Siddharth Kumar

Data Science, Machine Learning, Computer Vision, NLP

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EDUCATION

Singapore University of Technology and Design 09/2020 – 08/2022 | Singapore
Masters of Engineering, Computer Science Department
Information Systems and Programming, Innovation by Design, Design Thinking, Data Science, ML, DL, CV, NLP
Full Tuition Scholarship + Monthly Stipend

Birla Institute of Technology and Science (BITS) Pilani 08/2014 – 07/2018 | India
Bachelors of Engineering (Hons.) Chemical Engineering, Computer Vision
First Class Honours + Scholarship, 1.47% Acceptance Rate
Undergraduate Thesis @ Harvard-MIT HST, Boston

TECHNICAL SKILLS

Python | **PyTorch** | **Git** | **C++** | **Docker** | **MATLAB** | **Tensorflow** | **OpenCV** | **spaCy** | **SQL** | **Flask**
CI/CD | **Streamlit** | **FastAPI** | **AWS SageMaker** | **JIRA** | **Pandas** | **NumPy** | **Kaggle** (Top 1%)

PROFESSIONAL EXPERIENCE

Senior ML Engineer (Research) | Visual Computing Group @SUTD 10/2022 – Present | Singapore

Robust hyperspectral based plastic classification for recycling
- Building a low latency object detection/segmentation model leveraging synthetic data
- Building the synthetic data pipeline using image overlays with unpaired image to image translation using CycleGAN
- Building YOLO based object tracking pipeline to make the pick-n-place robotic arm more robust
- Trained wavelength based tabular data with extensive augmentation and featuring - compared SOTA algorithms
- Collaborating with Agency for Science, Technology and Research (A*STAR) and Sembcorp Industries for deployment

Machine Learning Intern | Prudential 11/2020 – 08/2021 | Singapore

NRIC Verification using OCR to automate the KYC procedure
- Built a web app and microservices-based RestAPI in Flask and FastAPI using Keras-OCR & Tesseract (> 80% TP)
- Built a custom ID card detection-segmentation model using YOLOv5 and Detectron2 to achieve mAP > 0.9
- Optimised Inference time to be < 200ms per image
- Computed inference using PyTorch and OpenCV on both CPU and GPU running CUDA 11.2
- Dockerised the WebApp and hosted it on internal servers for testing
- Operated Bitbucket's VCS in the CI/CD pipeline. Wrote extensive sanity check routines along with exception handling
- Integrated Postman to track the usage of the RestAPI and SwaggerUI to test the API on any browser
- Tracked progress on JIRA
- Worked on speech-to-text model with speaker diarization using Watson API to analyse customer calls for sentiments

Computer Vision Intern | Polybee | SG Innovate Summation 11/2021 – 04/2022 | Singapore

Computer vision based plant health and phenotyping monitoring system for indoor farms
- Built Plant phenotyping pipeline using YOLOv5 and Detectron2; Achieved mAP > 0.9
- Operated in-house data annotation for the POC and collaborated with data annotation agencies for large datasets
- Maintained training log and stats using Weights&Biases and Tensorboard
- Tested autonomous mapping pipeline using T265 and RGBD by using SIFT for Feature Extraction
- Implemented DeepSORT for object tracking and to uniquely count objects in a video
- Leveraged different imaging sensors (stereo/ NIR/ multispectral/thermal) to determine plant morphology and quantify different levels of plant health
- Integrated logging and unit tests in the development

Machine Learning Intern | Bifrost 09/2021 – 10/2021 | Singapore

Pirate ship object detection/segmentation using both synthetic and real data
- Used GCP compute engine to train a object detection/segmentation model leveraging transfer learning
- Used both RGB and NIR images and videos for training data

- Experimented with Unpaired Image to Image Translation using CycleGAN and Pix2Pix to simulate different surroundings and increase the robustness of the model

Researcher | SUTD-MIT Innovation Design Centre 12/2018 – 08/2020 | Singapore

Novel computer vision-based artificial whiskers to detect micro-vibrations underwater for deep ocean object tracking
- Deployed the model and evaluated FPS on various edge devices - Raspberry Pi 4, ODROID-XU4 and Jetson Nano
- Used Adaptive Thresholding, Sobel-Canny, Feature Matching, Dilation-Erosion coupling, Dense Optical Flow to track the motion of whiskers and contour moments to quantify coordinates in the frame
- Utilised the time-series coordinates data to train ARMA and ARIMA for prediction
- Used Moving Window Standard Deviation(MWSD) to track minimal temporal changes
- Handled missing coordinates before model inference using Facebook's Prophet TS library
- Tested the real-time detection model to TFLite to increase the FPS
- Corrected Lens distortion using chessboard based camera calibration to calibrate the Camera Intrinsic Matrix

Engineering Intern | Harvard-MIT HST 05/2017 – 01/2018 | Boston

- Compressed Sensing Based Image Reconstruction in 3D Micro-Bioimaging published in the Royal Society
- Mobile-camera based Expansion Mini Microscopy (ExMM)
- One of only 2 students from India to get selected for this position

NOTABLE PROJECTS

More on GitHub
- DeepSafe - Open Source - Web based - DeepFake Detector! – GAN, Flask RestAPI, Docker, Google Cloud, Streamlit
- Biceps Curl Game - Compete with friends-see who can do more biceps curl! – Pose Estimation, 30 FPS, 32 Key-points
- TL;DR WebApp - Summarise research paper abstracts in 1-click! – NLP, Docker, Heroku, AWS EC2, Summarisation
- Video Super Resolution - Upscale your videos to 4X higher resolution! – ISR, Artefact Cancellation

ACADEMIC PUBLICATIONS AND ARTICLES

Academic Publications
Robust Spectral Feature Extraction and Classification using Hyperspectral Imaging and Unsupervised Deep Learning with Spectral-Preserving Data Augmentation [Ongoing]
A miniaturized optical tomography platform for volumetric imaging of engineered living systems
A Study on the Role of Additives in Non-Cyanide Baths for the Fabrication of Anisotropic Metallic Nanostructures
Freeform Liquid 3D Printing of Soft Functional Components for Soft Robotics

Articles
DeepSafe: Open source deepfake detection platform built for Researchers
A hitchhiker's guide to Synthetic data for Deep Learning – CycleGAN, Image Overlay, Blender, SDV, Faker
Synthetic training data from Blender + Object Detection with Transfer Learning = Deep Learning on Steroids
Real time Object tracking and Segmentation using YoloV8 with Strongsort, Ocsort and Bytetrack

AWARDS AND MEDIA FEATURES

World Summit Awards for Young Innovators | Lisbon, Portugal

BITSAA Global 30 Under 30 | Hyperloop India - Finalist, SpaceX Hyperloop Pod Competition

Featured in XRDS, New Delhi Times, The Hindu, Internshala, Thenewminute, BITScan and SRUJAN magazine, Sinhgad College, Pune

Granted ~30000 SGD for the design of Advanced Disaster Mitigation Module(ADMM) | Lockheed Martin, USA

REFERENCES

Dr. Ngai Man Cheung, *Assistant Professor*, SUTD, Singapore

Dr. Jeffrey Karp, *Professor*, Harvard University, Boston

Dr. Y. Shrike Zhang, *Assistant Professor*, MIT, Boston

Dr. Pablo Valdivia y Alvarado, *Assistant Professor*, SUTD, Singapore