Akshay Sharma

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Education

Carnegie Mellon University *Pittsburgh, PA*

Master of Science in Mechanical Engineering (Specialization: Machine Learning) (**GPA:** 3.94/4.0) *Aug'18 - May'20*

- **Courses:** Deep RL and Control | Convex Optimization | Computer Vision | Deep Learning for Engineers | AI and ML for Engineers | Statistical Techniques for Robotics | Engineering Optimization

Indian Institute of Technology Kanpur *Kanpur, India*

Bachelor of Technology in Mechanical Engineering (**GPA:** 8.6/10.0) *Jul'14 - May'18*

- **Courses:** Intro to Natural Language Processing | DS and Algorithms | Introduction to Robotics | Robot Motion Planning

Work Experience

Advanced Agent Robotics Lab, Robotics Institute, Carnegie Mellon University *Pittsburgh*

Research Associate *May'20-Present*

- Building a simulated agent capable of exploring a disaster hit environment while having a dialog with a guiding human
- Working on the neural network architecture of the vision to dialog, vision to mapping module, synthetic data generation, and integrating these modules with a central simulator

Advanced Agent Robotics Lab, Robotics Institute, Carnegie Mellon University *Pittsburgh*

Graduate Research Assistant *Oct'18 - May'20*

- Designed a neural network based observer policy capable of identifying states for which an RL agent is confused and facilitate efficient communication with an expert
- Resulting network cuts down on episode lengths and improves episode return while minimizing expert queries

Computer Vision Lab, Indian Institute of Technology Madras *Chennai, India*

Research Intern *May'18 - Jul'18*

- Designed a novel **2-phase progressive-retrogressive** training, and a **dual motion warping** frame alignment techniques
- Designed a neural network for explicit **refinement and fusion of high-frequency details** of super resolved videos
- The system produced visually more appealing results than most SOTA methods with no noticeable temporal artifacts

Projects

Analysis and Comparison of generative models for Optical Flow estimation *Dr. Amir Farimani | CMU | 2020*

- Designed architectures for **GAN** and **VAE** based optical flow estimators with an **image pair conditioned generator**
- Compiled a comparative study of the above methods with the commonly used auto-encoder based optical flow estimators

Unsupervised Optical Flow Estimation with temporal smoothing *Dr. Amir Farimani | CMU | 2018*

- Designed an unsupervised version of the Flownet-C architecture for optical flow estimation
- Formulated a **temporal smoothing loss** term which penalizes large changes in consecutive optical flow maps
- Generated temporally smoother optical flow maps producing more temporally consistent warped images

Visual Question Answering *Dr. Harish Karnick | IIT Kanpur | 2018*

- Designed an open-ended visual Q/A system capable of differentiating question types and choosing the correct answer
- The system used a **LSTM network** on top of the GloVe embeddings for question words, and **VGG16** features for images

Vision based Active Target Tracking *Dr. Mangal Kothari | IIT Kanpur | 2018*

- Improved upon an existing Siamese neural network based object tracker by designing a **LSTM based memory network**
- This auxiliary system learnt a motion model of the tracked objects and improved tracking accuracy in cases of occlusion

Controllable Tennis Ball Launching Machine *Dr. Mohit Law | IIT Kanpur | 2017-18*

- Designed and manufactured an economical and efficient tennis ball launching machine completely from scratch
- Designed a control system which allowed variable yaw and pitch, along with both backspin and topspin

Technical Skills

- **Programming Languages & Utilites:** Python, C, C++, MATLAB, AWS EC2, AWS MTurk
- **Python & DL libraries:** PyTorch, Keras, TensorFlow, OpenAI Gym, NumPy, Matplotlib, SciPy, Scikit-Learn
- **OS:** GNU/Linux, Windows
- **ML & DL Techniques:** Regression, Naive Bayes, SVM, KNN, K-means, PCA, CNN, RNN, LSTM, GRU, Transformers

Publications

Vikram Singh, Akshay Sharma, Sudharshann D., Dr.Anurag Mittal, **Retrogressive Training towards High-Frequency Prediction for Video Super-Resolution**, Winter Conference on Applications of Computer Vision (WACV) 2020. [Paper]