Q&AI: AI Mock Interview Bot
Design Presentation

Gokul Baburaj (U2003087, 13)
Joel Manuel C J (U2003106, 34)
Maria Sabi (U2003127, 54)
Merene Benson (U2003132, 58)

RSET

November 14, 2023

Guide: Dr.Saritha S.

Contents

Contents

Problem Definition

To empower candidates to refine their interview skills by utilizing AI Mock Interview Bot.

Purpose and Need

- Embarking on an interview journey is a nerve-wracking experience, especially for those new to the process.
- While there are resources available for preparation, an interview's success hinges on your presentation, language proficiency, confidence, and even expressions.
- In today's competitive job market, it's important that one recognize their strengths and weaknesses and work on improving their shortcomings.

Project Objective

To develop an AI-powered mock interview bot that

- offers realistic interview simulations and asks questions based on resume
- grade answers to the simulated questions
- analyze user responses based on confidence and sentiment
- provides detailed feedback and performance analytics for improvement

Literature Survey

AI-Based mock interview evaluator: An emotion and confidence classifier model

- The paper[1] proposed an AI-based interview platform that assesses users based on emotion, confidence, and knowledge base.
- Audio and video are both analyzed.
- Questions are taken from a database.
- **Emotion**: CNN algorithm
- **Confidence**: Speech recognition using Pydub, Librosa, and NumPy. LSTM for emotion classification to output confidence score.
- **Knowledge**: Keyword mapping, semantic analysis.

Literature Survey

CIT University Tutoring Interviewer Environment

- CUTIE[2] is an interview bot developed using open-sourced applications like Vue.js and Django that performs real-time sentiment and emotional analysis.
- Audio and video are both analyzed.
- Questions are taken from a set of questions provided by Society of Human Resource Management.
- **Sentiment Analysis**: Compare input string to AFINN list and assign valence scores to positive and negative words used.
- **Emotion Recognition**: Javascript face recognition API.

Literature Survey

Interview Bot with Automatic Question Generation and Answer Evaluation

- In this paper[3], the interview bot scans resumes for keywords required for the job role.
- Initial screening with multiple-choice questions and in-depth evaluation with text-based short answer questions.
- Proctored interviews via camera to prevent cheating.
- Final score based on job match and interview performance.

Literature Survey

Chatbots

- Chatbots on transformer models like ChatGPT, BERT, etc. provide exceptional user interaction in text.
- It can ask questions based on the user's response
- But audio and video of the user cannot be analyzed
- The score and feedback of the interview will always depend on how the user gives the prompt to the model
- Questions cannot be generated directly from a resume

Literature Survey

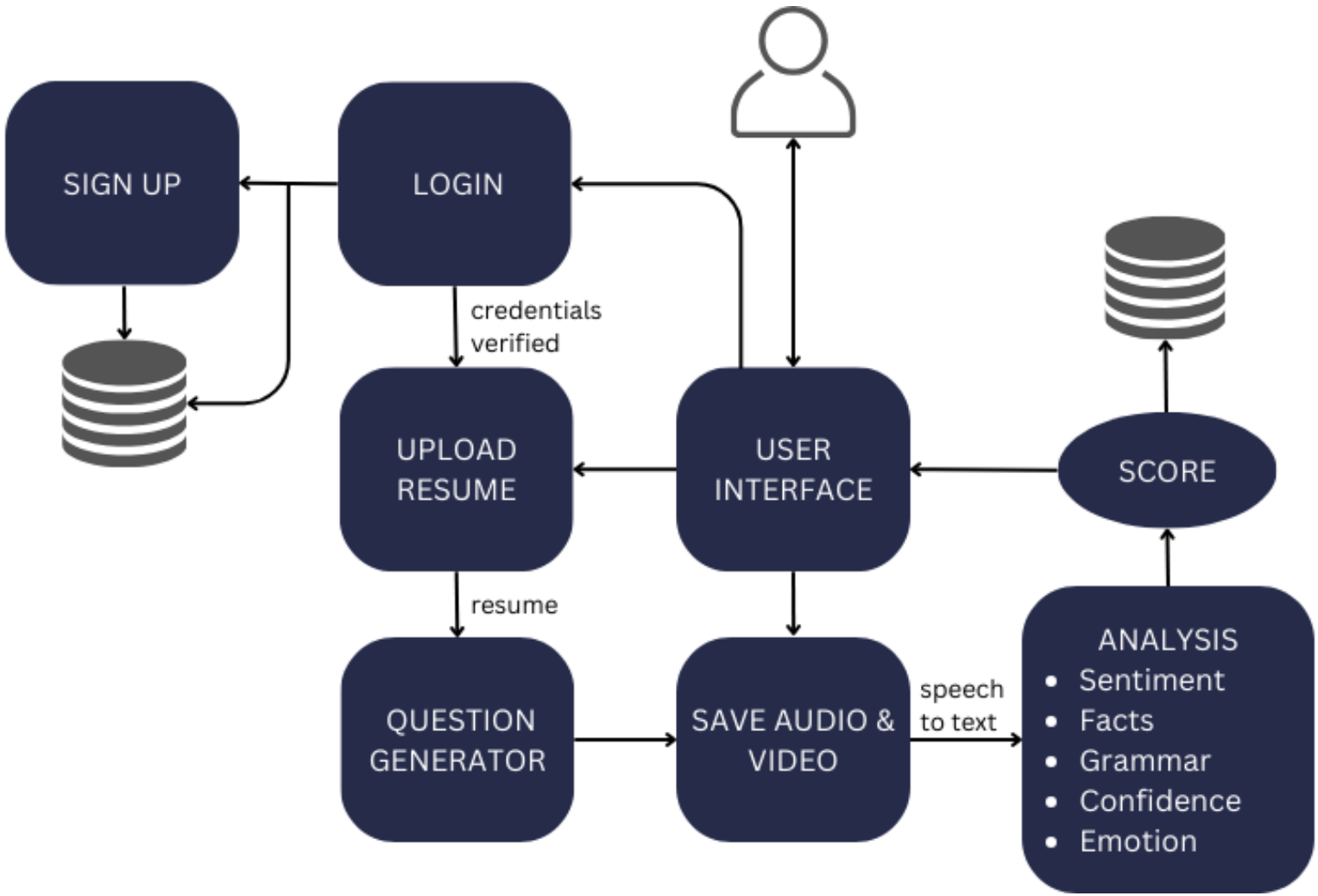
Existing Interview Bots:

Google's Interview Warmup [10]	• Questions based on chosen domain. • Answers transcribed to provide insights into frequently used words, language patterns, and talking points covered. • Responses are not graded.
InterviewBot [11]	• Questions based on chosen domain • Audio and video analyzed. • Feedback depends on the chosen subscription plan.
interviewschool [12]	• Suite of tools for interview preparation - mock interviews, live interview coaching, job tracking. • Job role based mock interviews.

