

# MUHAMMAD ANEEQ UZ ZAMAN

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<https://scholar.google.com/citations?user=9WRGZ0kAAAAJ&hl=en>

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## EDUCATION

**University of Illinois, Urbana–Champaign** Urbana, IL • PhD Mechanical Engineering, 2018 - 2023  
**University of Illinois, Urbana–Champaign** Urbana, IL • MS Mechanical Engineering, 2015  
**National University of Science and Technology** Islamabad, Pakistan • B.S., Mechatronics Engineering, 2010

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## PROFILE

**Research Experience:** Oracle-free RL for Mean-Field Games, Policy Gradient (PG) methods for Multi-Agent Reinforcement Learning (MARL) over Networks, Deep Learning for fault diagnosis (Recurrent Neural Networks), Adversarial Mean-Field Games over Multi-graphs, Peer-to-Peer Energy trading networks using MFGs.

**Industrial Experience:** Embedded system programming and design for control of precision actuators, System identification of the propeller/rotor assembly of DJI F550 platform, Wireless communication with AutoQuad autopilot using MavLink protocol.

**Programming Skills:** Python (Pandas, TensorFlow), C, C++, Java, MATLAB/Simulink, NI LabVIEW, Mathematica, ROS, PCL, X-Plane, AutoQuad, TI Code Composer Studio, Player/Stage, Weka, Samiam, L<sup>A</sup>T<sub>E</sub>X.

**Technical Skills:** Dynamical systems modeling, control and simulation using MATLAB/Simulink and NI LabVIEW environment. UAV controller design and simulation using X-Plane simulation software. UAV Autopilot development using TI Code Composer Studio. Industrial control design using IntelliMax software.

**Leadership Skills:** Autonomous team lead while representing UIUC in NASA Robotic Mining Competition 2014. Board member for Fulbright UIUC chapter. Assistant manager in a public sector organization responsible for managing a team of technical staff. Team lead in final year project during the final year of bachelors degree.

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## PROFESSIONAL EXPERIENCE

- Summer Intern at General Motors, Global R&D Labs, Vehicle Health Management group from May to August 2018. I designed, implemented and tested fault diagnosis, failure prediction modeling and Remaining Useful Life (RUL) estimation for the battery systems of electric vehicles. A combination of model based and data driven techniques were used to obtain the modules using real world data.
- Intern at Intelinair Inc. from February 2015 to May 2015. I was involved with developing the mathematical model of the propeller-motor assembly of the DJI F550. Also worked on emulating the F550 in the X-Plane environment and mass properties calculator.
- Research Assistant at the Department of Mechanical Science and Engineering, UIUC, From June 2015 to August 2015. During the research assistantship I worked on sensor fusion algorithms, adaptive control and autopilot-base station communication using MavLink messages.
- Design Engineer in Public Sector Organization from May 2011 to December 2012.
- Applications and Design Engineer in Product Management Group in SENSYS Pvt. Ltd. from December 2010 to May 2011. I was involved with competitor study and developing new features for the IntelliMax DCS software.

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## TEACHING EXPERIENCE

- Teaching Assistant at the Department of Mechanical Science and Engineering, University of Illinois, Urbana-Champaign, from August 2017 to May 2018.
- Lecturer at the College of E&ME, NUST, from September 2015 to August 2017. Courses taught include Solid Modeling, Numerical Methods, Electro-Mechanical Systems, Mechatronics System Design, Linear Control Systems.

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## AWARDS AND ACHIEVEMENTS

- Participated in NASA Robotic Mining Competition as Autonomous Team Lead, 2014
- Won the Fulbright Masters Award, 2012
- Won University scholarship in 4th to 7th semesters in Mechatronics Engineering at National University of Science and Technology (NUST), 2009
- 3rd runners-up in the National Engineering Robotics Contest (NERC), 2009
- Was shortlisted in the top 7 students from all over Pakistan in National Physics Talent Contest (NPTC) held at GIKI, 2006
- Won the Eureka Award and 3rd place in All-Pakistan Science Contest held at GIKI, 2006

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## PUBLICATIONS

- **M. Zaman**, A. Koppel, S. Bhatt, T. Başar, *Oracle-free Reinforcement Learning in Mean-Field Games along a Single Sample Path* [submitted to Artificial Intelligence and Statistics 2023 \(AISTATS 2023\)](https://arxiv.org/abs/2208.11639)  
<https://arxiv.org/abs/2208.11639>.

