Manan Tayal

Curriculum Vitae

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Evolution is a Tinkerer, So am I

Education

2021-Present **PhD**, *Cyber Physical Systems, IISc*, Bangalore, *CGPA: 9.30/10*.
Working on Legged Robots in Stoch Lab, RBCCPS
Recipient of Prestigious Prime Minister's Research Fellowship (2021)

2017-2021 **BTech.**, *MechE IIT Bombay*, Mumbai, *CGPA: 9.13/10*.
Got an AP Grade in Solid Mechanics Course

2015-2017 **Intermediate/+2**, *SD Jain Modern School*, Surat, *Percentage: 94%*.
Cleared Exams like KVPY, NSEP and NSEC

2013-2015 **Matriculation**, *SD Jain Modern School*, Surat, *CGPA: 10/10*.
Cleared NTSE stage 1 (Gujarat)

Experience

Aug'22 - Dec'22 **Teaching Assistant**, *IISc*, Bangalore.
CP214 Foundations of Robotics | IISc's MTech Online
- Helped students get better insight of the course, clarified concepts and evaluated their performances

Aug'22 - Dec'22 **Remote Teaching Assistant**, *NIT*, Srinagar.
MSDM 105 Robot Mechanics | Towards the fulfillment of PMRF's Deliverables
- Helped students get better insight of the course and clarified their concepts
- Took sessions on robotic simulations (MATLAB and Python) to compliment the classroom learning.

Jan'22 - June'22 **Remote Instructor**, *Daksh Industrial Training Center* , Mathura.
Computer Programming | Towards the fulfillment of Prime Minister's Research Fellowship's Deliverables
- Was the main instructor of the course to teach computer programming in C/C++.

Apr'20 - May'20 **Research Internship**, *Siemens Technology and Services Pvt. Ltd.*, Bangalore.
Indian Subsidiary of one of the largest manufacturing and automation company in the world
- Worked on controlling the straight line and turning movements of self balancing bot on various terrains (like flat, inclined & uneven surface) using Pybullet Simulation Platform.
- Trained the bot with different control algorithms like PID, Model Free Adaptive Controller(MFAC), Simultaneous Perturbation Stochastic Algorithm(SPSA), Iterative Feedback Learning (IFL) and Reinforcement Learning (RL) & compared the stability of the bot in each case on different terrains.

Apr'18 - Apr'20 **Tinkerers' Laboratory, IIT Bombay**, *[View]* .
*A 24*7 'Makerspace' open to all the students to promote hands on learning experience*
Manager
- Started 'Technovation' to provide students with sufficient funds and proper guidance resulting in formation of innovative & ambitious teams like Rocket, Quadruped bot & Hyperloop teams in IITB
- Started regular Training Sessions in the Lab to train students with Standard SOPs to use the machines like CNC machines, 3D printer, Power tools, Milling and Lathe Machines.
- Organised TL Talks by famous international entrepreneurs, professors and technologists
- Raised (with the help of Alumni) & Handled Rs 50 Lakhs funds to ensure proper facilities in Lab

Convener
- Organized Workshops in the fields of AI, IOT and 3D Printing with 100+ students each
- Single handedly developed and maintained the Tinkerers' Lab's Website

Aug'19 - Mar'20 **STRIDE**, *[View]* .

Technical team @IITB working with a goal of developing an autonomous quadruped bot

- Co-founded a technical team along with 2 other members, with the goal of developing a fully autonomous quadruped for maneuvering through difficult terrains
- Designed a library of linear and rotational walking gaits for the quadruped bot and analysed & simulated them in Pybullet Physics Engine to enhance its balance and speed
- Worked with the design team to suggest the modifications to enhance the balance and speed of bot
- Worked on a stabilizing platform for placement & stability of camera on the bot while it is in motion

Jul'18 - Jun'19 **Physics Tutor**, *Toppr.com*, Remote.

India's one of the most comprehensive online education platform for classes 5 to 12

- Solved 1000+ real time subject queries of students, preparing for JEE on the platform
- Guided and Mentored several students in conceptualizing physics topics and sharing tips and techniques to crack the coveted JEE Mains and JEE Advanced exams

Projects

Jan'22 - Apr'22 **Safe Reinforcement Learning Using Robust Control Barrier Functions**, *[View]* .

Course Project:Robot Learning and Control under Prof. Shishir NY, IISc

- An implementation of SAC + Robust Control Barrier Functions (RCBFs) for safe reinforcement learning in two custom environments

Jan'22 - Apr'22 **Offline Reinforcement Learning Using Implicit Q-learning**, *[View]* .

Course Project: Reinforcement Learning under Prof. Shalabh Bhatnagar, IISc

- Analysed the Offline Reinforcement Learning Using Implicit Q-learning and its limitations
- Tried to find out ways to improve upon this method and implemented the solution on Pybullet

Jan'21 - May'21 **Travelling Salesman Problem:Parallel Implementation &Analysis**, *[View]* .

Course Project: High Precision Scientific Computing under Prof. S. Gopalakrishnan, IITB

- Explored & compared various paradigms of parallelization by implementing Brute Force TSP solution using OpenMP, Message Passing Interface (MPI) and CUDA (for GPUs)
- Contrasted OpenMP, MPI and hybrid (of OpenMP & MPI) implementations using parallelization efficiency & Karp-Flatt Metric, and investigated the extent of speedup for CUDA
- Quantitatively deduced the need to pick an efficient algorithm instead of parallelizing inefficient one

Aug'20 - Dec'20 **PANACEA: AI-Powered Health Predictor**, *[View]* .

