Natnael M. Negash

+1-469-396-1304 | natnael_negash@baylor.edu | Personal Website
LinkedIn Profile | ORCiD ORCiD Account | GoogleScholar | ResearchGate
Waco, TX - 76798-7356, USA

Summary

I am a researcher and educator specializing in dynamics, control, and intelligent systems, with expertise in system modeling, advanced control, machine learning, and optimization. My research focuses on developing safe, efficient, and intelligent solutions for autonomous transportation systems, including autonomous ground vehicles, aerial vehicles, and eVTOL platforms, with applications to next-generation smart mobility.

Education

- **Texas Tech University** *Aug. 2019 - Aug. 2024*
  Ph.D. in Mechanical Engineering Lubbock, TX, USA
  - **Dissertation:** Socially Compatible Behavior Prediction, Decision-making, and Control for Autonomous Vehicles in Mixed Traffic
  - **GPA:** 3.98/4.00
- **Addis Ababa University** *July 2016*
  MSc. in Mechanical Engineering Addis Ababa, Ethiopia
- **Adama Science and Technology University** *July 2012*
  BSc. in Mechanical Engineering Adama, Ethiopia

Experience

- **Baylor University [🌐]** *Aug. 2024 - Present*
  Postdoctoral Research Associate Waco, TX, USA
  - Engaged on a NASA ULI project in developing a mobility energy coordinated platform for efficient infrastructure planning to support advanced air mobility (AAM) operations. The tasks include modeling flight energy consumption, battery dynamics, and trip requests; assessing energy costs, emissions, and reliability from an electric grid perspective; and developing a holistic optimization model for AAM portal siting that considers an electric grid readiness assessment.
  - Prepared and submitted external funding proposals to obtain competitive research grants.
  - Co-taught advanced graduate courses, including **Introduction to Reinforcement Learning** and **Applied Reinforcement Learning**.
  - Advised more than 6 Ph.D. and MSc. Students.
  - Led outreach events and US Drone Soccer initiatives at Baylor University, guiding students in assembling and configuring over 10 soccer drones.
- **Texas Tech University [🌐]** *Aug. 2019 - Aug. 2024*
  Graduate Research Assistant Lubbock, TX, USA
  - Developed a human-like longitudinal driving control system for automated platoons using intelligent control algorithms.
  - Formulated a string-stable platoon control approach incorporating intelligent approximation methods and enhanced inter-vehicle spacing policies.
  - Devised a deep reinforcement learning-based longitudinal motion control strategy for autonomous vehicles to maintain string-stable formation.
  - Investigated and advanced a socially aware, interactive control strategy for autonomous vehicles.
  - Designed and developed context-aware motion prediction techniques for road participants to improve autonomous vehicle decision-making.
- **Addis Ababa Institute of Technology [🌐]** *Aug. 2012 - July 2019*
  Lecturer Addis Ababa, Ethiopia
  - Served as a course instructor: Oversaw classrooms of 50+ students through expert public speaking and engaging educational activities to meet all learning targets for the courses assigned.
  - Served as a course coordinator for over 10 sections of undergraduate pre-engineering students, each section comprising more than 50 students.
  - Served as an undergraduate thesis advisor for two research projects in 2016 and 2017: 'Domestication of Rotavator Tiller for Ethiopian Landscape' and 'Baby Shoe Sole Mould Design.'
- **Belay Ab Motors [🌐]** *Oct. 2012 - Mar. 2013*
  Spare Part Engineer Addis Ababa, Ethiopia
  - Performed in-depth assessments of vehicle components, identifying critical replacements to enhance reliability and performance.

- Verified and qualified parts to ensure strict compliance with design specifications and industry standards.
- Designed detailed layouts and curated inventories to launch a new spare parts warehouse, streamlining storage and retrieval processes.
- Coordinated and resolved spare part inquiries from leading automotive suppliers, strengthening supplier relationships and ensuring timely fulfillment.

- **Wonji Shoa Sugar Factory [🌐]** *Oct. 2011 – Mar. 2012*
  Mechanical Engineering Intern Wonji, Ethiopia
  - Studied and compiled a feasibility study report assessing the performance of boiler systems, centrifugal pumps, and vacuum plants while conducting an in-depth analysis of their operational efficiency.
  - Utilized theoretical scientific principles to develop benchmarking strategies for enhancing efficiency in manufacturing workshops and optimizing various activities within the production process.

PROJECTS

- **Project A: NASA University Leadership Initiative** *Aug. 2024 - Jul. 2026*
  Tools: Centralized and decentralized metaheuristic and learning algorithms for optimal scheduling and charging demand [🌐]
- **Project B: Toyota Mothership Project** *2024*
  Tools: Reinforcement Learning
  - Assisted and Developed a reinforcement learning controller for maximizing energy harvesting of wind kites

PUBLICATIONS

C=CONFERENCE, J=JOURNAL, P=PATENT, S=IN SUBMISSION

[S.3] **Negash, M. Natnael**, Prell, Ryan, Sun, Liang, Jiang, Lulin, Fan, Chao, Shi, Di, Wang, Fengyu, Song, Houbing, "**Review of Technologies for Vegetation Management, Wildfire Detection, and Suppression: State of the Art and Research Gaps**."

