

CURRICULUM VITAE

Pulkit Goyal

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AREAS OF INTEREST

Robotics, Automation, Control Theory, Computer Vision, Machine Learning, Mathematics

EDUCATION

- **Indian Institute of Technology Roorkee** Uttarakhand, India
Bachelor of Technology (B.Tech.); GPA: 85.68%
MAJOR: Mechanical Engineering • MINOR: Computer Science
RELEVANT COURSEWORK:
 - Advanced Robotics • Robotics and Control • Mechatronics • Automatic Control • Artificial Neural Networks
 - Vibration and Noise • Kinematics and Dynamics of Machines • Mathematical Imaging Techniques (Audited)
 - Mathematical Statistics • Data Structures • Design and Analysis of Algorithms • Computer Graphics
 - Tensors and Differential Geometry (Audited)
- **Delhi Public School, Indore** Madhya Pradesh, India
Mathematics and Science; GPA: 89.40% *Jul 2012 – Mar 2014*

EXPERIENCE

- **Software and Embedded Systems Engineer** Tokyo, Japan
JIG-SAW Inc. *Oct 2018 - Current*
 - Developed edge processing algorithms for sensing applications in IoT using image processing.
 - Developed libraries for custom JS firmware for IoT gateway device.
 - Lead a team of engineers to design experiments and develop libraries for various sensors.
 - Created internal automation tools for testing, deployment and documentation packages with CI/CD.
 - Prepared technical demonstrations for novel IoT use cases and showcased them in expos like MWC (Barcelona), IoT M2M (Tokyo), IoT World (San Jose) and AWS Summit (Tokyo).
 - Worked extensively with AWS cloud services (Lambda, EC2, CF, S3, IoT Core).
 - Worked with AR/VR technologies to develop IoT apps for industrial monitoring (*as intern*).
- **Engineering Intern** [[recommendation](#)] Guntur, India
ITC Ltd. [Project: Mechanization of De-Stemming Operation of Dried Chili] *May 2017 – July 2017*
 - Identified technologies, designed mechanisms, oversaw the fabrication of prototypes and assessed them on the basis of cost, production and quality to get the best possible solution to replace manual de-stemming
 - Proposed and demonstrated potential solutions with 7-fold decrease in the manufacturing cost
- **Control Engineer** Roorkee, India
Team Robocon IIT Roorkee *Jan 2015 - Apr 2018*
 - Worked on year long projects to design robots solving the problem statement of ABU Robocon for 3 years
 - 2016: *5th/108 Teams + Best Aesthetics Award* | 2018: *7th/107 Teams + Best Innovative Award*
 - Developed control systems for navigation of several semi-automatic/automatic chassis using sensor fusion and image processing

PROJECTS

- **Humanoid Modelling for Walking on Vibrating Beam** IIT Roorkee
B.Tech. Project — 2nd best project in 32 projects in the department *Aug 2017 – May 2018*
 - Studied human gait and analyzed vibrations generated due to human-beam interaction in sagittal plane
 - Mathematical dynamics modelling of biped robot using Lagrangian mechanics and bond graphs
 - Conceptualised a control system to stabilize gait on the basis of vibrations induced due to walking and verified it on a simplistic supported robotic biped model

[\[presentation\]](#) [\[report\]](#)

- **Design of 8-DOF Redundant Manipulator on Holonomic Platform**

Summer Undergraduate Research Award, 2016

 - Worked on CAD designing, structural analysis and metal-fabrication. Automated the robot using encoders, hall effect sensors (Maxon Motors) and optical flow sensors
 - Simulated path planning algorithms for trajectory generation/optimization in MATLAB
 - Forward/inverse kinematics/dynamics of the robot using bond graphs

IIT Roorkee

May 2016 – Dec 2016

[\[report\]](#)
- **Telescope Automation**

2nd Position in Engineers' Conclave, Inter-IIT Tech Meet 2018

 - Automated 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

IIT Roorkee

Jan 2017 – Mar 2017

[\[report\]](#)
- **3D-Line Follower Using Image Processing**

Member of Team Robocon IIT Roorkee

 - Developed a 3-wheeled robot with front wheel steering for line following over a contoured surface
 - Streamed image from an on-board camera, finding the orientation of line using edge/contour detection algorithms and passing appropriate signal to a servo motor for steering
 - Experimented with multiprocessing and GPU rendering for increasing response quality

IIT Roorkee

Jan 2016 – Feb 2016
- **General Curve Tracing – Four (Omni-)Wheel Chassis**

Member of Team Robocon IIT Roorkee

 - Developed an algorithm and control system to trace any mathematical curve given in explicit notation
 - Used machine learning algorithms to get an equation of the sensor mapping, by training using the data-set obtained by moving the bot on the desired path manually

IIT Roorkee

Oct 2015

[\[report\]](#)
- **Coordinate Based Navigation – Four (Mecanum-)Wheel Chassis**

Member Of Team Robocon IIT Roorkee

 - Built a navigation control algorithm for point to point traversal with or without orientation lock
 - Interfaced magnetometer, IR sensor and encoder; Kalman filter for smoothing sensor data

IIT Roorkee

Sept 2015
- **Stair Climbing Robot**

Member of Team Robocon IIT Roorkee

 - Designed a small pneumatic based RC wheeled robot that could climb stairs of variable dimensions

IIT Roorkee

Aug 2015
- **Fuzzy Logic Library**

Member of Team Robocon IIT Roorkee

 - Formulated a generalized automatic fuzzification rule base (on different functions/methods)
 - Developed a general fuzzy logic library in C++ for control of wheeled robots

