

Ashish Malik

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EDUCATION

PUNJAB ENGINEERING COLLEGE

B.E. IN MECHANICAL ENGINEERING

August 2014 - May 2018

Cum. GPA: 7.63

Senior Year GPA: 8.9

KENDRIYA VIDYALAYA

SENIOR SECONDARY

April 2013 - March 2014

Aggregate: 92.0 %

MATRICULATION

April 2011 - March 2012

GPA: 10/10

SKILLS

LANGUAGES & SOFTWARE

- Python
- Embedded C
- Pytorch
- SolidWorks
- MATLAB
- C++
- Robot Operating System (ROS)
- L^AT_EX

HARDWARES & SIMULATORS

- Arduino
- Gazebo
- Raspberry-pi
- Mujoco

EXTRA-CURRICULAR

ACHIEVEMENTS

- Awarded the **best G.E.T. award** in Maruti-Suzuki for exceptional performance in training period.
- Scored **99.46 percentile** in JEE Mains 2014, a nationwide engineering entrance examination with over 1 million test takers.
- Received **scholarships from Indian Air Force** for exceptional performance in 6th, 7th and 8th undergrad semesters.
- Selected as head of Electrical and Electronics sub-team for university's FSAE team.
- Scholar blazer holder in High-school, which is the highest status given for academics.

SOCIAL SERVICE & MISCS

- Successfully completed 1 year of social service under **National Service Scheme**, PEC. Taught physics to under-privileged high school students under project Abha.
- Volunteered for organizing several blood donation camps under National Service Scheme. **Star blood donor** for donating blood 5 different times.
- Sub-head for organizing 3 day vehicle dynamics workshop as part of SAE chapter of college.

PUBLICATIONS

- Zero-shot generalization using cascaded system-representation.
- **A Malik** (Sole Authorship)
Journal - The International Journal of Robotics Research (Under review) | arXiv
- A Generic Decentralized Gait Generator Architecture for Statically Stable Motion of Crawling Robots.
- **A Malik** (Sole Authorship)
Conference - Third IEEE International Conference on Robotic Computing (IRC), Naples, Italy
- A unified framework for operational range estimation of mobile robots operating on a single discharge to avoid complete immobilization.
- K Tiwari, X Xiao, **A Malik**, NY Chong
Journal - Mechatronics

EXPERIENCE

ROBOTICKX | FOUNDER

June 2019 - Current

- **Founded** robotickx.com, a website for learning Robot Operating System (ROS).
- The website aims to provide systematic topic-wise tutorials with clear progress markers, which the official documentation of ROS lacks.
- Currently the courses & exercises include basics of ROS, modelling & simulation of robots, etc. and are made using **IBM-Watson text to speech API**.

MARUTI-SUZUKI INDIA LTD. | ENGINE CALIBRATION DIVISION

July 2018 - April 2019 | EN8T2 Dept.

- Calibration and **Hardware in loop (HIL)** testing of automobile exhaust composition for various emission calibration parameters.
- Developed Emission control parameter predictor (E.C.P), which uses a multi-layered perceptron to **predict calibration parameters** for emission regulation components of automobiles.
- E.C.P. uses data of catalytic converter, engine, fuel, etc. to predict calibration parameters of oxygen sensors of the catalytic converter and fuel injector.
- E.C.P. tuned system provides similar **exhaust emissions performance** which is achieved after 2-3 manual calibration iterations on new automobile models, thereby saving 3-4 days of manual calibration work per model.

JAPAN ADVANCED INSTITUTE OF SCIENCE AND TECH. |

RESEARCH INTERN

June 2017 - Oct. 2017 | Remote : August'17-Oct'17

- Worked with **Prof. Nak Young Chong** and Dr. Kshitij Tiwari to develop a unified framework for estimating the operational range of any robot.
- Derived novel equations for energy consumption for UAVs and UGVs which account for real-world environmental conditions (variable wind-speed, terrain-profile, friction, gravel, etc).
- By classifying applicable forces in 4 abstract classes, derived energy consumption equations for the **unified framework for operational range estimation of any robot**.
- Aided in **development of a custom UGV** by interfacing electronic components and raspberry pi along with modifying ARDrone 2.0 for conducting validation experiments. Programmed the teleop module for manual control of UGV.

