Karthik Kalidas

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EDUCATION

The Ohio State University (OSU), Columbus, OH [Aug '19 – Present]
M.S. in Mechanical Engineering | GPA: 4.0/4.0

Indian Institute of Technology Bombay (IITB), Powai, India [Aug '15 – Aug '19]
BTech. in Mechanical Engineering | CPI: 8.40/10.00

INTERNSHIP EXPERIENCE

KPIT Technologies, Pune, India | Autonomous Driving & ADAS Research Group [May '18 – Jul '18]
Research Internship under Dr. Nadeer Eliparakkal

- Responsible for designing and testing Plug and Play hardware to enable Automatic Emergency Braking (AEB)
- Modeled AEB on Simulink to extract design requirements for actuators and linkages, and simulate vehicle behavior
- Worked on sensor suite integration including solid-state 2D LiDAR, Radars, Camera, and ultrasound sensors
- Evaluated path-planning algorithms such as **A***, **D***, **RRT**, **RRT*** (Global), and **DWA** (Local) for computational efficiency
- Developed **GUI** to visualize real-time display of control inputs estimated using Model Predictive Control **(MPC)**
- Received **Pre-Placement Offer** to join full-time based on internship progress and performance

RESEARCH EXPERIENCE

Automated Driving Lab, OSU **|** Center for Automotive Research [Aug '19 – Present]
Guide – Prof. Bilin Aksun Guvenc | MAE Department, OSU

- Working towards developing autonomous shuttles to operate at the Ohio State School of Blind
- Actively involved in shuttle (**Dash EV**) hardware architecture design and stack integration
- Responsible for testing Dash vehicle and map-building using Localization and Mapping (**SLAM**) techniques
- Employing **Lanelet** libraries and map-matching for building high definition (HD) maps
- Involved in tuning MPC-based lateral controller by performing Hardware-in-the-loop (**HiL**) simulations
- Modeled ODD on **CARLA** for validating path-following controller and behavior planning algorithms
- Completed Self-Driving Cars Specialization by University of Toronto (Coursera)

LEADERSHIP AND ENGINEERING EXPERIENCE

Formula SAE | IIT Bombay Racing

TECHNICAL LEAD [Jul '18 – Aug '19]

Led **3-tier** cross-functional team of **60+** students to build an electric racecar for Formula Student (FS), an international student racecar design competition organized annually by IMechE at Silverstone, UK

- Led the overall mechanical system design, manufacturing and performance testing of E-11, racecar for FS UK '19 with focus on electro-mechanical powertrain, high-voltage battery, cooling system and system integration
- Responsible for technical design event & all dynamic events accounting for **82.5%** of total competition points
- Monitored the allocation and expenditure of mechanical subsystem budget of over INR **1.5** million
- Responsible for managing complete car 3D CAD model, with over **3k** components for efficient product design
- Employed Gantt charts & PLM Software in the team for optimized product development processes
- Extended technical alliances with industries like Tata Motors, Wipro, NRB, and TE, incorporating design and safety standards
- Responsible for competition rulebook compliance and scrutineering based on SAE standards and guidelines
- Achieved over **100Kms** of track testing both nationally and internationally for boosting reliability and performance
- Presented at the prestigious Design Event and Cost Event to leading motorsport professionals at FS UK '19

Won the prestigious **FS Award** worth **£3000** twice consecutively, given to top **8** international teams based on overall team progress
Placed all-time best ranking of 3rd in EV category

DESIGN ENGINEER | POWERTRAIN [Sep '16 – Jun '18]

- Presented at the Design Event at Formula Student UK '18 securing **12th** place out of **85+** international teams
- Responsible for design and manufacturing of planetary gearbox and driveshaft assembly for FS UK '18
- Performed extensive analysis and simulations for gear ratio optimization based on acceleration and efficiency
- Achieved **53%** weight reduction and **33%** volume reduction via gear optimization using KISSsoft

JUNIOR DESIGN ENGINEER | POWERTRAIN CONTROLS

- Developed and implemented PID based yaw rate controller improving cornering performance
- Modeled complete car on CarMaker integrated with MATLAB for validating yaw rate controller
- Spearheaded research on All-Wheel-Drive with torque vectoring and In-Hub motors for future racecars

