

PRAJWAL BHASKAR BHARADWAJ

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EDUCATION

National Institute of Technology Karnataka (NITK), Surathkal Bachelor of Technology in Mechanical Engineering, <i>CGPA: 9.05/10</i>	Surathkal, India May 2019
VVS Sardar Patel Pre-University College Class 12, <i>Overall 98.67% with 100% in Physics, Chemistry, Mathematics and Electronics</i>	Bangalore, India April 2015
VVS Sardar Patel High School Class 10 - Karnataka State Secondary Examination Board, <i>Overall 99.2%</i>	Bangalore, India April 2013

PUBLICATIONS

Bhavik Parmar, **Prajwal B Bharadwaj***, “Design, Implementation of Gaits and Control of a Quadruped Robot”, 8th International Engineering Symposium, Kumamoto University, Japan, 2019 · [\[Oral Presentation\]](#) · [\[Publication\]](#) · * equal contribution

Prajwal B Bharadwaj, Jeyaraj Pitchaimani, “Newtonian approach towards mathematical modelling and tuning of a Continuously Variable Transmission”, International Conference on Mechanical Power Transmission, IIT Madras, India, 2019 · Oral Presentation · [\[IOPscience Conference Series Publication\]](#)

WORK EXPERIENCE

Caterpillar India Bangalore, India
Associate Engineer, Power Systems and Controls Division July 2019 - Present

- Delivered simulation and remote testing projects as an end-to-end engineer, with expertise in performance optimization using artificial neural networks and calibration of software maps
- Developed scripts for generating BODE plots from experimental sine sweep data and tuned PID controllers for implementing noise rejection and reference tracking strategies
- Improved test cell operational efficiency (TEEP) by 24.5% by developing VBA-based automation tools, remote monitoring and fast-paced data analysis
- Translated MATLAB-based field emissions analysis tool to Python scripts eliminating license costs

Mechanical Chef (Cooking Robot Startup) Bangalore, India
Mechanical Design and Robotics Intern May 2019 - June 2019

- Designed a novel mechanism for volume-based delivery of cooking ingredients, which reduced the number of required actuators to half the original count and slashed production costs [\[Video\]](#)
- Prevented ingredients from spilling out of loosely-held dispensing flaps, by implementing a self-locking system based on the concept of toggle positions in four bar mechanisms
- Developed models for series-elastic robot arms and designed feedback loops for soft compliance

Indian Institute of Technology (IIT), Bombay Mumbai, India
Research Intern, Suman Mashruwala Advanced Micro-Engineering Lab May 2018 - July 2018
Advisor: Dr. Prasanna S Gandhi, Professor, Department of Mechanical Engineering

- Developed a feedback-controlled mechatronic system running on Simulink-Tiva real-time interface, for precision control of z-stage motion in a Microstereolithography 3D printer [\[Video\]](#)
- Designed the actuating assembly consisting of geartrain reduction followed by a lead-screw mechanism for converting the micro-steps of stepper motor into desired precision of linear motion
- Achieved microscopic displacement resolution of 10µm and validated using opto-electronic sensors [\[Image\]](#)

Indian Institute of Space Science and Technology (IIST) Thiruvananthapuram, India
Research Intern, IIST Summer Internship Programme June 2017 to July 2017
Advisor: Dr. K Kurien Issac, Senior Professor and Dean IPR&CE

- Developed a MATLAB script for animating the effects of gait parameters on the stability of a quadruped robot and used the same iteratively to obtain a set of stable, quasi-static gait parameters
- Designed static and dynamic leg trajectories, simulated them using Fourier techniques for computational advantage in cyclic operation, and implemented reference tracking using five-bar inverse kinematics
- Achieved stable walking, turning and trotting gaits using MATLAB-Adams Co-simulation [\[Video\]](#)

ACHIEVEMENTS

- First place in the Spotter Snake theme at the e-Yantra National Robotics Competition (conducted by the Department of Computer Science, IIT Bombay) which had 5932 participating teams [\[Image\]](#)[\[Video\]](#)
- Awarded the NITK Institute Merit Scholarship for two consecutive years for being among the top 3 percentile in the Mechanical Engineering Department. Recipient of the JEE Main Scholarship

