

Chen Meng

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Ph.D, Department of Mechanical & Aerospace Engineering
University at Buffalo

EDUCATION

- Doctor of Philosophy, Mechanical Engineering** Jan, 2019 Jun, 2022
University at Buffalo
Dissertation: Modeling and Robust Optimal Design of Aerial and Net-based Robotic Systems (Advisor: Dr. Souma Chowdhury)
- Master of Science, Aerospace Engineering** 2015-2018
University at Buffalo
Thesis: Conceptual Design and Optimization of A Tilt-Arm Hybrid Unmanned Aerial Vehicle
- Bachelor of Science, Geophysics** 2010-2015
Tongji University, Shanghai, China

PRIMARY RESEARCH TOPICS

- Morphology/Intelligence Co-design for Robotic Systems**
Combine morphology & intelligence designs into a single learning/optimization process for intelligent robotic systems. Implement artificial-life-inspired inheritance schemes (Baldwinian & Lamarckian). Propose and implement non-nested intermediate parameter optimization featuring the talent metrics.
- Bayesian Optimization (BO/EGO) for Mixed-Discrete Spaces**
Propose an efficient global optimization (EGO) framework for mixed continuous and discrete (combinatorial) variable spaces. Adapt discrete variable scaling and mixed-space surrogate modeling. Projected to demonstrate class-leading optimality and efficiency for high-cost mixed-discrete optimization problems.
- Physics-Infused Hybrid Machine Learning for Robotics**
Propose a digital twin of aerial robot with physics-infused models for high robustness and low computing cost. Implement the aforementioned digital twin onto onboard hardware for network-free flying object recognition, tracking and prediction.

PROFESSIONAL EXPERIENCE

Assistant Professor of Teaching (Aug 2023)
Department of Mechanical and Aerospace Engineering, University at Buffalo
Member of Center of Embodied Autonomy and Robotics

Instructed courses:

- MAE 93/593 Robotics (undergraduate/graduate)
- MAE 90/594 Collaborative Robotics (undergraduate/graduate)
- MAE 77/577 CAD Applications (undergraduate/graduate)
- EAS 95 Deep Learning in Robotic Applications (graduate)
- EAS 96 Robot Control (graduate)

Volunteer Researcher (Aug 2022-Jul 2023)
ADAMS Lab, Department of Mechanical and Aerospace Engineering, University at Buffalo

- Develop programming, assembly, and experimental protocols for flight of unmanned aerial vehicles for validation and testing.

Research Assistant (Jan 2019-June 2022)

Granted research topics participated:

- Physics of Artificial Intelligence Physics Learning (PAI-PLEA)** Jan 2019-Mar 2020
Sponsored by DARPA (HR00111890037). Joint program with Xerox Palo Alto Research Center.
Build multi-sensor hardware for UAV-to-UAV tracking, lead and conduct indoor and outdoor UAV flight experiments. Establish control stacks for multiple crazyfly UAVs in conjunction with vision motion capture. Perform UAV dynamics and aerodynamics interaction experiments for physics-infused modeling.
- Recovery of Symbolic Mathematics from Code (ReMath-CONSTRUCT)** Jan 2021-May 2022
Sponsored by PARPA (HR00112190019). Joint program with Xerox Palo Alto Research Center.
Students workgroup leader, organize & maintain meetings and reports. Integrate ROS-based robotics platform with custom control stacks of Modelica functional mock-up units (FMUs). Perform testing and validations of custom control stacks with simulations and real robots.
- Modeling, Design and Operation of Robotic Tether-Net Systems for Reliable Capture of Targets** Aug 2021-June 2022
Sponsored by NSF CMMI Award (2128578). Cooperation with Dr. Eleonora Botta.
Cross-lab students workgroup leader. Co-write proposal chapters. Create hardware & behavior optimization framework of the tether-net system with Bayesian optimization. Develop reinforcement learning structure of the behavior in debris capture mission.

Teaching Assistant (Jan 2018 - Jan 2021)

Instructed Courses:

- EAS 30 Engineering Computations (Undergraduate Level)
- MAE 77 Introduction to Computer-Aided Design (Undergraduate Level)
- MAE 376 Applied Math for MAE (Undergraduate Level)

PUBLICATIONS

[Google Scholar](#)