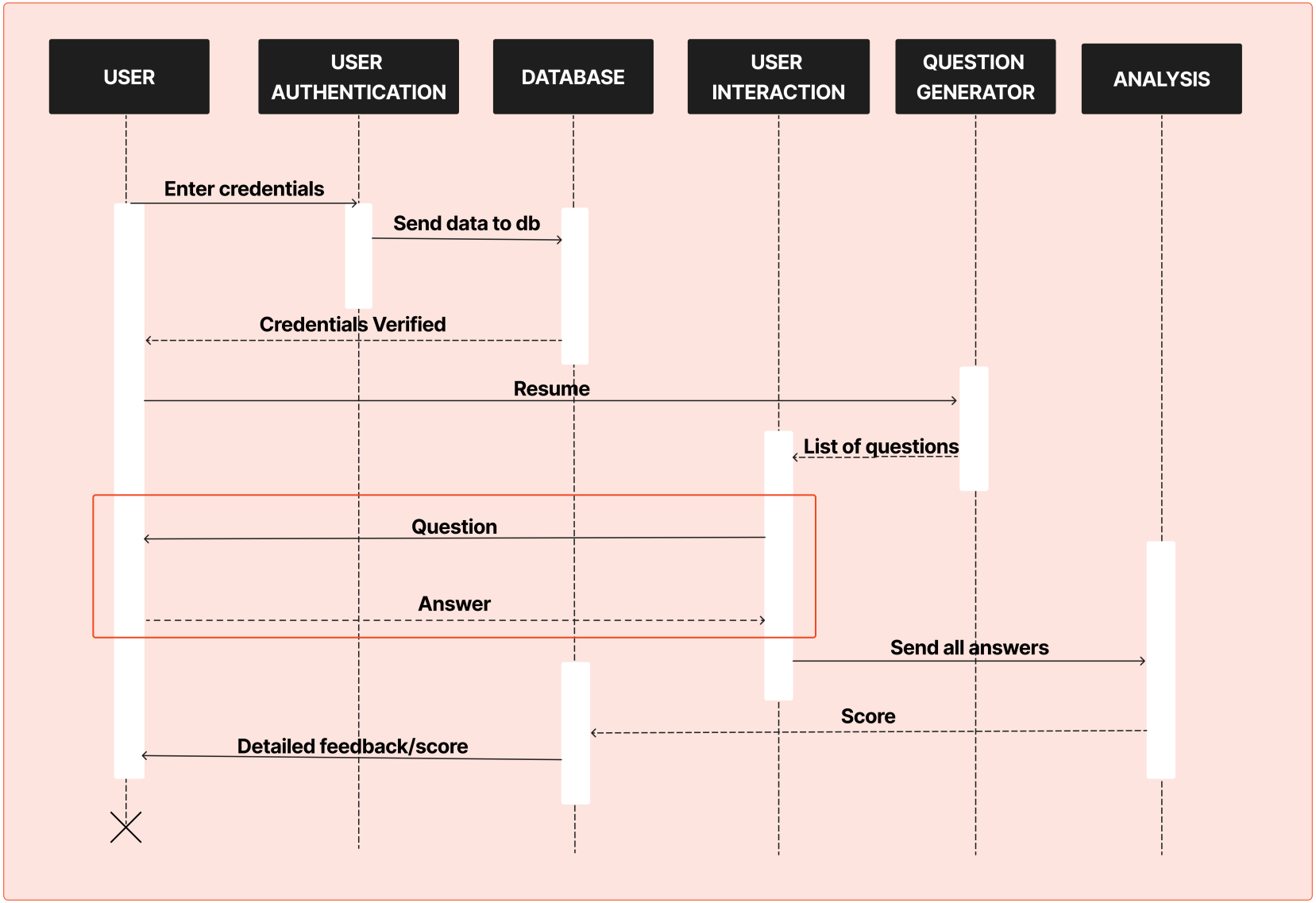
Proposed Method

- A user can sign up or log into the desktop application, Q&AI.
- From the home page, a resume can be uploaded.
- In doing so, questions will be generated by the bot based on the resume and the corresponding domain of the job application.
- A real-time environment is utilized to ask each question generated. The response is stored in audio, video, and text format and sent for further processing.
- An analysis that includes fact check, sentiment, grammar, confidence levels, and emotion detection is performed on the response.
- Scores and feedback are generated based on this analysis.
- Users can also view past scores and track progress.

