JIE WANG
CURRICULUM VITAE

E5-4119, University of Waterloo
200 University Avenue West
Waterloo, ON N2L 3G1, Canada

Email: jwangjie@outlook.com
Website: www.jiewang.name

(Last updated: April 12, 2023.)

RESEARCH INTERESTS

I aim to advance the safe and reliable operation of mobile robots and autonomous systems. My research involves developing algorithms that combine the high-performance benefits of machine learning with the stability and safety guarantees of model-based control. Specifically, I focus on applying machine learning techniques to dynamic modeling and control for field robots and autonomous vehicles. I am dedicated to enhancing the performance and safety of robotic systems operating in complex and dynamic environments.

Key Words: Mobile robots, Learning-based control, Machine learning, Mechatronics Engineering.

EMPLOYMENT

Research Associate (Advisor: Prof. Yash Pant and Prof. Sebastian Fischmeister)   2022.03– present
Department of Electrical and Computer Engineering, University of Waterloo, Canada.
- Work on safe learning-based control of autonomous vehicle platoons interacting with human-driven vehicles.

Postdoctoral Fellow (Advisor: Prof. Joshua Marshall and Prof. Brian Surgenor)   2020.02–2021.09
Department of Electrical and Computer Engineering, Queen's University, Canada.
- Proposed a high-performance path following algorithm that combines Gaussian processes based learning and feedback linearization with model predictive control for ground mobile robots operating in off-road terrains.
- Developed a quantitative comparison method of motion accuracy simulations for ground mobile robots in four simulation environments: CoppeliaSim (V-REP), Gazebo, MORSE, and Webots.

Postdoctoral Fellow (Advisor: Prof. Mozhdeh Shahbazi and Prof. Gunho Sohn)   2018.10–2020.01
Department of Geomatics Engineering, University of Calgary, Canada.
Department of Earth and Space Science and Engineering, York University, Canada.
- Developed a robust multi-vehicle tracking algorithm for unmanned aerial vehicles that combined a deep convolutional neural network to extract deep appearance features and a Kalman filter to estimate motions.
- Implemented visual SLAM solutions including LSD-SLAM, ORB-SLAM2, and LDSO on unmanned aerial vehicles and evaluated map quality.

Research Assistant (Advisor: Prof. Alex Ramirez-Serrano)   2011.09–2017.02
Department of Mechanical and Manufacturing Engineering, University of Calgary, Canada.
- Developed multibody dynamics modeling, locomotion mode control and motion planning of a leg-tracked quadrupedal robot.
- Designed two stair climbing gaits for quadrupedal ground robots.

EDUCATION

Ph.D.   Mechanical and Manufacturing Engineering (Robotics), University of Calgary, Calgary,
          AB, Canada.   2011–2017
          Advisor: Prof. Alex Ramirez-Serrano.
          Thesis title: "Autonomous Locomotion Mode Transition of Ground Hybrid Robots."

B.Eng.   Mechatronics Engineering, Northwest A&F University, Xi'an, Shaanxi, China.   2007–2011

PUBLICATIONS

Journal Articles

[J3]   **Jie Wang***, Michael T. H. Fader, and Joshua A. Marshall. "Learning-Based Model Predictive Control for Improved Mobile Robot Path Following using Gaussian Processes and Feedback Linearization". Journal of Field Robotics, 2023. DOI: 10.1002/rob.22165. [PDF, Q2 in Robotics]

[J2]   Andrew Farley, **Jie Wang***, and Joshua A. Marshall. "How to Pick a Mobile Robot Simulator: A Quantitative Comparison of CoppeliaSim, Gazebo, MORSE and Webots with a Focus on Accuracy of Motion". Simulation Modelling Practice and Theory, vol. 120, no. 102629, 2022. DOI: 10.1016/j.simpat.2022.102629. [PDF, Q1 in Software Engineering]

[J1]   **Jie Wang**, Sandra Simeonova, and Mozhdeh Shahbazi*****. "Orientation- and Scale-Invariant Multi-Vehicle Detection and Tracking from Unmanned Aerial Videos". Remote Sensing, vol. 11, no. 18, pp. 2155, 2019. DOI: 10.3390/rs11182155. [PDF, Q1 in Imaging Science and Photographic Technology]

Conference Papers

[C4]   Mozhdeh Shahbazi*****, Sandra Simeonova, Derek Lichti, and **Jie Wang**. "Vehicle Tracking and Speed Estimation from Unmanned Aerial Videos". International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences, vol. XLIII-B2-2020, pp. 623-630, 2020. [PDF]

[C3]   **Jie Wang*** and Mozhdeh Shahbazi. "Mapping Quality Evaluation of Monocular SLAM Solutions for Micro Aerial Vehicles". International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences, vol. XLII-2/W17, pp. 413-420, 2019. [PDF]

[C2]   **Jie Wang*** and Alex Ramirez-Serrano. "Stair-climbing and Energy Consumption Evaluation of a Leg-tracked Quadruped Robot". In Proceedings of the IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), pp. 1448–1453, 2016. [PDF]

