Keshav Bagri

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Summary

Experienced graduate student passionate about vehicle controls and systems engineering, seeking full-time opportunities

Education

The Ohio State University — **Columbus, OH**
*Master of Science in Mechanical Engineering [GPA: **4.0/4.0**]* — *Aug'22 – May'24 (Expected)*
Graduate Specialization in Automotive Systems and Mobility [Ongoing]

Indian Institute of Technology Kharagpur — **Kharagpur, India**
*Bachelor of Technology (Hons.) in Mechanical Engineering [GPA: **9.26/10**]* — *July'18 – May'22*
*Micro Specialization in Embedded Control, Software, Modelling and Design [GPA: **9.5/10**]*

Publications

Y. Singh, **K. Bagri**, A. Jayakumar, G. Rizzoni, *Fault Diagnostics for Oscillatory Failure Case in Aircraft Elevator Servos*, IFAC-PapersOnLine

Technical Skills

Programming: C/C++, Git, Python, MATLAB, ROS, JavaScript
Softwares: SOLIDWORKS, Ansys, MATLAB/Simulink, CARLA Simulator, Gazebo
Libraries: NumPy, SciPy, Pillow, SymPy, Matplotlib, OpenCV, TensorFlow, Keras, PyTorch, CARLA

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**

Industry Experience

The MathWorks Inc. — **Natick, MA**
Engineering Development Group Intern — *May'23 – Aug'23*

- Engineered the **full stack development** of a feature to create & analyze **fault trees**, from concepts into functional software
- Incorporated functionalities to enable the precise determination of **failure probability** & identification of **minimal cut sets**
- Coordinated with fellow developers to establish key requirements, fostering seamless alignment across the project lifecycle
- Recognized limitations in existing implementation of functionalities, proposing actionable solutions for effective resolution

Revolute Robotics — **Tucson, AZ**
Controls Engineer — *Mar'22 – July'22*

- 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

KPIT Technologies Ltd. — **Pune, India**
Summer Intern, CTO – Deep Learning — *May'21 – July'21*

- Worked on the comparison between compilers & DL frameworks using pre-trained models for **performance analysis**
- Generated **deployable executables** using AI compilers like TVM, Glow to substantially reduce memory & inference time
- Created a streamlined approach for deploying **hardware-specific** deep learning models tailored for automotive applications

Ati Motors — **Bengaluru, India**
SLAM Intern, Autonomy Team — *Nov'20 – Jan'21*

- Studied the **OctoMap** mapping and implemented open-source datasets to facilitate enhanced visualization of 3D maps
- 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

Research Experience

General Motors – SAE AutoDrive Challenge II **Columbus, OH**
Co-Lead, Planning & Controls team *Aug'22 – May'23*

- 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 setup & performed simulation-based testing for the same
- Crafted decision-making & maneuvering module for level 4 autonomous vehicle using Stateflow, ensuring safety compliance
- Coordinated with the systems safety, perception, and CAN teams to develop the entire pipeline, considering key requirements

Warwick Manufacturing Group, University of Warwick **Coventry, UK**
Research Collaborator, Verification and Validation Team *Jan'22 – July'22*

- 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**

OSU Centre for Automotive Research **Columbus, OH**
Undergraduate Research Assistant, Driver Dynamics Lab *Feb'21 – Mar'22*

- Worked on the validation of **IMU data** collected from different locations using physics-based transformation & noise filtering
- Proposed the **testing methodology** for the simulator's platform's motion and analysed the results in essence of the OMCT
- Utilized the output of **LVDTs** for multiple displacement inputs to compute the platform's **roll** & **pitch** angles in MATLAB

Fault Tolerant Control System for Electric Vehicles | [Bachelor's Thesis Project] **IIT Kharagpur**
Supervisor: Dr. Somnath Sengupta, Advanced Technology Development Center *Feb'21 – Apr'22*

- Assembled a comprehensive **electro-mechanical** model for a 4WD EV to examine fault impacts and refine control strategies
- 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

Powertrain development for Formula Student prototype **IIT Kharagpur**
Supervisor: Dr. Dhananjay Kumar Srivastava, Department of Mechanical Engineering *June'19 – Aug'21*

- Worked on the design of a custom **reactive muffler** for noise reduction from a vehicle, with an insertion loss of **25 dB**
- 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

Relevant Coursework

University: Simulation Techniques for Dynamic Systems, Powertrain Dynamics, State Space Control Systems, Embedded Control Systems, Embedded Sensing, Actuation & Interfacing System, Principles of Automotive Dynamics & Controls

Online: Algorithms for Battery Management Systems Spl., Data Structures, Reinforcement Learning Spl., Self-Driving Cars Spl., Convolutional Neural Networks, Neural Networks and Deep Learning, Machine Learning

Leadership

Co-captain **The Ohio State University**
General Motors - SAE AutoDrive Challenge II *Sept'22 – May'23*

- Assisted the captain & faculty advisors in the project's activities and managing the **competition deliverables** & deadlines
- Coordinated with safety, controls, CAN, and perception teams to establish the **overall pipeline** on the system level

Deputy Team Leader **IIT Kharagpur**
TeamKART, Formula SAE *July'20 – Aug'21*

- Spearheaded a dedicated team of **47** students towards the research & development of Formula Student prototype vehicle
- Responsible for managing the project & sponsorship initiatives to ensure timely completion of the team's planned milestones
- Prepared the design & manufacturing timeline and procurement plan to ensure a smooth & efficient workflow for project **K6**

Powertrain & Corporate Relations Team Member **IIT Kharagpur**
TeamKART, Formula SAE *July'19 – July'20*

- Responsible for the design, analysis, and testing of the powertrain components in the FSAE prototype vehicle
- Involved in the training of **30** freshmen in basic automotive engineering, powertrain technology, and aspects of manufacturing
- Acquired monetary as well as technical sponsorships worth **INR 1,10,000** for the season 2019-20