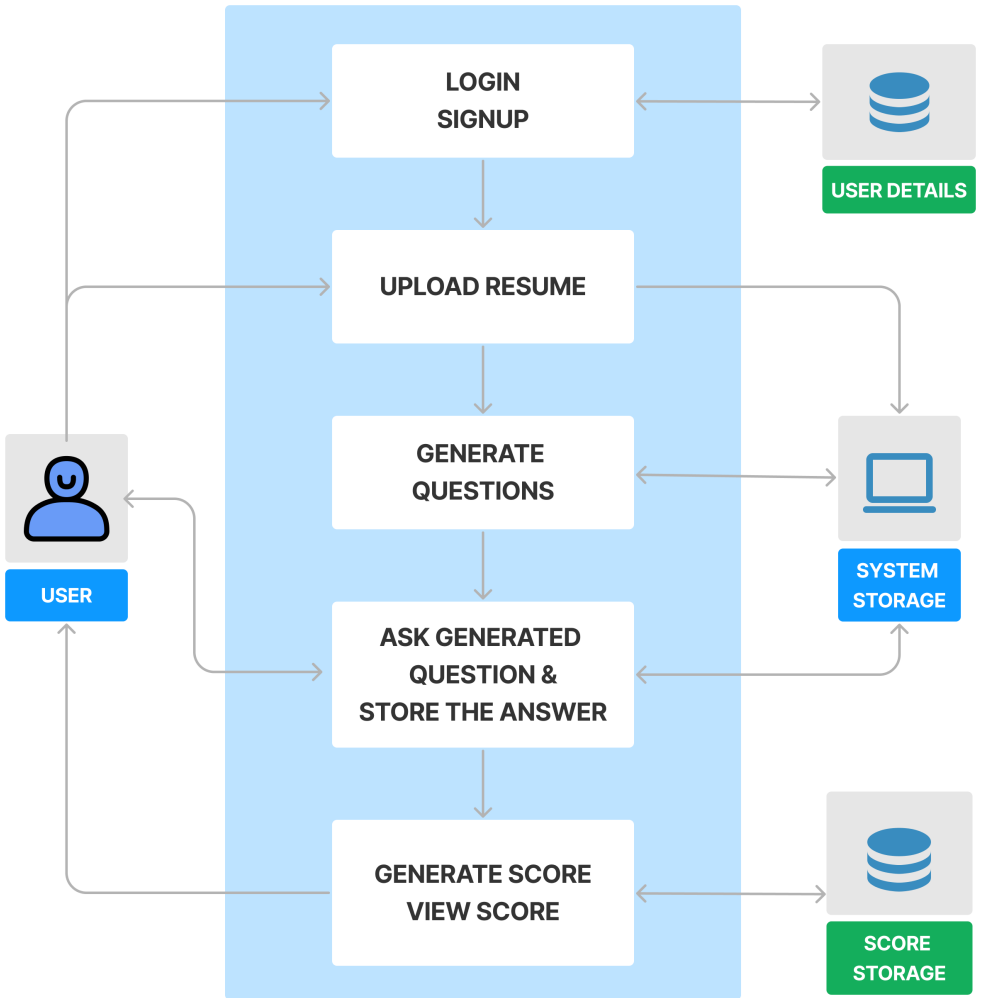
Architecture Diagram



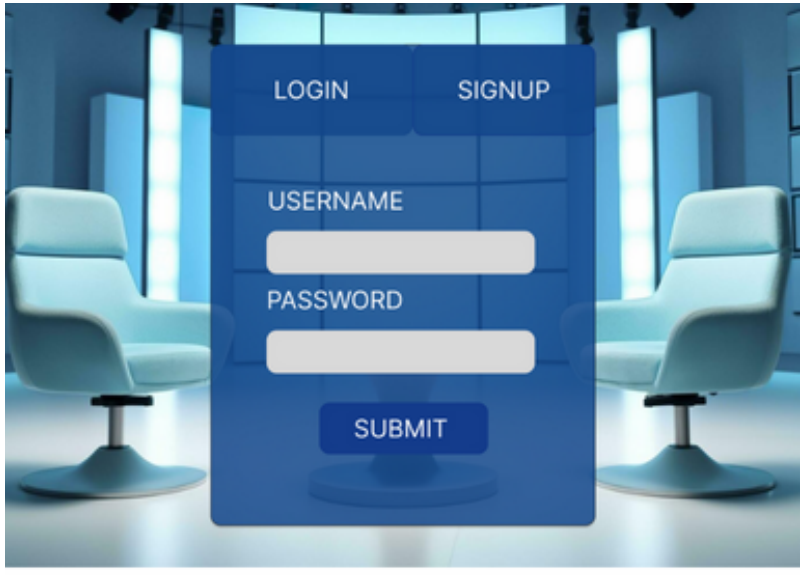
Sequence Diagram

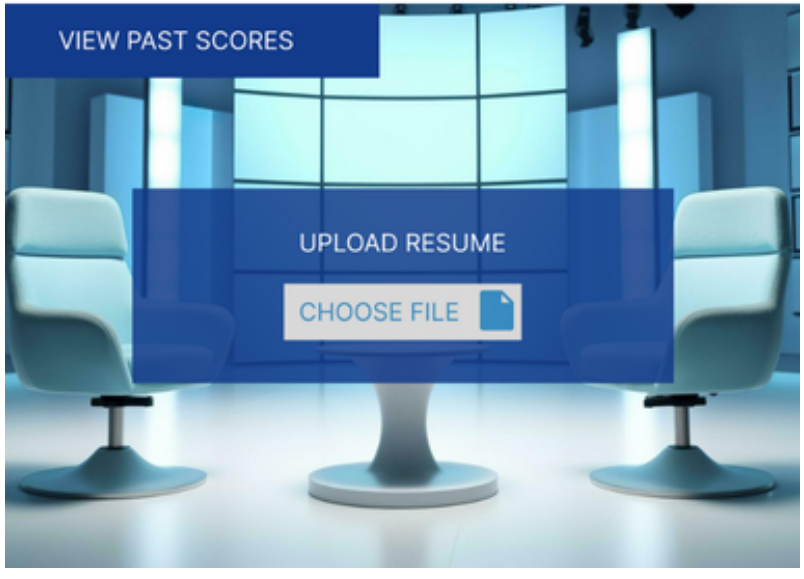


Use Case Diagram

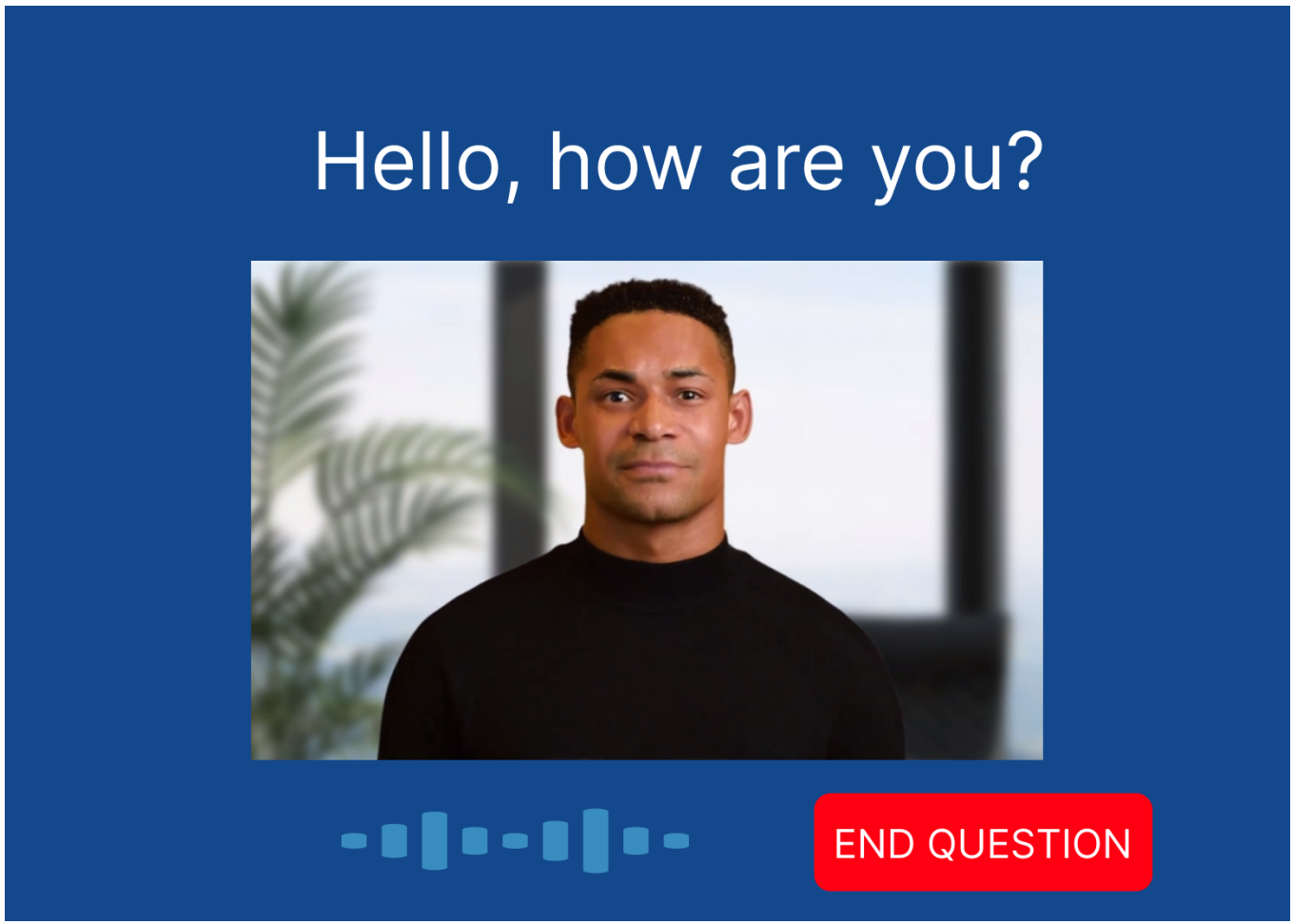


UI

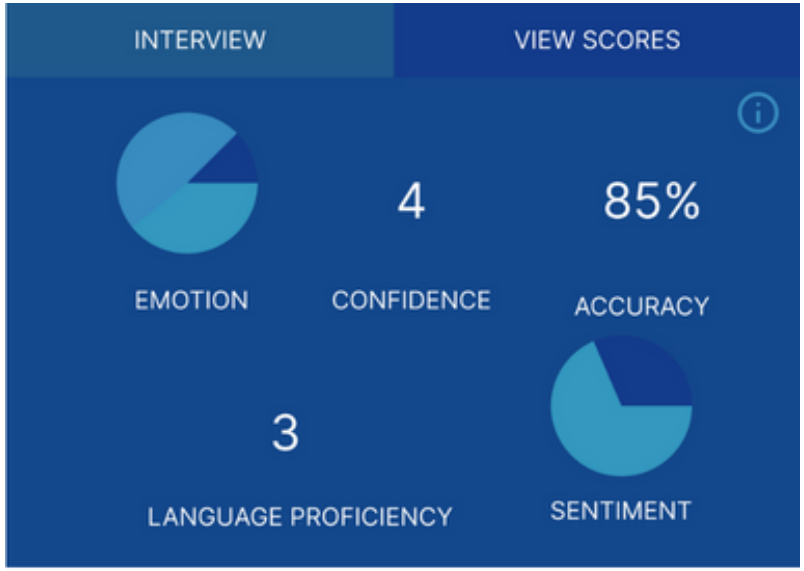

LOGIN
SIGNUP
USERNAME
PASSWORD
SUBMIT


VIEW PAST SCORES
UPLOAD RESUME
CHOOSE FILE

UI



UI



EMOTION	ANGER, SAD, HAPPY, NEUTRAL
ACCURACY	0-100%
CONFIDENCE	0-5
LANGUAGE PROFICIENCY	0-5
SENTIMENT	POSITIVE, NEGATIVE

Modules

1. User Authentication
2. Question Generator
3. User Interaction
4. Analysis
    - Grammar Check
    - Fact Check
    - Emotion Detection
    - Sentiment Analysis
    - Confidence Analysis

User Authentication Module

- Registered users can log in using their username and password.
- The credentials will be validated against those stored in the database.
