(720) 761-1716
Boulder, CO
tutr8197@colorado.edu

TUHINA TRIPATHI

linkedin.com/in/tuhina-tripathi
github.com/tuhina2313
github.io/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

Research Interests

My research interests are in Learning from Demonstrations (LfD), safety in HRI, Reinforcement Learning.

Experience

GRADUATE RESEARCH ASSISTANT **SEPT 2021 — Present**
CAIRO Lab, University of Colorado *Boulder, CO*

- Developing an algorithm using Inverse Reinforcement Learning to learn human preferences and evaluate the preference information to ensure safety
- Implementing the proposed algorithm on the OpenAI gym highway driving environment. Also implemented it on AWS DeepRacer to record real-world trajectories and evaluate the human demonstrator's preference in real-time

RESEARCH ASSISTANT **AUG 2021 — DEC 2021**
Emotive Computing Lab, University of Colorado *Boulder, CO*

- Worked on designing, writing, and testing python code for an ML wrapper library used internally within the lab that worked with multiple backends such as sklearn and TensorFlow.
- The library integrated with and supported research development in various areas such as eye tracking, speech and language processing, physiological sensing, computer vision, and machine learning.

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)

https://www.overleaf.com/project/63389ae6a8bb2b8fe7949e41

Projects

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

- Developed an interactive grid-based pathfinding game to learn human-like opponent behavior using Inverse Reinforcement Learning.
- Used a maximum entropy formulation and state visitation frequencies to learn a reward structure from the demonstrations

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

- Developed a method to perform a human-robot collaborative task of clearing cans from a tabletop using the UR5e robot arm in the real-world Webots simulator. The method predicts human behavior and plans the motion of the robot arm accordingly.
- The robot maintains a belief over the human's intended goal, continually updating based on the 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 intention estimation using a POMDP framework.

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 discretized and state visitation frequencies were used as features to learn the weights for the network.
- The obtained policy showed promising results by exhibiting driving behavior that 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 the 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

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

Activities

Undergraduate Research Experience program at CU Boulder	Fall 2022
Graduate Peer Mentoring Program at CU Boulder	Fall 2022
Presented a poster at the CU Boulder Annual Research Expo	Spring 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