# Muhammad Bilal

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## EDUCATION

**FAST National University of Computer and Emerging Sciences, Islamabad** *2020 – 2024*
Bachelor of Science in Artificial Intelligence CGPA: 3.0/4.0
*Relevant Coursework – Natural Language Processing, Computer Vision, Digital Image Processing, Artificial Neural Networks, Machine Learning, Knowledge Representation and Reasoning, MLOps, Design and Analysis of Algorithms, Data Structures, Database Systems.*

## TECHNICAL SKILLS

**Programming Languages:** C, C++, Python, MATLAB, SQL, SPARQL, HTML, CSS, Bash
**Developer Tools and Cloud Services:** VS Code, Git, GitHub, Docker, Jenkins, MySQL Workbench, Selenium, AWS, Azure, Azure DevOps
**ML Techniques and Optimization:** Hyperparameter tuning, model pruning, and quantization, clustering, transformers, dimensionality reduction, Text preprocessing, tokenization, Supervised/unsupervised learning, BERT, GPT models.
**Frameworks:** NumPy, Pandas, PyTorch, TensorFlow, Keras, NLTK, spaCy, Flask, OpenCV, scikit-learn, Langchain, HuggingFace, OpenCV, Flask, Keras, Transformers, Open3D

## WORK EXPERIENCE

**AI Engineer, Smart-IS International, Rawalpindi, Pakistan** *August 2024 – Present*

- **SMART ASSISTANT**: Developed and deployed an AI-Agent for warehouse and supply chain systems to interact with warehouse management systems (WMS) using natural language, replacing proprietary MOCA (Blue Yonder WMS) commands.
  - Enabled natural language analytics, multi-turn queries, interactive visualizations, and low-code deployment across Teams, web, and desktop via a custom Component Hook Library.
  - Built and integrated custom and opensource evaluation pipelines to monitor agent performance, transparency, and behaviour.
- **TRADE BASED MONEY LAUNDERING**: Developed AI-based TBML detection using unsupervised learning and anomaly detection models.
  - Used **FAISS** clustering, **Isolation Forest**, **One-Class SVM**, and **Autoencoders**.
  - Designed a hybrid voting system combining statistical, machine learning, and deep learning techniques.
- **MENTORSHIP**: Mentored an intern on ML fundamentals, **Git workflows**, **Azure DevOps** practices, company codebase architecture, **Knowledge Graphs**, and building end-to-end **Retrieval-Augmented Generation (RAG)** applications.

**AI Intern, IKNEX (Intelligence, Knowledge, and Experience) Design and Research Lab, Islamabad, Pakistan** *March 2023 – August 2023*

- AUTO-KG TABARI: Led a collaborative project with Goethe University Frankfurt, constructing and validating a **knowledge graph** using **OWLReady2** and **GraphDB**. Developed Python scripts for validation by querying XML data with lxml and the graph with SPARQL, ensuring precise mapping.
- **Mentored** a team of 3 students in developing an application powered by the constructed knowledge graph, guiding them through knowledge graph fundamentals, XML data structures, and **SPARQL**-based graph querying to ensure effective integration.

## PROJECTS

**Final Year Project: PoseQuest** *Sept 2023 - May 2024*

- Final Year Project dedicated to enhancing human pose retrieval from 3D large motion databases by extracting and evaluating the nearest motion given a 3D motion query. Employed a novel approach to extract global motion alignments using techniques such as **KD-trees**, **K-Means clustering**, **DTW (Dynamic Time Warping) algorithm**, and Pose Graph Searches to extract **3D motions of lengths 40 to 70** frames in **0.1 seconds**.

**Federated Learning Model for medical Imaging** *June 2024*

- Built a privacy-preserving federated learning system using the MURA X-ray dataset to detect bone abnormalities without exposing patient data.
- Finetuned **EfficientNet-B3** model across users locally, encrypted weights with **AES-based Fernet**, and securely transferred them via **SFTP** to a central server for aggregation and redistribution.

**Cloud Removal Using GANs** *November 2023*

- Utilized Pix2Pix **GAN (Generative Adversarial Network)** architecture to train the model on satellite images. Given a cloudy image as input, the model removes the clouds from the satellite image by generating its unclouded counterpart.

**3D Point Cloud Registration** *November 2023*

- Optimized 3D point cloud registration and LiDAR odometry using Open3D with voxel downsampling, ICP, and global registration methods, achieving **sub-0.1s** registration for **20K** points per frame.

## HONORS/AWARDS

- Recognized as "**Internee of the Year**" for exceptional performance, and contributions as an AI Intern at IKNEX Lab during spring 2023 and summer 2023.
- Won the data visualization competition at the National Solutions Conference 2023 by addressing analytics and probability problems using graphs and plots.