- New users can sign-up by entering their details which will be stored in the database and then continue to log in.
- Once the credentials are verified, user will be directed to the home page of the application.

User Authentication Module

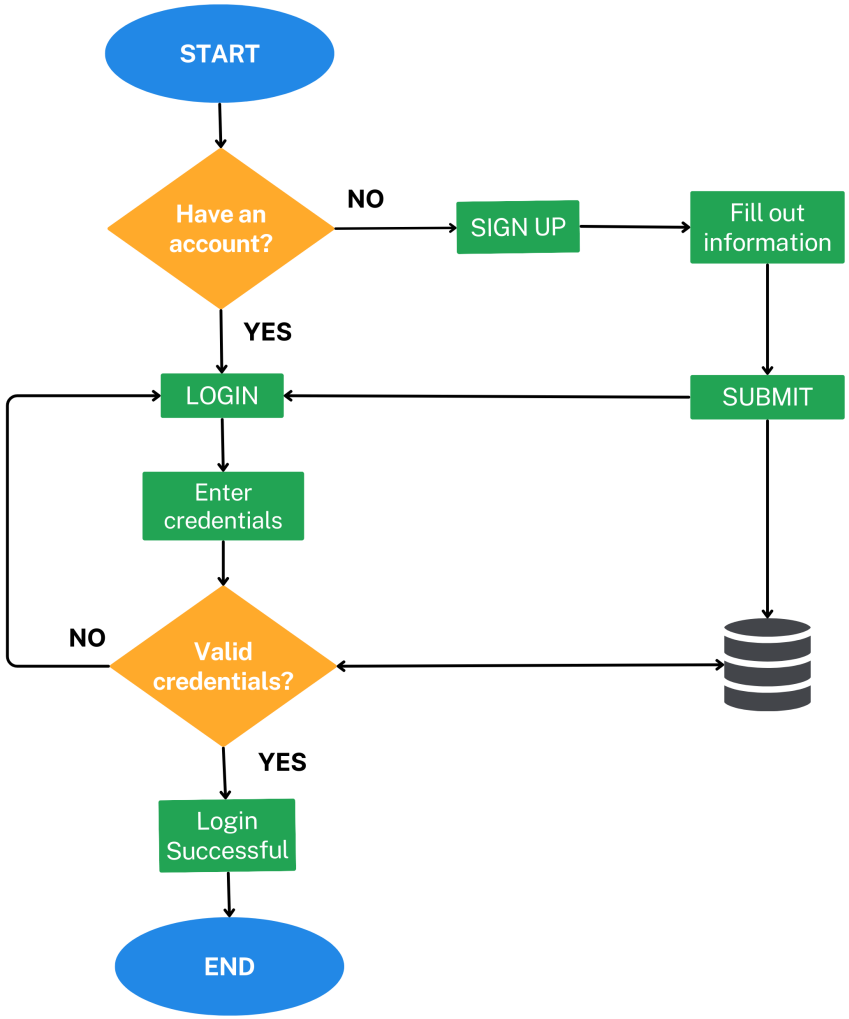


Figure: User Authentication Module

Question Generation Module

- The uploaded resume in PDF format is converted into text
- Then key features are extracted and passed onto the question generation phase
- Question generation is performed using a transformer model like BERT, RoBERTa or ChatGPT
- An API request is sent to such a model or a Hugging Face transformer is used
- 2 general interview questions, 3 questions on the job domain, and 3 questions on the resume (skills and project included) are retrieved from the model
- The generated questions are then stored to ask the user

