Muhammad Khaquan

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Education

Lahore University of Management Sciences – BS. Computer Science | **CGPA – 3.78** ***Aug 2021 – Aug 2025***

Key Courses**:** Data Science, Machine Learning, Generative AI, AI, Advanced Programming, Linear Algebra (Honors), Quantitative Finance

Professional Experience

WhichDraft | **Machine Learning Engineer** ***Jun 2023 – Jan 2024***

- **Established** an **end-end pipeline** with Open AI API to **automate legal contract** generation using **AI powered agents.**
- **Developed a** vanilla agent which **automated taxonomy generation** by **90% +** leading to custom legal contract generation.
- **Developed** an editor agent to integrate **client instructions** into generated contracts**, enhancing satisfaction by 70% +.**
- **Developed** a MVP Agent which **enabled contract wide and component specific customizations**, boosting **user engagement by 52%** and **reducing support inquiries by 25%.**

Data Solutions | Machine Learning Engineer ***Mar 2023 – Apr 2023***

- **Developed** a notebook to be used in **demonstration of AI agent** capabilities using Lang-chain and GPT-4 API for a class of **over 150 students.**
- **Established** an **agent executor** to incorporate memory and instruction recall thus **boosting response quality** by **40% +.**

Environ AI | Machine Learning Engineer ***Jan 2023 – Feb 2023***

- Created a **chatbot** for **navigating** a corpus of **1 million + legal documents** to **facilitate client's green policy decisions.**
- **Improved model throughput by 42%** by employing a semantic hashing protocol to shortlist relevant documents.
- **Conducted Retrieval Augmented Generation** on the shortlisted documents to respond to client queries.

Research & Projects

LUMS | Centre for Speech & Language Translation| ML Researcher ***Jun- Aug 2024***

- **Authored the paper** titled 'Beyond Uniform Query Distribution: Key-Driven Grouped Query Attention' **submitted to AAAI'25.** The paper introduces **three new variants to the Grouped Query Attention** (GQA) to compress the self-attention module of transformers in a low loss manner.
- **Developed** the **DGQA** mechanism which introduces attention informed, dynamic grouping capability to **GQA. DGQA outperforms GQA** across 4 datasets from CIFAR10 to Tiny ImageNet **by as much as 8%.**
- **Developed** the **PGQA** mechanism which introduces normalized Gaussian Noise to the self-attention output of groups, providing a deeper look into the similarity/dissimilarity patterns of attention outputs across heads.
- **Optimized** the **py-Torch code** for PGQA **to avoid OOM errors on CUDA kernels** allowing the PGQA to utilize finer grained windows for its updates.

LUMS | Department of Computer Science| CS 5302 (Gen AI) ***Jun 2024***

- **Built a Data Science Chatbot** (Data-Sci Bot) which does EDA, Statistical Inference and ML inference on user data.
- **Created 4 dedicated agents** in LLaMa3 and Mixtral LLMs **using deterministic approaches** such as function calling and JSON parsing **to facilitate a smooth agentic pipeline.**
- **Curated a custom data** of over 50 well labelled neural net architectures ranging from simple LSTMs to decoder nets.
- **Finetuned Mistral-7B** on the curated data to boost performance of Data-Sci Bot on human eval.
- **Developed a custom RAG pipeline** to **improve the Human-Eval performance** of the statistical inference agent to enable more informed choices of statistical tests by the model.

LUMS | Centre for Speech & Language Translation| ML Researcher ***Sep 2023 – May 2023***

- **Credited in a published** Natural Language Processing **paper for annotating** corpora for translation accuracy.
- **Established** a **Part of Speech Tagging agent** for the resource poor, morphologically rich Urdu language corpora in GPT 3.5, Phi 1.5 and Small Llama LLMs.

LUMS | Department of Computer Science| CS 436 (Computer Vision) ***Dec 2023***

- Conducted ground segmentation and top view generation on the Comma-2k19 dataset.
- Used the Super-glue GNN to find the homography mapping between 1st and nth frames to progressively stitch top view images.
- Mapped the dashcam view onto the top view obtained via road satellite image by building a custom homography mapping pipeline.

LUMS | Department of Computer Science| ML Researcher ***Dec 2023***

- Developed a **Sentiment Analysis Model** to classify tweet sentiment with a **max accuracy of over 95%.**
- **Introduced a random sampling protocol** to **mitigate the effect of class imbalance** in the dataset on model's predictions.
- **Benchmarked** the results from a **deep Bi-LSTM** architecture **against simpler protocols** such as **Naïve Bayes.**

Leadership & Extra-curriculars

LUMS Consultancy Group (LCG) | Project Manager ***Mar 2023***

- **Spearheaded** the creation of **LCG View from the Top**, a flagship **event attended by 200 + students**, more than **130% of initial estimates. Procured Mr. Aatif Awan** founding partner at IVC, one of Pakistan's largest early-stage VC as the guest speaker.

LUMS Consultancy Group (LCG) | Assistant Director (Research & Insights) ***Aug 2022 – Sep 2023***

- Achieved **300% more corporate clients** YoY **across 3 sectors** by introducing an **algorithmic outreach** approach.
- **Spearheaded case creation** causing a **50% increase** in participation YoY in the **LUMS Casing Competition** (largest casing competition in Pakistan)**.**

Honors & Awards

- Placed on **Dean's Honor List (top 25 in the batch)** ***Dec 2022, Dec 2023***
- **USEFP High Achiever** SAT **(1560/1600)** ***Nov 2021***

Skills & Hobbies

Skills: Primary Research, Machine Learning**,** Data Science, NLP, Statistical Modelling

Interests: Generative AI, Quantitative Finance, Cricket, Powerlifting