Journal Publications

- J4 Zeng, C., Hecht, B., Chowdhury, S. and Botta, E., 2023. Concurrent Design Optimization of Tether-Net System and Actions for Reliable Space-Debris Capture. *AIAA Journal of Spacecraft and Rockets*, pp.1-11.
- J3 Matei, M., Zeng, C., Chowdhury, S., Rai, R. and De Kleer, M., 2021. Controlling Draft Interactions Between Quadcopter Unmanned Aerial Vehicles with Physics-aware Modeling. *Journal of Intelligent and Robotic Systems*, 01(1), pp.1-21.
- J2 Behjat, A., Zeng, C., Rai, R., Matei, M., Doermann, D. and Chowdhury, S., 2020. Physics-aware Learning Architecture with Input Transfer Networks for Predictive Modeling. *Applied Soft Computing*, 96, p.106665.
- J1 Zeng, C., Abnous, R., Gabani, K., Chowdhury, S. and Maldonado, V., 2020. New Milt-arm Transitioning Unmanned Aerial Vehicle: Introduction and Conceptual Design. *Aerospace Science and Technology*, 99, p.105755.

Conference Publications

- C11 Zeng, C. (presenter), Kumar, P.K., Witter, J. and Chowdhury, S., 2022. Efficient Concurrent Design of the Morphology of Unmanned Aerial Systems and their Collective Search Behavior. *IEEE ROS 2022 Conference*.
- C10 Zeng, C. (presenter), Hecht, B.R., Kumar, P.K., Shah, R.K., Botta, E.M. and Chowdhury, S., 2022. Learning Robust Policies for Generalized Debris Capture with an Automated Tether-Net System. *In AIAA CITECH 2022 Forum* (p. 379).
- C9 Shah, R.K., Zeng, C., Botta, E.M. and Chowdhury, S., 2021. Launch and Closure Optimization Under Uncertainties for Tether-Net Space Debris Capture System. *In AIAA AVIATION 2021 FORUM* (p. 103).
- C8 Ghassemi, P., Behjat, A., Zeng, C., Mulekar, S.S. and Chowdhury, S., 2020. Physics-Aware Surrogate-based Optimization with Transfer Mapping Gaussian Processes: for Bio-inspired Flow Airlining. *In AIAA AVIATION 2020 FORUM* (p. 183).
- C7 Behjat, A., Gabani, K.K., Zeng, C. and Chowdhury, S., 2020. Concurrent Morphology-Optimization and Behavior-Learning: Co-Designing Intelligent Quadcopters. *In AIAA AVIATION 2020 FORUM* (p. 116).
- C6 Zhang, Z., Zeng, C., Dharmeliya, M., Chowdhury, S. and Rai, R., 2020. Deep Learning Based Multi-Modal Sensing for Tracking and State Extraction of Small Quadcopters. *Arxiv Preprint*.
- C5 Zeng, C. (presenter), Behjat, A., Gabani, K.K. and Chowdhury, S., 2019. Artificial Life-inspired Morphology/Learning Co-Design Framework: Towards Conceptual Design of Intelligent Hybrid Quadcopters. *In AIAA Aviation 2019 Forum* (p. 457).
- C4 Zeng, C. (presenter), Behjat, A. and Chowdhury, S., 2018. Uncertainty-aware Optimal Flight State Selection for Transitioning UAV via Simulation-based Learning. *In 2018 Multidisciplinary Analysis and Optimization Conference* (p. 415).
- C3 Zeng, C. (presenter), Abnous, R. and Chowdhury, S., 2017. Aerodynamic Modeling and Optimization of Blended-wing-body Transitioning AV. *In 8th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference* (p. 000).
- C2 Abnous, R., Zeng, C. and Chowdhury, S., 2017. Dynamics and Control Design of Blended Wing-body Transitioning AV. *In 8th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference* (p. 150).
- C1 Abnous, R., Zeng, C., Chowdhury, S., Maldonado, V. and Mancuso, P., 2017. Conceptual Design of Blended-wing-body Milt-arm hybrid Unmanned Aerial Vehicle. *In 8th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference* (p. 1072).

ACADEMIC CONTRIBUTIONS

Memberships of Technical Committee:

- Design Automation Committee (DAC), The American Society of Mechanical Engineers (ASME)

Conference Session Chair and Organizer:

- ASME DETC-CIE DAC-02: AI & ML for Challenging Real-World Problems in Design Automation
- ASME DETC-CIE DAC-14: Metamodel-Based Design Optimization (MBDO)

Reviewer Responsibilities:

- Science and Technology Journal, (Elsevier) (2019, 2020)
- ASME DETC Conference) (since 2020)
- Part C: Journal of Aerospace Engineering Journal, (MechE) (since 2020)
- IEEE CRAI Conference) (since 2021)
- AIAA Journal Journal, (AIAA) (since 2021)
- ASCE Journal of Aerospace Engineering Journal, (ASCE) (2021)
- Part D: Journal of Automobile Engineering Journal, (MechE) (since 2022)