Question Generation Module

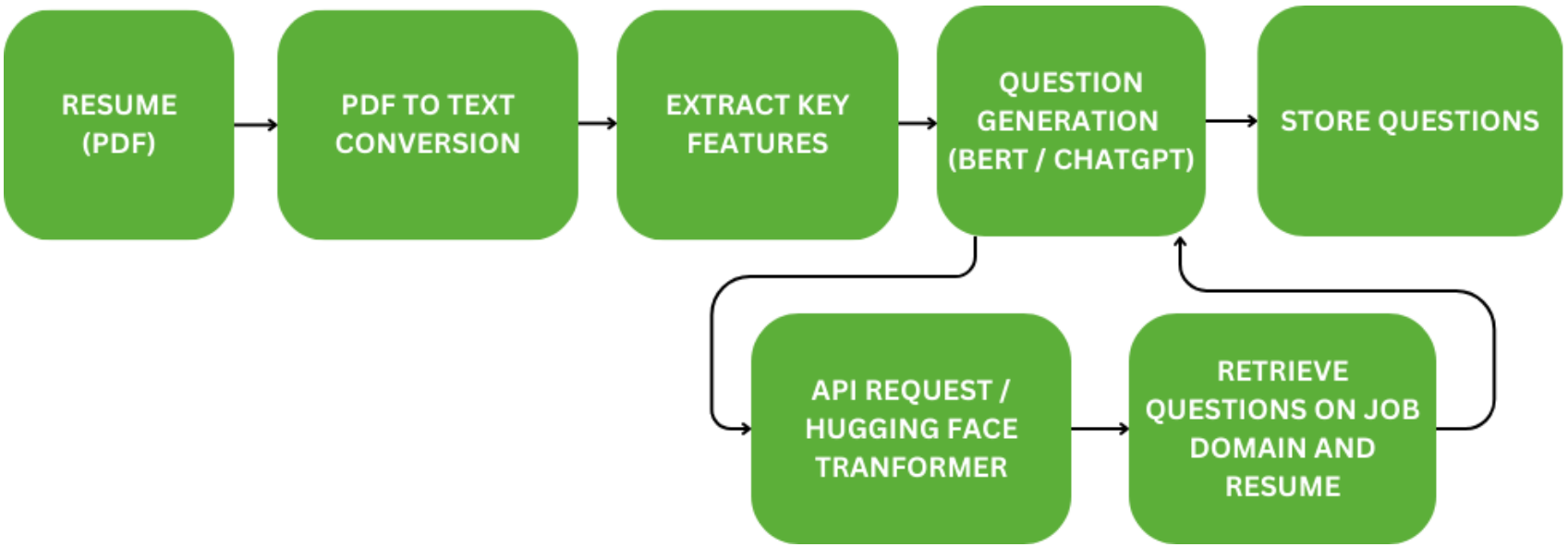


Figure: Question Generation

User Interaction Module

- The questions from the question generation module are asked to the user one by one
- Response to each question is retrieved from the user through the camera and microphone
- The audio is also converted to text format and the response is sent to the analysis module as audio, video, and text

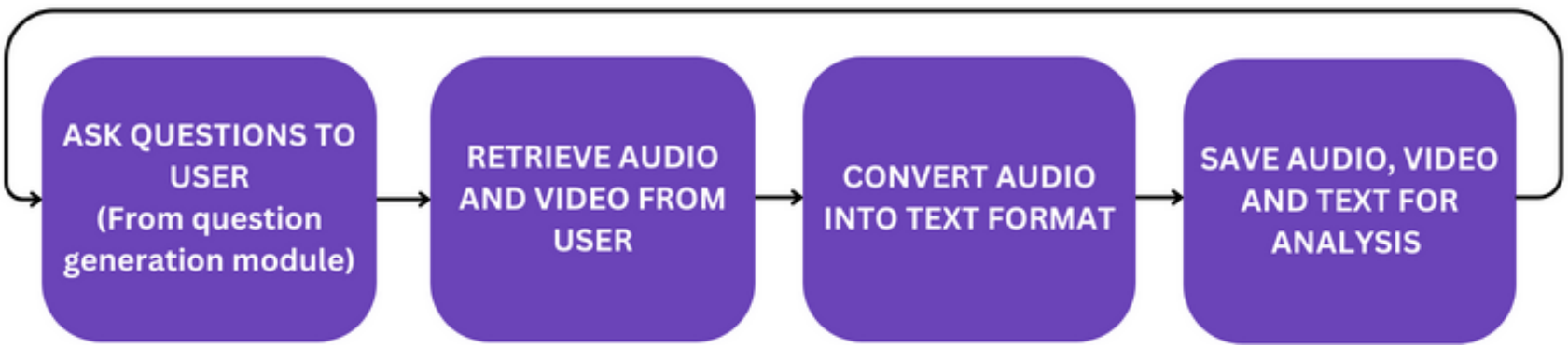


Figure: User Interaction

Analysis Module

Grammar Checking

- Python's language_check library specifies the grammatical mistakes in the user's answers.
- Score, from a scale of 0-5, is calculated by applying weights to the errors identified.

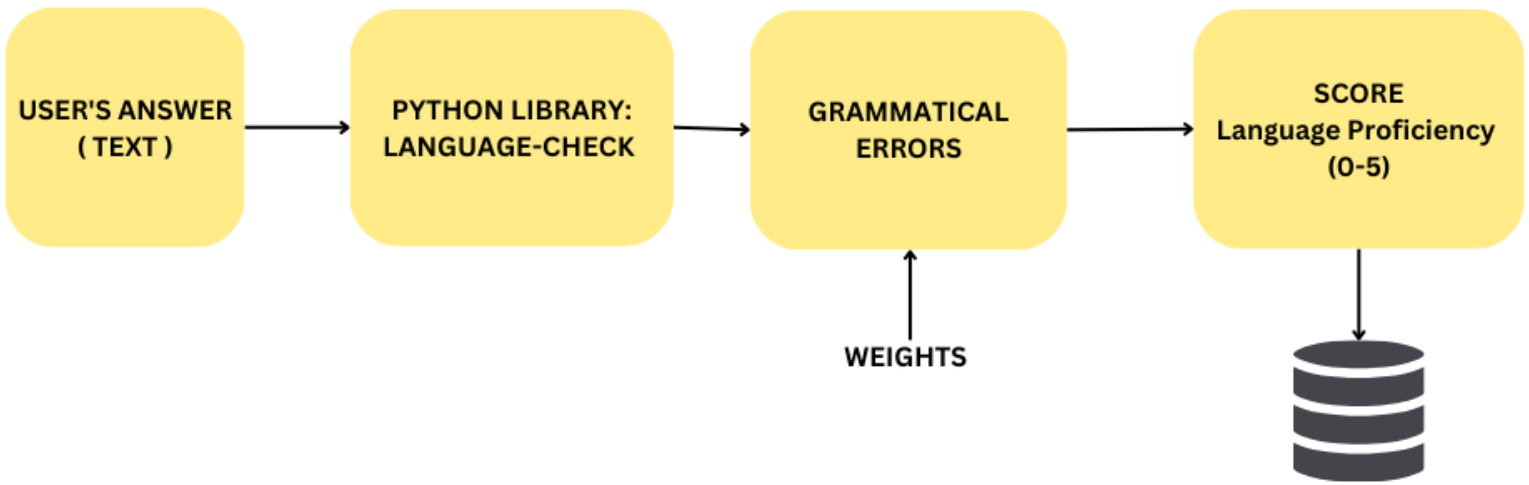


Figure: Grammar check

Analysis Module

Fact Checking

- User's answer in text format is summarized and given to the ChatGPT API along with it's corresponding question.
- Text summarization is done using Hugging Face transformers
- A prompt instructs the GPT to score the factual accuracy of the answer in percentage.

