MUHAMMAD NABEEL RAZA

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Education

University of Engineering and Technology, Lahore Oct. 2019 – Jul. 2023
Bachelor of Science in Computer Engineering *Lahore, Pakistan*

Experience

Spatial Labs Pvt. Ltd. Feb. 2023 – Present
Data Scientist *Pakistan*

- Utilized a hybrid approach combining **Learned Noise Prediction** (JPG to RAW image conversion) and Fourier Transform to differentiate between **real and fake satellite images**. Developed a Stable Diffusion model to generate synthetic images, achieving an impressive **89% classification accuracy**. Model Link.
- Contributed to a project for **tracking cars** from overhead imagery using aerial images. Enhanced the **YOLOv8 model's performance** from 67 mAP to **95 mAP** by splitting images and annotations into smaller chunks. Converted annotation coordinates into **latitude and longitude** for storage in **Geobase**.
- Compared Mistral and GPT-4 responses using **PairRM** in **LLM Blender**. Reported that **longer responses** were more favoured by the comparison technique.
- Deployed the **Whisper** model at a remote location without Internet access by setting up a **local instance** to transcribe audio to English.
- Developed scripts to synthetically **generate real-world-like data in Blender**, focusing on automobiles in realistic environments. Assisted in randomizing scene settings such as Sun angles, car materials, road appearance, and camera angles.
- Contributed to **Big Geo Data** course by writing detailed tutorials on spatial analysis, **H3**, **DuckDB**, **Dagster** pipeline, and spatiotemporal modelling using **OpenSTL**. Course Link.
- Performed data analysis for stakeholder meetings to provide insights into three **GPS datasets**. The comparison included spatial analysis using the H3 index. Extracted data from **AWS S3 buckets**, developed transportation mode classification, and compared data spread and visibility.

Spatial Labs Pvt. Ltd. Sep. 2022 – Feb. 2023
Software Engineer - Intern *Pakistan*

- Fine-tuned a UNET model for land cover mapping with **5 classes**, **0.92 IoU** and deployed it on **Hugging Face Spaces**.
- Fine-tuned a **YOLOv5** model to detect and quantify **forest tree damage**. Gained hands-on experience converting **Pascal VOC** annotations to **Darknet format**. Used the same method for participating in a ship detection competition. Achieved an **mAP** score of around **0.82** on the private leaderboard and **0.86** on the public leaderboard. Link.

Educative Inc. Jun. 2022 – Aug. 2022
Answers Intern *Lahore, Pakistan*

- Wrote **28** technical articles and code blocks. The articles were related to AI and Computer vision with emerging topics. I also assisted in reviewing **52** articles.
- Topics included ViT, Segmentation, Transformers, Attention Mechanism, Data Augmentation, etc. Profile link.

Personal Projects

TrajectoryQA - Answering Questions from Trajectory Descriptions | *DuckDB, Transformers* March 2024

- Used **Geolife** dataset of Human trajectories and geocoded it with **OpenStreetMap**. Then automated the process of writing a complex description, questions and answers. Trained a **GPT-2** LLM to answer user queries. Also tried the **Mistral 7B** quantized version but took too long. Achieved an accuracy of **79.6%** and perplexity of **1.24**.

Email Lead Generator and Escalator | *LangChain* April. 2024

- Using **LangChain**, I created created two different kinds of agents to respond using **GPT-4**. The first agent, called Opener, created an opening email that used lead information and gave a company description and relevancy. The second agent, called Escalator, responded to the reply from the Opener to inquire information about project budget, project scope, etc.

Tech Stack

Python, DuckDB, PyTorch, PySpark, HuggingFace libraries, OpenCV, Docker, etc.