SHREY VERMA

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EDUCATION

Stanford University — Stanford, California
M.S. in Mechanical Engineering — *September 2022 – March 2024*

Indian Institute of Technology Kharagpur — Kharagpur, West Bengal
B.Tech. Mechanical Engineering | ***CGPA: 9.52/10*** — *August 2018 – April 2022*

PROJECTS

DAAD WISE21 - Puck Reset Mechanism - Robot Air Hockey — June 2021 – September 2021

Mentor: Prof. Jan Peters, Intelligent Autonomous Systems - TU Darmstadt — *Darmstadt, Hesse*

- Designed a Puck Reset Mechanism in **SolidWorks**, using a lead screw linear actuator(stepper), scissor mechanism(servo), and a tilt bed.
- Tested the mechanism in **ROS**(RViz and Gazebo), controlled various actuators by publishing values to ROS topic using a Python Script.
- Manufactured the mechanism, designed the circuit, and controlled the stepper motor and three servo motors using **ROS** and **Arduino**.
- The puck reset mechanism will be used for Bayesian Optimization Model Identification and Movement Prediction in **Robot Air Hockey**

RuTAG's Agrobot Design Innovation Challenge, Inter IIT Tech Meet 9.0 — February 2021 – March 2021

Mentor: Prof. Aditya Bandopadhyay (Mechanical Department), IIT Kharagpur — *Kharagpur, West Bengal*

- Designed a Semi-Autonomous Modular Agricultural Robot for Inter IIT Tech Meet 9.0 and won **Gold** amongst the 22 participating IITs
- Developed the **sowing module** consisting of a hopper and a rotating seed metering plate for achieving the ordered sowing of rhizomes.
- Modeled the Electronic Architecture for the robot consisting of 5 motors and 3 IR sensors controlled using **ESP32** and a **Wifi Remote**.
- Finalized modular robot consisted of an **FWD**(differential drive) for locomotion, interchangeable sowing and planting modules, and a weeding subsystem; thus proving a **low-cost(710 USD)** solution to the marginalized farmers in hilly terrains.

Design and Development of a Hybrid Mobile Robot — September 2019 – July 2020

Mentor: Prof. D. K. Pratihar (Mechanical Department), IIT Kharagpur — *Kharagpur, West Bengal*

- Designed a **hybrid robot leg** capable of switching between a **Leg** and a **Wheel**, improving upon the Robot's Locomotion Capabilities.
- Ideated leg consisted of 2 **3D printed lock-pin mechanisms** and a **Linear Sliding Pair**, ensuring a Minimal Power Consumption.
- Prototyped mechanism actuated using an **Arduino** that controlled the state of 2 solenoids, requiring no power in the extreme positions.
- Targeted mechanism was used in a 6-Legged Robot, increasing its efficiency by ensuring minimal usage of the **Servos** on a plane surface.

Terrace Farming Robot, Inter IIT Tech Meet 8.0 — October 2019 – December 2019

Mentor: Prof. Aditya Bandopadhyay (Mechanical Department), IIT Kharagpur — *Kharagpur, West Bengal*

- Manufactured **Terrace Farming Robot** for Inter IIT Tech Meet 8.0 held at IIT Roorkee and won **Gold** amongst the 22 participating IITs
- Developed an **X-cross Scissor-Lift Mechanism** to climb stairs of the height up to 43cm, and novel a module for **seeding** and **irrigation**
- Finalized robot could **Autonomously** execute several **Agricultural Tasks** of plowing, seeding, harvesting, watering, and locomotion.
- For locomotion, it uses the data from four **Linear-LIDAR Sensors**, an **IMU sensor** and encoder data from four motors processed by **Raspberry Pi** running the **Robot Operating System(ROS)** and controlled using **Arduino**.

Prosthetic Hand, Hardware Modelling General Championship, IIT Kharagpur — January 2018 – March 2018

Nehru Hall of Residence — *Kharagpur, West Bengal*

- Fabricated a **Prosthetic Hand** consisting of two **4-Bar Mechanisms** per finger to replicate the grabbing action of the human hand.
- Adopted **Servo Motors** to actuate the mechanism and took input from a **Capacitive Pressure Sensor** to stop the grabbing operation.
- Prototyped hand took inputs using **Voice Commands**, **EMG Muscle Sensor**, and **PiCAM**(RaspberryPI Camera): using Image Processing to predict when to actuate, a **RaspberryPI** was used to process these inputs, and Arduino was used for actuation.
- Implementation of **Brain-Computer Interface(BCI)** as input for hand to actuate directly using **Brain Waves** is the plan for the future.