[S.2] Yang Y., **Negash, M. Natnael**, and Yang J., "**Dynamic Lane-Changing Motion Planning for Autonomous Vehicles: A Hybrid Safety-Aware Path Planning and Enhanced Sampling-Exploration MPPI Framework**."

[S.1] **Negash, M. Natnael**, Tang S., Yang J., and Sun L., "**Dual-Layer CBF-MPPI with Safety Projection: Safety-Critical Model Predictive Path Integral Control for Autonomous Vehicles**."

[J.6] **Negash, M. Natnael**, Yang Y., and Yang J., "**Socially Compatible Decision-Making of Autonomous Vehicles: A Probabilistic Rationally Bounded Game Theoretic Approach**.", Automotive Innovation, 2026 [In Press].

[J.5] Yang Y., **Negash, M. Natnael**, and Yang J., "**Autonomous Vehicle Lane-Changing Decision-Making via Social Value Orientation and Cumulative Prospect Theory: Development, Parameter Identification, and Validation**." ASME. J. Auton. Veh. Sys. January 2026; 6(1): 011003. doi: 10.1115/1.4070633.

[J.4] Yang Y., **Negash, M. Natnael**, and Yang J., "**Recent Advances in Interactive Driving of Autonomous Vehicles: Comprehensive Review of Approaches**," Aut. Innov., doi: 10.1007/s42154-024-00332-w, April 2025. [Impact factor: **4.8**].

[J.3] **Negash M. Natnael**, Tang S., and Yang J., "**Prescribed Performance Backstepping and Sliding Mode Control for Automated Platoons With Internal Type-2 Fuzzy Logic and Exponential Spacing Policy**," ASME Journal of Autonomous Vehicles and Systems, vol. 4 no. 3, 2024, doi: 10.1115/1.4066315.

[J.2] **Negash, M. Natnael**, Yang J., "**Driver Behavior Modeling Towards Autonomous Vehicles: A Comprehensive Review**," IEEE Access, 11:2023, pp. 22788-22821, doi: 10.1109/ACCESS.2023.3249144 [Impact factor: **3.557**].

[J.1] **Negash, M. Natnael**, Yang J., "**Anticipation-Based Autonomous Platoon Control Strategy with Minimum Parameter Learning Adaptive Radial Basis Function Neural Network Sliding Mode Control**, SAE Int. J. Veh. Dyn., Stab., and NVH, 6(3):2022, doi: 10.4271/10-06-03-0017 [Impact factor: **2.8**].

[C.12] **Negash, M. Natnael**, and Liang Sun, "**Synergistic Skies: Distributed Optimization for eVTOL Dispatching and Charging in Advanced Air Mobility**," in Proceedings of AIAA SCITECH 2026 Forum, 12-16 January 2026, Orlando, FL, USA.

[C.11] Sergio C. Ochoa, **Negash, M. Natnael**, and Liang Sun, "**Parameter Estimation for Flight Energy Consumption Models using Kalman Filtering**," in Proceedings of AIAA SCITECH 2026 Forum, 12-16 January 2026, Orlando, FL, USA.

[C.10] Sofia Aranda Rocha, **Negash, M. Natnael**, and Liang Sun, "**Deep Reinforcement Learning for Energy-Aware Path Planning of Multicopters in 3D Dynamic Environments**," in Proceedings of AIAA SCITECH 2026 Forum, 12-16 January 2026, Orlando, FL, USA.

[C.9] Liang Sun, Ryan Prell, Reagan Rubio, Joseph Soughtout, and **Negash, M. Natnael**, "**A Decision-Making Framework for Autonomous Aerial Vehicles in Responding to GPS Loss**," in Proceedings of AIAA SCITECH 2026 Forum, 12-16 January 2026, Orlando, FL, USA.

[C.8] Sofia Aranda Rocha, **Negash, M. Natnael**, and Liang Sun, "**Energy-Efficient Path Planning for Multicopters in Dynamic Wind Conditions Through Deep Reinforcement Learning**," in 2025 AIAA DATC/IEEE 44th Digital Avionics Systems Conference (DASC), 14-18 Sep. 2025, Montreal, QC, Canada, doi: 10.1109/DASC66011.2025.11257248.

[C.7] **Negash, M. Natnael**, Liang Sun, Chao Fan, Di Shi, and Fengyu Wang, "**Review of Wildfire Detection, Fighting, and Technologies: Future Prospects and Insights**," in Proceedings of AIAA Aviation Forum and Ascend 2025-3469, July 21-25, 2025, Vegas, NV, USA.

[C.6] Sergio C. Ochoa, **Negash, M. Natnael**, Liang Sun, and George Gorospe, "**Flight Energy Consumption Modeling and Analysis for Advanced Air Mobility**," in Proceedings of AIAA Aviation Forum and Ascend 2025-3469, July 21-25, 2025, Vegas, NV, USA.

