Natnael M. Negash

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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

- **Texas State University [🌐]** — *Aug. 2026 – Present*
  Assistant Professor, Mechanical Engineering — San Marcos, TX, USA
  - PI of Safe Autonomy for Mobility Systems (SAMS) laboratory. Lead research in **dynamics, control, autonomous systems, and intelligent mobility**, emphasizing decision-making, motion planning, safety-critical control, and optimization for autonomous ground and aerial systems.
  - Advise and mentor graduate and undergraduate students in research, technical development, scholarly publication, and laboratory activities.
- **Baylor University [🌐]** — *Aug. 2024 – Aug. 2026*
  Postdoctoral Research Associate — Waco, TX, USA
  - Conducted research under a NASA University Leadership Initiative (ULI) project focused on mobility-energy coordination and infrastructure planning for advanced air mobility (AAM).
  - Co-taught graduate courses in **Introduction to Reinforcement Learning** and **Applied Reinforcement Learning**, and mentored graduate and undergraduate researchers.
  - Supported STEM outreach and U.S. Drone Soccer activities, including student training, drone assembly, configuration, and operation.
- **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.
  - Developed deep reinforcement learning-based longitudinal control strategies for autonomous vehicles to maintain string-stable formations.
  - Investigated socially aware and interactive decision-making and control strategies for autonomous vehicles.
  - Developed context-aware motion-prediction techniques for surrounding road users to improve autonomous vehicle decision-making.
- **Addis Ababa Institute of Technology [🌐]** — *Aug. 2012 – July 2019*
  Lecturer — Addis Ababa, Ethiopia
  - Taught undergraduate mechanical engineering courses and managed classes of more than 50 students through lectures, problem-solving sessions, and engineering applications.
  - Served as course coordinator for more than 10 sections of undergraduate pre-engineering students, with over 50 students per section.
  - Advised undergraduate thesis projects, including “Domestication of Rotavator Tiller for Ethiopian Landscape” and “Baby Shoe Sole Mould Design.”
- **Belay Ab Motors [🌐]** — *Oct. 2012 – Mar. 2013*
  Spare Parts Engineer — Addis Ababa, Ethiopia

- Performed technical assessments of vehicle components and identified replacement requirements to support vehicle reliability and maintenance.
- Verified spare parts for compliance with design specifications and applicable technical standards.
- Developed warehouse layouts and inventory organization procedures to support efficient storage and retrieval of automotive components.
- Coordinated technical inquiries with automotive suppliers to support parts identification, procurement, and timely fulfillment.

- **Wonji Shoa Sugar Factory [🌐]** *Oct. 2011 – Mar. 2012*
  Mechanical Engineering Intern Wonji, Ethiopia
  - Conducted performance assessments of boiler systems, centrifugal pumps, and vacuum systems and contributed to a technical feasibility study.
  - Applied mechanical engineering principles to evaluate manufacturing operations and develop recommendations for improving workshop and production efficiency.

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.2] **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.1] 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**."

[J.7] **Negash, M. Natnael**, Tang S., Yang J., and Sun L., "**Dual-Layer Safety Projection for Model Predictive Path Integral Control Using Control Barrier Functions in Autonomous Driving**." IEEE Open Journal of Control Systems on October 1, 2026, DOI: 10.1109/OJCSYS.2026.3740020.

[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.13] Yang Y., **Negash, M. Natnael**, and Yang J., "**Towards Human-Like Lane-Changing Reference Trajectory: A Novel Dynamic Path Planner for Autonomous Vehicles**," in 2026 IEEE Intelligent Vehicles Symposium (IV), 22-25 June 2026, Plymouth, MI, USA.

[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, Baylor University)
  Applied Reinforcement Learning (Spring 2025, Baylor University)
- **Undergraduate Courses:**
  Engineering Mechanics: Dynamics (Fall 2026, TXSU)
  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-Integral-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