Internships

Reducing Electrical Resistivity (ER) of Baked Anode June 2021 – July 2021

Mechanical Engineering Internship, Vedanta Limited - BALCO *BALCO, Chattisgarh*

- Identified important parameters of **Green Anode Plant** and **Bake Oven** influencing the **Baked Anode** properties, especially the ER.
- Constructed several **Correlation Matrices** using past empirical data(2018-21). Detected Baked Anode parameters pertaining to ER.
- Devised **Stringent Guidelines** for manufacturing of the Baked Anode by providing indispensable parameter values to be maintained.
- Achieved target ER value of 55.5micro.Ohm.m, ensuring a profit of **INR 28Lakh.pm.** Performance rated as **Excellent** by the guide.

MITACS GRI'21 - Lean Manufacturing Gamification(Legos) May 2021 – July 2021

Mentor: Prof. Rafiq Ahmad, LIMDA - University of Alberta *Alberta, Canada*

- Reviewed research related to Digital **Serious Games** & **Gamification** and their application in learning **Lean Manufacturing** techniques
- Designed the outline of the game, which intended to teach **5S lean manufacturing** in a **Digital Environment** using **Lego Blocks**.
- Developing the **Multiplayer Game** in **Unity3D**, in which students are required to build the given part while implementing **5S** concepts.
- Finalized game will be tested and later used by the students of Prof. Rafiq for the course **Lean Manufacturing (ENG M 607)** at **UoA**.

Electric Vehicle Group, IIT Kharagpur August 2019 – December 2020

Mentor: Prof. Vikranth Racherla (Mechanical Department), IIT Kharagpur *Kharagpur, West Bengal*

Lab intern: Centre For Railway Research, IIT Kharagpur

- Familiarized with types of equipment available in the lab. Learned about various components of **Deshla**(Indigenous Electric Rickshaw).
- Studied the **Gearbox Subsystem**(assembly and working) and the different types of transmissions using the gearbox of a Piaggio Ape.

Building a custom-designed electric vehicle for TruTrade NGO

- Formulated vehicle is a **Three-Wheeled Electric(Smart) Cart** aimed for farmers to sell their produce and maximize their profit directly
- Designed Piaggio Ape inspired CAD model of the Steering Assembly on Fusion360; calculated the Turning Radius and Steering Torque.

Academic Achievements

- Awarded Narotam Sekhsaria Foundation PG Scholarship and K.C. Mahindra Scholarship for getting an admit from Stanford University
- Awarded OP Jindal Engineering and Management Scholarship 2021 for designing agricultural robots for marginalised farmers of India.
- Awarded best B.Tech. project award by the department of Mechanical Engineering, IIT Kharagpur.
- Received institute order of merit(Institute Blue) for best outgoing technology 2022 by IIT Kharagpur.

Competitions

Silicon Labs' Social Entrepreneurship Challenge | **Inter IIT Tech Meet 10.0** | **IIT Kharagpur** March 2022

Won a **Gold** by designing an IoT based truck monitoring system for fleet owners in India. The system was capable of monitoring tyre pressure, axle bending, fuel volume, and driver drowsiness detection.

Inter IIT Tech Meet 8.0 | **Runner Up** | **Payatu's Infosec** | **IIT Roorkee** December 2019

Ranked **4th/**22 participating IITs in a **Jeopardy Style CTF** organized by Payatu's Infosec in **Inter IIT Tech Meet 8.0** held at IIT Roorkee

Technical Skills

Research Interests: Robotics, Mechatronics, Automation and Controls
Experience: CAD Modelling(SolidWorks, Fusion360), Simulation(Ansys, MATLAB), Manufacturing(3D Printing, Lathe, Mill, CNC), Embedded Systems
Skills: Mechanical designing(CAD- SolidWorks, Fusion360, Simulation- Ansys, MATLAB, Simulink, ROS, Gazebo), Machining(Lathe, CNC, Mill, FDM 3D printing), Embedded systems(Arduino, Raspberry Pi, IOT-ESP8266), Control Systems
Background Knowledge: Dynamics, Fluid Mechanics, Kinematics of Machines, Thermodynamics, Solid Mechanics, Heat Transfer, Machine Learning(Python), AVR microcontrollers, Principles of Automotive Dynamics Control, Embedded Sensing, Actuation and Interfacing System

Extra Curricular Activities

- Participated in Combined Annual Training Camp conducted by 3(B) Air Sqn NCC 2018-19 and awarded the B-Certificate.
- Mentoring seven students of the batch 2020 under the Student Welfare Group, IIT Kharagpur.
- Awarded with Level 1 Award in Graded Examination in Music Performance, Grade 3 Electronic Keyboards (with Merit) by Trinity College London.