Course Project: Engineering Data Mining and Applications under Prof. Asim Tewari, IITB

- Trained a library of ML models to detect health problems (Diabetes, Heart issue, Breast Cancer and even Covid19) with their symptoms using publicly available randomised data-sets
- Created a web application, where patients can choose their symptoms and upload X-rays of chest (in case of Covid19) and get a rough estimate of health condition and well being.
- Created Marketing videos, presentation, brochure & user manual to imitate business work culture

Aug'20 - Dec'20 **Bone Conduction embedded Military Helmet**, *[View]* .

Course Project: Machine Design under Prof. Ramesh Singh, IITB

- Analysed & compared the pathway of sound via Bone conduction and conventional Ear conduction
- Designed a military helmet embedded with Bone conduction headphone to send commands directly to soldier's cochlea instead of covering his/her ears, thus improving the spatial awareness of warzone

June'20 - Jul'20 **Bipedal Walking in Pybullet** , *[View]* .

Under Prof. Abhishek Gupta, IITB

- Simulated various the walking, standing, squating, jumping (with and without Twist), and Twisting of torso in PyBullet Simulation Platform

Jan'20 - Apr'20 **Manipulation of Kuka arm in a determined Trajectory**, *[View]* .

Course Project: Robotics Under Prof.Abhishek Gupta, IITB

- Worked on a manipulating a Kuka arm in predetermined path in Pybullet Simulation Environment

Aug'19 - Dec'19 **Force Controlled Gripper**, *[View]* .

Course Project: Design of Mechatronic Systems Under Prof. Prasanna Gandhi, IITB

- Worked on a force controlled gripper with 3D Printed parts for gripping of deformable objects

Competitions

Jul'21 **FLORENCE: Fast Learning and Observant Robot for Empowering and Nursing in Containment Environments**, *[View]* , using Tiago++ robot by PAL Robotics.
IROS 2021 Mobile Manipulation Hackathon
- Worked in a team of 3 to formulate a goal of using Tiago++ to nurse in Covid containment zones
- Simulated the bot in containment environment, avoiding collisions with objects and humans, serving medicines and glass of water to the patients and sanitizing the outsiders using Webots simulation
- Worked on Face recognition and simulation of patients' & visitors' face database updation

Oct'18 - May'19 **Robocon Team, IIT Bombay**.
ABU RoboCon '19 Ulaanbaatar, Mongolia
- Worked on walking mechanism of a quadruped bot by applying concepts of klanns model
- Designed a 4 DoF servo motor based robotic gripper arm to be mounted on the quadruped and a catapult structure to be mounted on wheeled bot using SolidWorks (in a design team of 3 students)
- Manufactured bot components using sophisticated machines like CNCs, water jet cutting etc

Jan'18 **LINE FOLLOWER BOT**.
Competition by Electronics and Robotics Club, IIT Bombay
- Designed & Fabricated a robot (team of 3) within 3 days from scratch with self-manufactured infrared sensors assembly for a Line Follower competition and secured first position among 50 teams
- Tuned PID controller to minimize deviation from ref.line by using the feedback from infrared sensors

Awards and Recognition

- Awarded an **AP grade** in Solid Mechanics Course(UG) for exceptional performance
- Secured **All India Rank 626** in JEE Advanced 2017 out of 1,59,540 candidates
- Secured **All India Rank 289** in JEE Mains 2017 out of 10.2 lakh candidates
- Recipient of the prestigious **Kishore Vaigyanik Protsahan Yojana (KVPY) Scholarship** in 2017 in SX stream
- Among National Top 1% in **National Standard Examination in Physics** 2016-17
- Among State Top 1% in **National Standard Examination in Chemistry** 2016-17
- Ranked **26 out of 173 students selected in NTSE Stage 1(Gujarat)** in 2015

Courses Completed

Cyber Physical Systems	Robotics, Computer Integrated Manufacturing, Intelligent Feedback and Control, Engineering Data Mining and Applications, High Performance Scientific Computing, Textile Machines Design and Automation, Computer Aided Simulation of Machines, Microprocessors and Automatic Control, Design of Mechatronic System, Kinematics and Dynamics of Machines, Engineering Graphics and Drawing, Introduction to Electrical and Electronics Circuits, Computer Programming and Utilization, Calculus, Linear Algebra, Differential Equations, Introduction to Numerical Analysis.
Mechanical Engineering Core	Fluid Mechanics, Thermodynamics, Solid Mechanics, Strength of Materials, Mechanical Measurements, Manufacturing Processes, Heat Transfer, Industrial Engineering and Operations Research, Applied Thermodynamics, Machine Design, Acoustic Devices
Other courses	Economics, Psychology,Environmental Studies, Managing Technological Innovation, Business Fundamentals for Technopreneurs.

Advanced Technical Skills

Programming Language	C, C++, Python, Django, HTML5, CSS, PHP, XML, MATLAB
Robotic Simulation Platforms	MuJoCo, Pybullet, Webots, Gazebo(ROS)
Modelling and Analysis Tools	Solidworks, ANSYS, Blender, AutoCAD, MATLAB
Languages	English(Fluent), Hindi(Fluent), Sanskrit(Elementary)

Extra-Curricular Activities

- Volunteer in Second level of SIH 2019 Hardware Edition at IIT Bombay Nodal Center
- Completed 2 Semester Course in Musical Keyboard under NSO, IIT Bombay in 2017-18
- Was a Organiser of Pronites in Mood Indigo, Asia's Largest College Cultural Fest in 2017
- Was a part of winning team in inter house Cricket tournament of S.D.Jain Modern School (2013-14)