Mukesh Ghimire

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Summary

Ph.D. candidate integrating multi-agent game theory, reinforcement learning, and foundation models to enable robust, interpretable autonomous systems.

Relevant Experience

Arizona State University
Ph.D. Researcher, 06/2021 - today
- Developed a novel algorithm to solve one-sided incomplete-information differential games, emphasizing explainable strategies and safe interactions [1].
- Modeled vehicle interaction as general-sum complete and incomplete information differential games to generate safe equilibrial policies for both autonomous vehicles [2, 3, 5] and swarm systems [4].
- Proposed an RL-based controller to reduce the frequency of inference in incomplete-information interactions between a human driver and an autonomous agent, enhancing real-time performance.
- Exploring the integration of Large Language Models (LLMs) into multi-agent simulation frameworks for more intuitive strategy design and safer policy explanations.

Arizona State University
Teaching Assistant, 01/2023 - 05/2024
- Teaching assistant for the graduate courses - MAE 501: Partial Differential Equations, and MAE 547 Modeling and Control of Robots at ASU.

Thyssenkrupp Elevator
Engineering Intern, 08/2019 - 08/2020
- Reduced data pre-processing using Python, reducing processing time by more than 50%.
- Improved operational inefficiencies through data-driven process optimization.
- Collaborated across teams to integrate quality control standards into production workflows.

Skills

AI & ML: Reinforcement Learning (RL), Explainable AI (XAI), Model Predictive Control, Agentic AI, Large Language Models (LLMs)
Mathematical & Theoretical: Differential Games, Game Theory, Stochastic Processes, Numerical Methods for PDEs
Technical: Python (JAX, NumPy, PyTorch), MATLAB, Scikit-Learn, Julia, Java, Linux, Git, AWS

Education

Arizona State University
Tempe, AZ, USA
Ph.D. Robotics & AI
Research Focus: Incomplete Information Differential Games, Reinforcement Learning, Optimization
08/2021 - 12/2025 (Anticipated)

University of Mississippi
Oxford, MS, USA
B.Sc. (Hons) Mechanical Engineering
Minors: Computer Science, Mathematics
Thesis: *A Study of Deep Reinforcement Learning in Autonomous Racing Using DeepRacer Car.*
08/2016 - 05/2021

Relevant Coursework

Game Theory, Causal Inference, Stochastic Processes, Convex Optimization, Advanced Modern Control, Numerical Methods for PDEs, Reinforcement Learning.

Selected Awards & Honors

Experiential Learning Grant 2023, 2024
GPSA Travel Grant Award 2023
ICRA Travel Grant 2023
SMBHC Research Fund Award 2020

Selected Publications

[1] **M. Ghimire**, L. Zhang, Z. Xu, Y. Ren. *State-Constrained Zero-Sum Differential Games with One-Sided Information.* ICML'24.
[2] L. Zhang, **M. Ghimire**, W. Zhang, Z. Xu, Y. Ren. *Value Approximation for Two-Player General-Sum Differential Games with State Constraints.* TRO'24.
[3] L. Zhang, **M. Ghimire**, Z. Xu, W. Zhang, Y. Ren. *Pontryagin Neural Operator for Solving Parametric General-Sum Differential Games.* L4DC'24.
[4] **M. Ghimire**, L. Zhang, W. Zhang, Y. Ren, Z. Xu. *Solving Two-Player General-Sum Games Between Swarms.* ACC'24.
[5] L. Zhang, **M. Ghimire**, W. Zhang, Z. Xu, Y. Ren. *Approximating discontinuous nash equilibrial values of two-player general-sum differential games.* ICRA'23.

Full list on Google Scholar.

Academic Activities

TALKS: Sparky's Cup Education - Lightning Talk on Game-Changing AI Applications in Sport.

REVIEWING: TAC, AAAI, IJCAI, ICLR.