150 E Wynnewood Rd.
Wynnewood PA, 19096

MICHAEL BOWMAN

michael.bowman44@gmail.com
702-677-7751

EDUCATION

Doctor of Philosophy Mechanical Engineering May 2023

Advisor: Dr. Xiaoli Zhang

Colorado School of Mines – Golden, CO

Dual Major: Bachelor of Science Mechanical and Electrical Engineering May 2017

Colorado School of Mines – Golden, CO

RESEARCH EXPERIENCE

University of Pennsylvania
Philadelphia, PA

Postdoctoral Research Assistant—Bowman Lab 06/2023 – Present

Advisors: Dr. Robert Bowman, Dr. Lewis Chodish

Colorado School of Mines
Golden, CO

Graduate Research Assistant –Intelligent Robotics and Systems Lab 07/2017 – 06/2023

Advisor: Dr. Xiaoli Zhang,

Dissertation Title: Advanced Shared Autonomy From Controlled Environments to the Real-World for Object Telemanipulation

Colorado School of Mines
Golden, CO

Undergraduate Research Assistant –Industrial Robotics and Automation Research Lab 08/2013 – 05/2017

Advisor: Dr. John Steele

RESEARCH FOCUS

I am a postdoctoral researcher specializing in the study of shared control between humans and robots for telemanipulation. Specifically, I have an expertise in **optimal control strategies** including both Model-based (Model Predictive Control and Sequential Action Control) and Model-free (Reinforcement Learning and Active Learning) approaches, **data-driven methods** (Neural Networks, SVM, Bayesian Networks, Koopman Operators), and **multi-objective optimization** strategies (multi-label classification, genetic algorithms, and fuzzy logic). These efforts have focused on 1) determining the human's intent inference, 2) developing an optimal grasp goal for the robot based on the intent inference, and 3) designing control strategies to aid in appropriately grasping objects in a manner the operator prefers.

TEACHING EXPERIENCE

University of Pennsylvania, Philadelphia PA

Co-Course Designer--Cancer Biology Department--Intro to Bioinformatics for Graduate Students

- Aided in developing lecture material and practical examples for different types of bioinformatic analysis. Co-lecture material and help students with their own projects. Provided additional learning resources for self-paced learning.

Colorado School of Mines
Golden, CO

Graduate Teaching Assistant – Mechanical Engineering — Senior Design

- Supported reviewing class assignments and facilitated office hours. Aided students in finding campus resources available to them. Also was in charge of purchasing equipment needed for all student teams.

Graduate Teaching Assistant – Mechanical Engineering — Intro to Robotics

- Guest Lecturer for instruction on ROS. Provided demo projects to facilitate hands-on learning. Assisted students with direction and trouble shooting of their final projects.

Graduate Teaching Assistant – Mechanical Engineering — Advanced Robot Control

- Guest Lecturer for instruction on multi-objective optimization. Provided demos to facilitate hands-on learning for techniques used throughout the course in a lab setting. Assisted students with direction and trouble shooting of their final projects.

SOFTWARE AND EQUIPMENT SKILLS

C++	ROS	Matlab
Python	R	Arduino
Linux/Unix	MICO robot	ABB robots
Turtlebot/Husky	Pepper robot	

WET LAB SKILLS

DNA extraction
Bone marrow and spleen isolation
Lentiviral production
Plasmid bacterial production

AWARDS AND GRANTS

2023 Colorado School of Mines Mechanical Engineering Emeritus Faculty Graduate Student Award

OUTREACH AND MENTORING

Advisor for Summer K-12 coding camp-Sunshine AI
Guest lecturer for Summer Internship-Penn Research Administrator Program