TATA MOTORS | INTERN

Feb. 2017 - May 2017

- Designed new-generation jigs and fixtures for gear manufacturing production lines which used air pressure sensors to sense proper fitting and alignment of the work components.
- Implemented various lean manufacturing tools (Standardized work, Jidoka, etc) on the production line as part of TATA's annual improvement cycle.

PROJECTS

UNIVERSAL ROBOT CONTROLLERS | RESEARCH PUBLICATION

Aug. 2019 – Dec. 2019

- Proposed a recurrent neural networks based framework which can be utilized to learn general-purpose system representations for robot control. These representations can then be used to learn **policies that achieve zero-shot generalization** over similar robot types with different morphologies which are unseen during training.
- Using the proposed framework, trained two separate control policies which **generalize over planer manipulators with different DOFs and crawling robots with different morphologies** respectively (number of legs, structures, sizes, degrees of freedom, etc.)
- Trained and evaluated the control policies using 50+ morphologically different models of crawling robots and 15+ planer manipulator models using **OpenAI gym and Mujoco physics simulator**. Training and evaluation were done using state of the art on and off-policy reinforcement learning algorithms (PPO and SAC respectively).
- Research Paper under review in **The International Journal of Robotics Research**.

GENERIC GAIT GENERATOR | RESEARCH PUBLICATION

Sept. 2018 – Dec. 2018

- **Proposed first of its kind**, modular and easy to implement architecture for deciding and changing crawling robot's gait depending upon the robot's morphology, terrain profile, limb actuation limits and walking speed requirements.
- Used the **Kuramoto model of synchronization** to achieve synchronous leg movement and smooth gait transitions by controlling stance and swing phase relations of different robot legs.
- Tested the system in simulation and **presented the results in IEEE's** international conference on Robotic Computing held in Naples, Italy (Feb' 2019).

REAL TIME OBSTACLE AVOIDING MANIPULATOR | CAPSTONE PROJECT

Aug. 2017 – May 2018

- Developed a **low cost, obstacle avoiding robotic arm** using 2 monocular cameras mounted on perpendicular planes to estimate 3d-position and velocity of obstacles in real-time using **Kalman filter**.
- Arm's trajectory controller, inverse kinematics calculator and vision system implemented using **Robot Operating System (ROS)**.

WHEELED QUADRUPED | SEMESTER PROJECT

Aug. 2016 - Dec 2016

- Semester project involving design and development a 4 wheeled legged robot as a proof of concept for their usefulness in extra-terrestrial exploration & search and rescue scenarios.
- Teleop module, servo controller and inverse kinematics calculator developed in ROS and interfaced with on-board Arduino.

HEXAPOD | ROBOTICS LEARNING AND TESTING PLATFORM

Sept. 2016 – Nov 2016

- Designed a manual controller for hexapod locomotion to test the effect of various hexapod walking gaits (tripod, tetrapod and wave gait) and posture on its stability on different terrains.

Nov. 2017 – Dec 2017

- Ported the controller into ROS and added new capability of automatic gait selection from the terrain profile estimated using the on-board accelerometer.

FSAE | NATIONAL LEVEL FORMULA STUDENT COMPETITION

Dec. 2015 – July 2016 | Team member

- FSAE team member for SUPRA '16, a national level competition of designing and racing FS style race cars.
- Designed QRM steering mechanism and modeled various transmission components (differential, wheel knuckles, etc.) using Solidworks.
- The team secured a position of 29 out of 190 nationally competing teams.

Dec. 2016 - July 2017 | Electrical and Electronics team sub-head

- Designed and helped in the development of an **automatic gear shift mechanism**.
- The developed system was not used in the final car because of problems in stable mounting of gear actuating servo.

AQUAJET

Feb. 2015 – March 2015

- Design and fabrication of pressurized water-propelled rocket with simple variable angle launcher for an intra-college competition.
- Integrated a manual wireless parachute deployment mechanism using Arduino and hobby servos.