Muhammad Bilal

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Education

•FAST-NUCES, Islamabad *2020 - 2024*

Bachelor of Science in Artificial Intelligence CGPA: 3.00/4

Technical Experience

•Smart-IS International *August 2024 - Present*

AI Engineer Rawalpindi

– **BLUEYONDER CHAT:**.

* Smart Warehouse Agent designed for BLUEYONDER to convert natural language into propreitary **MOCA** commands used within the company, executed to streamline and enhance warehouse operations and analytics.
* Improved database efficiency and adaptability by conducting schema modifications to enhance data retrieval and storage.
* Implemented **windowing method** for efficient data retrieval and reduced token usage and GPT exposure.
* Created endpoints for multiple features of the warehouse agent, such as uploading, and chatting with dataframe, downloading DB, and resetting context etc.

– **TRADE BASED MONEY LAUNDERING:**

* Conducted research and experiments on Trade-Based Money Laundering (TBML) detection using unsupervised machine learning methods.
* Employed **Isolation Forest**, **DBSCAN**, **One-Class SVM**, and **KMeans**, optimizing hyperparameters to identify anomalous transaction patterns effectively.
* Implemented a unique method for detecting outliers by first creating clusters of unlabelled items to categorize them, and then applying outlier detection models on the specified clusters improving the overall outlier detection.

– **SMART-RAG:**.

* Employed multiple advanced chunking and splitting strategies, including semantic and hybrid chunking, to enhance data retrieval from complex documents.
* Implemented a hybrid retrieval system using **Azure AI Search** and **Azure Blob Storage** to extract data from tabular and complex documents containing extensive numerical codes and their references
* Utilized **Azure container Registry (ACR)**, **Azure WebApps**, and **Azure Devops** to create a **CI/CD** pipeline for deployment.

•IKNEX Labs *June 2023 - July 2024*

AI Intern Islamabad

– **Auto-KG Tabari**.

* Led a collaborative project with Goethe University Frankfurt, overseeing the construction, validation, and analytics of a **knowledge graph** related to the Tafsir of Tabari.
* Constructed the graph using the Python **OWLReady2** library, utilized **GraphDB** for querying, visualization, and analytics, enhancing research in the project domain.
* Developed Python scripts to validate the graph by querying XML data using **lxml** and querying the knowledge graph with **SPARQL**, ensuring precise mapping.

Leadership Experience

–FAST Society of Arts *2022 – 2023*

Vice Head Logistics Islamabad

* Organized **Devils Lair**, a two-tiered escape room challenge at NaSCon, attracting over **200** participants.
* Managed logistics, designed immersive decorations, and collaborated effectively with the team to deliver a memorable and successful experience.

–Google Developers Student Clubs *2021 – 2022*

Officer Creatives Islamabad

* Created corporate-style documents for major events, including ideathons, facilitating collaborations with software houses and boards.

Projects

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

Research and development Project on efficient 3D Pose Retrieval from large motion Database

* 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**, the **DTW** algorithm, and **Pose Graph Searches** to extract 3D motions of lengths **40 to 70** frames in **0.1** seconds.
* Tools and technologies used: MATLAB, Python, scikit-learn, Flask

–Federated Learning Model for Secure Distributed Training *June, 2024*

Trained an EfficientNet-B3 model in a federated learning setup with secure weight transfer.

* Implemented federated learning to train an **EfficientNet-B3** model across users, ensuring data privacy and security.
* Encrypted model weights using the Python **Fernet** library with the **AES** algorithm to ensure secure weight updates.
* Utilized **SFTP (Secure File Transfer Protocol)** for the secure transfer of encrypted weights.
* Tools and technologies used: Python, Fernet (AES), EfficientNet-B3, SFTP, Jupyter Notebook

–Cloud Removal Using GANs *November 2023*

Cloud Removal on Remote Sensing Data Using GANS

* Utilized **Pix2Pix GAN** (Generative Adversarial Networks) 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.
* Tools and technologies used: Keras, Python, opencv

–Knowledge Grounded Chat-bot for E-commerce *June, 2023*

Developed a knowledge-grounded chat bot for Daraz using GPT4All and langchain.

* Implemented **Retrieval-Augmented Generation (RAG)** to optimize output of a large language model by retrieving relevant information provided as context to the language model to enhance the output and enrich the interaction between the customer and the chatbot.
* Tools and technologies used: Langchain, GPT4All, Python, Jupyter Notebook

–3D Point Cloud Registration *November 2023*

3D Point Cloud Registration and Odometry

* Used **Open3D** to optimize 3D point cloud **registration**, leveraging **voxel downsampling**, **ICP Registration**, and global/pairwise methods to register **20,000** points per frame in under **0.1** seconds.
* Computed **3D odometry** for **LiDAR** camera trajectory for the given LiDAR data
* Tools and technologies used: Open3D, Python

–Full-Stack Machine Learning Deployment *November 2023*

End-to-End MLOps Pipeline

* Designed and implemented a comprehensive end-to-end Machine Learning pipeline, leveraging tools such as **GitHub** for version control, **Jenkins** for continuous integration to automate testing and deployment, **DVC** for data versioning, and **Apache Airflow** for ETL (Extract, Transform, Load) data, and automating model training, testing, and deployment and status.
* Implemented CI/CD processes and integrated workflow orchestration, ensuring seamless and efficient model deployment across different environments while maintaining reproducibility and version control.

Technical Skills and Interests

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, Postman, Azure AI Search
Frameworks: NumPy, Pandas, PyTorch, TensorFlow, Keras, NLTK, spaCy, Flask, OpenCV, scikit-learn, Langchain, LangGraph
Soft Skills: Collaboration, Communication Skills, Problem Solving, Critical thinking

Achievements

–DataViz Competition Won the data visualization competition at the National Solutions Conference 2023 by addressing analytics and probability problems using graphs and plots.