Awarded **1st** in Business Presentation & **2nd** in Design at FS Electric Vehicle Concept Challenge, India

SCHOLASTIC ACHIEVEMENTS

- Awarded Institute Technical Citation for exemplary contribution to IIT Bombay's technical culture ['18]
- Awarded Institute Technical Color for research into four-wheel drive electric systems ['18]
- Secured All India Rank **606** in Joint Entrance Exam - Advanced out of **0.2 million** candidates ['15]
- Secured **99.91** percentile in Joint Entrance Exam - Mains among **1.3 million** applicants ['15]
- Recipient of Kishore Vaigyanik Protsahan Yojana (KVPY) scholarship by IISc. Bangalore ['15]

OTHER RELEVANT PROJECTS

- **Automotive Cybersecurity** [Aug '19 – Nov '19]

  Guide – Prof. Abhishek Gupta, ECE Department, OSU
  - Investigated critical vulnerabilities to several in-vehicle networks (including CAN) for cyberattacks
  - Explored state-of-the-art Intrusion Detection Systems (IDS) for detecting Denial-of-Service (DoS) attacks
  - Modeled and simulated stochastic controller to mimic sensor signals robust to bus-off attacks
- **SLAM & Path-Planning for Mobile Robots** [Sep '19 – Jan '19]

  Guide – Prof. Claus Brenner, Leibniz Universität Hannover | Online Course Project
  - Implemented SLAM module for 2D robot using landmark detection and state estimation using C++
  - Incorporated several filtering techniques such as EKF, PF, FastSLAM for position estimation
  - Integrated path-planning algorithms such as Dijkstra, A*, and potential functions in kinematic state space
- **AV Simulation using CARLA** [Dec '16 – Present]

  Self-Driving Cars Specialization | University of Toronto | Coursera Final Project
  - Developed AV stack including sensor fusion, trajectory planning, and behavior planning modules on Python
  - Implement lateral controllers such as Pure Pursuit and Stanley controller for path following
  - Simulated variety of realistic driving scenarios for improving safety and smooth performance
- **Autonomous Basket-Bot** [May '16 – Aug '16]

  Institute Technical Summer Project Robotics Club, IIT Bombay
  - Designed and fabricated an Arduino controlled ball thrower with major focus on accuracy
  - Designed 3D CAD Models of bot with structural analysis performed along with working animation

MENTORSHIP EXPERIENCE

- **Mentor | Department Academic Mentorship Program, IIT Bombay** [Apr '17 – Apr '18]
  - Selected by ME department to offer academic guidance to junior students and addressing concerns
  - Active involvement in improving student-faculty interactions and students' academic experience
- **Mentor | IIT Bombay Racing Summer Internship Program, IIT Bombay** [May '17 – Jul '17]
  - Responsible for managing internship program for **50+** freshmen to impart knowledge in racecar engineering
  - Conducted sessions on using CAD and simulation software like MATLAB, Simulink, SOLIDWORKS & ANSYS

TECHNICAL SKILLS

- **Programming Languages -**

  Comfortable - C++, Python, Java **| Familiar** - C#, JavaScript, MySQL, Arduino
- **Software/ Tools**
  - **Proficient** - MATLAB/Simulink , ROS, CARLA, UE4, CarSim, CarMaker, Git, Linux, ADAMS, SolidWorks, ANSYS
  - **Familiar** - Unity3D, OptimumG, MoTeC, Eagle, PSpice, Mbed

EXTRA-CURRICULAR ACTIVITIES

- Attended 5-day OptimumG Data-Driven Performance Engineering Seminar by Mr. Claude Roulle ['18]
- Presented IIT Bombay Racing's electric racecar at Autocar Performance Show 2017 ['17]
- Selected for Autodesk Student Expert Boot Camp for collaborative product development ['17]
- Secured **3rd** place in Inter-Hostel Dance General Championship ['16]
- Volunteered as an organizer for Mood Indigo, Asia's largest college cultural festival ['15]