- Recipient of the JASSO (Japan America Student Services Organization) scholarship for the research paper presentation and Spring Internship Program at Kumamoto University, Japan
- Ranked 3rd out of 6 lakh students in the Class 10 State Board Examination
- Secured 4th rank out of 2.3 lakh students in Class 12 Pre-University Board Examination
- Secured All India Rank - 816 out of 15 lakh candidates (99.5 Percentile) in the IIT-JEE Main Exam
- Bronze medallist at the Intel IRIS National Science Fair for design and prototype of the novel product, Clothes Retrieval System - used to prevent hung clothes from getting wet during rain

PROJECTS

Snake Robot, *e-Yantra National Robotics Competition Winning Team* [\[Video\]](#)

- Developed novel algorithms for rapid pitching and fall recovery of snake robot, simulated them alongside caterpillar, side-winding, serpentine gaits in V-REP, and implemented in Arduino code
- Designed modular servo-motor holding brackets to ensure compliance with the component volume limitations as per competition rules, which also saved 30% of allocated cost for 3D printing
- Led the team by setting task deadlines and providing working-level clarity to the team members

Quadruped robot, *Mechanical Team Lead, ABU Robocon 2019* [\[Video\]](#)

- Developed a framework for automatically generating leg trajectories on a quadruped robot based on pose values obtained from IMU and proximity sensors
- Tackled the issue of lack of torque from leg-actuating motors by leading the team in fabricating a lead-screw combined with RRRP four bar mechanism to obtain desired mechanical advantage
- Implemented stair climbing gait on the four-legged robot and tested it for 35% gradient

Smart City, *Theory and Practice of Sensors and Actuators Course Project*

- Developed an algorithm incorporating the use of ArUco markers to identify and locate moving robots as well as stationary POIs on the smart city grid to aid path-planning of robots
- Leveraged localization data from the USB Webcam as a feedback for providing more accurate positions, to ensure smooth functioning of bots in case of any malfunction during run-time

Newtonian approach towards Mathematical Modelling and Tuning of a CVT, *Bachelor's Thesis Advisor: Dr. Jeyaraj Pitchaimani (Featured among top 2% scientists 2020 list by Stanford University)*

- Developed a novel force-based mathematical model of a CVT for optimizing the combination of flyweights and springs required to achieve the constant engine speed which maximizes power
- Research paper accepted for publication and presentation at IC4M - International Conference on Mechanical, Manufacturing, Modeling and Mechatronics at Nice, France [\[Acceptance\]](#) and ICMPPT - International Conference on Mechanical Power Transmission at IIT Madras, India [\[Publication\]](#)

Water Equity Project, *IoT-based Water Management Project for Apartment Complexes*

- Bench-marked competitive products and provided technological recommendations to the Bangalore Apartment Federation regarding feasibility of house-wise water metering in apartments
- Designed IoT architecture for communication of water consumption data between flow-sensor and central server, and tested LoRa protocol for seamless data transmission for a range of 20m

SKILLS

Application Softwares: Simulink, MSC Adams, V-REP, Labview, OpenCV, Solidworks, Fusion 360
 Programming: Python, C, C++, Visual Basic, Mathematica

POSITIONS OF RESPONSIBILITY AND EXTRA-CURRICULARS

- Cultural Convener - Led a 20+ member team in organizing classical concerts with 400+ audience outreach
- Powertrain Head at Baja NITK Racing - Led a team of 5 fabricating the powertrain subsystem [\[website\]](#)
- Executive Member of IEEE NITK - Mentored and periodically reviewed sophomore projects
- Chief Editor for the vernacular section of the annual college magazine with 20+ articles
- Managed a 25-member team organizing cultural competitions for school kids (550+ participants)
- Volunteer at CoachEd - Mentored two underprivileged Mechanical undergraduates to secure jobs
- Tabla artist at NITK Music Club - Performed in 15+ concerts and inter-collegiate competitions
- Long Distance Runner - Completed half-marathon (21.1km) in 1 hr 58 min at NITK Coastal Marathon