

# SATYAM BHAWSINGHKA

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## EDUCATION

**Master of Science in Robotics**  
OREGON STATE UNIVERSITY  
CGPA: 3.88/4

Corvallis, USA | Sep'21 - Dec'23

**Coursework:** Kinematics, Dynamics and Control; Learning Based Control; Sequential Decision Making; Optimization in Design; Linear Multivariable Control; Intro to Robotics I and II; Software Development for Engineering Research; Algorithms and Data Structures

**Bachelor of Technology in Mechanical Engineering**  
INDIAN INSTITUTE OF TECHNOLOGY (BHU) VARANASI  
CGPA: 9.23/10

Varanasi, IN | Jun'16 - Jun'20

**Coursework:** Machine Design; Theory of Machines; Computer Programming; Computational Mechanics; Linear Control Systems; Control Systems Engineering; Finite Element Method; Optimization for Engineering Design; Manufacturing Technology

## RELEVANT WORK EXPERIENCE

**GRADUATE RESEARCH ASSISTANT** | INTELLIGENT MACHINES AND MATERIALS LAB  
SUPERVISOR: DR. JOSEPH DAVIDSON

Corvallis, USA | Apr'22 - Dec'23

- Fabricated and characterized **hydraulically activated silicone knuckles** which act as **variable stiffness joints (VSJ)**.
- Development of **compliant underwater gripper** using hydraulically activated knuckles as VSJ.
- Developed the **pressure control system** using **Arduino** and gripper mechanism using **DynamixelSDK** and integrated the controls with a user interface on **ROS**.
- Increased **grasp strength of a tendon driven gripper by 7%** along with performing **multiple grasp primitives** by modulating joint stiffness alone.
- Developed a multi link chain tendon driven planar mechanism for trajectory generation with silicone VSJ knuckles.
- Expanded capabilities of hydraulic knuckles for proprioception with **90%** state estimation accuracy.

**ASSOCIATE DATA SCIENTIST** | UNITED HEALTH GROUP, OPTUM

Gurgaon, IN | Aug'20 - Aug'21

- DEVELOPMENT OF CLASSIFICATION MODEL**
  - Developed an XGBoost classification predictive model with an **accuracy of 84%** and **lift of 5X** in the first decile for potential annual saving of **US\$ 0.2 billion**.
  - Optimized the model performance by tuning hyper-parameters and deployed **automatic scheduling** of the process.
  - Collaborated with the marketing stakeholders to work on test design of the campaign (**A/B Testing**).
- SANDBOX MIGRATION**
  - Transitioned legacy processes previously executed on SAS to in-house Big Data Platform using HQL.
  - Automated multiple processes eliminating manual intervention from various teams.

**SUMMER RESEARCH INTERN** | NANYANG TECHNOLOGICAL UNIVERSITY  
SUPERVISOR: DR. XIE MING

Singapore | May'19 - Jul'19

- Formulated a platform that uses loop closure techniques and RTABMap standalone libraries to combine stereo images from a real environment to plot a navigable virtual 3D environment using DEM.
- Tested object classification algorithm had an **accuracy of 92%** in the virtual environment.

**RESEARCH INTERN** | INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SUPERVISOR: DR. SANTOSHA K. DWIVEDI

Guwahati, IN | May'18 - Jul'18

- Development of Motorized Exoskeleton System for transition between two modes (wheelchair and exoskeleton) for rehabilitation of people with paraplegia.
- Simulated the system on exoskeleton mode using **Simulink** for different design parameters to find the required actuator torques while **reducing total cost by 68% and weight by 54%** by using same actuators for both modes.

## PROJECTS

**MCTS Energy Optimal Trajectory for Variable Joint Stiffness Underactuated Finger** 

JAN'23 - MAR'23

- Development of Monte Carlo Path Planning framework to generate control sequences for reaching any desired joint configuration for tendon driven gripper with pressure controlled knuckles as variable stiffness joints under **transition uncertainty** while expanding **minimum energy**.
- Compared the effects of various design parameters and extend of transition uncertainty on algorithm performance.
- Able to generate optimal cost paths for even **10% transition uncertainty**.