[C.5] Yang Y., **Negash, M. Natnael**, and Yang J., "**Human-Like Lane-Changing Decision-Making Using Cumulative Prospect Theory and Social Value Orientation**," to be Presented at AVT-02/07: Advances in methods for intelligent vehicle systems design, August 17–20, 2025, Anaheim, CA, USA.

[C.4] Yang Y., **Negash, M. Natnael**, and Yang J., "**Influence of Prediction Horizon on Trajectory Optimization for Autonomous Vehicle Maneuvers**," WCX SAE World Congress Experience 2025, Technical Paper, ISSN: 0148-7191, 2025.

[C.3] Aranda S. R, **Negash, M. Natnael**, Sun L. "**Energy-Efficient Control for Multicopters in the Presence of Wind for Advanced Air Mobility**," in Proceedings of AIAA 2025-2281, January 06-10, 2025, Orlando, FL, USA.

[C.2] **Negash M. Natnael**, Yang J., "**Safe Autonomous Vehicle Cooperative Cruise Control With Deep Reinforcement Learning**," in Proceedings of IDETC/CIE, August 20-23, 2023, Boston, MA, USA.

[C.1] **Negash, M. Natnael**, Yang J., "**Coupled Integral Sliding Mode Control for Bidirectional Automated Platoon with an Exponential Spacing Policy and Uncertainty Approximation**," in *Proceedings of IDETC/CIE*, August 14-17, 2022, St. Louis, MO, USA. **[Best Student Paper Award]**

Teaching Experience

- **Graduate Courses:**
  Introduction to Reinforcement Learning, Fall 2024
  Applied Reinforcement Learning, Spring 2025
- **Undergraduate Courses:**
  Engineering Mechanics: Dynamics
  Numerical Methods
  Engineering Drawing
  Machine Drawing
  Strength of Materials I and
  Strength of Materials II.

Skills

- **Programming:** MATLAB/Simulink, Python, Simscape
- **Design and Simulation Tools:** RoadRunner, CARLA, SUMO, ABAQUS, CATIA/AutoCAD
- **Documentation:** MS Word, LaTeX
- **Control Theory:** Model Predictive Control (MPC), Model Predictive Path Integral Control (MPPI), Linear Quadratic Regulator (LQR), Proportional Integrator Derivative (PID), Sliding Mode Control, Deep Reinforcement Learning, Uncertainty and Disturbance Estimator (UDE), Backstepping Control, Neural Network and Fuzzy Approximation, Advanced State Estimation and Kalman Filtering, etc.
- **Training Certifications:** Machine Learning (Stanford University), Jan. 2022, Introduction to Self-Driving Cars (University of Toronto - Dec. 2023), State Estimation and Localization for Self-Driving Cars (University of Toronto- Jan. 2024), Motion Planning for Self-Driving Cars (University of Toronto - Jan. 2024.)
- **Soft Skill:** Leadership, hardworking, teamwork, interpersonal skills, time management, problem-solving, research, writing, accelerated learning, public speaking, attention to detail, presentation skills, ability to learn quickly.

Honors and Awards

- **Best Student Paper Award** *Aug. 2022*
  ASME 24th Int. Conf. on Adv. Veh. Tech. (AVT) [🌐]
  ◦ Awarded to the paper title "**Coupled Integral Sliding Mode Control for Bidirectional Automated Platoon with an Exponential Spacing Policy and Uncertainty Approximation**"
- **Doctoral Dissertation Completion Fellowship** *Aug. 2023*
  Texas Tech Graduate School [🌐]

Professional Service

1. **Reviewing Article**
   - American Control Conference (ACC)
     SAE International Journal of Vehicle Dynamics, Stability, and NVH
     IEEE Transactions on Human-Machine Systems
     Journal of Human Factors and Ergonomics in Manufacturing
     IEEE Transactions on Vehicular Technology
     International Journal of Advanced Robotic Systems
     Journal of Guidance, Navigation and Control
     ASME Journal of Dynamic Systems, Measurement and Control
2. **Session Chairing**
   - **AIAA AVIATION Forum 2025:** Served as a chair for seven presentations in sessions IS-01/ISG-01 Adaptive Systems and Sensor Systems and IS-03/GNC-01 GNC in Intelligent Systems
3. **Editorial Review Board:** SAGE Journal of Advanced Robotic Systems

Professional Memberships

- **American Institute of Aeronautics and Astronautics (AIAA)**, Membership ID: 1760736 *2024 - Present*
- **Institute of Electrical and Electronics Engineers (IEEE)**, Membership ID: 98655665 *2022 - Present*
- **American Society of Mechanical Engineers (ASME)** *2021 - Present*
- **Society of Automotive Engineers (SAE)**, Membership ID: 6155272923 *2021 - Present*

Grant Writing Experience

- FIRE-SAGE: Fire Learning and Reasoning Engine: Satellite-Aerial-Grounded-Edge AI
  Grant Amount: $485,610
  Source of Support: National Science Foundation