IIT Roorkee

May 2015 – July 2015

[\[github-directory\]](#)
- **Quadcopter**

Best Project, Models and Robotics Section; Srishti 2015

 - Fabricated and automated a quad-copter using BLDC motors, Arduino and IMU
 - Implemented and compared various control algorithms for stable flight

IIT Roorkee

Feb 2015 – Mar 2015

OTHER PROJECTS

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- **An Evolutionary Approach to a Modified Multi-Objective Job-Shop Problem**

Course Project, Operating Systems

 - 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

IIT Roorkee

Mar 2018

[\[presentation\]](#) [\[report\]](#)
 - **Digital Circlism (Algorithmic Art)**

Course Project, Computer Graphics

 - Implemented mean-shift segmentation and euclidean distance transform for finding the best fit for different size circles in a coloured image (digital circlism)

IIT Roorkee

Oct 2017

[\[report\]](#)
 - **Comparison of Regression Techniques for Short-Term Time-Series Prediction**

Course Project, Artificial Neural Networks

 - Compared LSTM, SVR and ARIMA for short-term time-series prediction

IIT Roorkee

Apr 2017

[\[report\]](#)
 - **Stereo-Imaging Using Segmentation**

Course Project, Mathematical Imaging Techniques

 - Formulated a method to generate the disparity map using hierarchical segmentation and iterative cluster comparison for stereo imaging

IIT Roorkee

Oct 2016

SKILLS

Programming Languages	C/C++, Python, JavaScript/TypeScript, Processing, C#, JAVA, Bash, L ^A T _E X
Softwares	MATLAB, Mathematica, GNU Octave, Git, AWS, GCP, openCV, Solidworks, Fusion 360, Ansys, Eagle, AutoCAD, ADAMS
Languages	English (RWS), Hindi (RWS), Japanese (Basic \sim JLPT-N5)

ACADEMIC ACHIEVEMENTS (AWARDS/HONORS/SCHOLARSHIPS)

- **Trust Scholarship - Dean of Resources and Alumni Affairs**
For overall performance during B.Tech. 2019
- **Annual Excellence Award — IIT Roorkee Heritage Foundation**
For outstanding curricular, co-curricular and extra-curricular achievements 2017
- **Summer Undergraduate Research Award**
Sponsored Research And Industrial Collaboration (SRIC), IIT Roorkee 2016
- **Certificate of Merit in Mathematics — Top 0.1%; Marks:100/100**
AISSCE, Central Board Of Secondary Education, India 2014
- **JEE Advanced**
National Rank: 1331 in 150,000 selected candidates from 1.5 million students 2014

LEADERSHIP/POSITIONS OF RESPONSIBILITY

- **Convener | Srishti 2018 (Annual Techno-Hobby Exhibition), IIT Roorkee** Jan 2018 – Mar 2018
 - Led a team to plan, organize and manage the event which had more than 500 exhibitors and 73 projects and all technical groups of the campus exhibited their past years' work.
- **Secretary | Tinkering Lab, IIT Roorkee** Aug 2017 – Apr 2018
 - As the first secretary of Tinkering Lab (rapid prototyping lab), focused on promoting and making the access to the lab easy for all students and professors for research and independent student projects
- **Joint Secretary | Models and Robotics Section (MaRS), IIT Roorkee** Apr 2016 – Apr 2017
 - Took open lectures on robotics for all students and guided more than 100 students from all academic years and branches, for variety of robotics related projects exhibited in Srishti 2016 and 2017 [\[github\]](#)
- **Member | Students' Technical Council (STC), IIT Roorkee** Jan 2017 – Apr 2018
 - One of the 16 student members of the technical decision-making body of IIT-R which oversees the workings of all technical groups, promotes and effectuates technical projects and reforms in the campus
- **Co-ordinator | Cognizance 2016 (Annual Technology Festival), IIT Roorkee** Mar 2016

ADDITIONAL EXPERIENCE (WORKSHOPS/COMPETITIONS/SUMMER-SCHOOLS/CO-CURRICULAR)

- **SRISTI-UNICEF Summer School on Inclusive Innovations** Gandhinagar, India
Proposed to increase efficiency of traditional wood-based-stove by 40% [\[presentation\]](#) [\[report\]](#) May 2018 - Jun 2018
- **6th Inter-IIT Tech Meet — Engineers' Conclave** IIT Madras
2nd Position – Telescope Automation Project Jan 2018
- **5th Inter-IIT Tech Meet — Indoor Localisation** IIT Kanpur
Designed a wheeled robot to locate a WiFi beacon based on the received signal strength [\[picture\]](#) March 2017
- **Industrial Automation Workshop — Delta Electronics** Gurgaon, India
Researched and conceptualized 'warehouse automation and monitoring solutions [\[proposal\]](#) Feb 2017
- **Techfest 2016 – 17 — Satellite Image Classification Competition** IIT Bombay
Ranked in the Top 5 Teams – Implemented a SVM based classifier [\[report\]](#) Dec 2016
- **Short Term Course** IIT Roorkee
Modelling and Control of Robots July 2016
- **Cognizance 2015 — Robosapiens** IIT Roorkee
2nd position in over 50 teams Mar 2015

OTHER EXPERIENCE

- **Senior Student Mentor | Student Mentorship Program, IIT Roorkee** Sept 2016 – Apr 2018
- **Teaching Assistant** IIT Roorkee
- *Engineering Drawing* Jan 2018 – Apr 2018
- *Programming And Data Structures* Oct 2017 – Nov 2017