(720) 761-1716
Boulder, CO
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# TUHINA TRIPATHI

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github.com/tuhina2313

## Education

**University of Colorado Boulder** **Boulder, CO**
*Master of Science in Computer Science* *AUG 2021 — MAY 2023*

- Coursework: Advanced Robotics, Robotic Manipulation, Decision Making under Uncertainty, Theoretical Foundations of Autonomous Systems, Design and Analysis of Algorithms, Datacentre Scale Computing

**Delhi Technological University** **Delhi, India**
*Bachelor of Technology in Information Technology* *AUG 2015 — MAY 2019*

- Coursework: Computer Vision, Image processing, Machine Learning and AI, Pattern Recognition, Software Development, Natural Language Processing, Data Mining, Information Security

## Experience

**COLLABORATIVE AI AND ROBOTICS LABORATORY** **SEPT 2021 — Present**
*University of Colorado* *Boulder, CO*

- Working on preference-based Inverse Reinforcement Learning that uses human-like driving data from a driving simulator.
- The work proposes a formal and more rigorous definition of "preference" in learning from human demonstrations and also differentiates sub-optimal demonstrations from scenarios where human preference is actually adaptable.
- Using the above-mentioned definition, come up with useful segments of a trajectory to make sure preference learning is satisfied without having any catastrophic outcomes of incorporating human preference.

**SOFTWARE DEVELOPMENT ENGINEER** **JUL 2019 — JUN 2021**
*Citicorp Services India Pvt. Ltd.* *Pune, India*

- Swap Data Reporting Engine: Developed an end-to-end enrichment solution for data patching of trades using Springboot and Angular7 . The tool reduced inconsistencies on the Production database by 65%
- Compliance Data Engine: Implemented 'Advanced Search' functionality on Elasticsearch that reduced average query response time by 80%. Also worked on creating CI/CD pipeline for the project and responsive templates for CitiCODE dashboard

**RESEARCH INTERN** **AUG 2018 — OCT 2018**
*Indian Institute of Technology* *Delhi, India*

- Implemented a GAN-based latent fingerprint enhancement algorithm that improved the quality of fingerprint images while preserving the ridge structure (Used IIITD-MOLF Dataset)
- NFIQ scores of enhanced images were three times lower than state-of-the-art approaches (around 1.88%). The improved quality fingerprints further boosted latent fingerprint recognition performance.

**RESEARCH AND DEVELOPMENT INTERN** **JUN 2018 — JUL 2018**
*Nucleus Software Exports Ltd.* *Noida, India*

- Developed a Code Generator that transformed GUI screenshots into front-end code that reduced the hours spent by developers by 8hr/week on average. The solution was deployed end-to-end as a developer tool on Production and used by multiple internal teams in the company.
- Developed a multi-lingual chat bot to communicate in Hindi and Punjabi. The chat bot was built upon the RASA framework and was capable of retaining the context of long conversations (over 8 messages)

## Projects

**IRL INTERACTIVE GAME TO LEARN HUMAN-LIKE OPPONENT BEHAVIOUR**
*Project for ASEN 5519 - DMU* *Spring 2022*

- Developed an interactive grid world game to collect human demonstration data and implement inverse reinforcement learning to learn the reward function from the observed behavior of the human player.

**DYNAMIC OBSTACLE AVOIDANCE IN SHARED HUMAN-ROBOT WORKSPACE**
*Project for CSCI 7000 - Robotic Manipualtion* *Spring 2022*

- Developed a method to perform a human robot collaborative task of clearing cans from a table top using the UR5e robot arm in the real-world Webots simulator. The method predicts human behaviour and plans the motion of the robot arm accordingly.
- The robot maintains a belief over the human's intended goal, continually updating based on human's motion at each time step. The manipulator then tries to figure out the best action to execute in the environment by reasoning over the uncertainty in human's intention estimation using a POMDP framework.

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**IMITATING HUMAN-LIKE DRIVING USING INVERSE RL IN WEBOTS**
*Project for CSCI 5302 - Advanced Robotics* *Fall 2021*

- Implemented a Maximum Entropy Deep Inverse RL approach on human-like demonstration data. The data was generated using the vehicle "Tesla Model 3" on Webots Robot simulator, driven around using keyboard controls.
- A deep neural network with two hidden layers of dimension 3 was used to estimate the reward structure. The state space was discretised and state visitation frequencies used as features to learn the weights for the network.
- The obtained policy showed promising results by exhibiting driving behaviour which was very close to the human-demonstrator.

**BIO-METRIC IDENTIFICATION AND FINGERPRINT PERCEPTIVITY ENHANCEMENT**
*Undergraduate Major Project* *2019*

- Performed fingerprint enhancement using short-term Fourier Transform and Contextual filtering, to help intensify the ridges and minutiae [Dataset: 12k images from Optical and Capacitive sensors]. Enhanced images fed into a CNN for feature extraction. Achieved an accuracy of 98.32% with a significantly less False Acceptance Rate(FAR).

**AUTOMATED HATE SPEECH DETECTOR**
*Undergraduate Minor Project* *2018*

- Implemented a solution for separation of tweets into three categories-hate speech, offensive language and normal text. A dataset of 25k labeled tweets was used with extensive preprocessing using TF-IDF scores and POS tags.
- Model used Regression with L2 Regularization giving a precision of 0.91 and F1 score of 0.90. Additionally studied a BERT-based Transfer learning model to enhance performance for new datasets and unlabelled data.

## Teaching

**Introduction to Robotics (CSCI 3302/ECEN 3303)** **Fall'22**
*Teaching Assistant*

- Managed weekly labs for around 60 students that included explaining and helping students implement concepts like IK, path planning, etc. on the Webots simulator
- Also responsible for conducting Office Hours and grading the Lab work and Homework.

**Starting Computing (CSCI 1300)** **Spring'22, Summer'22**
*Teaching Assistant*

- Conducted weekly recitations and office hours. Responsible for reviewing the course material and planning out final projects.

## Skills

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|---|---|
| **Languages** | Python, C++, Julia, SQL, Java , Javascript |
| **Software & Tools:** | Webots, Pytorch, Tensorflow , Linux, Angular, Spring, Elasticsearch, ROS |

## Activities

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|---|---|
| Graduate Peer Mentoring Program CU Boulder | Fall 2022 |
| CitiCorp **Bronze award** for Enrichment Tool deployment on Production | 2021 |
| CitiCorp **Gratitude award** for Elasticsearch integration | 2020 |
| Teaching Volunteer at 'Teach For India' | 2018 - 2019 |
| **Best Innovation Award** at Nucleus Software for 'Code Generator' | 2018 |
| Technical Head of the Computer Society of India (CSI-DTU) | 2017 - 2018 |
| Among the Top 8 teams in SIH' 17 conducted by Govt. of India | 2017 |