Maitrey Gramopadhye

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Research Interests

Computer Vision, Robotics, Deep Learning, Image Processing

Education

University of North Carolina, Chapel Hill *(Aug 2021 - present)*
Master of Science in Computer Science **GPA: 4.00/4.00**

Indian Institute of Technology, Bombay, India *(July 2016 - July 2020)*
Bachelor of Technology in Computer Science with Honors **GPA: 7.84/10.0**

Publications

- **Maitrey Gramopadhye**, Shreyansh Singh, Kushagra Agarwal, Nitish Srivasatava, Alok Singh, Siddhartha Asthana and Ankur Arora. "*CuRL: Coupled Representation Learning of Cards and Merchants to Detect Transaction Frauds*". **ICANN 2021**

Research Experience

VIDEO INSTANCE SEGMENTATION *(Aug 2021 - Present)*
Prof. Gedas Bertasius, UNC Chapel Hill
- Working on improving the **instance segmentation and tracking** of objects across video frames
- Experimenting with adding tracking to pretrained image level instance segmentation models using **video transformers**

CuRL *(Oct 2020 - Apr 2021)*
AI Garage, Mastercard | ICANN, 2021
- **CuRL: Coupled Representation Learning of cards and merchants to detect transaction frauds** proposes method to generate contextual embeddings for payment entities (card and merchant)
- Key idea involved effectively capturing the cross-interactions in a bipartite graph of payment entities
- Generated embeddings when used as features for **fraud detection** showed improved performance
- Proposed approach ran faster than many state-of-the-art representation learning algorithms

3D RECONSTRUCTION IN CRYO-ELECTRON MICROSCOPY *(July 2019 - July 2020)*
Prof. Ajit Rajwade, IIT Bombay | Undergraduate Thesis
- Built a pipeline for reconstructing 3D structures of viruses from 2D tomographic projections
- Built upon earlier work for estimating projection angles by also estimating and **correcting for translation errors** in electron micrographs, thus adding (2+3) degrees of freedom to be estimated
- Devised **2-step** hierarchical approach by first estimating coarse translation error, and then fine tuning

Industry Experience

RESEARCH ENGINEER *(Aug 2020 - Aug 2021)*
AI Garage, Mastercard India
- Research paper **CuRL** got accepted in **ICANN 2021**
- Built models to predict whether transactions would **clear** as well as the details of clearing, i.e. **time taken to clear**, **is clearing amount same as the authorised amount** etc. with **99.5%** precision
- Developed a **TextVQA** inspired solution for the **Product Pricing Challenge, RetailVision, CVPR 2021** for detecting and matching price tags to products, in images of supermarket shelves

MONOCULAR 3D OBJECT DETECTION *(May 2019 - July 2019)*
Samsung Research Institute, Bangalore | Research Internship
- Worked in the **Advanced Technology Lab** at Samsung Research Institute, Bangalore
- Implemented **3D object detection** model to estimate 3D bounding box around objects in 2D images
- Received a job offer to work at the for outstanding performance during the internship

REAL-TIME KINEMATIC POSITIONING *(May 2018 - July 2018)*

CarSense - formerly Carnot | Summer Internship

- Developed a selection type **Network based Real-Time Kinematic (RTK)** Positioning System
- Used Skytraq **NS-HP Module** to communicate with satellites and get location accurate upto **3 cm**
- Setup RTK basestations to broadcast **correction data** to rovers, reliable upto **10 kms**

Academic Projects

DEEP REINFORCEMENT LEARNING ON BREAKOUT *(Aug 2019 - Dec 2019)*

Prof. Shivaram Kalyanakrishnan, IIT Bombay | Foundations of Intelligent and Learning Agents

- Trained an agent to play the arcade game: Breakout using Double-DQN and Actor-Critic algorithms
- Applied Reward Shaping to include features like distance to ball and episode time in the cost function
- Utilized domain knowledge of the game to extract meaningful features like ball position and velocity and paddle position from the game's GUI and reduce size of the state space to speed-up training

CONDITIONED TEXT TO SPEECH *(Aug 2019 - Dec 2019)*

Prof. Preethi Jyothi, IIT Bombay | Automatic Speech Recognition

- Trained a model to generate speech given an input text that is conditioned on speaker and emotion
- Utilized wavenet architecture to generate raw unconditioned waveforms of speech for text
- Used LSTM based speaker encoder to generate speaker embedding, to condition the wavenet output
- Trained Auto-Encoder and GAN to take wavenet output and emotion and output conditioned speech

SPARSE MONO-SLAM 3D RECONSTRUCTION *(Jan 2019 - May 2019)*

Prof. Arjun Jain, IIT Bombay | Computer Vision

- **Constructed** 3D surroundings and **tracked** the motion of a camera from a monocular video stream
- Implemented the project using Conventional Computer Vision **Structure from Motion** algorithm
- Displayed the constructed 3D surrounding and motion of camera frame in **real-time**
- Used **sparse feature based SLAM** to track feature points in the video stream

Teaching and Mentoring Experience

GRADUATE TEACHING ASSISTANT *(Aug 2021 - Dec 2021)*

Prof. Mike Reed, UNC Chapel Hill | 2D Computer Graphics

- Worked as a Teaching Assistant for COMP 475 - 2D Computer Graphics taught by Prof. Mike Reed
- Conducted meetings to help students debug C++ code for assignments and clarify course content

SOFTWARE SUBSYSTEM HEAD *(May 2018 - July 2020)*

Mars Rover Team, IIT Bombay

- The IIT Bombay Mars Rover Team builds rovers capable of traversing and conducting operations and experiments in Mars like terrain, for competing in the University Rover Challenge, Mars Society
- Responsible for supervising the team's progress on the software required for **URC 2020**
- Intensively worked on **Autonomous Object detection** and **Autonomous Obstacle Avoidance**

INSTITUTE STUDENT MENTOR *(May 2019 - July 2020)*

Institute Student Mentorship Program, IIT Bombay

- Responsible for guiding a group of 12 undergraduate freshmen for the academic year
- Providing counsel and mentoring them about any academic or personal problem

DEPARTMENT ACADEMIC MENTOR *(Apr 2019 - July 2020)*

Department Academic Mentorship Program, CSE Department, IIT Bombay

- Mentor to 5 sophomore students responsible for guiding them with their academic concerns
- Mentor to additional 2 students in academic rehabilitation program, helping them get back on track

Key Courses Undertaken

Computer Science - Computer Vision, Advanced Image Processing, Foundations of Intelligent and Learning Agents, Automatic Speech Recognition, Digital Image Processing, Computer Networks, Operating Systems, Computer Architecture, Data Structures and Algorithms, Data Analysis
Miscellaneous - Linear Algebra, Differential Equations, Calculus, Quantum Physics, Economics