictions for Improved HEV Fuel Economy

David A. Baker, **Zachary D. Asher**, and Thomas H. Bradley

2018 SAE World Congress and Exhibition

Technical Paper

45. Development of an Autonomous Vehicle Control Strategy Using a Single Camera and Deep Neural Networks

Anthony Navarro, Jendrik Joerdening, Rana Khalil, Aaron Brown, and **Zachary D. Asher**

2018 SAE World Congress and Exhibition

Technical Paper

46. Investigation of Vehicle Speed Prediction from Neural Network Fit of Real World Driving Data for Improved Engine On/Off Control of the EcoCAR3 Hybrid Camaro

David A. Baker, **Zachary D. Asher**, and Thomas H. Bradley

2017 SAE World Congress and Exhibition

Technical Paper

47. The Importance of HEV Fuel Economy and Two Research Gaps Preventing Real World Implementation of Optimal Energy Management

Zachary D. Asher, Van Wifvat, Anthony Navarro, Scott Samuelsen, and Thomas Bradley.

2017 SAE World Congress and Exhibition

Technical Paper

48. The Effect of Hill Planning and Route Type Identification Prediction Signal Quality on Hybrid Vehicle Fuel Economy

Zachary D. Asher, Thomas Cummings, and Thomas H. Bradley

2016 SAE World Congress and Exhibition

Technical Paper

49. The Effect of Trip Preview Prediction Signal Quality on Hybrid Vehicle Fuel Economy

Thomas Cummings, Thomas H. Bradley, and **Zachary D. Asher**

2015 Engine and Powertrain Control, Simulation and Modeling (E'COSM)

Technical Paper

Graduate Students

1. PhD -Pritesh Patil (Anticipated graduation 2026)
2. PhD -Parth Kadav (Anticipated graduation 2025)
3. PhD - Nicholas Brown (Anticipated graduation 2023)
4. PhD - Farhang Motallebi Araghi (Anticipated graduation 2023)
5. PhD - Johan Fanas Rojas (Anticipated graduation 2023)
6. MS - Kyle Carow (Anticipated graduation 2022)
7. PhD - Nick Goberville (2022)
8. MS - Yara Mahmoud (2021)
9. MS - Johan Fanas Rojas (2020)
10. MS - Yogesh Jagdale (2020)
11. MS - Tushar Gaikwad (2019)
12. MS - Amol Patil (2019)

Teaching

<p>ME 3580: Mechanism Analysis Graphical, analytical, and numerical techniques are developed for position, velocity, acceleration, and force analysis of various mechanisms including four-bar linkages, crank-slider linkages, cam-driven linkages, and gear trains. Solidworks, Python, and MSC Adams software are used.</p>	<p>Fall 2018, Spring 2019, Fall 2019, Fall 2020, Fall 2021, Fall 2022</p>
<p>ME 4650: Vehicle Dynamics Ride quality, handling, and safety requirements are used to design passive and active ground vehicle suspension and steering systems. Analysis techniques are developed using analytical solutions and commercial software using Python and MSC Adams.</p>	<p>Spring 2020, Spring 2021, Spring 2022, Spring 2023</p>
<p>ME 5950/6950: Autonomous Vehicles This interdisciplinary course combines sensing, computer vision, artificial intelligence, controls, and systems engineering using hands-on experiences with real sensors and real commercial vehicles. Python, ROS, and Carla software are used.</p>	<p>Spring 2020, Summer II 2021, Spring 2023</p>
<p>ME 5950/6950: Electric Vehicles This applications-focused interdisciplinary course utilizes the Python programming language to model and evaluate electric vehicles and their role in automotive transportation.</p>	<p>Spring 2022</p>
<p>AE 4700: Orbital Mechanics Introduction to astrodynamics, including the two-body problem and restricted three-body problem, orbital trajectories, transfers and targeting, and orbit determination. Computer modeling and simulation of orbital trajectories.</p>	<p>Spring 2021</p>
<p>Graduate Teaching Certificate from The Institute for Learning and Teaching (TILT) at Colorado State University Completed teaching seminar reviews, 20 hours of teaching service, and published a teaching portfolio.</p>	<p>2018</p>

Academic Service

<p>Media Coverage 15+ TV, radio, and articles from WMU and local news outlets</p>	<p>2019 -Present</p>
<p>WMU Committees MAE Graduate Curriculum, MAE Seminar, and 2 hiring committees</p>	<p>2018 -Present</p>
<p>Marketing Created official university lab website, helped design logo and car wrap</p>	<p>2019 -Present</p>
<p>Facilities Upgrades Lab space remodel and update, nearly \$300k in externally funded equipment to</p>	<p>2018 - Present</p>

be used for research and teaching

Conference Organizer

2020 -Present

SAE World Congress - Autonomous Vehicle Perception Systems

Publication Reviewer

2015 -Present

SAE World Congress, IEEE Transactions on Intelligent Transportation Systems, ASME Journal of Journal of Autonomous Vehicles and Systems, IEEE Transactions on Intelligent Vehicles, IEEE Transactions on Transportation Electrification, IEEE Transactions on Control System Technology, IFAC American Controls Conference, IFAC Engine and Powertrain Control, Simulation and Modeling, ASME Journal of Dynamic Systems, Measurement and Control, and the ASEE annual conference.