

# SUPPLEMENT PORTFOLIO

**Pulkit Goyal**

[pulkitgoyal.work@gmail.com](mailto:pulkitgoyal.work@gmail.com)



+91 974 650 4022

## ACADEMIC PROJECTS

---

- **An Evolutionary Approach to a Modified Multi-Objective Job-Shop Problem** IIT Roorkee  
*Course Project, Operating Systems* Mar 2018
  - Researched about scheduling problems and the existing approaches to their solution
  - Compared evolutionary algorithms (GA, PSO, SA, and ACO) to optimize the number of machines given a time constraint, single task jobs and identical machines in MATLAB [\[presentation\]](#) [\[report\]](#)
- **Digital Circlism (Algorithmic Art)** IIT Roorkee  
*Course Project, Computer Graphics* Oct 2017
  - Implemented mean-shift segmentation and euclidean distance transform for finding the best fit for different size circles in a coloured image (digital circlism) [\[report\]](#)
- **Comparison of Regression Techniques for Short-Term Time-Series Prediction** IIT Roorkee  
*Course Project, Artificial Neural Networks* Apr 2017
  - Conducted a comparative study of LSTM, SVR, and ARIMA for short-term time-series prediction
  - Used Sklearn library for SVR and TensorFlow for LSTM [\[report\]](#)
- **Stereo-Imaging Using Segmentation** IIT Roorkee  
*Course Project, Mathematical Imaging Techniques* Oct 2016
  - Reviewed existing stereo imaging techniques and formulated a method to generate the disparity map using hierarchical segmentation and iterative cluster comparison for stereo-imaging [\[presentation\]](#) [\[report\]](#)

## INDEPENDENT PROJECTS

---

- **Servo Controlled, 3D-Line Following Robot Using Computer Vision** IIT Roorkee  
*Team Robocon IIT Roorkee* Feb 2016
  - Developed a 3-wheeled robot with front wheel steering for line following over a contoured surface by processing images from an on-board camera
- **General Curve Tracing – Four (Omni-)Wheel Holonomic Robot** IIT Roorkee  
*Team Robocon IIT Roorkee* Oct 2015
  - Designed a control system for a holonomic four-wheeled robot to trace any explicit mathematical curve
  - Improved magnetometer accuracy using regression to calibrate and obtain the sensor mapping [\[report\]](#)
- **Coordinate Based Navigation – Four (Mecanum-)Wheel Holonomic Robot** IIT Roorkee  
*Team Robocon IIT Roorkee* Sept 2015
  - Built a point-to-point navigation system for a holonomic robot with or without orientation lock
  - Interfaced magnetometer, IR sensor, and encoder; Kalman filter for smoothing sensor data
- **Stair Climbing Robot** IIT Roorkee  
*Team Robocon IIT Roorkee* Aug 2015
  - Designed a small pneumatic based RC wheeled robot that could climb stairs of variable dimensions
- **Fuzzy Logic Library** IIT Roorkee  
*Team Robocon IIT Roorkee* July 2015
  - Formulated a generalized scalable fuzzification rule base (on different membership functions/methods)
  - Developed a fuzzy logic library in C++ for control of wheeled robots [\[github-directory\]](#)
- **Quadcopter** IIT Roorkee  
*Best Project, Models and Robotics Section; Srishti 2015* Mar 2015
  - Fabricated and automated a quadcopter using 3-D printed chassis, BLDC motors, Arduino, and IMU
  - Implemented and compared various control algorithms for stable flight

## ADDITIONAL EXPERIENCE (CONFERENCES/WORKSHOPS/SUMMER-SCHOOLS/COMPETITIONS)

---

- **NeNa 2023** Frankfurt, Germany  
*Project — fnirsPy: A Sufficient, Easy, and Flexible fNIRS Preprocessing Library*  
[poster] [picture] [report]  
Sep 2023
- **SRISTI-UNICEF Summer School on Inclusive Innovations in Rural India** Gandhinagar, India  
*Project — An Ergonomic Chula (Stove): 40% More Efficient than Traditional Wood-Based Stove*  
Jun 2018
  - Analysed the design of “chula” (traditional wood-based-stove used in rural India)
  - Proposed improvements that can be easily adapted by existing users with a few modifications, and could be fabricated using biodegradable materials freely and readily available in the area [presentation] [report]
- **6<sup>th</sup> Inter-IIT Tech Meet** IIT Madras  
*2<sup>nd</sup> Position in Engineers' Conclave*  
Jan 2018
  - Automated an equatorial mount telescope using stepper motors, Raspberry Pi, and 3-D printed parts
  - Developed a Python API to interface with Stellarium to automatically point the telescope [report]
- **5<sup>th</sup> Inter-IIT Tech Meet** IIT Kanpur  
*Represented IIT Roorkee in Indoor Localization Competition*  
March 2017
  - Designed a wheeled robot to locate a Wi-Fi beacon based on the received signal strength [picture]
- **Industrial Automation Workshop** Gurgaon, India  
*Delta Electronics*  
Feb 2017
  - Got training with hands-on experience on programming industrial standard PLC, motors, and electric drives
  - Competed in “Warehouse Automation and Monitoring” IIoT competition at national level [proposal]
- **Techfest 2016–17** IIT Bombay  
*Ranked in the Top 5 Teams in Resemblance – A Satellite Image Classification Competition*  
Dec 2016
  - Implemented a SVM based classifier to classify satellite images in C++, using LIBSVM [report]
- **Short Term Course** IIT Roorkee  
*Modelling and Control of Robots*  
July 2016
- **Code.Fun.Do** IIT Roorkee  
*Hackathon, Microsoft*  
Oct 2015, Mar 2016 and Mar 2018
  - 2015 — C# and XML app to detect material of an object using the sound generated on its vibration
  - 2016 — Android app implementing a CNN classifier for crop disease detection using leaf images
  - 2018 — A web app that shares the victim's ID and medical data to nearest hospital in case of emergency
- **Robotics Event Organizer**  
*Cognizance 2016 (Annual Technology Festival, IIT Roorkee)*  
Mar 2016
  - Organized a center-stage automatic ground robot obstacle maze course competition – “Cyborg Break-In”
  - Participation of over 200 students from universities all over India
- **Robosapiens** IIT Roorkee  
*Cognizance 2015 (Annual Technology Festival, IIT Roorkee)*  
Mar 2015
  - Won 2<sup>nd</sup> position in over 50 teams from colleges all across the country
  - Fabricated two small wheeled robots, automatic (line following) and manual robot with a pneumatic gripper capable of picking and throwing small sized wooden blocks at small distances (5m-6m)