- S. Aggarwal, **M. Zaman**, Melih Bastopcu, T. Başar, *Weighted Age of Information based Scheduling for Large Population Games on Networks* <https://arxiv.org/abs/2209.12888>.
- S. Aggarwal, **M. Zaman**, Melih Bastopcu, T. Başar, *Weighted Age of Information based Scheduling for Linear Quadratic Mean-Field Games with Communication Constraints* at 2023 American Controls Conference (ACC 2023) [submitted].
- **M. Zaman**, E. Miehling, T. Başar, *Reinforcement Learning for Non-Stationary Discrete-Time Linear-Quadratic Mean-Field Games in Multiple Populations* at Dynamic Games and Applications.
- S. Aggarwal, **M. Zaman**, T. Başar, *Linear Quadratic Mean-Field Games with Communication Constraints* at 2022 American Control Conference (ACC 2022).
- **M. Zaman**, S. Bhatt, T. Başar, *Adversarial Linear-Quadratic Mean-Field Games over Multi-graphs* at 2021 60th IEEE Conference on Decision and Control (CDC 2021). *Nominated for the Roberto Tempo CDC Best CDC Paper Award*.
- **M. Zaman**, S. Bhatt, T. Başar, *Secure Discrete-Time Linear-Quadratic Mean-Field Games* at 2020 International Conference on Decision and Game Theory for Security, (GameSec 2020).
- M. Sayin, D. Sahabandu, **M. Zaman**, T. Başar, R. Poovendran, *Minimax detection (MAD) for computer security: a dynamic program characterization* at 2020 Game Theory and Machine Learning for Cyber Security.
- **M. Zaman**, K. Zhang, E. Miehling, *Reinforcement Learning in Non-Stationary Discrete-Time Linear-Quadratic Mean-Field Games* at 2020 59th IEEE Conference on Decision and Control (CDC 2020).
- **M. Zaman**, K. Zhang, E. Miehling, *Approximate Equilibrium Computation for Discrete-Time Linear-Quadratic Mean-Field Games* at 2020 American Control Conference (ACC 2020).
- **M. Zaman**, S. B. Mehdi, S. B. Shams, *Path Planning for Cooperative Autonomous Soaring Gliders*, MIRROR-16 workshop at IROS 2016.
- **M. Zaman**, S. Shafqat, A. Imran, I. Noor, K. Faraz, *On-line Vision-Based Techniques for Robotic Soccer Environments*, 43rd International Symposium on Robotics.

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#### EVENTS ORGANIZED

- Helped organize the National Engineering Robotics Contest (NERC) in 2016 and 2017 at the National University of Science and Technology, Islamabad, Pakistan.
- Program Committee member the 2nd International Conference on Robotics and Artificial Intelligence (ICRAI) in November 2016 at the National University of Science and Technology, Islamabad, Pakistan.
- Home discussion organized on History and Culture of Pakistan for the Fulbright UIUC chapter.

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#### INVITED TALKS

- Delivered a talk in the "Machine Learning and Mean Field Games" Seminar series on "*Reinforcement Learning for Non-Stationary Discrete-Time Linear-Quadratic Mean-Field Games in Multiple Populations*" on May 17<sup>th</sup> 2022. Available at <https://sites.google.com/view/mlmfgseminar/past-talks>.
- Delivered a talk on "*Efficient Methods for Cooperative Autonomous Soaring*" at the Laboratory for Cyber Physical Networks and Systems (CyPhyNets) at the Lahore University of Management and Sciences (LUMS)
- IEEE Control Systems Seminar on "*Path Planning for Cooperative Autonomous Soaring gliders*" at Control and Signal Processing Research Group (CASPR) at the Capital University of Science and Technology (CUST).

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#### REFERENCES

- Tamer Basar, Professor, Coordinated Science Lab, University of Illinois Urbana-Champaign, 1308 W Main St, Urbana, IL 61801, **Email:** basar1@illinois.edu.
- Azeem Sarwar, Senior Researcher, Vehicle Health Management group, General Motors, Warren Technical Center. 30001 Van Dyke Ave, Warren, MI 48093, **Email:** azeem.sarwar@gm.com
- Alec Koppel, AI Research Lead, JP Morgan AI Research, **Email:** alec.koppel@jpmchase.com
- Sujay Bhatt, Research Scientist, JP Morgan AI Research, **Email:** sujaybhatt.hr@gmail.com