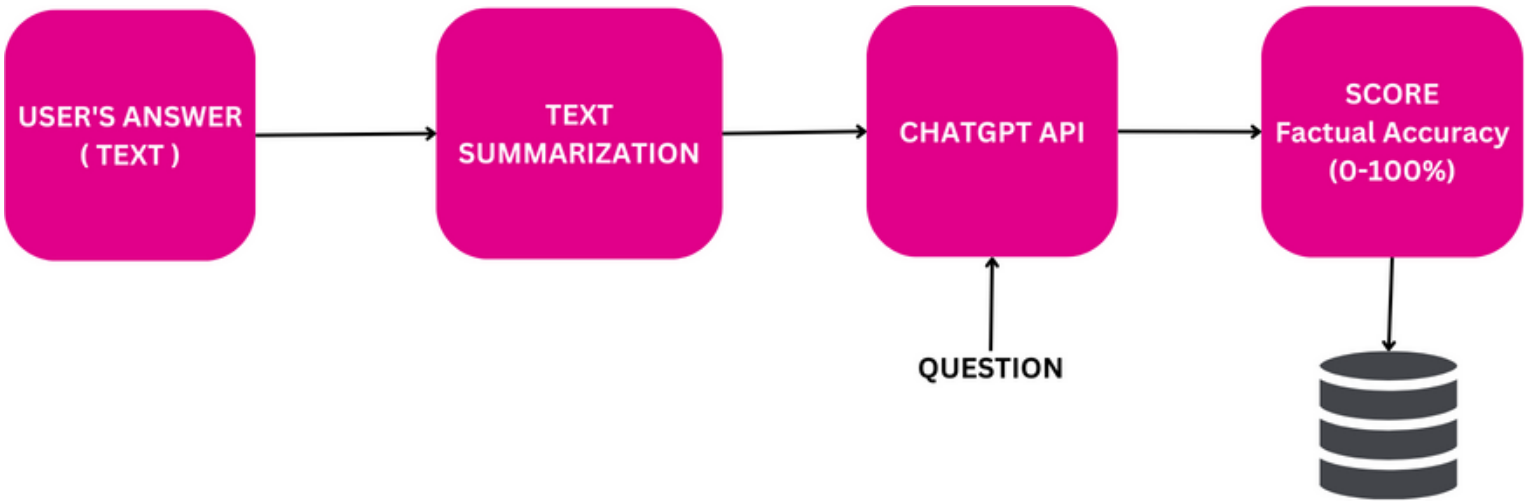


Figure: Fact check

Analysis Module

Emotion Detection

- A CNN model is trained using FER-2013 dataset to recognize the 4 emotions - neutral, happy, sad, angry.
- Data pre-processing is performed on the dataset (Eg: reshaping data)
- Image data augmentation is done (using ImageDataGenetrator provided by Keras) to improve the performance and ability of the model to generalize.
- A classifier like CNN is used to identify emotion as neutral, happy, sad or angry
- An evaluation metric like accuracy is used to optimize the prediction

Analysis Module

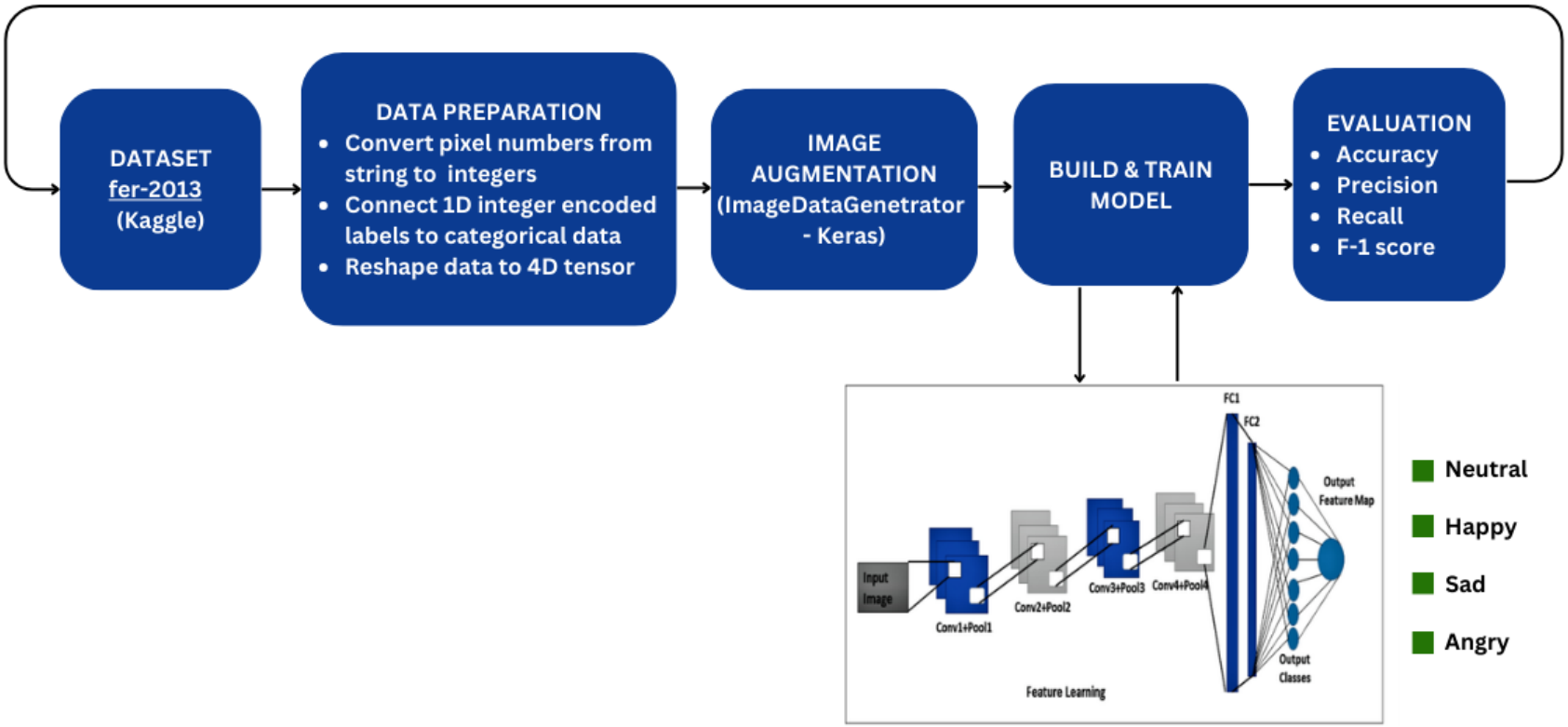


Figure: Emotion Detection

Analysis Module

Sentiment Analysis

- The user response in text is the input
- Data pre-processing is performed on the dataset (Eg: lowercasing, stopword removal, etc.)
- The resultant data is transformed into a numerical vector using Word2vec
- A classifier like LSTM-CNN-GS is used to predict whether the text has a positive or negative sentiment
- An evaluation metric like accuracy is used to optimize the prediction

