

# Chetan Reddy N

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## EDUCATION

<b>Stanford University, California, USA</b> <i>MS in Mechanical Engineering (Robotics)</i>	Sept 2024 - Present
<b>Indian Institute of Technology Madras, India</b> <i>Bachelors (B.Tech) in Mechanical Engg, Masters (M.Tech) in Data Science   CGPA: 9.48/10   Rank: 3/41</i>	Aug 2019 - May 2024
<b>KTH Royal Institute of Technology, Sweden</b> <i>Semester Exchange   School of Electrical Engineering and Computer Science   GPA: 5.0/5.0</i>	Aug 2022 - Jan 2023



## SCHOLASTIC ACHIEVEMENTS

- Awarded **\$7,200** for **successfully filing a patent at the USPTO** from our work at Adobe Research. 2024
- Secured **3rd place** among 70 researchers for the **Best Thesis Poster in Data Science** receiving a prize of **Rs.25000** 2024
- Recipient of the **¥160,000 JASSO Scholarship** awarded by the **Government of Japan**. 2022
- Secured an **All India Rank 957** in JEE (Mains) 2019 out of **1 million candidates** across the country. 2019
- Secured an **All India Rank 931** in JEE (Advanced) 2019 out of 150,000 shortlisted candidates. 2019
- Achieved a **State Rank of 15** in Karnataka Common Entrance Test 2019 written by about **200,000 students**. 2019

## RESEARCH EXPERIENCE

- Human in the Loop, Safe and Verifiable Reinforcement Learning (RL) | IIT Madras**  Chennai, India  
*Dual Degree Thesis | Guides: Prof. Nirav Bhatt and Prof. Balaraman Ravindran* Aug 2023 - Jun 2024
- Developed a framework to formulate Safe RL problems with human guidance, to enable safer training.
  - Modified the DDPG algorithm to enable action masking in continuous spaces by leveraging a human-provided safe set.
  - Achieved close to 100% safety in both training and deployment while maximising rewards.
- Safety Critical Navigation using Depth Information | KTH Royal Institute of Technology**  Stockholm, Sweden  
*Graduate Research Collaborator | Guide: Prof. Jana Tumova* Jan 2023 - May 2023
- Developed control strategies to achieve obstacle avoidance with provable safety guarantees in an unknown and stochastic environment by using control barrier functions (CBFs).
  - Defined new notions of safesets that can be obtained from the noisy depth images to construct the CBFs.
  - Implemented a fully functioning pipeline in ROS with a turtlebot equipped with an Intel RealSense RGB-D camera.
- Use of Deep Reinforcement Learning in Autonomous Cars | Hokkaido University**  Sapporo, Japan  
*Research Intern | Guide: Prof. Hidenori Kawamura* May 2022 - Jul 2022
- Investigated the use of RL to optimise traffic flow in scenarios like highway merge and intersection crossings.
  - Implemented the Dueling Double DQN Algorithm and tested it with different state space encodings to represent the traffic.
  - RL-based autonomous cars reduced the average congestion clearance time by 30% relative to rule-based agents.

## WORK EXPERIENCE

- Targetable Causal AI: Clustering Users according to Causal Relationships | Adobe Research**  Bengaluru, India  
*Summer Research Intern | Guide: Dr. Atanu R Sinha | \*Patent Application submitted to USPTO* May 2023 - Aug 2023
- Examined the role of unobserved heterogeneity in estimating causal effects of actions to improve targeting decisions.
  - Researched and implemented different algorithms for causal inference like PC, FGES, FCI and LINGAM.
  - Achieved robust market clustering by developing a novel algorithm combining DL with causal structure discovery.
  - Identified and analyzed metrics for evaluating the causal models implemented on real and observational data.
- Clickbait Analysis of News Sites | Digital Outcomes**  Mumbai, India  
*Machine Learning Intern | Guide: Pranav Shah* May 2021 - Jun 2021
- Worked on applying advanced ML techniques to identify whether a news headline is clickbait or not.
  - Developed a web scraping tool to gather data from news websites and collected around 100,000 data points.
  - Built SVM and decision tree models with TF-IDF embedding and achieved an F1 score of 0.91 and 0.88.
  - Achieved a higher F1 score of 0.94 using a transfer learning model with BERT implemented in TensorFlow.

