Weekly Progress Report

Project Title: *AI Inbound Conversational Calling Agent for University of Sargodha (UOS)*
Week: *[Week 11 / 24.11.2025 to 30.11.2025]*
Team Members:

- **M. Asmaad Saeed**
- **Areeba Rehman**
- **Laiba Siraj**
- **Fatima Zahid**

1. Overview

This report outlines the weekly progress made by each team member in developing the initial components of the **AI Inbound Calling Agent**, specifically targeting the use case of handling ***admission-related queries***. Core tasks completed this week involved **Knowledge Graph construction, intent classification modeling, ASR system research, and TTS prototype development**.

2. Individual Contributions

2.1. M. Asmaad Saeed: Knowledge Graph (KG) Reasoning and Representation

- Conducted a complete review of publicly accessible routes on **su.edu.pk**, identifying relevant admission-related information.
- Utilized Python-based scraping techniques to extract structured data and supplemented it with manual data collection.
- Organized the acquired data into three structured CSV files: **Faculty.csv**, **Programs.csv**, and **Curriculum.csv**.
- Performed initial experimentation with **Neo4j** and **GraphBuilder** to understand graph structures and data representation.
- Evaluated the complexity of automated KG generation and concluded that a manually curated KG is currently more reliable, interpretable, and easier to maintain.

Next Steps:

- Execute Cypher-based queries to validate KG traversal.
- Begin integration of the KG with GraphRAG for retrieval-augmented generation.

2.2. Areeba Rehman: Intent Classification for Admission Queries

- Installed all required machine learning libraries and prepared the working environment.
- Successfully loaded the dataset and performed preprocessing, including **label encoding** for intent categories.
- Applied a **train-test split** to structure the dataset.
- Tokenized textual data using the **XLM-RoBERTa tokenizer**.
- Constructed PyTorch datasets for model training and evaluation.
- Initialized **XLM-RoBERTa for Sequence Classification** and configured model training parameters.
- Trained the model for **four epochs** while recording relevant loss metrics and performance indicators.

Next Steps:

- Evaluate model performance on custom test cases.
- Perform fine-tuning if necessary to improve classification accuracy.

2.3. Laiba Siraj: Research on Automatic Speech Recognition (ASR)

- Conducted a detailed study of the **Whisper ASR** architecture and its associated processing flow.
- Analysed Whisper's 30-second audio window requirement and data needs (~5-6 hours for fine-tuning).
- Compared Whisper with alternative ASR solutions, identifying significantly lower processing times (0.5-3 seconds) in optimized models.
- Documented the complete ASR workflow from audio capture to transcription output.

Next Steps:

- Prepare a model selection recommendation suited to UOS operational needs.
- Begin initial planning for domain-specific dataset collection.

2.4. Fatima Zahid: Text-to-Speech (TTS) Prototype Development

- Implemented a functional **Google TTS** prototype capable of converting structured JSON output into synthesized speech.
- Tested and validated API endpoints for stability and accuracy.
- Confirmed that the prototype is ready for further integration with upstream components.

Next Steps:

- Replace JSON dummy inputs with outputs from KG and LLM modules in later stages.
- Explore higher-fidelity TTS engines (e.g., ElevenLabs) for improved naturalness.

3. Plan for the Upcoming Week

- Begin early integration of the Knowledge Graph with the retrieval pipeline (GraphRAG).
- Conduct preliminary end-to-end testing of **ASR - Intent Classification - KG Query - TTS.**
- Initiate planning for audio dataset creation for future ASR fine-tuning.
- Connect the TTS prototype to the backend flow for automated responses.