Minjae [MJ] Cho

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Summary

Strong competencies in the following research fields:

- **AI Robotics**: Proficient in designing high-fidelity robotic simulations and implementing Sim-to-Real transfer pipelines to bridge the reality gap for autonomous systems.
- **Reinforcement Learning**: Experienced in developing advanced RL algorithms for robotic control tasks (e.g., path-tracking, learning-to-learn, and sparse-reward tasks).
- **Control Theory**: Skilled in integrating control-theoretic stability analysis with learning-based methods to ensure robust and safe operation of nonlinear dynamical systems.
- **Scientific machine learning**: integration of machine learning tool into engineering applications.

Four years of experience in Scientific Machine Learning, Numerical Analysis, and Reinforcement Learning, focusing on integrating AI into engineering to develop robust, safe, and practical algorithmic and hardware structures.

Education

University of Illinois Urbana-Champaign **Aug. 2024 –**
Ph.D in Aerospace Engineering: Control and Dynamics System *Urbana-Champaign, IL*

- Outstanding academic and research achievement.

Mississippi State University **Aug. 2019 – May 2024**
B.Sc in Mechanical Engineering; Minor in Applied Mathematics *Starkville, MS*

- *Summa Cum Laude*; Shackouls Honors College; President's List

Research Experience

Lab for Intelligent Robots and Agents - Prof. Huy T. Tran **July 2024 – Present**
Graduate Research Assistant *Urbana-Champaign, IL*

- Research in reinforcement learning algorithms based on formal guarantees for effective operation in real-world robots.

Autonomous System Lab - Prof. Chuangchuang Sun **May 2023 – July 2024**
Research Assistant *Starkville, MS*

- Research in reinforcement learning algorithms for safe and adaptable operation under the presence of uncertainty.

Department of Mathematics - Prof. Seongjai Kim **Aug. 2022 – May 2023**
Research Assistant *Starkville, MS*

- Developed a high-accuracy numerical solver for Wave equations using Richardson Extrapolation.

Advanced Propulsion and Spray Lab - Prof. Joonsik Hwang & Sungkwang Mun **Oct. 2021 – May 2022**
Research Assistant *Starkville, MS*

- Developed a conditional generative model for 3D multi-phase flow prediction in an internal combustion engine.

Teaching Experience

(AE 352, UIUC) Aerospace Dynamical System — Prof. Prof. Wayne Chang **Jan. 2026 – May 2026**

(AE 353, UIUC) Aerospace Control System — Prof. Timothy Bretle and Prof. Wayne Chang **Aug. 2025 – Dec 2025**

(AE 352, UIUC) Aerospace Dynamical System — Prof. Wayne Chang **Jan. 2025 – May 2025**

(PH 2223, MsState) Physics II — Dr. Robert Wagner **Jan. 2023 – Dec. 2023**

Work Experience

Technical Translator for International Collaborative Technological Development **June. 2024 – July. 2024**

- Translator for Technology Development Agreements of autonomous systems between the German Aerospace Center (DLR) and the Korea Automotive Technology Institute (KATECH).

Republic of Korea Army, Military Operational Engineer: Combat Engineer Division **Jan. 2020 – Jul. 2021**

- Managed the corps-level information and communication systems (e.g., radio, confidential network channel, and radar & satellite aerial warning system) for all-division combat-ready status.

Publications

1. **Cho, M.**, Sun, C. Sparsity-based Safety Conservatism for Constrained Offline Reinforcement Learning, *Proceedings of the AIAA AVIATION Forum*, 2026
2. **Cho, M.**, Tran, H. Intrinsic Reward Policy Optimization for Sparse-reward Environments, *Name of submitted journal/conference is concealed for double-blind review policy*, 2026 [Under review]
3. **Cho, M.**, Tsukamoto, H., Tran, H. CARL: Contraction-Aware Reinforcement Learning for Robust Path-Tracking, *Name of submitted journal/conference is concealed for double-blind review policy*, 2026 [Under review]
4. **Cho, M.**, Sun, C., Hierarchical Meta-Reinforcement Learning: Streamlined Architectures for Automated Macro-Action Discovery Across Tasks, *Scientific Reports, Nature Portfolio*, 2025 [Under review]
5. **Cho, M.**, Sun, C., Out of Distribution Adaptation in Offline RL via Causal Normalizing Flows, *Mathematics: Advances in Decision Making, Control, and Optimization*, 2025
6. **Cho, M.**, Sun, C., Constrained Meta-Reinforcement Learning for Safety Guarantees with Differentiable Convex Programming, *Proceedings of the Association of Advancements for Artificial Intelligence (AAAI)*, 2024

