Keshav Bagri

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EDUCATION

The Ohio State University — Columbus, OH

Master of Science in Mechanical Engineering [GPA: 4.0/4.0] | Advisor: Prof. Giorgio Rizzoni   2022 – 2024
Graduate Specialization in Automotive Systems and Mobility
Thesis: *Quantitative risk assessment and mitigation through fault diagnostics for automated vehicles [Link]*

Indian Institute of Technology (IIT) Kharagpur — Kharagpur, India

Bachelor of Technology (Hons.) in Mechanical Engineering [CGPA: 9.26/10]   2018 – 2022
Micro Specialization in Embedded Control, Software, Modelling and Design [CGPA: 9.5/10]
Thesis: *Fault tolerant control system for Electric Vehicles*

PUBLICATIONS

◇ [Under review] **Bagri, K.**, Rizzoni, G., "Risk quantification and mitigation through fault diagnostics for highly automated vehicles", IEEE Access.

◇ **Bagri, Keshav.** "Quantitative risk assessment and mitigation through fault diagnostics for automated vehicles." Master's thesis, Ohio State University, 2024. [Link]

◇ Singh, Y., **Bagri, K.**, Jayakumar, A., Rizzoni, G. Fault Diagnostics for Oscillatory Failure Case in Aircraft Elevator Servos. IFAC World Congress in Yokohama, Japan, July 2023. [Link] [Media]

PROFESSIONAL AFFILIATIONS

◇ As a Member
  - SAE Hybrid EV Committee   [2025]
  - ASME Technical Committee on Automotive and Transportation Systems (ATC)   [2025]
  - IFAC Technical Committee on Automotive Control (TC 7.1)   [2025]
  - IFAC Technical Committee on Transportation Systems (TC 7.4)   [2025]

◇ As a Reviewer
  - SAE International Journal of Electrified Vehicles   [2025]
  - IEEE Open Journal of Controls Systems   [2025]
  - American Control Conference (ACC)   [2024, 2025]
  - Modeling Estimation and Control Conference (MECC)   [2024]

AWARDS AND ACHIEVEMENTS

◇ 2nd **place** in "Aerospace Competition on Fault Detection & Fault Tolerance" at **IFAC World Congress 2023** by **Airbus**

◇ **Gold Medal** in Inter IIT Tech Meet 10.0 (2022) in the event "Powered Bonnet for EVs" by **Jaguar Land Rover India**

◇ **1st place** in Combustion category & Engineering Design among **31 teams** globally at Formula Bharat Virtuals 2021-22

◇ **Gold Medal** in Inter IIT Tech Meet 9.0 (2021) in the event "Bosch's Electric Vehicle Simulation" by **Robert Bosch India**

PROFESSIONAL EXPERIENCE

Lucid USA, Inc. — Newark, CA
Engineer, Battery Algorithms   *August 2024 – Present*

◇ Developing and refining algorithms for controlling the battery's performance with a focus on optimizing powertrain demands, enhancing user experience, and maximizing battery longevity

◇ Planning and executing comprehensive testing to verify software performance under extreme conditions, including temperature variations and unusual driving scenarios

◇ Collaborating with data analysts to analyze fleet and customer data, translating insights to improve estimation and control algorithms for charging

The MathWorks Inc. — Natick, MA
Software Developer, Engineering Development Group | [Simulink Fault Analyzer]   *May 2023 – August 2023*

◇ Engineered the **full stack development** of a feature to analyze fault trees, reducing safety engineers' workload by **50%**

◇ Incorporated functionalities to enable the precise determination of **failure probability** & identification of **minimal cut sets**

◇ Recognized limitations in the existing implementation, proposing actionable solutions to improve the efficiency by **30%**

Center for Automotive Research, The Ohio State University   **Columbus, OH**
General Motors - SAE AutoDrive Challenge II | [Center for Automotive Research]

Graduate Research Associate   *August 2023 – August 2024*
- ⬦ Developed an optimal graph-based dynamic rerouting algorithm, enabling real-time on-demand computation of a new trajectory for obstacle avoidance in an urban driving environment, ensuring efficient navigation towards the global goal
- ⬦ Devised a Finite State Machine - based behavior planner for navigation in an urban environment using object and traffic sign detections for decision-making and collision avoidance
- ⬦ Coordinated with the systems safety, perception, & CAN teams to develop testing scenarios, considering key requirements

