Sanskar Agrawal

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ABOUT ME

I am a Machine Learning Researcher and Engineer based in India with 4 years of experience. I specialize in 3D Computer vision and Machine Learning, with a keen interest in tackling hard technical problems through R&D.

EDUCATION

Indian Institute of Technology, Kharagpur **July, 2020**
Bachelor of Technology in Electrical Engineering; GPA: 8.7/10; *Kharagpur, India*

- **Minor**: Computer Science and Engineering *GPA: 9.1/10*

PUBLICATION

[1] Objects with Lighting: A Real-World Dataset for Evaluating Object Relighting
Benjamin Ummenhofer, ***Sanskar Agrawal****, Yixing Lao, Kai Zhang, Stephan R. Richter* arxiv *3DV 2024*

[2] Prior Guided GAN Based Semantic Inpainting
Avisek Lahiri, ***Sanskar Agrawal****, Arnav Jain, Pabitra Mitra, Prabir Biswas* CVF *CVPR 2020*

[3] Off-Road Lane Detection Using Superpixel Clustering And RANSAC Curve Fitting
Sanskar Agrawal*, Indu Kant Deo, Siddhant Haldar, G Rahul Kranti Kiran* IEEE Xplore *ICARCV 2018*

[4] Design and Implementation of Autonomous Ground Vehicle for constrained environments
G Rahul Kranti Kiran, ***Sanskar Agrawal****, Indu Kant Deo, Siddhant Haldar, Het Shah* IEEE Xplore *IEEE IRC*

WORK EXPERIENCE

Preimage.ai **Bengaluru, India**
Machine Learning Lead *Oct 2022 – Present*

- **Led a team** of 5 research engineers, brought cutting edge computer vision models from research to production. Played a central role in hiring and mentorship within the company. Submitted **2 patents** detailing our pipeline.
- **Depth Estimation with MVS** - Worked on state-of-the-art classical PatchMatch MVS methods and Vision Transformers based cost volume generation to estimate depth from multi view stereo images in **milimeter accuracy**.
- **3D Reconstruction with NeRFs** - Built and deployed a fast and scalable method for generating textured 3D models from images of massive scenes(10 sq.km) based on neural radiance fields. Implemented custom **CUDA kernels** for extending PyTorch autograd to second order gradient optimization through kernel fusion resulting in **2x speedup**.
- **PointCloud Fusion** - Built and deployed **multi view fusion pipeline** to create pointclouds using GPU accelerated voxel hash grid based **tsdf fusion**. Implemented custom CUDA kernels for improvements achieving **10x speedups**.
- Presently working on real-time **NeRF** and **Gaussian Splat** rendering in the browser for 360° indoor images.

Intel Intelligent Systems Lab(ISL) **Bengaluru, India**
Research Engineer *Jul 2020 - Oct 2022*

- Lead the development of **Open3D-ML**, open source library for 3D semantic segmentation and object detection tasks.
- Worked on **Physically based rendering** and material estimation from images. Developed a novel dataset enabling quantitative evaluation for **scene relighting**. Proposed a streamlined Mitsuba-based baseline, surpassing current state-of-the-art algorithms. Paper accepted at **3DV 2024** conference with Oral recommendation. Paper(TBA)

RESEARCH EXPERIENCE

Eye Gaze Estimation | Bachelor's Thesis May 2019 - Apr 2020
Prof. Pabitra Mitra

- Worked on Unsupervised Eye Gaze Estimation using domain adaptation from synthetic UNITY dataset. **[thesis]**
- Implemented GAN based Adversarial Autoencoder to achieve mean angle error of 8° beating the current state of the art.

Image Inpainting Apr 2019 - Dec 2019

Prof. Pabitra Mitra

- Implemented a GAN based generative model to map latent prior distribution to natural images, optimizing Image Inpainting as a *'best-matching'* prior problem. Our work outperforms current state of the art and is accepted at **CVPR**
- Conducted extensive benchmarks on baselines like GPI, PIC, MC-CNN, on CelebA-HQ and ImageNet datasets.

CUDA DL Framework | Term Project April 2019

Prof. Soumyajit Dey

- Designed Deep Learning Framework using CUDA and C++. Implemented CUDA kernels for forward and backward propogation for Convolution, Linear, and Cross Entropy layers. Developed APIs to train on custom dataset. **[repo]**

Autonomous Ground Vehicle (AGV) | Research Group Mar 2017 - Apr 2020

Prof. Debashish Chakrabarty

- Worked on Lane Detection, Traffic Sign Recognition, Path planning, Localization, SLAM etc. **[repo]**
- Experienced working with IMUs, GPS, lidars, stereo cameras, and other robot peripherals.
- Among the top 5 teams out of 400 in Mahindra Driverless Car Challenge to build autonomous car for Indian roads.

National Digital Library Dec 2017 - June 2018

Prof. Partha Pratim Das

- Developed a tool to extract concepts related to programming domain for C programs using LSTM.
- Implemented GloVe and Skipgram models trained on a corpus of programming domain.

COMPETITIONS

Inter IIT Technology Meet 2019 *Dec 2019*

- Captain of Gold winning contingent amongst 23 participating IITs. Implemented an AutoEncoder based NLP model to predict currency fluctuations based on news events.

Inter IIT Technology Meet 2018 *Dec 2018*

- Secured Bronze medal amongst 23 teams. Developed an ensemble satellite image segmentation U-Net model with channel-level attention. **[Report]**

Intelligent Ground Vehicle Competition | Oakland University, Michigan *June 2018*

- Represented IIT Kharagpur and secured silver medal out of 46 teams in AutoNav challenge in 26 IGVC. **[Report]**
- Built an autonomous bot to follow lane markings while avoiding obstacles to navigate a set course. Implemented ROS package for lane detection using SLIC and RANSAC. **[video]**

Hardware Modelling - Pipe Inspection Robot *Dec 2017 - Mar 2018*

- Built a low cost pipe surveillance robot which is capable of moving in a variable radius pipe. Implemented radius estimation of the pipe using monocular PiCamera.

TECHNICAL SKILLS

- **Languages :** C++, Python, Bash, Julia, Matlab
- **Tools / Frameworks :** PyTorch, TensorFlow, CUDA, Docker, OpenMP, Git.

COURSEWORK

- **University :** Reinforcement Learning, Algorithms, Advanced Computer Vision, High Performance Parallel Programming, Deep Learning, Image Processing, Machine Learning.
- **Online :** Introduction to Computer Vision, Artificial Intelligence for Robotics, Deep Learning Specialization, CS231n, Natural Language Processing.

ACHIEVEMENTS

- World rank 2 in Autonomous Navigation Challenge of IGVC for both 2017 and 2018.
- Secured 1st place all over India in Softbank Forex Algorithm Challenge.
- Won Gold medal in Open IIT Data Analytics Competition held at IIT Kharagpur.