[C1]   **Jie Wang*** and Alex Ramirez-Serrano. "Locomotion Mode Transition Study of Ground Hybrid Robots". In Proceedings of the International Conference on Climbing and Walking Robots and Support Technologies for Mobile Machines (CLAWAR), pp. 531–538, 2016. [PDF]

Thesis

[T]   **Jie Wang**. "Autonomous locomotion mode transition of ground hybrid robots". University of Calgary, 2017. [PDF]

Under Review

[UR3]   **Jie Wang***, Yash Vardhan Pant, and Zhihao Jiang. "Learning-Based Modeling of Human-Autonomous Vehicle Interaction for Enhancing Safety in Mixed-Vehicle Platooning Control". Submitted to IEEE Robotics and Automation Letters on March 15, 2023. Manuscript # 23-0594. (arXiv:2211.04665 [cs.RO]). [PDF, Q2 in Robotics]

[UR2]   **Jie Wang***, Zhihao Jiang, and Yash Vardhan Pant. "Improving Safety in Mixed Traffic: A Learning-based Model Predictive Control for Autonomous and Human-Driven Vehicle Platooning". Submitted to IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) on March 1, 2023.

(arXiv:2211.04665 [cs.RO]) [PDF]

[UR3] **Jie Wang***. "An Intuitive Tutorial to Gaussian Processes Regression". Submitted to IEEE Transactions on Pattern Analysis and Machine Intelligence on December 14, 2022. Manuscript # TPAMI-2022-12-2436. (arXiv:2009.10862 [stat.ML]). [PDF, Q1 in Artificial intelligence]

TEACHING

Guest Lecturer

    ECE 481: Digital Control Systems, University of Waterloo.   Spring 2022
- Path Following Control of Ground Vehicles by Combining Machine Learning with Model Predictive Control.

    ECE 780: Model Predictive Control, University of Waterloo.   Winter 2022
- Gaussian Processes Learning-based Model Predictive Control.

Course Instructor and Developer

    Edgemont School, Calgary, AB, Canada.   2019
- Developed and Lectured Lego Challenge courses of stage II and III.
- Coached FIRST LEGO League Challenge team Supernova.

Light Prototyping Technician

    Schulich School of Engineering, University of Calgary.   2014–2016
- Provided technical support (3D prints, Arduino, NI myDAQ) for the undergraduate capstone projects.
- Managed lab equipment and inventory (3D printers and base electronics)

Teaching Assistant

    Schulich School of Engineering, University of Calgary.
- ENGG 200: Engineering Design and Communication.   2016
- ENME 461: Foundations of Mechatronics. Lead TA.   2014
- ENME 339: Engineering Graphics and CAD.   2014
- ENME 337: Computing Tools for Engineering Design.   2013
- ENME 538: Mechanical Design Methodology and Application.   2011–2012

MENTORING

Master's Students

    Leroy D'Souza (Electrical and Computer Engineering, University of Waterloo)   2022
    Jack Caldwell (Electrical and Computer Engineering, Queen's University)   2021
    Michael Fader (Mechanical and materials Engineering, Queen's University)   2020–2021
    Natassia Lunzmann (Electrical and Computer Engineering, Queen's University)   2020
    Sandra Simeonova (Geomatics Engineering, University of Calgary)   2019–2020
    Parnia Shokri (Electrical Engineering, University of Calgary)   2019–2020

Undergraduate Students

    Chris Tseng (Mechanical and Mechatronics Engineering, University of Waterloo)   2023
    Soham Lakhi (Electrical and Computer Engineering, University of Waterloo)   2022
    Dean Sacoransky (Electrical and Computer Engineering, Queen's University)   2021
    Jinhao Ruan (Electrical and Computer Engineering, Queen's University)   2021
    Andrew Farley (Electrical and Computer Engineering, Queen's University)   2020

AWARDS

Full Scholarship of the Deep Learning and Reinforcement Learning (DLRL) Summer School, Alberta Machine Intelligence Institute & Canadian Institute for Advanced Research.	2019
Mitacs Career Connect Award, University of Calgary.	2018–2019
Graduate Research Travel Award, University of Calgary.	2016
Research Assistant Scholarship, University of Calgary.	2011–2015
First-Class Excellent Academic Scholarship, Northwest A&F University.	2009–2011
Outstanding Student Leader Award, Northwest A&F University.	2008–2009

SERVICE

Reviewer of IEEE Indian Control Conference	2022
Reviewer of IEEE International Conference on Embedded and Real-Time Computing Systems and Applications	2022
Reviewer of Artificial Intelligence Review	2021
Reviewer of IEEE/ASME Transactions on Mechatronics	2021
Reviewer of IEEE International Conference on Robotics and Intelligent Systems	2017–2021
Reviewer of IEEE Transactions on Systems, Man and Cybernetics: Systems	2020