MAITREY GRAMOPADHYE

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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**

INTERESTS

Computer Vision, Robotics and Image Processing

RESEARCH EXPERIENCE

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)
- Generated embeddings when used as features for **fraud detection** showed improved performance
- Key idea involved effectively capturing the cross-interactions in a bipartite graph of payment entities
- Ensured efficient embedding generation process by keeping the model lightweight
- Proposed approach ran faster than many state-of-the-art representation learning algorithms and produced embeddings that outperformed other relevant baselines on fraud classication task
- Research paper was accepted in **International Conference on Artificial Neural Networks 2021**

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 degrees of freedom to be estimated
- Devised **2-step** hierarchical approach by first estimating coarse translation error, and then fine tuning
- Conducted promising experiments on simulated as well as real electron micrograph images

MULTI-RESOLUTION WEAKLY SUPERVISED LEARNING *(Jan 2020 - July 2020)*
Prof. Amit Sethi, IIT Bombay | Research and Development Project

- Worked on tumor metastasis detection in histopathology slide images of breast tissue
- Models trained on slides at varying resolutions are used sequentially for improved accuracy
- Presented preliminary results using **Attention Multiple Instance Learning**

WORK EXPERIENCE

ASSOCIATE ANALYST *(Aug 2020 - Aug 2021)*
AI Garage, Mastercard India

- Research paper **CuRL: Coupled Representation Learning of cards and merchants to detect transaction frauds** 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
- Built expected spend forecasting model for cards by analysing their transaction patterns

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
- Built real-time monocular **3D object detection** model in Pytorch for mobile phones
- Implemented methods to estimate 3D bounding box around objects in 2D images
- Received a return job offer 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**
- Identified applications like region wide accurate positioning, precision agriculture, autonomous robotics

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

TOMOGRAPHIC RECONSTRUCTION WITHOUT ANGLES (Jan 2019 - May 2019)
Prof. Ajit Rajwade, IIT Bombay | Advanced Image Processing

- Given tomographic projections with unknown angles of projection, reconstructed the original object
- Implemented multiple methods using Graph Laplacians and Spherical Local Linear Embedding
- Approaches involved mapping projections to lower dimensions to estimate angles of projections
- Project has applications in **Cryo-Electron Microscopy**, identifying structure of viruses etc.

VECTOR-VALUED IMAGE REGULARIZATION WITH PDEs (Aug 2018 - Dec 2018)
Prof. Ajit Rajwade & Prof. Suyash Awate, IIT Bombay | Digital Image Processing

- Implemented applications like color image restoration, inpainting, magnification and flow visualization
- Demonstrated that filtering using Oriented-Laplacian represents the smoothing geometry of PDEs
- Developed a closed form solution for propagating image gradients and updating the image

Technical Projects

IIT-B MARS ROVER TEAM
(May 2017 - July 2020)
Student Technical 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
- Intensively worked in the field of **Computer Vision** for autonomous tasks performed by the rover
- Worked on **Autonomous Object detection** task by implementing a hybrid method, using conventional CV approach followed by deep learning, to get real-time detection from a video stream
- Worked on **Autonomous Obstacle Avoidance** task of the rover, using data from **GPS** and **LiDAR**

SORT BOT
(May 2017 - June 2017)
Electronics and Robotics Club, IIT Bombay
- Built a robotic car to find and sort balls by their colour for Institute Technical Summer Project
- Used **Raspberry Pi 3** for processing and **RPi3-NOIR-V2** module for taking pictures of objects
- Developed a Depth Mapping Algorithm by collecting sample images and observing a relation between pixel coordinate and depth to devise distance of the ball as a function of its y co-ordinate in images
- Presented the project in **Tech and RnD Expo 2017**, at IIT Bombay, to visiting researchers

Leadership Experience

SOFTWARE SUBSYSTEM HEAD
(May 2019 - July 2020)
Mars Rover Team, IIT Bombay
- **Head** of **Software Subsystem** of the IIT-Bombay Mars Rover Technical Team
- Responsible for supervising the team's progress on the software required for **URC 2020**
- The team participated in University Rover Challenge (URC) 2018 and stood 31st out of 95 teams

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 for helping them cope with the curriculum
- Responsible for guiding them with their academic and general concerns
- Mentor to additional 2 students in academic rehabilitation program, helping them get back on track

CO-ORDINATOR
(Apr 2017 - Jan 2018)
Technoholix, Techfest | Asia's largest science and technology festival
- Managed a workshop on High Performance Computing and parallel processing
- Member of the team that organized shows by professional artists, pulling a crowd of more than 15,000
- Co-ordinated and drafted **Op Rahat**, a Rescue Drone competition simulating disaster situations

MANAGER
(Mar 2017)
Institute Basketball Playoffs, IIT Bombay
- Coordinated execution of a basketball league spanning over 2 months and catering to 72 participants
- Trained for **refereeing** a Basketball match and officiated as well as participated in close contests

Extracurriculars and Social Work

- Partnered with various NGOs for a **Mastercard** social initiative to develop an automated platform for matching students and young adults with professional mentors, and tracking their relationship
- Won **Institute Technical Colour** award for extraordinary contribution towards technical activities
- Assisted in **SHE**, an initiative to promote Sanitary and Health Education in remote villages
- Assisted in **CURED**, a Pan India initiative of Techfest 2017 to promote awareness about Diabetes
- Participated in **National Level Science Exhibition** 2011, Ahmedabad, organised by KV Sangathan
- Achieved **2nd** position in Inter Hostel General **Basketball Championship**