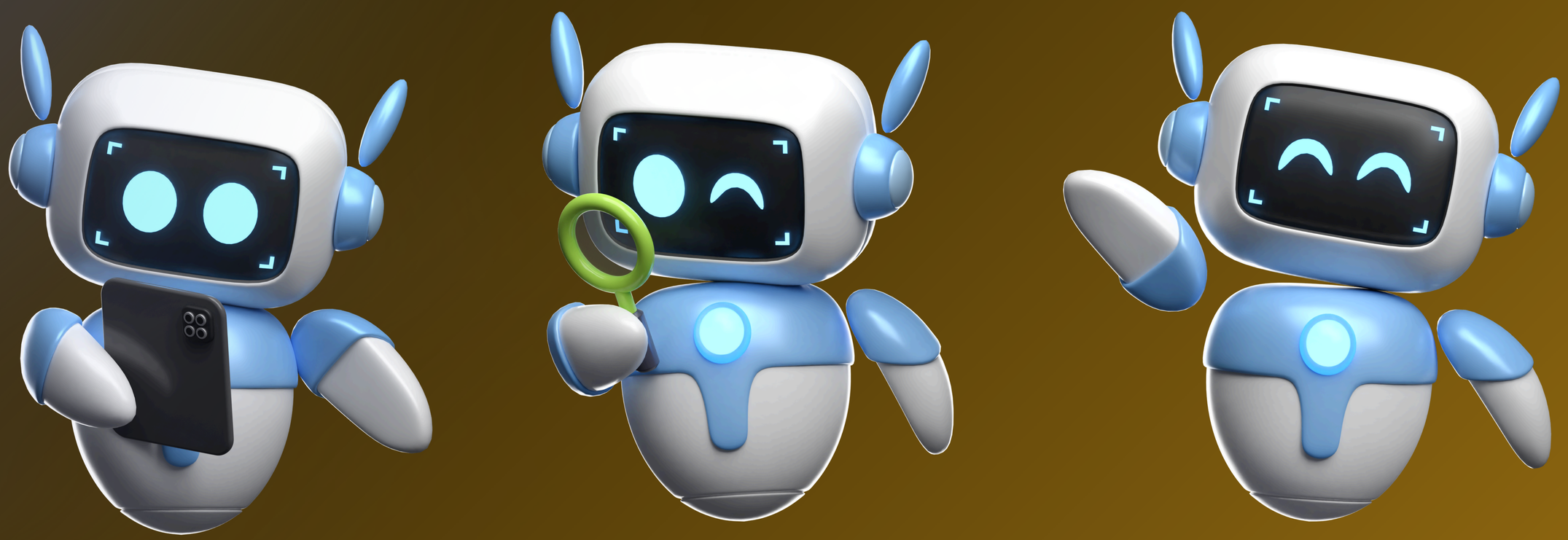
TalkTeck Project Documentation



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1. Introduction :

1.1 Project Overview

This project focuses on developing a conversational chatbot designed to assist users by providing accurate responses to their queries, particularly in navigating through the Hugging Face platform.
The chatbot utilizes advanced natural language processing (NLP) techniques, leveraging the LLama 3.1 model with Unsloth for enhanced conversational capabilities.
Additionally, Retrieval-Augmented Generation (RAG) is implemented to improve the quality and relevance of the chatbot's responses.
The API is built using Flask to facilitate seamless interactions between users and backend services.
The data used for training the chatbot is sourced from the Hugging Face documentation, ensuring it is well-equipped to guide users effectively.
The chatbot is deployed on Microsoft Azure for scalability and robustness.

1.2 Objectives

- To create an interactive chatbot capable of understanding and responding to user input.
- To assist users in navigating the Hugging Face documentation and resources.
- To implement machine learning and NLP techniques to enhance response quality using Hugging Face's library and models.
- To deploy the chatbot on Azure with integration for MLOps to enable efficient model tracking and management.

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2. Requirements

2.1 Functional Requirements

- Handle user input through text interactions.
- Provide guidance on Hugging Face documentation and features.
- Generate context-aware responses based on previous conversations.