## EXTRA-CURRICULAR

---

- **Member, National Sports Organization (NSO)** IIT Roorkee  
*Among 200 students selected to be a member of NSO (Proficiency: Table Tennis)* 2014 – 2015
- **2<sup>nd</sup> Position, Intra-College Table Tennis Competition, 2016 and 2018** IIT Roorkee
- **Marathon** IIT Roorkee  
*Sangram 2017 (Annual Sports Festival, IIT Roorkee)* 2017
- **Football** Delhi Public School, Indore  
*School Team* 2011 – 2012
- **Table Tennis** Ujjain, India  
*Division Level, Under 17* 2011
- **Chess** Mandsaur, India  
*District Level, Under 17* 2011

## HOBBIES (EXHAUSTIVE LIST)

---

- Hiking/Trekking • Camping • Biking • Backpacking • Surfing • Football • Table Tennis • Shooting • Cooking
- Pool • Card Games • Board Games • Photography (landscape, architecture, fauna) • Rock Music • Guitar
- Collecting (stamps, coins, pine cones, random flora, cultural artifacts, pamphlets, software) • Puzzles • Haiku
- Letter Writing • Reading (fantasy, fiction, thriller) • Audiobooks • Manga • History • Art History • Philosophy
- Astronomy • Astrophotography • Mathematics • Physics • Neuroscience • Robotics • Artificial Intelligence
- Automation • Open Source • Linux • Software Customization

## ACADEMIC REFERENCES

---

### Prof. Dr. Georg Martius

Professor (Master's Thesis Supervisor)  
University of Tübingen  
Tübingen, Germany  
✉ [georg.martius@tuebingen.mpg.de](mailto:georg.martius@tuebingen.mpg.de)

### Prof. Dr. Andrea Burgalossi

Professor  
University of Tübingen  
Werner Reichardt Center for Integrative Neuroscience  
Tübingen, Germany  
✉ [andrea.burgalossi@cin.uni-tuebingen.de](mailto:andrea.burgalossi@cin.uni-tuebingen.de)

### Prof. Pushparaj M. Pathak

Professor  
Indian Institute of Technology (IIT) Roorkee  
Roorkee, India  
✉ [pushparaj.pathak@me.iitr.ac.in](mailto:pushparaj.pathak@me.iitr.ac.in)  
[[recommendation letter](#)] (2021)

### Prof. Jun Tani

Professor  
Okinawa Institute of Science and Technology (OIST)  
Okinawa, Japan  
✉ [jun.tani@oist.jp](mailto:jun.tani@oist.jp)

### Dr. Josef G. Schönhammer

Researcher  
University of Zürich (UZH)  
cereneo Foundation (cefir)  
Vitznau, Switzerland  
✉ [josef.schoenhammer@cereneo.foundation](mailto:josef.schoenhammer@cereneo.foundation)  
[[recommendation letter](#)] (2023)

### Prof. Anil Kumar

Associate Professor (B.Tech. Project Supervisor)  
Indian Institute of Technology (IIT) Roorkee  
Roorkee, India  
✉ [anil.kumar@me.iitr.ac.in](mailto:anil.kumar@me.iitr.ac.in)  
[[recommendation letter](#)] (2021)

## INDUSTRY REFERENCES

---

### Shuichi Watanabe

Manager, Software Development  
IoT Division, JIG-SAW Inc.  
Tokyo, Japan  
✉ [shuichi.watanabe@jp.jig-saw.com](mailto:shuichi.watanabe@jp.jig-saw.com)  
[[recommendation letter](#)] (2021)

### Hirotoishi Maegawa

President  
Resonest Corporation  
Tokyo, Japan  
✉ [maegawa@resonests.onmicrosoft.com](mailto:maegawa@resonests.onmicrosoft.com)