VISHAL GUPTA

5th Yr Undergrad - Computer Science & Engineering | IIT Kharagpur

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EXPERIENCE

Anthropometry - Estimating 3D structure of a baby from video

Wadhwani Institute of Artificial Intelligence | Dr. Rahul Panicker

May 2019 – July 2019 Mumbai, India

- Jointly estimated the 3D structure of the baby and the camera parameters using video frames.
- Removed affine ambiguity assuming orthographic projection and scale ambiguity using scale retrieval from 3D reconstructed reference object.
- For moving babies, modelled the SfM problem as affine parametrised reconstruction and recovered the basis shapes and co-efficients for each frame.
- Registered the generated point cloud to a deformable mesh including the optimization of translation and rotation ambiguity resulting from SfM.

Anthropometry - Environment for Synthetic Data generation

Wadhwani Institute of Artificial Intelligence | Namrata Deka

May 2019 – July 2019 Mumbai, India

- Used Blender to generate realistic synthetic data of indoor babies.
- Automated the task of aligning and placing babies at desired place with proper physics constraints and realistic view.
- Added support for both static and moving babies and applied realistic lighting using spherical harmonics and texture on the babies based on UV mapping.
- Simulated camera movement around the baby in an arc with a little wobble so as to mimic a human hand motion while taking a video.

Explainability of Deep Learning Models

IBM Research | Diptikalyan Saha

May 2018 – July 2018 Bangalore, India

- Created a novel pipeline to tackle the Explainability problem in Deep Learning.
- Focused on explaining the neural network implementation of Stanford Co-reference Resolution System.
- Extracted new rules which improves the existing Stanford Deterministic System.

Natural Language to Code

IBM Research - Hackathon | Diptikalyan Saha

June 2018 Bangalore, India

- Designed a LSTM based sparse reward feeding Natural language to code translator.
- Used RL as the training regime and attention mapping for action selection.

PROJECTS

Advance Lane Finding

Udacity Self Driving Car Nanodegree

March 2019 - April 2019 IIT Kharagpur, India

- Developed a software pipeline to identify the lane boundaries and calculate its Radius of Curvature in a video.
- Calibrated camera and removed distortion effects from input images. Detected lane pixels based on thresholding and sliding window and fit second-order polynomials to it.
- Improved robustness of lane detection based on strong lane points and used the final polynomials for proper ROI identification and Radius of Curvature calculation.
- Optimized the performance over video frames so that the next frame lanes build up on the previous frame rather than from scratch.

INTERESTS

I have quite an interest in Deep Learning, Computer Vision and Reinforcement Learning. Alongside these, I like to spend time on System Design and Game Development.

EDUCATION

- **Indian Institute of Technology Kharagpur, India**
  Aug 2015 - Present
  Dual Degree in Computer Science and Engineering (Btech + MTech)
  CGPA : 8.53/10.0
- **Modern International School**
  May 2013 - Apr 2015
  All India Senior School Certificate Examination (AISSCE), CBSE board
  Score : 94.2%

ACHIEVEMENTS

- Awardee of **Kishore Vaigyanik Protsahan Yojana (KVPY)** scholarship
  2015
- Ranked in top 1.2% in **JEE Advanced**(1.25L participants) and top 0.1% in **JEE Mains**(13L participants).
  2015
- Awardee of **National Talent Search Examination (NTSE)** scholarship.
  2013
- Achieved a rank of 421 in **Google Kickstart** Round H.
  2018

SKILLS

C, C++, Python, PyTorch, OpenCV, Blender ●●●●●

Tensorflow, OpenAI-Gym, Scikit-learn, git, Keras, Nltk, Stanford Core-NLP, Linux, Java ●●●●○

Extended Kalman Filter

Udacity Self Driving Car Nanodegree

Jun 2019 - July 2019 | IIT Kharagpur, India

- Developed a pipeline to estimate the state of a moving object using Kalman Filters.
- The Kalman Filter operated on Sensor Fusion data coming from noisy LIDAR and RADAR measurements generating measurement and its uncertainty as output at each step.