Co-Lead, Planning & Controls team   *August 2022 – May 2023*
- ⬦ Devised a polynomial-interpolation-based **trajectory generation** module to sample waypoints for lane change maneuver
- ⬦ Formulated the logic for **lane changing maneuver** in a highway environment & performed SIL testing for edge cases
- ⬦ Assisted in formulating the **Functional Interface Analysis** & Requirements Traceability Matrix, ensuring safety compliance

WMG, University of Warwick   **Coventry, UK**
Research Collaborator | [Intelligent Vehicles]   *January 2022 – July 2022*
- ⬦ **Project**: Robust translation between 2 levels of Scenario Description Language
- ⬦ Developed the Java-based translation framework between levels of **Scenario Description Language** for ADS simulation
- ⬦ Formulated the mapping between environmental features and language variables using the taxonomy defined in **PAS 1883**
- ⬦ Defined the boundary conditions for the agents' maneuver to describe the **Synchronised Serial Maneuver Sequences**

Revolute Robotics   **Tucson, AZ**
Controls Engineer | [Revolute Robotics]   *March 2022 – July 2022*
- ⬦ **Project**: Develop optimal motion control algorithms for a Hybrid Mobility Robot
- ⬦ Modified the **min. jerk trajectory** planner for smooth navigation using a dynamic window of **3 waypoints** per time step
- ⬦ Formulated the cost-based **path planning & obstacle avoidance** approach using min. jerk planner & A* search algorithm
- ⬦ Identified multiple methods to enable **data-logging** over cloud from the flight controller thus reducing manual intervention

Center for Automotive Research, The Ohio State University   **Columbus, OH**
Research Intern | Advisor: Dr. Jeffrey P. Chrstos   *February 2021 – March 2022*
- ⬦ **Project**: Performance assessment of Driver-in-Loop simulators
- ⬦ Reviewed literature for absolute and relative validity of medium fidelity D-i-L simulators for **physical validation**
- ⬦ Proposed the **testing methodology** for the simulator's platform's motion and analyzed the results in the essence of OMCT
- ⬦ Utilized the output of **LVDTs** for multiple displacement inputs to compute the platform's roll & pitch angles using MATLAB

Ati Motors   **Bengaluru, India**
Winter Intern | Autonomy team   *November 2020 – January 2021*
- ⬦ **Project**: SLAM for autonomous cargo delivery vehicles
- ⬦ Explored multiple **SLAM algorithms** like IMLS, EKF, Gmapping, etc. to select an efficient method for implementation
- ⬦ Implemented the **Particle Filter** SLAM algorithm to build maps on a 2D grid using lidar and wheel odometry in Python
- ⬦ Analysed the effects of multiple **resampling algorithms** and variation in **hyperparameters** on the map's quality

Autonomous Robots and Multi-robot Systems Lab, IIT Bombay   **Mumbai, India**
Research Intern | Advisors: Prof. Leena Vachhani and Prof. Arpita Sinha | Website   *July 2020 – October 2020*
- ⬦ **Project**: Motion planning for autonomous vehicles in a non-signalized environment
- ⬦ Formulated the **Markov Decision Process** representation for the agent considering different state and action spaces
- ⬦ Generated training datasets for a **RL model** for the safe traversal of the vehicle in a **non-signalized** environment
- ⬦ Developed a **Finite State Machine** for lane following & 2-way lane intersection (without traffic signals) management

PROJECTS

Formula SAE powertrain development | TeamKART | [Website]   **IIT Kharagpur**
Supervisor: Prof. Dhananjay Kumar Srivastava   *June 2019 – August 2021*
- ⬦ Designed the **fuel tank** and the mounting arrangement for the vehicle considering the optimal capacity requirement
- ⬦ Designed and analyzed the components of the **transmission** and **cooling system** for a standard FSAE electric vehicle
- ⬦ Engineered the **intake manifold** & **crossflow radiator** for a single cylinder engine, producing a power output of **35 HP**
- ⬦ Performed **engine simulations** in Ricardo WAVE and **CFD analysis** using Ansys Fluent for designing the intake manifold