**A\* Optimal Path for Variable Joint Stiffness in an Underactuated System** 

APR'22 - JUN'22

- Developed a framework for generating joint stiffness sequences for variable joint stiffness finger to reach any desired joint configuration using A\* search algorithm.
- Generated optimal paths for pinch and wrap grasp primitives.

**Development of a software package for Measuring Deformation (*deformmeasure*)** 

JAN'22 - MAR'22

- Development of a software package to measure deformation from images or frames from videos using Digital Image Correlation (DIC).

**Development of Autonomous System for Generating Braille** 

JAN'22 - MAR'22

- Generating braille from text files using a custom built end-effector on a **Hiwonder xArm**.

## Neural Network Based Chatter Detection and Control on CNC Milling Machine

SEP'21 - NOV'21

- Developed a framework for detecting chatter using force data. Able to detect chatter with **95%** accuracy **0.4 sec** before the occurrence of chatter.
- On detection of chatter, the operating frequency is changed to protect workpiece quality.

## Development of Origami Inspired Variable Diameter Wheel Robot

JAN'19 - DEC'19

- Design and development of STeVe( Smart Terrain Vehicle) viz. a wheeled mobile robot capable of maneuvering over various terrains with increased mobility by dynamically adjusting wheel diameter.
- Designed and developed mechanical system for actuation to dynamically change wheel diameter and control system which gives characteristic features of obstacle clearance, tunneling through narrow gaps and balancing.

## Increasing the efficiency of Solar Panel by using dual axis Solar Tracker

AUG'17 - NOV'17

- Constructed a 2-DOF light tracker controlled via an electronic circuit consisting of LDR and H-Bridge circuit increasing energy output by **72%** under controlled environments.

## SKILLS

**Programming Languages:** Python, Java, C, MATLAB, SQL, Octave

**Hardware:** Raspberry Pi, Arduino, Dynamixel

**Technology:** IoT, SolidWorks, ROS, Git, Docker,  $\text{\LaTeX}$ , Apache Hive, KiCad

**Others:** Gazebo, RViz, Simulink, PyBullet, SOFA, Ansys

## PUBLICATIONS

- Bhawsinghka, S., Troxler, N., Walker, S., & Davidson, J. R. (2023, April). Hydraulic Modulation of Silicone Knuckles for Variable Control of Joint Stiffness. In 2023 IEEE International Conference on Soft Robotics (RoboSoft) (pp. 1-6). IEEE.
- Narayan, J., M. Dowarah, S. K. Dwivedy and S. Bhawsinghka, "Experimental Investigation and Dynamic Analysis of a Lower Limb Exoskeleton System", Proceedings of 2nd International Conference on Advances in Robotics, Automation and Sensing, 15-16 December, 2018 at PSG College of Technology, Coimbatore, India (Presented, December 2018)

## ACCOMPLISHMENTS

- 2020 CR Performance Award (UHG) (Dec'20)
- 2020 Performance Award (UHG)(Dec'20)
- Selected for NTU-India Connect Research Internship Programme 2019
- Top 0.1% in Joint Entrance Examination (JEE) Advanced 2016

## ADDITIONAL WORK EXPERIENCE

### MEMBER, WORKING COMMITTEE | MECHANICAL ENGINEERING SOCIETY

Varanasi, IN | Aug'17 – Apr'18

- Organized industrial visits for Mechanical Engineering Department students to Hindalco Renukoot plant and DLW, Varanasi resulting in **6 students securing job offers**.

### CO-CONVENER | CONFERENCE ON MECHANICAL ENGINEERING AND TECHNOLOGY (COMET'18)

Varanasi, IN | Jan'17 – Apr'18

- Organized tech talks by world renowned researchers, roping in sponsorship from local institutions. As part of the PR team, promoted the conference through Campus Ambassador Program and CDQ (aptitude test) increasing **college engagement by 32%** and **footfall by 57%** from previous year.

## ADDITIONAL COURSES

- Specialization in Modern Robotics (Audit), Northwestern University
- Machine Learning, Stanford University
- Specialization in Internet of Things, University of California, Irvine
- Introduction to Programming with MATLAB, Vanderbilt University
- Materials Science: 10 Things Every Engineer Should Know, University of California, Davis