



# Talha Nadeem

Algorithm Development • Machine Learning Engineering • Time-Series & Signal Modelling

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🌐 <https://talhanadeem7860.github.io/>

## 👤 PROFILE

Data Scientist & ML Engineer with 5+ years of experience building intelligent data systems, LLM-powered workflows, and production-ready predictive models. Skilled in LLMs (GPT, Claude, Llama), RAG pipelines, agentic AI, and Python-based automation. Have designed data pipelines, integrated AI models into end-to-end systems, and deployed scalable solutions involving multimodal, time-series, and text data. Strong foundation in SQL, statistical modeling, data processing, and model evaluation, with a proven ability to collaborate across engineering and business teams.

## 🧠 CORE SKILLS

### • AI & LLM Systems

LLM Integration (GPT, Claude, Gemini, Llama), RAG Pipelines (LangChain, LlamaIndex), Agentic Workflows, Tool Use & Orchestration, Prompt Engineering, PEFT/LoRA Fine-Tuning, Model Evaluation (LLM-as-a-Judge), Quantization, ONNX

### • Data Science & Analytics

Data Processing, Feature Engineering, Cleaning, Predictive Modeling, Time-Series Forecasting, A/B Testing, Statistical Inference, Causal Analysis, Kalman Filtering, Sensor Fusion, Multimodal Data

### • Tools & Technologies

Python, SQL, MATLAB, C++, PyTorch, TensorFlow, Hugging Face  
Pandas, NumPy, Matplotlib, Vector Search: FAISS, Pinecone, Weaviate, FastAPI, Streamlit, Docker, Git, CI/CD

### • Databases

SQL Server, MySQL, PostgreSQL (1+ year), Document Parsing & Indexing Pipelines

### • Signal Processing & Estimation

Time-series analysis, filtering, smoothing, spectral methods, Variational Bayes Filters, Bayesian smoothing, State-space modelling, sensor fusion, noise modelling.

## 💼 PROFESSIONAL EXPERIENCE

01/2026 – Present  
Lahore, Pakistan

**RAZA AND CO (EG Group Limited)**  
Data Scientist

09/2019 – 12/2025  
Lahore, Pakistan

**Lahore University of Management Sciences (LUMS)**  
Machine Learning Researcher

- Developed algorithms for noise removal, smoothing, and filtering of multi-sensor and biomedical signals.
- Designed and implemented Kalman and Variational Bayes Filters for robust state estimation under uncertainty.
- Constructed state-space models and applied MLE/MAP techniques for system parameter estimation.
- Built LSTM-based time-series forecasting models to predict system behaviour and detect anomalies.

- Integrated classical signal processing with ML techniques to improve prediction reliability and temporal pattern recognition.
- Designed end-to-end ML pipelines: data preprocessing → feature engineering → model training → evaluation → optimization.
- Conducted experiments measuring prediction error, filtering accuracy, time-lag behaviour, and uncertainty intervals.
- Implemented clean, reproducible experiment pipelines with modular Python code.
- Collaborated cross-functionally to test algorithm robustness on real-world datasets.

06/2018 – 05/2019  
Islamabad, Pakistan

#### **National University of Sciences and Technology (NUST)**

Research Assistant

- Performed statistical signal analysis and modeling on EEG data for real-time source localization.
- Developed artifact removal and preprocessing pipelines improving localization accuracy for downstream predictive models.
- Built time-series smoothing and inference algorithms for brain activity reconstruction.

07/2018 – 08/2018  
Lahore, Pakistan

#### **Space & Upper Atmosphere Research Commission (SUPARCO)**

Intern

Research intern at Power & Control Systems Lab

### **SELECTED PROJECTS**

#### **Normalized Innovation Ratio–EKF (NIR-EKF) for Robust State Estimation**

Developed a robust state estimation algorithm that integrates MAP estimation with an NIR-based statistical test to detect and suppress outliers in multidimensional sensor data automatically. Achieved higher estimation accuracy and lower computational cost than standard EKF methods, enabling reliable real-time deployment.

**Skills:** Python, Kalman Filtering, MAP Estimation, Statistical Inference, Outlier Detection, Linear Algebra, Time-Series Modeling, NumPy, SciPy, Optimization Algorithms

#### **Multi-Degradation Image Restoration Network Based on Deep Unfolding Neural Network**

Built a Multi-Degradation Image Restoration Network using deep unfolding, where classical optimization steps are converted into a trainable neural architecture. The model restores images affected by noise, blur, compression artifacts, and mixed degradations while maintaining interpretability and stability. Integrated statistical priors with deep feature extractors for improved fidelity under real-world degradations.

**Skills:** Image Restoration, Deep Unfolding, Artifact Removal, Optimization Techniques, Experimentation & Benchmarking

#### **Statistical Driver Analysis & Model Explainability for Clinical ML Models**

Conducted key driver analysis using SHAP, regression coefficients, and hypothesis testing to interpret ML predictions on biomedical datasets. Identified statistically significant factors and validated model behavior using cross-validation and control-group style evaluation.