Fault tolerant control system for electric vehicles   **IIT Kharagpur**
Supervisor: Prof. Somnath Sengupta | Advanced Technology Development Center   *February 2021 – April 2022*
- ⬦ Worked on the modeling of integrated **ABS & regenerative braking** for efficient braking & maximum energy recuperation
- ⬦ Engineered a **non-linear state estimator** using vehicle dynamics' equations to generate estimates of the vehicle's conditions
- ⬦ Designed a novel **constraint-aware PI - sliding mode controller** for regulating the stability under all driving conditions
- ⬦ Explored the possibility of integrating the novel controller with **reconfigurable control allocator** for fault-tolerant control

Mathematical modelling of Li-ion batteries focusing on Si anode particles   **IIT Kharagpur**
Supervisor: [Prof. Jeevanjyoti Chakraborty](#) | Mechanical Engineering Department   *February 2020 – January 2021*

⋄ Studied the mechanics behind **crack development** and formation of amorphous lithiated Si with time around the Si anode
⋄ Solved Ordinary and Partial differential equations, using **Finite Difference & Liebmann's methods**, in Python
⋄ Established a **two-way coupling** relation between diffusion & stress, to understand the effect of one parameter on the other

Deep reinforcement learning for autonomous vehicles   **IIT Kharagpur**
[[Description](#)] | [Github](#)]   *August 2020 – September 2020*

⋄ Deployed a **Dueling DNN** to predict discrete action values & mapped them to continuous signals for vehicle control
⋄ Used **84x84 RGB** images for the environment perception as the state information collected from the camera sensor
⋄ Accommodated the wheel odometry, collision & lane invasion sensor data to compute **real-time reward** for the agent

COURSEWORK / TECHNICAL SKILLS

Programming: C/C++, Git, Python, MATLAB, LaTex, Arduino, ROS, Atmel Studio
Softwares: MATLAB/Simulink, CARLA Simulator, Gazebo, COMSOL
Coursework: Powertrain control, Autonomy in Vehicles, Fault diagnosis, Vehicle dynamics & control, Linear Systems Theory

TEACHING & VOLUNTEERING EXPERIENCE

College of Engineering   **The Ohio State University**
GUIDE Peer Mentor   *August 2023 – April 2024*

⋄ Responsible for assisting fresh graduate students in navigating the university by guiding them about university resources

Department of Mechanical & Aerospace Engineering   **The Ohio State University**
Graduate Teaching Associate   *January 2023 – May 2023*

⋄ Courses: ME 3751 (Kinematics & Mechanism Design) and ME 3670 (Design & Analysis of Machine Elements)
⋄ Responsible for conducting weekly recitations, office hours and doubt clarification sessions for a batch of 60+ UG students

LEADERSHIP EXPERIENCE

Captain   **The Ohio State University**
General Motors – SAE AutoDrive Challenge II   *May 2023 – August 2024*

⋄ Led a team of 20+ students from Ohio State to prototype the hardware & software stack for SAE Level 4 autonomy

Deputy Team Leader   **IIT Kharagpur**
TeamKART, Formula SAE   *July 2020 – August 2021*

⋄ Spearheaded a dedicated team of **47** students towards the research & development of Formula Student prototype vehicle

PROFESSIONAL REFERENCES

⋄ Prof. Giorgio Rizzoni (Email: rizzoni.1@osu.edu)
- Professor, Departments of MAE and ECE at The Ohio State University
- Director at the Center for Automotive Research (OSU)
- Ford Motor Company Chair in Electromechanical Systems

⋄ Prof. Qadeer Ahmed (Email: ahmed.358@osu.edu)
- Assistant Professor, Department of MAE at the Ohio State University
- Core affiliate faculty of the Center for Automotive Research (OSU)

⋄ Prof. Lisa Fiorentini (Email: fiorentini.2@osu.edu)
- Clinical Professor, Department of ECE at the Ohio State University
- Associate Fellow at the Center for Automotive Research (OSU)

⋄ Prof. Andrea Serrani (Email: serrani.1@osu.edu)
- Professor, Department of ECE at the Ohio State University

⋄ Prof. Somnath Sengupta (Email: sengupta.s@atdc.iitkgp.ac.in)
- Assistant Professor, Advanced Technology Development Center (ATDC) at IIT Kharagpur

⋄ Ying Shi ([LinkedIn](#))
- Sr. Manager, Battery Algorithms, Lucid Motors

⋄ Giovanni Miraglia ([LinkedIn](#))
- Sr. Software Engineer, The MathWorks Inc.

⋄ Mahesh Nanjundappa ([LinkedIn](#))
- Software Engineering Manager, The MathWorks Inc.