Analysis Module

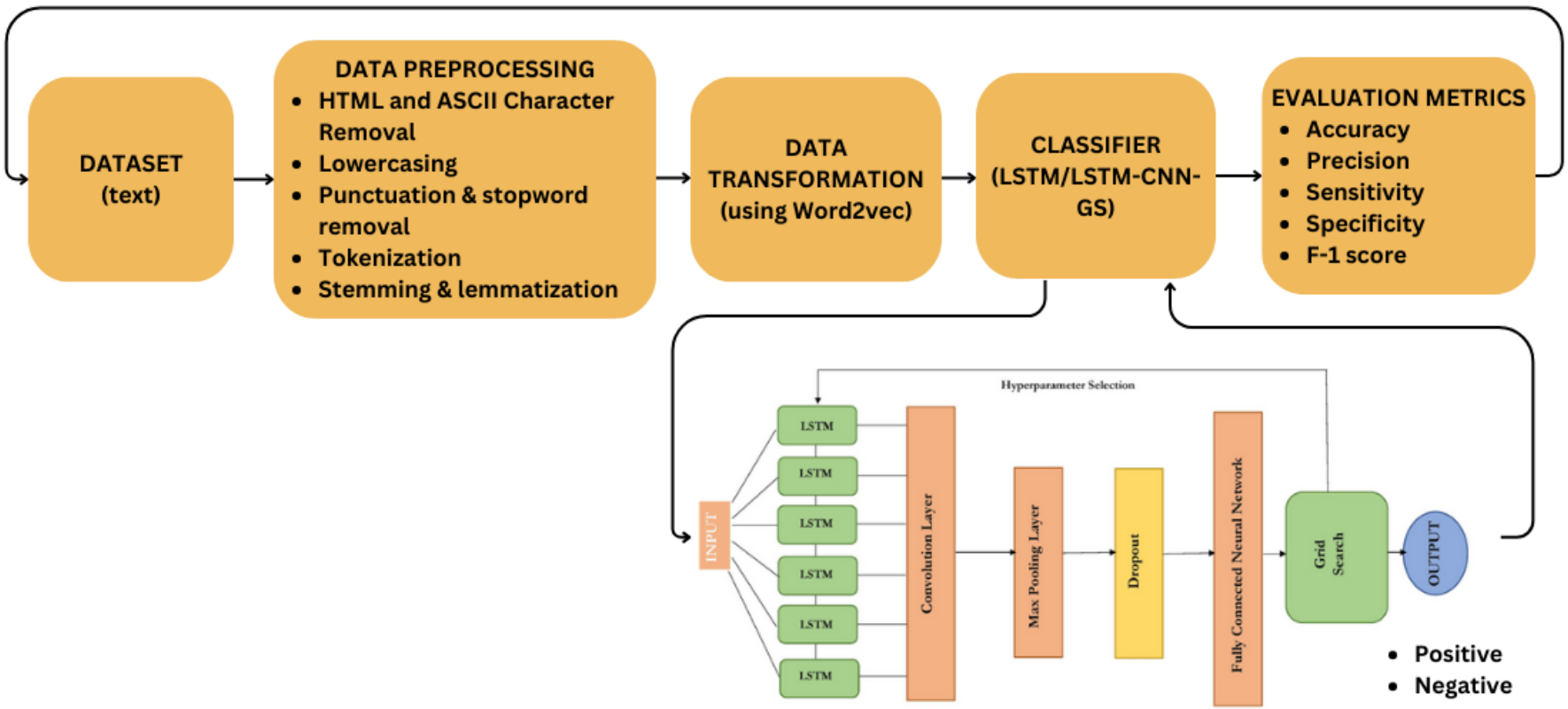


Figure: Sentiment Analysis

Analysis Module

Confidence Analysis

- Audio and text are fed as input to this module
- From audio, key features like pause duration are extracted. Based on these features, clarity, modulation, pace, and volume are rated
- A classifier like CNN is used to train the audio network and a score from 0-5 is generated
- From text, the frequency of unconfident words/phrases is considered to generate a score from 0-5
- An average score from the text and audio component is the confidence score

Analysis Module

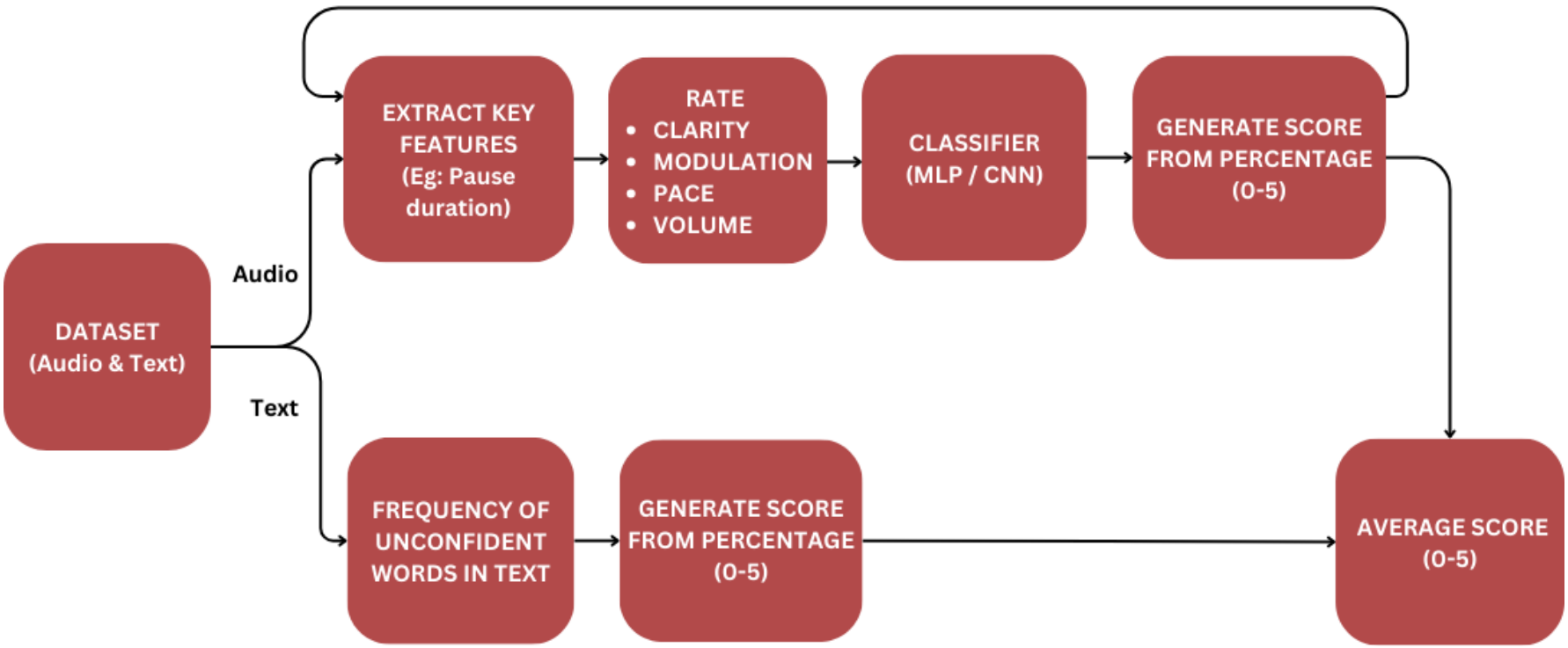


Figure: Confidence Analysis

Assumptions

- Network connection must be stable
- Only one face must be visible and it must be clear through the camera
- Audio input must be clear
- Interview is conducted in English language