Awards, Fellowships, and Funds

University Block Grant Fellowship (Outstanding Academic and Research Achievement): $880 **2025**
- *Aerospace Engineering Department, University of Illinois, Urbana-Champaign*

AE Graduate Research Poster Competition (Best Oral Delivery): $200 **2025**
- *Aerospace Engineering Department, University of Illinois, Urbana-Champaign*

Stillwell Fellowship: $12,555 **2024**
- *Aerospace Engineering Department, University of Illinois, Urbana-Champaign*

Beatty Fellowship: $6,000 **2024**
- *Aerospace Engineering Department, University of Illinois, Urbana-Champaign*

Student Research Travel Award: $2,000 **2024**
- *Bagley College of Engineering, Mississippi State University*

2023 Best Use-Inspired Data Science Research Project **2023**
- *Mississippi State University Data Science Program and the University Data Science Committee*

MAMA 2022-2023 Scholarship Award: $2,000 **2022**
- *Mississippi Automotive Manufacturing Association*

2022 Undergraduate Research Stipend: $2,000 **2022**
- *Mechanical Engineering Department, Mississippi State University*

Top-Rated Project for 2022 Undergraduate Research Symposium **2022**
- *Shackouls Honors College, Mississippi State University*

2021 ORED Undergraduate Research Fund: $2,000 **2021**
- *Office of Research and Economic Development, Mississippi State University*

Technical Skills

Research Skills: Reinforcement Learning, Control Theory, Optimization, Scientific Machine Learning, Numerical Analysis, Statistical Learning Theory, Data Analysis
Languages: Python, MATLAB
Software & Tools: Pytorch, TensorFlow, NVIDIA IsaacSim
Licenses: Aircraft Airframe Maintenance, SolidWorks

Peer Review Contributions — ORCID

ICML 2026: International Conference on Machine Learning
ICRA 2025: IEEE International Conference on Robotics and Automation
CORL 2025: Conference on Robot Learning
IJCNN 2025: International Joint Conference on Neural Networks
Elsevier Neurocomputing 2024
Springer Applied Intelligence 2024

Presentations

1. **Cho, M.**, "Constrained Meta-Reinforcement Learning for Safety Guarantees with Differentiable Convex Programming" Presented at 2024 AAAI (Association for Advancement of Artificial Intelligence), Vancouver, Canada on February, 2024
2. **Cho, M.**, "Development of Parameter Dependent GAN (PDGAN) for 3d Fuel Spray Prediction" Presented at 2023 Undergraduate Research Symposium showcase, Starkville, MS on April 13, 2023
3. **Cho, M.**, and Kim, Seongjai "On Recursive Richardson Extrapolation for High-Order Numerical Solutions of PDEs." Presented at Mathematics Department Faculty Seminar, Starkville, MS on March 10, 2023
4. **Cho, M.**, "Development of conditional GAN (cGAN) for Multi-phase Fuel Spray Prediction" Presented at 2022 Undergraduate Research Symposium showcase, Starkville, MS on April 13, 2022

Advising Experience

Daniel Song - Undergraduate Student, Aerospace Engineering, UIUC **Aug 2025** –
Undergraduate research volunteer *Urbana-Champaign, IL*

- Sim-to-real transfer of an RL-trained policy using IsaacSim.

Nikita Kovalov - Undergraduate Student, Aerospace Engineering, UIUC **Aug 2025** –
Undergraduate research volunteer *Urbana-Champaign, IL*

- Sim-to-real transfer of an RL-trained policy using IsaacSim.

Relevant *Graduate* Coursework

- ECE543: Statistical Learning Theory
- MA540: Real Analysis
- MA6183: Mathematical Foundation of ML
- MA6313/6323: Numerical Analysis I / II
- AE598: Estimation of Dynamical Systems
- AE598: Formal Methods in AE Robotics
- IE534: Deep Learning
- IE521: Convex Optimization
- CS 542: Statistical Reinforcement Learning
- IE 598: RL and Learning-based Control