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Dhruti Shah

Education

2019–Present **Masters in Data Science**, *EPFL*, *5.34/6.0*.
Expected graduation : February 2022
Master Thesis (ongoing) at **IBM Research**
Advised by Prof. Rudiger Urbanke (EPFL) and Cristiano Malossi (IBM Research)
Conducting research in areas of Computer Vision and Signal Processing.

2014–2019 **Bachelors + Masters in Electrical Engineering**, *IIT Bombay*, *9.30/10*.
Shankar Dayal Sharma **Institute Gold Medalist** – awarded for general proficiency
Master Thesis in '*Top-m entity resolution*' advised by Prof. Nikhil Karamchandani
Completed with Minor in Computer Science

Key Projects and Internships

Title **Interactive Fast Annotation Method for Machine Learning pipelines** [2021-22]
Master Thesis (Ongoing), AI Automation Team, IBM Research

Description Deep learning has achieved remarkable performance in computer vision due to the availability of large, well-curated data sets (e.g. ImageNet, COCO). However, there still exist several application scenarios where either the amount or quality of annotations is limited. Further, existing annotation tools present several limitations like operating with application-specific labels like cracks on Civil Engineering structures. To address these issues, we are working towards developing a method for auto-annotation.

Title **Improved Image Stitching for Defect and Anomaly Detection** [2020-21]
Research Internship, AI Automation Team, IBM Research
Patent Pending

Description Current image stitching algorithms suffer from scalability, low speed and distort component images for a smooth output. We develop a fast image stitching method that works for a large number of planar images. Our algorithm runs on the GPU providing a speed-up of 30x, and stitches more than 100 images in under 5 min. It is integrated with state-of-the-art detection methods, to localize defects on high-end civil engineering infrastructure. Further, we utilized image registration techniques to study the evolution of defects over time.

Title **Long-term motion prediction using keyposes** [2021]
Semester Project, Computer Vision (CV) Lab, EPFL
Publication in progress

Description The problem of human pose motion forecasting can be tackled by decomposing the input sequence into few essential 'keyposes' and performing prediction over these keyposes. Current works determine the key poses using traditional k-Means clustering and perform sequence prediction using RNN-based architectures. In natural language processing and vision, transformers are becoming the de-facto model for sequence prediction. Therefore, we replace the RNNs with the transformer architecture. Additionally, we explore the use of VQ-VAE based models to obtain a better set of keyposes.

Title **Top-m entity resolution** [2018-19]
Master Thesis, Signal Processing Lab, IIT bombay
Published in **AAAI 2020** (20.6% acceptance rate)

Description We developed information theoretic bounds and algorithms to identify the top clusters for entity resolution in presence of an oracle. We considered two cases, one with a noisy oracle and the second with noisy side information matrix. Provided a theoretical proof and supporting empirical study (on Amazon Purchase Dataset) that our algorithm reduces the query complexity from $O(n^2)$ to $O(n \log n)$ in both cases.

Title **Feature enhancement for flash memory communication** [2017]
Summer Internship, Qualcomm

Description Modified and enhanced the primary tool used responsible for sending Operating System (OS) images from the source to flash memory on target, thereby loading and booting the OS on target. Optimized time requirements by 50% through compression of sparse files & sending smaller data chunks. Innovated the handling of partitions for NAND targets through integration with existing GPT partition tables. Tested the above enhancements and innovations on Qualcomm devices before real-world deployment

Other Projects

Title **Benchmarking Reinforcement learning algorithms** [2020]
Semester Project, advised by Prof. Rudiger Urbanke, EPFL

Description Studied theory and mathematics behind popular RL algorithms. Implemented these in Python using OpenAI Gym and PyTorch to practical problems

Title **Open source Image Processing library for SCILAB computational package** [2016]
Open Source Contributions, FOSSEE, IIT Bombay

Description Developed algorithms to implement MATLAB image processing functions in SCILAB. Utilized OpenCV library in C++ to write function code and implement algorithms

Title **Intelligent Video Analytics - object tracking and license plate recognition** [2015]
Matrix Comsec India

Description Optimized the currently used face detection and license plate recognition algorithm. Programmed for object tracking in OpenCV, for real time video analysis

Technical Strengths

Languages Python, C++, C, MATLAB, Spark, SQL, HTML

Softwares Pytorch, OpenCV, Raspberry Pi, OpenGL

Academic Achievements

- Recipient of the Shankar Dayal Sharma **Institute Gold Medal** out of more than 900 graduating students for general proficiency, both academic and extra-curricular.
- Secured **State Rank 1** among girls in JEE-Mains-2014, national level engineering entrance examination, out of **1.5 million** candidates
- Secured **All India Rank 328** in JEE-Advanced-2014 out of **150,000** candidates

Relevant Courses

CS Courses: Machine Learning, Computer Vision, Digital Image Processing, Applied Data Analysis, Image Analysis and Patter Recognition, Data Structures and Algorithms

EE Courses: Signals and Systems, Digital Signal Processing, Advanced Topics in Signal Processing, Markov Chains, Probability and Random Processes, Information theory and Coding

Math Courses: Linear Algebra, Applied Mathematical Analysis, Complex Analysis, Calculus

Leadership and Volunteering

Fall 2017 **Contingent Leader, Inter IIT sports meet**, *IIT Bombay*.
First ever female contingent leader to lead the IIT Bombay contingent at Inter IIT sports meet
Led 150-member strong IIT Bombay contingent to victory, winning the overall General Championship trophy. Fostered team spirit by interacting with captains, coordinating practice sessions, team selections of all sports

2017-19 **Institute Student Mentor**, *IIT Bombay*.
Part of 80 member team to help freshmen students; ensure their smooth transition to college life
Selected from over 350 applicants based on peer review, academic, and mentoring skills. Mentoring 12 freshmen students to guide them for overcoming academic & personal difficulties

2016-19 **Volunteer, Abhiyasika Social Services**, *IIT Bombay*.
Abhiyasika – Student initiative of IIT Bombay to tutor underprivileged students in a slum
Volunteering to teach English and Science to grade 11 and 12 students from underprivileged families twice a week. Conducted career counselling sessions to inculcate the value of higher education among low-income families

Extra-curricular Activites

- **Google Get Ahead Program:** Participated in 6-week virtual program for selected CS students across EMEA; involving technical challenges, YouTube live trainings and interview workshops
- Volunteer at Empowerment Lab, Geneva: taught Data Analytics to 12-16 year olds
- Recipient of **"Institute Sports Roll of Honor"**, the highest sporting honor at IITB
- Awarded **"Person of the Year"** for contribution to sports in the Institute.
- Awarded **"Sports Freshman of the Year"** for outstanding performance, **2** of **880**
- Successfully completed IITB Run & Powai Hiranandani **Half Marathon – 21 km**
- Completed the Runathon, endurance running - **4 hours, 32.8 km** at IIT Bombay