Muhammad Nabeel Raza

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Education

National University of Science and Technology, Islamabad **Sept. 2023 – Jun. 2025**
Master of Science in Data Science (3.9/4.0 CGPA) *Islamabad, Pakistan*

University of Engineering and Technology, Lahore **Oct. 2019 – Jul. 2023**
Bachelor of Science in Computer Engineering (3.76/4.0 CGPA) *Lahore, Pakistan*

Publications

ECG Lead Selection for Disease Diagnostics Using CNN-Transformer **Aug. 2025**

- Developed a novel **1D CNN-Transformer architecture** to facilitate low-cost cardiovascular disease diagnostics in resource-limited rural areas by reducing the number of required ECG leads.
- Pioneered the first formal **intra-lead comparative analysis** in this context, systematically evaluating the diagnostic contribution of each of the 12 standard ECG leads using deep learning.
- Achieved a state-of-the-art weighted F1-score of **0.761** on the PTB-XL dataset, outperforming prior benchmarks, and a score of **0.997** on the St. Petersburg INCART database.
- Authored and published the findings in the **peer-reviewed** *International Journal of Innovations in Science & Technology*. The complete source code is publicly available on GitHub.
- The paper can be accessed here.

Experience

Securiti.ai **Jun. 2025 – continued**
Data Scientist *Pakistan*
- ∗ I have joined Securiti.ai fairly recently, and so far, I have been working on classical ML-based clustering algorithms. We primarily work with Data Privacy at scale, tackling issues related to the processing of PetaBytes of data while ensuring data security.

Antematter **Jun. 2024 – Jun. 2025**
AI Engineer *Pakistan*
- ∗ Smart Contract Auditor – Developed a code review agent using OpenAI's API and LangChain's ReAct prompting. Integrated Slither and ItyFuzz for analysis. Addressed compiler version parsing, OpenZeppelin dependencies, and handling extended contexts.
- ∗ Atlas/Otto – Collaborated on developing a Web3 tool for on-chain data and market stats. Utilized a mixture-of-agent framework to deliver a high-performance chatbot with market insights and social sentiment analysis.
- ∗ Agent-builder / IAO – Initially known as Agent Builder, later transformed into the IAO platform. Utilizing ai16z's Eliza backend enables the creation of custom characters.
- ∗ I contributed to developing the feature that permits the dynamic creation of agents instead of relying on Eliza's method of a character file (JSON).

Spatial Labs Pvt. Ltd. **Feb. 2023 – Jun. 2024**
Data Scientist *Pakistan*
- ∗ Employed a hybrid technique combining Learned Noise Prediction for converting JPG to RAW images and Fourier Transform for distinguishing between authentic and counterfeit satellite images, achieving **89%** accuracy with the Stable Diffusion model. Model Link.
- ∗ Played a role in a project aimed at **monitoring vehicles** through aerial imagery. Improved the **YOLOv8 model's efficacy** from 67 mAP to **95 mAP** by dividing images and their annotations into smaller portions. Converted the annotation coordinates to **latitude and longitude** for integration into **Geobase**.
- ∗ Assessed responses from Mistral and GPT-4 utilizing **PairRM** in **LLM Blender**, revealing that **more extended responses** were preferred in the evaluation process.
- ∗ Implemented the **Whisper** model at a site lacking Internet by configuring a **local instance** to translate spoken words into English text.
- ∗ Created scripts to produce synthetic **realistic data in Blender**, particularly around vehicles in real-world environments. Supported randomising scene attributes like Sun angles, car textures, road look, and camera perspectives.
- ∗ Contributed to the **Big Geo Data** course, drafting comprehensive guides on spatial analysis, **H3**, **DuckDB**, **Dagster** workflows, and spatiotemporal modeling employing **OpenSTL**. Course Link.
- ∗ Conducted data analytics for stakeholder discussions using spatial assessments with H3 index, including **GPS datasets** retrieval from **AWS S3**, transportation mode classification, and evaluation of data distribution and visibility.

Spatial Labs Pvt. Ltd. **Sep. 2022 – Feb. 2023**
Data Science - Intern *Pakistan*
- ∗ Customized a UNET model for land cover classification involving **5 categories**, achieving an **IoU of 0.92**, and successfully launched it on **Hugging Face Spaces**.

* Adapted a **YOLOv5** model for recognizing and assessing **forest tree damage**. Developed practical skills in transforming **Pascal VOC** annotations into **Darknet format**. The same technique was employed in a ship detection contest, yielding an **mAP** score around **0.82** on the private leaderboard and **0.86** on the public leaderboard. Link.
* Utilized the same approach with a different annotation format and varying Yolo versions to compete in a ship detection challenge on **HuggingFace**. Recorded an **mAP** score of about **0.82** on the private leaderboard and **0.86** on the public leaderboard. Link.

Educative Inc.   **Jun. 2022 – Aug. 2022**
Answers Intern   *Lahore, Pakistan*
* Authored **28** technical pieces and code segments focusing on emerging themes within AI and computer vision. Additionally, I contributed to evaluating **52** articles.
* Subjects covered included ViT, Segmentation, Transformers, Attention Mechanism, and Data Augmentation, among others. Profile link.

Research Projects

TrajectoryQA - Responding to Inquiries Based on Trajectory Descriptions | *DuckDB, Transformers*   **March 2024**
* Employed the **Geolife** dataset, which consists of human trajectories, and enhanced it with **OpenStreetMap** geocoding. Developed an automated system to generate intricate descriptions, alongside corresponding questions and answers. Trained a **GPT-2** language model to handle user inquiries efficiently. Experimented with the quantized version of **Mistral 7B**, though it was too time-intensive. The system achieved an accuracy rate of **79.6%** and a perplexity score of **1.24**.

Route similarity and pattern mining | *PySpark, DuckDB, Folium*   **March. 2024**
* Used the **AIS** dataset by the Denmark Government to find similar routes to any route using **LSH**. Also, mined association rules using **FP Growth** which helped predict the movement of boats. Repeated it for several resolutions to report the best ones.

Tech Stack

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

Leadership / Extracurricular

UET-ACM Student Chapter   **Sept. 2021 – May 2023**
Vice President and General Secretary   *UET, Lahore*