PRESENTATIONS & PUBLICATIONS

PEER-REVIEWED JOURNAL ARTICLES UNDER REVIEW AND PREPARATION

1. Li S**, Bowman M,** Zhang X., A General Arbitration Model for Robust Human-Robot Shared Control with Multi-Source Uncertainty Modeling, IEEE Human Machine Systems (under review)
2. Stanley M.*, Jung Y.*, **Bowman M.**, Tao L., Zhang X., Transferability-based Chain Motion Mapping from Humans to Humanoids for Teleoperation, Journal of Intelligent & Robotic Systems (under review)
3. Jung Y., Tao L., **Bowman M.**, Zhang X., Physics-Guided Hierarchical Reward Mechanism for Learning-Based Multi-Finger Object Grasping, American Control Conference ACC (under review)
4. Jung Y, Tao L, **Bowman M,** Zhang J, Zhang X. Risk-prioritized Experience Replay for Stable In-hand Manipulation *2024 IEEE* International Conference on Robotics and Automation ICRA (under review)
5. Skuli S, Bakayoko A, Kruidenier M, Manning B, Pammer P, Salimov A, Riley O, Brake-Sillá G, Dopkin D, **Bowman M**, Martinez-Gutierrez L, Anderson C, Reisz J, Buono R, Paul M, Saland E, Wong S, Xu J, Nee E, Hausler R, Lai C, Maxwell K, Sarry J, Fruman D, D'Alessandro A, Mesaros C, Keith B, Celeste Simon M, Sung P, Wertheim G, Skuli N, Bowman RL, Matthews A, Carroll M. Chemoresistance of TP53 mutant AML requires the mevalonate byproduct, GGPP, for induction of a mitochondria stress response (under review)
6. Wellhausen N, Zhou Y, **Bowman M**, Anupindi K, Gowda A, Srivatsa S, Engel N, June C, Bowman RL, Riley J, Gill S. Selection for an HIV resistant immune system by multiplex base-edited CD45 CAR-T cell therapy (under review)
7. Drucker M, Lee D, Zhang X, Kain B, **Bowman M**, Nicolet D, Wang Z, Stone R, Mrózek K, Carroll A, Starczynowski D, Levine R, Byrd J, Eisfeld A, Solomonis N, Grimes HL, Bowman RL, Miles L. Genotype-immunophenotype relationships in *NPM1*-mutant AML clonal evolution uncovered by single cell multi-omic analysis. Nature Genomics (under review)

8. Webb J.D., **Bowman M.**, Li S., Zhang X., The Use of Gaze-Derived Confidence of Inferred Operator Intent in Adjusting Safety-Conscious Haptic Assistance, IEEE Transaction on Haptics (under preparation)

9. **Bowman M**, Bandopadhyay R, Singh V, Shah N, Youn A, Gounder S, Gandhi A, Telpoukhovskaia M, Trowbridge J, Bowman RL SuperJump: Normal Hematopoiesis and Leukemia State Intent Inference and Lineage Tracking Through Semi-Supervised Jump Diffusion Modeling (under preparation)
10. **Bowman M,** Robinson T, Gounder S, Gandhi A, Shah N, Youn A, Bandopadhyay R, Miles L, Cai S, Levine R, Bowman RL, scDNA: Single Cell DNA analysis software toolkit for subclonality discovery and assessment. (under preparation)

ACCEPTED PEER-REVIEWED JOURNAL ARTICLES

11. Sande C, Chen S, Mitchell D, Lin P, Abraham D, Cheng J, Gebhard T, Deolikar R, Freeman C, Zhou M, Kumar S, **Bowman M,** Bowman RL, Zheng S, Munkhbileg B, Chen Q, Stanley N, Guo K, Lapite A, Hausler R, Taylor D, Corines J, Morrissette J, Lieberman D, Yang G, Shestova O, Gill S, Smith-Simmer K, Banaszak L, Shoger K, Reinig E, Peterson M, Nicholas P, Walne A, Dokal I, Rosenheck J, Oetjen K, Link D, Gelman A, Reilly C, Dutta R, Lindsley R, Brundige K, Agarwal S, Bertuch A, Churpek J, Tague L, Johnson F, Olson T, and Babushok D, ATM-dependent DNA Damage Response Constrains Cell Growth and Drives Clonal Hematopoiesis in Telomere Biology Disorders Journal of Clinical Investigation
12. Bowman RL, Dunbar A, Mishra T, Xiao W, Waarts M, Fernández Maestre I, Eisman S, Cai L, Mowla S, Shah N, Youn A, Bennet L, Fontenard S, Gounder S, Gandhi A, **Bowman M**, O'Connor K, Zaroogian Z, Sánchez-Vela P, Benitez A, Werewski M, Park Y, Csete I, Krishnan A, Lee D, Boorady N, Potts C, Jenkins M, Cai S, Carroll M, Meyer S, Miles L, Ferrell Jr. P, Trowbridge J, and Levine R. (2024) In vivo models of subclonal oncogenesis and dependency in hematopoietic malignancy. Cancer Cell
13. **Bowman M.**, Zhang J., & Zhang X. (2024) Intent-based Task-Oriented Shared control for Intuitive Telemanipulation. Journal of Intelligent & Robotic Systems
14. **Bowman M.** and Zhang X., Dimension-Specific Shared Autonomy for Handling Disagreement in Telemanipulation (2023), in *IEEE* Robotics and Automation Letters, vol. 8, no. 3, pp. 1415-1422, March 2023, doi: 10.1109/LRA.2023.3239313.
15. Tao L., **Bowman M**., Zhou X., Zhang J., & Zhang X. (2022). Learn and Transfer Knowledge of Preferred Assistance Strategies in Semi-Autonomous Telemanipulation. Journal of Intelligent & Robotic Systems, 104(3), 1-16.
16. Tao L., **Bowman M.**, Zhang J., & Zhang X. (2021). Forming Real-World Human-Robot Cooperation for Tasks With General Goal. IEEE Robotics and Automation Letters, 7(2), 762-769.
17. Miles LA***,** Bowman RL*, Merlinsky TR, Csete IS, Ooi AT, Durruthy-Durruthy R, **Bowman M**, Famulare C, Patel MA, Mendez P, Ainali C, Demaree B, Delley CL, Abate AR, Manivannan M, Sahu S, Goldberg AD, Bolton KL, Zehir A, Rampal R, Carroll MP, Meyer SE, Viny AD, Levine RL. (2020) Single-cell mutation analysis of clonal evolution in myeloid malignancies. Nature. 2020 Oct 28;. doi: 10.1038/s41586-020-2864-x.
18. Li S., **Bowman M.,** Nobarani H., & Zhang X. (2020). Inference of manipulation intent in teleoperation for robotic assistance. Journal of Intelligent & Robotic Systems, 99(1), 29-43.