Work Breakdown and Responsibilities

GOKUL BABURAJ
- Emotion Detection
- User Authentication
- UI Design

JOEL MANUEL
- Question Generation
- Fact Check
- UI Implementation

MARIA SABI
- Sentiment Analysis
- Confidence Analysis
- UI Implementation

MERENE BENSON
- User Interaction
- Grammar Check
- UI Implementation

Software and Hardware requirements

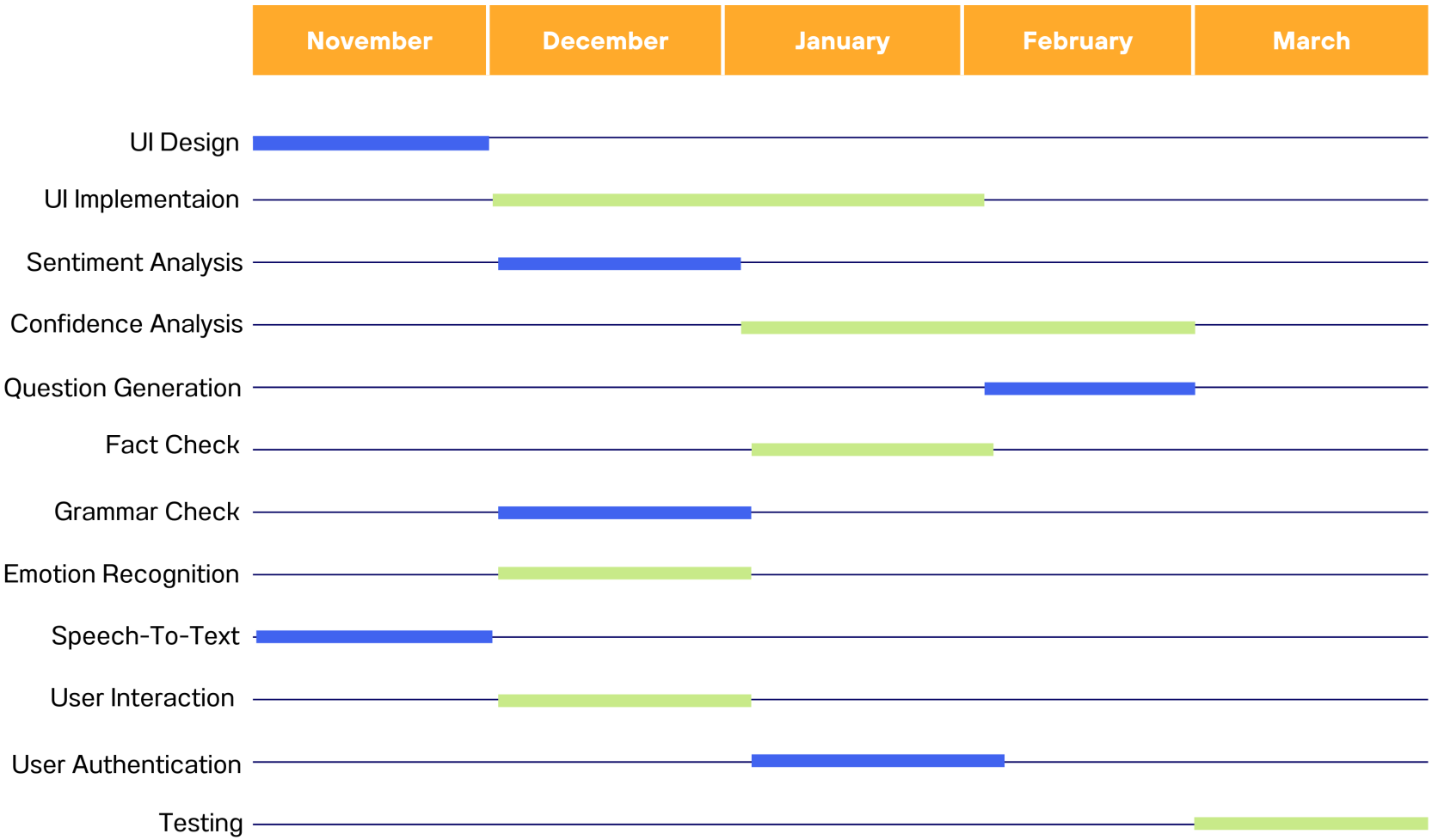
Software requirements

- Python 3.0+
- Tensorflow 2.0+
- Electron.js
- Hugging face transformers

Hardware requirements

- Camera
- Microphone
- Nvidia GPU

Gantt Chart


November
December
January
February
March
UI Design
UI Implementaion
Sentiment Analysis
Confidence Analysis
Question Generation
Fact Check
Grammar Check
Emotion Recognition
Speech-To-Text
User Interaction
User Authentication
Testing

Budget

- ChatGPT 3.5 Turbo - 30USD

Risks and Challenges

- Collecting and storing user interview data raises privacy and security concerns.
- Mimicking human interaction, including body language and non-verbal cues
- Analyzing extended video and audio recordings for interviews can strain computational resources.

Expected output

- Performance analytics of the interview
- Suggest improvements
- View past performance

Conclusion

Our AI Mock Interview Bot represents a powerful tool for individuals seeking to excel in their careers. By providing realistic interview simulations, valuable feedback, and insights into confidence, sentiment, and fact-checking, this application equips users with the skills and confidence they need to succeed in the competitive job market.

Reference I

1. R. Mandal, P. Lohar, D. Patil, A. Patil and S. Wagh, "AI -Based mock interview evaluator: An emotion and confidence classifier model," 2023 International Conference on Intelligent Systems for Communication, IoT and Security (ICISCoIS), Coimbatore, India, 2023, pp. 521-526, doi: 10.1109/ICISCoIS56541.2023.10100589.
2. Bacalso, P.L., Feliscuzo, L.S. and Aliac, C.J.C., CUTIE: INTERVIEWER BOT.
3. Pandey, R., Chaudhari, D., Bhawani, S., Pawar, O. and Barve, S., 2023, March. Interview Bot with Automatic Question Generation and Answer Evaluation. In 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS) (Vol. 1, pp. 1279-1286). IEEE.

Reference II

4. Jauhari, S., Aggarwal, C., Gautam, A. and Awal, D., 2022. Virtual Mock Interview Assistant (Video Bot-based) (No. 7290). EasyChair.
5. S. Suakanto, J. Siswanto, T. Febrianti Kusumasari, I. Reza Prasetyo and M. Hardiyanti, "Interview Bot for Improving Human Resource Management," 2021 International Conference on ICT for Smart Society (ICISS), Bandung, Indonesia, 2021, pp. 1-5, doi: 10.1109/ICISS53185.2021.9533248.
6. Cao, Y., 2020. Testbot: A Chatbot-Based Interactive Interview Preparation Application

Reference III

7. Priyadarshini, I. and Cotton, C. (2021) 'A novel LSTM–CNN–grid search-based deep neural network for sentiment analysis', The Journal of Supercomputing, 77(12), pp. 13911–13932. doi:10.1007/s11227-021-03838-w.
8. Wu, J., Gaur, Y., Chen, Z., Zhou, L., Zhu, Y., Wang, T., Li, J., Liu, S., Ren, B., Liu, L. and Wu, Y., 2023. On decoder-only architecture for speech-to-text and large language model integration. arXiv preprint arXiv:2307.03917.
9. Wolf, T., Debut, L., Sanh, V., Chaumond, J., Delangue, C., Moi, A., Cistac, P., Rault, T., Louf, R., Funtowicz, M. and Davison, J., 2020, October. Transformers: State-of-the-art natural language processing. In Proceedings of the 2020 conference on empirical methods in natural language processing: system demonstrations (pp. 38-45)

Reference IV

10. https://grow.google/certificates/interview-warmup/
11. https://interviewbot.com/
12. https://interviewschool.com/
13. Nair, S., Mohan, M., J. Ranga Rajesh and Chandran, P. (2020). On Finding the Best Learning Model for Assessing Confidence in Speech. doi:https://doi.org/10.1145/3426826.3426838.
14. Qazi, A.S., Farooq, M.S., Rustam, F., Villar, M.G., Rodríguez, C.L. and Ashraf, I. (2022). Emotion Detection Using Facial Expression Involving Occlusions and Tilt. Applied Sciences, 12(22), p.11797. doi:https://doi.org/10.3390/app122211797.

THANK YOU