Ana Pervan

ana.l.pervan@gmail.com | anapervan.github.io | anapervan

Experience

Wayve London, UK

Robotics Engineer Nov. 2021 - Current

- **Localization and State Estimation.** Researched and designed algorithms and software as an early member of the Deep Robotics team. Focused on sensor fusion for simultaneous localization and mapping (SLAM) by leveraging multiple cameras, radar, GPS, and wheel odometry to enable self-driving cars to navigate complex and dynamic environments.
- **Camera Calibration Expertise.** Designed and implemented novel optimization algorithms for precise camera calibration, elevating visual odometry, computer vision, and neural network performance. This led to a significant boost in vehicle navigation accuracy and stability.
- **Robust Software Engineering.** Developed optimized, documented, and maintainable code in both **Python** and **C++**. Ensured the seamless execution of critical autonomous vehicle functionalities. Regularly deployed code to be driven daily on London roads.
- **Cross-functional Collaborations.** Collaborated closely with interdisciplinary teams, including model development, perception, NeRF, and hardware, to ensure holistic development and training of machine learning models. Proactively pursued connections and encouraged collaborative efforts between teams by identifying common research threads and fostering effective communication.
- **DEI Initiatives.** Founded an employee resource group called Women Who Code, which grew to over 25 actively participating members and included monthly meetings and outreach events. Organized and led a foundational Python course, upskilling colleagues with no prior coding experience. Facilitated events and initiatives as a member of the Diversity, Equity, and Inclusion (DEI) Committee.

Center for Robotics and Biosystems Evanston, IL

Ph.D. Candidate, Northwestern University Sept. 2016 - Sept. 2021

- **Flexible Tools.** Created algorithms for simultaneous co-design of a flexible wire tool and an optimized control strategy for using the tool to attempt a given task. Physically experimented with a Baxter robot manipulating soft materials, including processing visual information, modelling shape deformation using deep neural networks, and planning control strategies with reinforcement learning.
- **Minimal Multi-Agent Cooperation.** Designed a multi-agent robotic system for applications on the micro-scale, limited in size and therefore computational capabilities. Proved minimal information requirements for exploration, programmed high-dimensional simulations in Python, and built custom robots for real-time experiments on autonomous navigation in a resource-constrained environment.
- **Algorithmic Design.** Developed novel algorithms in which physical designs for minimal robots were autonomously created from projecting optimized control policies onto physically feasible interconnections of sensors and actuators. Resulting designs reduced error in task performance by over 98% when compared to non-optimized designs.
- **Interdisciplinary Collaborations.** Collaborated with multiple universities and lead diverse teams to implement algorithms and evaluate theories across various experimental platforms of different scales, media, and abilities: from macroscopic robots with deterministic dynamics to microscopic devices operating under extreme uncertainty.

Active Learning in Robotics Course Evanston, IL

Co-teacher, Northwestern University April 2019 - June 2019

- Lectured a graduate seminar class, responsibilities included writing and editing lecture notes and homework assignments, holding office hours, and assisting students with conceptual and coding questions
- Topics included optimal control, probability, filtering, entropy and information, and function approximation (e.g., Gaussian processes)

Education

Ph.D. in Mechanical Engineering Evanston, IL

Northwestern University Sept. 2016 - Sept. 2021

- **Thesis:** Co-design of bodies and strategies
- **Advisor:** Todd D. Murphey

M.S. in Mechanical Engineering Evanston, IL

Northwestern University Sept. 2016 - Sept. 2018

B.S. in Mechanical Engineering, Cum Laude Notre Dame, IN

University of Notre Dame Aug. 2012 - May 2016

Selected Publications

- **Pervan, A.**, J. Weber, K. Baird, T. Berrueta. M. Elwin, A. Chaturverdi, A. W. Richa, T. D. Murphey, "Circulatory networks enable efficient distributed learning", *Submitted*, 2023.
- Liu A. T., M. Hempel, J. F. Yang, A. M. Brooks, **A. Pervan**, V. B. Koman, G. Zhang, D. Kozawa, S. Yang, D. I. Goldman, M. Miskin, A. W. Richa, D. Randall, T. D. Murphey, T. Palacios, and M. S. Strano, "Colloidal Robotics", *Nature Materials*, 2023.
- **Pervan, A.**, and T. D. Murphey, "Algorithmic Design for Embodied Computation in Synthetic Cells", *IEEE Transactions on Automation Science and Engineering (T-ASE)*, 2020.
- **Pervan, A.**, and T. D. Murphey, "Bayesian Particles on Cyclic Graphs", *IEEE Int. Conf. on Intelligent Robots and Systems (IROS)*, 2020.
- **Pervan, A.**, A. Q. Nilles, T. Berrueta, T. D. Murphey, and S. M. LaValle, "Information Requirements of Collision-Based Micromanipulation", *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, June 2020.
- Savoie, W., T. Berrueta, Z. Jackson, **A. Pervan**, R. Warkentin, S. Li, T. D. Murphey, K. Wiesenfeld, D. I. Goldman, "A robot made of robots: emergent transport and control of a smarticle ensemble", *Science Robotics*, vol. 4, issue 34, September 2019.
- **Pervan, A.**, and T. D. Murphey, "Algorithmic materials: Embedding computation within material properties for autonomy", *Robotic Systems and Autonomous Platforms:* Woodhead Publishing, pp. 197-221, 2019.
- Berrueta, T., **A. Pervan**, K. Fitzsimons, and T. D. Murphey, "Dynamical System Segmentation for Information Measures in Motion", *IEEE Robotics and Automation Letters*, vol. 4, issue 1, pp. 169-176, January 2019.
- **Pervan, A.**, and T. D. Murphey, "Low Complexity Control Policy Synthesis for Embodied Computation in Synthetic Cells", *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, December 2018.