CONFERENCE PEER-REVIEWED PUBLICATIONS AND PRESENTATIONS

19. **Bowman M**, Telpoukhovskaia M, Trowbridge J, Bowman RL. SuperJump: Normal Hematopoiesis and Leukemia State Intent Inference and Lineage Tracking Through Semi-Supervised Jump Diffusion Modeling. American Society of Hematology 2024 (ASH). (Poster Presentation- abstract only publication)
20. Wang, H, Bai, H, Zhang, X, Jung, Y, **Bowman, M**, Tao, L. Real-time Dexterous Telemanipulation with an End-Effect-Oriented Learning-based Approach. In 2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE
21. **Bowman M.** and Zhang X., WE-Filter: Adaptive Acceptance Criteria for Filter-based Shared Autonomy, *2023 IEEE* International Conference on Robotics and Automation *(*ICRA*)*, London, United Kingdom, 2023, pp. 12528-12534, doi: 10.1109/ICRA48891.2023.10161228.
22. Tao L, Zhang J., **Bowman M.,** and Zhang X., A Multi-Agent Approach for Adaptive Finger Cooperation in Learning-based In-Hand Manipulation, *2023 IEEE* International Conference on Robotics and Automation (ICRA*)*, London, United Kingdom, 2023, pp. 3897-3903, doi: 10.1109/ICRA48891.2023.10160909.

23. An H., **Bowman M**., Li S., & Zhang X. (2021, December). Robot-Enhanced Telepresence of Remote Teachers for Effective Distance Learning. In 2021 IEEE International Conference on Robotics and Biomimetics (ROBIO) (pp. 87-92). IEEE.
24. Tao L., **Bowman M**., Zhang J., & Zhang X. (2021, October). Learn Task First or Learn Human Partner First: A Hierarchical Task Decomposition Method for Human-Robot Cooperation. In 2021 IEEE International Conference on Systems, Man, and Cybernetics (SMC) (pp. 590-595). IEEE.
25. **Bowman M.,** & Zhang X. (2021, September). Dynamic Pre-Grasp Planning when Tracing a Moving Object Through a Multi-Agent Perspective. In 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (pp. 9408-9414). IEEE.
26. King J., Ghiglieri C.**, Bowman M.**, Zhang X., 2021 Development of an Active Learning Model for Control Rod Behavior to Improve Data-Driven Reactor Control, 2020 International Congress on Advances in Nuclear Power Plants, Mar. 15–19, 2021, Abu Dhabi, United Arab Emirates.
27. Stanley M., **Bowman M.**, King J., Zhang X., 2021 Data-Driven Uncertainty-Aware Nuclear Power Plant Sensor Modeling, 2021 International Congress on Advances in Nuclear Power Plants, Mar. 15–19, 2021, Abu Dhabi, United Arab Emirates.
28. **Bowman M.,** Li S., & Zhang X. (2019, May). Intent-uncertainty-aware grasp planning for robust robot assistance in telemanipulation. In 2019 International Conference on Robotics and Automation (ICRA) (pp. 409-415). IEEE.