Manan Shah

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Education

Indian Institute of Technology Mandi **Aug. 2019 – June. 2023**
Bachelor of Technology in Computer Science and Engineering *CGPA: 8.45/10*

- **Relevant Coursework**: Computer Vision, Deep Learning, Data Structures and Algorithms, Numerical Linear Algebra, Discrete Mathematics, Operating Systems and Networking, Database Systems, Computational Financial Modelling

Experience

Vision and AI Lab, Indian Institute of Science **March 2024 – Present**
Research Assistant — Mentor: Prof. R. Venkatesh Babu *Bangalore, India*

- Worked on the problem of addressing imperfect mirror reflections in recent state-of-the-art diffusion based generative models. Our work is accepted at the **3DV'25 conference**.
- Created a custom rendering pipeline leveraging BlenderProc to create a large scale synthetic dataset of mirrors. Created and trained custom diffusion based generative models in a multi GPU setup using SLURM and huggingface libraries - diffusers and accelerate.
- Researched alternative approaches using 3D Gaussian Splatting for constructing reflections in 3D.

Cashfree Payments **July 2023 – March 2024**
Software Development Engineer 1 *Bangalore, India*

- Built an in-house solution using **DINOv2** and augmentations to detect fake Aadhaar and PAN cards, enhancing the verification suite product's robustness.
- Developed an automated escalation email system for bank transfers exceeding turnaround time, saving **5hrs** of manual effort daily. Integrated **Prometheus** for monitoring lags and database fetch failures.
- Improved the entire team's development workflow by deploying all team services to a **Kubernetes** cluster using Devspace, which enables **real-time** updating of containers along with a GUI for a streamlined flow.
- Developed new APIs for internal services using Flask and Spring Boot, and designed responsive front-ends with Retool, delivering direct business impact.

Microsoft **June 2022 – August 2022**
Software Engineer Intern *Search Technology Center, India*

- Improved the tagging logic for tagging artists to their Entity IDs in Bing's Knowledge graph, leading to an increase in the features shown metric (DAU) for event related queries.
- Incorporated scripts using internal tools involving SQL and C# to scrape, clean and join data from various artist websites and developed a fully automated pipeline for achieving the objectives.

Publications and Preprints

*** denotes Equal Contribution**

[1] Reflecting Reality: Enabling Diffusion Models to Produce Faithful Mirror Reflections.
Ankit Dhiman, **Manan Shah***, Rishubh Parihar, Yash Bhalgat, Lokesh R Boregowda, Venkatesh Babu Radhakrishnan.* [**3DV'25**] [arXiv:2409.14677] [Webpage]

[2] Reproducibility Study of CDUL: CLIP-Driven Unsupervised Learning for Multi-Label Image Classification.
***Manan Shah**, Yash Bhalgat.* [arXiv:2405.11574] [Code]

Projects

Writer Verification Challenge - NCVPRIPG'23 Conference | *PyTorch, Weights & Biases* **July 2023**

- Won the Writer Verification Challenge held under the NCVPRIPG'23 Conference.
- Given two images of challenging handwritten texts with several variations, the challenge was to predict if they've been written by the same person.
- Modelled the problem as a metric learning task and used a triplet loss with miners and samplers along with a strong self supervised DINO backbone.
- Conducted experiments using PyTorch to achieve a striking **AUC** of **0.976** on the test set, **winning** the challenge from the second best by **5.5%**.

Cross Domain Generalized Category Discovery - MTP 2 | *Guide: Dr. Biplab Banerjee* **June 2023**

- Extended the problem formulation of Generalized Category Discovery (GCD) introduced in CVPR-2022, to incorporate domain shifts.
- Used a self supervised backbone as a common feature extractor and did further warmup training using supervised and self supervised contrastive losses.
- Tried to use Domain Adversarial Training of Neural Networks (DANN) for mitigating the issue of domain shifts.

Adapter BERT | *PyTorch Lightning, huggingface transformers, Weights & Biases* **March 2023**

- This is a paper implementation for "Parameter-Efficient Transfer Learning for NLP."
- Implemented the adapter module as proposed in the paper and integrated it with the BERT model from the huggingface transformers library.
- Achieved within 3-5% performance compared to full fine-tuning using just 3.6% more parameters on the CoLA dataset from the GLUE benchmark.
- Used yacs for handling configurations and Weights & Biases for logging experiments.

Needle Deep Learning Library | *Python, numpy, CUDA* **December 2022**

- This is my own PyTorch like deep learning library written in Python as part of the dl systems course from CMU
- Contains abstractions to things like Values, Tensors, CPU Devices, Operations.
- Implemented the capability to perform reverse mode automatic differentiation on tensors with extension of the computational graph. All operations have been rigorously tested using *pytest* to match with PyTorch.
- Added transposed convolutions as part of ops and implemented a simple UNET as part of the final course project.

Iris Recognition - Major Technical Project 1 | *Guide: Dr. Aditya Nigam* **November 2022**

- Created a pipeline and custom image server to process all CASIA IrisV4 datasets and label the pupil and iris centre, radii using the best ROI obtained from hough transform and PixlSegNet segmentation model.
- Employed a new way to extract useful spatio-spatial-temporal iris features by patching an iris image, stacking and using a modified 3D-CNN (I3D) as a feature extractor.

Codeforces Customizer | *Chrome Extension API, JavaScript, JQuery, CSS, HTML* **August 2021**

- Developed an extension that enhances user experience on Codeforces. This is actively being used by the community.
- Some features include: hiding long blogs, search-bar for blogs, displaying problemset by using userlists by default and easy navigation to all submissions from the problem page.
- Used JQuery for DOM traversal, Chrome Storage API to sync settings, implemented a live search filter for the blogs.

Technical Skills

Languages: Python, C++, C
Technologies/Frameworks: PyTorch, Scikit-learn, SLURM, Git, Docker, Kubernetes, FastAPI

Honors and Awards

- **Attended the 6th CVIT Summer School on AI:** I got selected for attending the 6th CVIT Summer School on AI With focus on Computer Vision and Machine Learning 2022.
- **9th Inter IIT Tech Meet 2021:** Our team secured a bronze medal in the automated identification, summarization and entity based sentiment analysis of mobile technology articles and tweets challenge.
- **ACM ICPC Kanpur-Mathura Regional Contest 2020:** Our team secured a rank of **50** in the Asia Kanpur-Mathura Online Regional Contest 2020.
- **Google Kickstart Round G 2021:** Stood 1,118th in google's kickstart competitive programming competition, among more than 10k participants.
- **Hacking Google Maps:** One of the best submissions for an intra-college heuristics event where we had to present underlying ideas and improvements to make our own map service similar to google maps.
- **Codeforces Rating:** Max - Specialist.
- **Codeniacs 2019:** Stood 4th in 1st year's competitive programming contest.
- **IITJEE-Advanced 2019:** Achieved an All India Rank of **7,721** among 245,194 candidates. Further awarded a branch change to the **CSE** department being among the **top CGPA** holders in the freshman year.

Leadership / Extracurricular

- **Core-Team member of the Programming Club:** Organized several sessions and competitions related to programming in college. Actively mentored several junior students.
- **Teaching Assistant for the courses CS202 (Data Structures and Algorithms) and IC152 (Introduction to Python):** Designed challenging assignments and automated the checking of programming assignments.
- **Problem Setter and Event Head for Dementia** - our competitive programming contest hosted on Codechef, which saw huge participation.