**Software Requirements Specification (SRS) Document**

**1. Introduction**

**1.1 Purpose**

This document specifies the requirements for an **AI-Powered Grammar & Spell Checker** that detects and corrects spelling mistakes and inappropriate word usage in **English and Hindi**. The project leverages **Large Language Models (LLMs)** to improve linguistic accuracy while maintaining contextual integrity.

**1.2 Scope**

The system will:

* Accept **English and Hindi** text inputs.
* Identify and correct **spelling, grammar, and contextual errors**.
* Provide real-time correction with high accuracy.
* Utilize **Groq’s Mixtral-8x7b-32768** model.
* Support integration via **API calls**.
* Feature a **Streamlit-based UI** for ease of use.

**1.3 Intended Audience and Reading Suggestions**

This document is intended for:

* **Developers** implementing and improving the model.
* **Project stakeholders** reviewing the application’s feasibility.
* **End-users** seeking clarity on system capabilities.
* **Researchers** working on NLP-based text correction.

**1.4 Definitions, Acronyms, and Abbreviations**

* **LLM**: Large Language Model
* **API**: Application Programming Interface
* **GLEU Score**: Generalized Language Evaluation Understanding Score
* **NLP**: Natural Language Processing
* **Streamlit**: Python framework for interactive UI

**2. System Overview**

**2.1 System Features**

* **Supports multiple languages (English & Hindi)**
* **AI-driven grammar & spell correction**
* **Real-time text processing**
* **Customizable API for external integration**
* **User-friendly Streamlit-based interface**

**2.2 System Architecture**

* **Frontend**: Streamlit UI for user interaction
* **Backend**: Python-based API handling requests
* **LLM Engine**: Groq’s Mixtral-8x7b-32768 for text processing
* **Database**: Stores user text input and correction history

**3. Functional Requirements**

**3.1 User Interaction**

* User inputs raw text.
* System detects spelling, grammar, and contextual issues.
* Corrected text is displayed with highlighted changes.
* Users can choose the preferred language.

**3.2 API Functionality**

* Accepts text input via API calls.
* Processes corrections using LLM.
* Returns structured output in JSON format.

**4. Non-Functional Requirements**

* **Performance**: Must return results within 1 second for <500 words.
* **Scalability**: Should handle concurrent users without performance loss.
* **Security**: API must be secured with authentication keys.
* **Usability**: The UI should be accessible and intuitive.

**5. Dataset Details**

* **English**: 969,039 sentence pairs.
* **Hindi**: 3,204,592 sentence pairs.

**6. Evaluation Metrics**

* **GLEU Score**: Measures correction accuracy.
* **Execution Time**: Measures response speed.
* **User Feedback**: Evaluates correction usefulness.

**7. Deliverables**

* **Codebase**: Fully implemented project with clear documentation.
* **Evaluation Outputs**: Results on test datasets.
* **Models System**: Probability tables, trained weights.
* **Final Report & Slides**: Detailed findings, approach, and analysis.
* **Demo Video**: 5-minute walkthrough of project functionality.

**8. Future Enhancements**

* **Support for additional languages** (Spanish, French, etc.).
* **Voice input for corrections**.
* **Real-time correction while typing**.
* **Improved contextual word replacement models**.

**9. Conclusion**

This project aims to provide a highly accurate, AI-powered grammar and spell-checking solution that enhances written text clarity while maintaining linguistic integrity. The integration of **Groq’s Mixtral-8x7b-32768** model ensures top-tier performance and contextual awareness.