- **Robotics:** Introduction to Robotics\* | Safe Robot Planning and Control\* | Control Systems | Automation in Manufacturing
- **AI/ML:** Reinforcement Learning | Pattern Recognition and Machine Learning | Data Analytics Lab | Big Data Lab
- **Mathematics:** Multivariable Calculus | Probability, Statistics and Stochastic Processes | Linear Algebra | Differential Equations
- **Computer Science:** Data Structures and Algorithms using Python | Design and Analysis of Algorithms

## SKILLS

- **Programming Languages:** C, C++, Python (NumPy, Pandas, PyTorch, TensorFlow, OpenCV, Matplotlib, Seaborn, Rospy)
- **Tools:** Robot Operating System (ROS), MATLAB, Fusion 360, Git,  $\LaTeX$ , Linux, Google Cloud Platform (GCP)

## KEY PROJECTS

### Drone Swarm Challenge | Inter IIT Tech Meet 2023 - IIT Kanpur [↗](#) Dec 2022 - Feb 2023

*Developed a vision-based centralised controller to communicate with and control drones to move in a coordinated manner.*

- Achieved stable hovering and vision-guided rectangular motion of drones by implementing a multi-axis PID controller.
- Developed a Telnet interface for swarm communication and a PID class for simultaneous control of multiple UAVs.
- Transformed the existing ROS-based communication framework into a python script making it platform-independent.
- Designed a post-flight analytics dashboard to assess and tune the algorithm using React.js and Plotly.

### Competitive Multi-Agent Reinforcement Learning | RL Games Hackathon | Shaastra 2022 [↗](#) Dec 2021 - Jan 2022

*Created bots using reinforcement learning to compete with other bots in a virtual two-player 2D game setting.*

- **Winner of the competition** with over 700 participants across India and earned a cash prize of Rs.10,000.
- Implemented two deep reinforcement learning models in Pytorch namely Policy Gradients and Deep Q Learning.
- Crafted a novel feature engineering technique inspired by the decision tree algorithm, doubling the average score earned.

### Mission Planner for Autonomous Robots | Course Project - Introduction to Robotics [↗](#) Aug 2022 - Dec 2022

*Course Project for the introductory course to the Masters in Robotics Program at KTH Royal Institute of Technology, Sweden*

- Implemented Inverse Kinematics solution for a 7 DOF robotic arm using its Denavit-Hartenberg parameterization.
- Coded A\* and Rapidly Exploring Random Tree (RRT) algorithms from scratch for navigation.
- Achieved autonomous navigation and manipulation based on high level instructions by building a mission planner for the TIAGo robot in ROS using behaviour trees.

### Wells Fargo Quantitative AI Hackathon | Shaastra 2022 [↗](#) Dec 2021 - Jan 2022

*Forecasted the implied volatility surface of options over 60 trading days using 2.5 years of past volatility surface data.*

- Secured **3rd place out of 500+ teams** registered across the country in the national-level quantitative AI hackathon.
- Attained an RMS error of 0.033 based on a univariate approach using ARIMA (Autoregressive Integrated Moving Average).
- Further implemented an autoencoder decoder LSTM network which decreased the RMS error by 15%.

### Extra-Terrestrial Manufacturing | Course Project - Automation in Manufacturing [↗](#) Feb 2022 - May 2022

*Conducted a study on the production of oxygen using lunar regolith and the feasibility of setting up a factory on the moon.*

- Designed the required space factory components in Fusion 360, addressing material handling systems and energy requirements for low-gravity operations.
- Analyzed the manufacturing metrics and the economic viability of setting up such a facility for future moon missions.

## SOCIAL IMPACT

- **Coordinator of UpSkill | Shaastra 2021 [↗](#)**
  - Worked in a team of 8 to promote computational thinking in schools impacting over **7000 school teachers** across India.
  - **Moderated a virtual Panel Discussion** on Computational thinking with panellists from Google, Microsoft and ACM. [🔗](#)
  - Solely responsible for striking a deal with Codingal, an ed-tech startup that served as the curriculum partner of UpSkill.

## TEACHING AND EXTRACURRICULAR ACTIVITIES

- Conducted lab sessions as the **Teaching Assistant** for courses - **Machine Design Lab and Automation in Manufacturing.**
- Served as a **mentor to six freshmen** at IIT Madras, facilitating their academic and co-curricular adaptation.
- Helped plan and organise large-scale games and ice breakers for the crowd at Saarang 2020, attended by 70,000+.
- **Sports**
  - **Athletics:** Awarded a 100m silver medal in a state level competition by Anju Bobby George (ex-Indian Olympic athlete).
  - **Field Hockey:** Played as a right forward on the gold medal winning team in the Intra IIT Madras Hockey Tournament 2022.