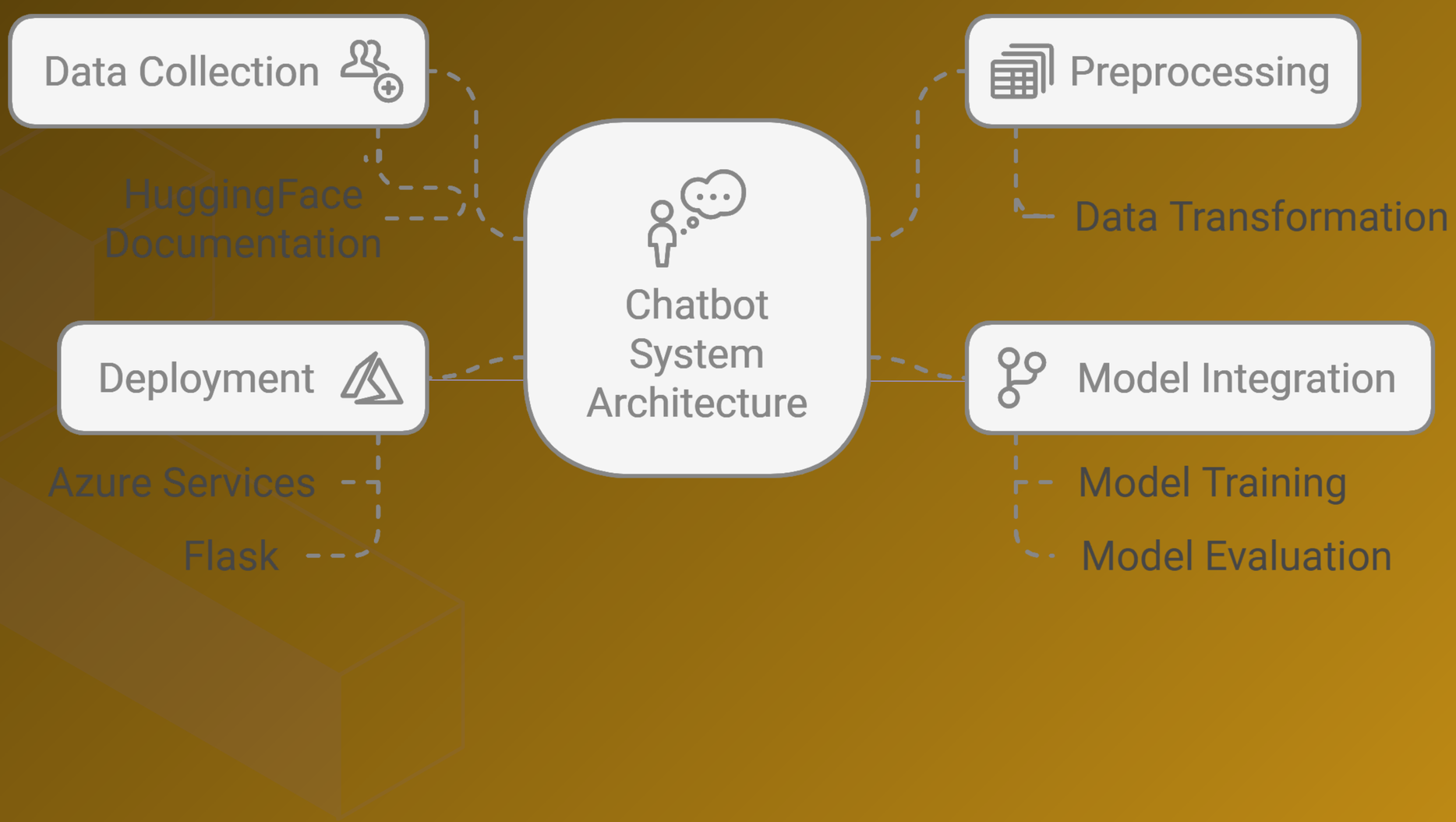
2.2 Non-Functional Requirements

- Ensure high availability and reliability for continuous user engagement.
- Achieve quick response times to enhance user experience.
- Provide a user-friendly interface for easy interaction.

2.3 Technical Requirements

- Programming Languages: Python, HTML, CSS.
- Libraries/Frameworks: LLama 3.1 with Unsloth, Flask.
- Deployment Platforms: Azure, MLflow.

3. Architecture



4. Implementation

4.1 Data Collection and Preprocessing

Data Sources: The primary dataset used for training the chatbot consists of the Hugging Face documentation: https://huggingface.co/datasets/m-ric/huggingface_doc

4.2 Chatbot Development

- Fine-Tuning: The LLama model was fine-tuned on a dataset , Fine-tuning involves adjusting the model weights on a specific dataset to optimize performance for the desired task, improving response accuracy and relevance.
- Inference: Once fine-tuned, the model is utilized for inference, The chatbot processes the user's query and returns a context-aware response, leveraging the extensive training it has undergone.
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4.3 RAG Implementation

Retrieval-Augmented Generation significantly bolstered the chatbot’s capabilities, making it a more effective tool for users seeking information about Hugging Face resources.

4.4 Prompt Engineering

Based on the identified user intents, initial prompts were crafted. These prompts serve as templates that guide the model in generating appropriate responses. For instance:

- "Explain what [topic] is and provide an example."
- "How can I use [Hugging Face feature] in my project?"

4.6 API and Azure Integration

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5. Challenges and Solutions

Significant challenges included fine-tuning the LLama 3.1 model, which affected computational efficiency and training time, addressed by optimizing hyperparameters and data quality. Integrating RAG strained resources, resolved by using Hugging Face's pre-trained models for efficient retrieval.

6. Conclusion

8.1 Summary of Achievements

The chatbot effectively integrates LLama 3.1 and utilizes RAG for enhanced conversation capabilities. Key features include dynamic prompt generation and efficient navigation of Hugging Face documentation, resulting in accurate, tailored responses that significantly improve user experience.

8.2 Future Work

Proposed enhancements include:

- Adding voice interaction for a more immersive user experience.
- Implementing a history feature for users to review past interactions.
- Improving user feedback integration for ongoing optimization.
- Creating personalized user profiles to tailor responses based on individual preferences.
- Exploring multi-modal capabilities to incorporate images and videos.
- Enhancing sentiment analysis for more contextually relevant responses.

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6. Refrences

- Llama Docs: https://huggingface.co/blog/mlabonne/sft-llama3
- RAG Docs: https://huggingface.co/learn/cookbook/en/rag_zephyr_langchain

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