

# MUKESH GHIMIRE

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## RESEARCH INTERESTS

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I am focused on **developing efficient algorithms for incomplete/imperfect information games** with continuous actions. My research interests include **reinforcement learning, control theory, and game theory**. I aim to advance both theoretical foundations and practical applications in these areas to solve complex, real-world problems.

## RELEVANT EXPERIENCE

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### Arizona State University

Ph.D. Researcher, 06/2021 - today

-Proposed an algorithm to solve one-sided incomplete information differential game with an emphasis on explainable strategies [1].

- Modeled vehicle interaction as general-sum complete (and incomplete) information differential games to generate safe equilibrial policies for autonomous vehicle agents [2, 3, 5] and swarms [4].

- Proposed RL-based controller to reduce the frequency of inference in incomplete information interaction between a human and an autonomous driver.

### 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

-Interned across different departments (quality, manufacturing, operations) in the TKE elevator manufacturing plant to shift the focus from configure-to-order model to standard-offerings model.

-Reduced data pre-processing time by more than 50% by implementing an automated Python process.

-Successfully reduced elevator cab assembly inefficiencies through process improvements.

## SKILLS

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**PROGRAMMING:** Python (Jax, NumPy, PyTorch),  $\LaTeX$ (PGFPlots, TiKZ), Matlab, Scikit-Learn, Linux, Julia, Java

**TOOLS:** Optimization, Optimal Control, Model Predictive Control, Physics-Informed Machine Learning, Reinforcement Learning.

Last Updated: June 26, 2024

## EDUCATION

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### Arizona State University

Tempe, AZ, USA

Ph.D. Mechanical Engineering, GPA: 4.0/4.0

2021 - 2025 (Anticipated)

### University of Mississippi

Oxford, MS, USA

B.Sc. (Hons) Mechanical Engineering, GPA: 3.98/4.0

Minors: Computer Science, Mathematics

Thesis: *A Study of Deep Reinforcement Learning in Autonomous Racing Using DeepRacer Car.*

2016 - 2021

## RELEVANT COURSEWORK

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

## SELECTED AWARDS & HONORS

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Experiential Learning Grant 2023, 2024

GPSA Travel Grant Award 2023

ICRA Travel Grant 2023

SMBHC Research Fund Award 2020

## SELECTED PUBLICATIONS

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- [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

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

**REVIEWING:** International Symposium on Distributed Autonomous Robotic System (DARS)