**Skills:** Python, SHAP, Regression Analysis, Hypothesis Testing, Statistical Inference, Model Explainability, Feature Importance, Cross-Validation, Scikit-Learn, Data Analysis

#### **Hybrid Reinforcement Guided Deep Unfolded Estimation for Preterm Birth Prediction**

A hybrid model combining deep unfolded estimation with reinforcement-guided learning to predict preterm-birth risk from noisy physiological time-series. Integrates probabilistic state-space modelling, Kalman/ variational updates, and LSTM-based sequence learning for improved robustness and interpretability.

**Skills:** Machine Learning Engineering, LSTM, State-Space Modelling, Reinforcement Guided Optimization, Probabilistic Inference Methods

#### **Molecular Property Prediction with GNNs**

Developed a graph neural network (GNN) model to predict molecular properties based on structural graph data. Applied techniques such as message passing and node embedding to learn chemical representations for AI-assisted drug discovery.

**Skills:** PyTorch Geometric, GNNs, Molecular Graphs, Chemistry ML, Node Embedding, Regression

## Retail Sales Forecasting

Built a demand forecasting model using SARIMA and k-NN regression to predict item-level sales across multiple stores. The pipeline included preprocessing of time-series data, seasonal trend analysis, and performance evaluation, aiding inventory planning decisions.

**Skills:** Python, Time-Series Forecasting, SARIMA, k-NN, Data Preprocessing, Pandas, Matplotlib

## Real-Time 3D Brain Visualization

Built a 3D brain imaging pipeline that captures real-time EEG data and visualizes source-localized brain activity using LORETA and dipole fitting methods. Developed artifact removal filters and implemented live signal acquisition through OpenVibe and Lab Streaming Layer. Enabled interactive and accurate visualization of neural events on a dynamic 3D brain model.

**Skills:** OpenVibe, EEG Acquisition, LORETA, Dipole Fitting, Real-Time Signal Processing, Python, MATLAB

## AQI Forecasting for Lahore

Developed a PM2.5 air quality prediction pipeline based on SARIMA using real-time environmental data from OpenAQ. Enabled future AQI visibility to support proactive health measures and urban monitoring.

**Skills:** Python, SARIMA, OpenAQ API, Air Quality Modeling, Data Cleaning, Visualization

## EDUCATION

09/2021 – Present  
Lahore, Pakistan

### PhD Electrical Engineering

Lahore University of Management Sciences (LUMS)

- 3.18 GPA
- Completed Coursework: Robot Motion Planning, Applied Probability, Remote Sensing of the Environment, Information Theory & ML, Smart Grid Systems
- Dissertation proposal: From Optimization to Learning: Adapting Model-Based Methods for Designing Learning Algorithms

09/2019 – 05/2021  
Lahore, Pakistan

### MSc Electrical Engineering

Lahore University of Management Sciences (LUMS)

- 3.63 GPA
- Completed Coursework: Stochastic Systems, Linear System Theory, Machine Learning, Advanced Digital Signal Processing, Convex Optimization, Multiagent Systems, Deep Learning, Digital Control Systems
- Thesis Title: Generalized Norm Estimator Based on Observer Principle for Robust State Estimation

09/2015 – 05/2019  
Islamabad, Pakistan

### BSc Electrical Engineering

National University of Sciences and Technology (NUST)

- 3.35 GPA
- Selected Coursework: Calculus, Linear Algebra & ODEs, Applied Physics, Linear Circuits Analysis, Electrical Network Analysis, Complex Variables and Transforms, Probability and Statistics, Signals and Systems, Electromagnetic Field Theory, Electrical Machines, Communication Systems, Digital Signal Processing, Microwave Engineering, Digital Image Processing
- Research Project :Real Time 3D Brain Visualization Depicting Source-localized Activity

## CERTIFICATIONS

- AI for Medical Prognosis (2025) - DeepLearning.AI
- AI for Medical Diagnosis (2025) - Deep Learning.AI
- Generative AI for Everyone (2025) - Deep Learning.AI
- Medical Image Processing (2025) - Mathworks
- Introduction to Neural Networks & Pytorch (2023) - IBM
- Image Denoising using Autoencoders & Keras (2023) - Deprecated Guided Projects
- Machine Learning (2020) - Stanford University
- Python for Everybody (2020) - University of Michigan

## PUBLICATIONS

- T. Nadeem, K.Ali, and M. Tahir "**NIR-EKF: Normalized Innovation Ratio based EKF for Robust State Estimation,**" *IEEE Sensors Letter*
- T. Nadeem, and M. Tahir, "**DUOV PCA: Deep Unfolded Orthogonal Variational PCA Network for Image Denoising,**" Under Review in *IEEE Signal Processing Letters*.
- T. Nadeem, and M. Tahir, "**Multi-Degradation Image Restoration Network Based on Deep Unfolding Neural Network**" Under Review in *IEEE Transactions on Image Processing*
- T. Nadeem, and M. Tahir, "**Hybrid Reinforcement Guided Deep Unfolded Estimation for Preterm Birth Prediction under Influence**" Under Preparation for Submission to *IEEE Transactions on Biomedical Engineering*

## LANGUAGES

English

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