Behavioural Cloning

Udacity Self Driving Car Nanodegree

March 2019 - May 2019 | IIT Kharagpur, India

- Developed a pipeline for Behavioural Cloning of a vehicle in a simulated environment.
- Used "NVIDIA End to End Learning" CNN architecture to train the autonomous vehicle.
- Generalised the model on previously unseen and very complex tracks to achieve an autonomy score of 83.33%(scoring method described in the NVIDIA paper).

Implementation of Deep RL Algorithms

Udacity Reinforcement Learning Nanodegree

Oct 2018 - Nov 2018 | IIT Kharagpur, India

- Implemented Deep RL Value based Algorithms like DQN, Double DQN, Duelling DQN etc.
- Trained agents for "Atari games (eg. Pong)" based on the above value-based algorithms.
- Implemented various Deep RL policy-based Algorithms like PPO, REINFORCE and D4PG.
- Trained agent for "Unity Reacher Task" based on the above policy-based algorithms.

Distributed Directory Service

Distributed Systems | Prof. Arobinda Gupta

Feb 2019 - April 2019 | IIT Kharagpur, India

- Implemented a Distributed Directory Service in Python based on OSI LDAP Protocol.
- Used rpyc library for Remote Procedural Calls and ensured One Crash Fault Tolerance and Sequential Consistency.

Loadable Kernel Module

Advance Operating Systems | Prof. Sandip Chakraborty

September 2019 | IIT Kharagpur, India

- Designed a LKM which takes as input strings or integers and sorts them.
- Designed another LKM with same inputs but with additional support of various ioctl calls and implementation of BST for storing the elements.
- Both the LKMs completely handle concurrency, mutual exclusion, process management, memory management and io-control.

MRFS and QUIC Protocol

OS-Networks Lab | Prof. Indranil Sengupta, Prof. Sandip Chakraborty

March 2018 | IIT Kharagpur, India

- Implemented a memory resident file system(MRFS) like FAT32 in C++.
- Divided the FS heiracrchy into superblocks and inodes and incorporated all useful functionalities like ls, cp, rm, cd, read, write etc.
- Implemented a QUIC like multiplexed connection protocol over UDP with TCP Tahoe-like congestion and flow control.
- Implemented multithreading with server and client side features rolled into a single application.

Text Prediction

Deep Learning | Prof. Sudeshna Sarkar

March 2019 | IIT Kharagpur, India

- Completed two subtasks, of predicting the nth word in a sentence based on previous n-1 words and predicting the second half of the sentence based on the first half.
- Used a GRU network to accomplish the above tasks. (The notable feature of this project is the self-implementation of forward and backward passes of a GRU net solely in numpy without using any previously defined APIs).

COURSEWORK

- Udacity Self Driving Car Nanodegree*
- Udacity Deep Reinforcement Learning Nanodegree
- Machine Learning
- Deep Learning(CS231n)
- Probability & Statistics
- Algorithms I & II
- Artificial Intelligence
- Matrix Algebra
- Intelligent Game Design
- Image Procressing
- Computer Networks
- Operating Systems
- Computer Architecture & Organization
- Software Engineering
- Computational Neuroscience
- Parallel & Distributed Algorithms
- Large Scale Search Engines
- Operation Research
- Information Retrieval
- High Performance Parallel Programming
- Distributed Systems
- Advance Operating Systems*
- Algorithmic Game Theory*

* denotes Ongoing Courses

EXTRA CURRICULAR

- **Protect Our Planet** - Designed a non-zero sum min-max game on Biodiversity Conservation using PyGame.
- **Embibe** - Led a team of 30 interns for metadata creation on 27000 competitive exam questions.
- **PRAVAH** - Performed several stage plays and nukkads across various colleges.
- **TAship** - Currently holding the position of TA in the RL course offered by the college.