Shubham Agrawal

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Education

Columbia University in the City of New York — New York, NY
Master of Science in Computer Science; CGPA: 3.91/4.0 — *Aug 2019 - Dec 2020 (expected)*

Indian Institute of Technology Kanpur — Kanpur, India
Bachelor of Technology in Computer Science; CGPA: 8.7/10.0 — *Jul 2013 - Apr 2017*

Experience

Tesla Inc — Palo Alto, USA (remote)
Autopilot Intern (C++, Python Software Developer) (Non Disclosure Agreement) — *Jun 2020 - Aug 2020*

Worked on identifying and associating same objects visible in multiple cameras to create object tracks across time. Implemented and wrote verification scripts for object tracks outlier rejection component

Robotics Embedded Research Laboratory, University of Southern California — Los Angeles, CA
Student Research Assistant (Robotics Research and Web Development) — *May 2019 - Aug 2019*

Worked on physics simulator which allows parameter estimation for nonlinear dynamical systems using automatic differentiation. Implemented Adjoint Method for getting fast differentials of integrated ODEs using C++ template metaprogramming. Arxiv Paper.

Adobe Inc — Noida, India
Member of Technical Staff (C++, JavaScript Software Developer) — *Jul 2017 - Jan 2019*

Implemented CRUD operations for highlight/underline/sticky notes for the next generation PDF webview using Javascript. Formulated efficient algorithm for modeling an annotation's position across multiple PDF views (with variable structure and content).

Adobe Inc — Bangalore, India
Research Intern (Machine Learning) — *May 2016 - Aug 2016 (voluntarily working till Jun 2017)*

Created a novel end-to-end system for automated design of affinity (user's interest) based smart geo-fences for selective targeting. US Patent US20180232767A1. **Conference paper** Smart Geo-fencing with Location Sensitive Product Affinity, ACM SIGSPATIAL 2017

Projects

- **Fit2Form: 3D Generative Model for Robot Gripper Form Design**: Given an object to be grasped, generate a pair of fingers for parallel jaw gripper that would maximize the design objectives (i.e., grasp success, stability, and robustness)
  - Trained a Fitness network that takes in the TSDF volumes for (object, left finger and right finger) and predicts the values for design objectives. Using the Fitness network, trained a Generator network that takes in the object TSDF volume and generates TSDF volumes for left and right fingers that would maximize the design objectives.
  - Our approach was able to get an average grasp success of 88.9% on unsee test set, while the general-purpose WSG50 gripper performance was at 25.8% and the imprint baseline's performance was at 78%.
  - **Conference paper** under submission to CoRL 2020 (joint first author). Code and paper will be released soon.
- **3D Style transfer**: Style transfer from 2D images to 3D meshes for novel view synthesis. We use two 3d mesh representations, neural-mesh-renderer and deep-voxels which provide a differentiable way to render mesh images from multiple viewpoints. Using these representations, we optimize the original mesh by applying style loss to the generated images. Code, Report.
- **Kaggle Diabetic Retinopathy Classification**: Task was to predict the severity of an input image given 3K labeled retina images. Used several preprocessing steps (CLAHE, smoothing, blood vessels segmentation) to remove noise and variable lighting conditions using OpenCV. EfficientNet-B2 and TTA gave an optimized kappa score of 0.895 and an overall standing 1311 (total 2943 teams) on the leaderboard. Code.
- **Porn Block**: Chrome extension for realtime identification and blurring of sensual images from webpages. Trained VGG-net on scrapped data using KerasJS. Wrote a proxy server to bypass CORS while generating the client-side image matrix. Code.

Skills

- **Languages**: C++, Python, JavaScript, SQL
- **Libraries**: PyTorch, PyTorch-Distributed, Ray distributed applications, Scikit-Learn, Stan-Math, Eigen, OpenCV, Numpy, Pandas

Achievements & Extracirricular

- **US Patent US20180232767A1** *Smart Geo-fencing with Location Sensitive Product Affinity*
- **Course Assistant**, Applied Machine Learning Spring 2020, Columbia University
- **Course Assistant**, Advanced Database Systems Spring 2020, Columbia University
- **Research Assistant** with Professor Shuran Song since September 2019, Columbia University
- **All India Rank 191**, IIT-JEE Advanced 2013 (among 150K candidates)
- Received *Academic Excellence Award* for excellent academic performance during 2013-14 cirriculum at IIT Kanpur
- Received award of *Best Rookie Team*, and *Design Finalists*, BAJA Student India 2015 (an inter-collegiate all-terrain vehicle design competition)
- Served as CS Department Senator at Viterbi Graduate Student Association, University of Southern California for spring semester, 2019
- Co-created TOEFL Infinite, an android application for TOEFL and GRE exam preperation with 150K downloads on Google Play