A

Mini Project

On

AUTOMATIC ASSESSMENT OF COMMUNICATION SKILL IN NON-CONVENTIONAL INTERVIEW SETTINGS A COMPARATIVE STUDY

(Submitted in partial fulfillment of the requirements for the award of Degree)

BACHELOR OF TECHNOLOGY
in
COMPUTER SCIENCE AND ENGINEERING

By

B. Bhavya Sri (227R5A0524)
D. Vamshi (217R1A05M1)
T. Vishwa Teja (217R1A05R2)

Under the Guidance of

A. KIRAN KUMAR

(Assistant Professor)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CMR TECHNICAL CAMPUS

UGC AUTONOMOUS

(Accredited by NAAC, NBA, Permanently Affiliated to JNTUH, Approved by AICTE, New Delhi) Recognized Under Section 2(f) & 12(B) of the UGCAct.1956,
Kandlakoya (V), Medchal Road, Hyderabad-501401.

2021-25

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the project entitled "**AUTOMATIC ASSESSMENT OF COMMUNICATION SKILL IN NON-COVENTIONAL INTERVIEW SETTINGS A COMPARATIVE STUDY**" being submitted by **B. BHAVYA SRI (227R5A0524), D. VAMSHI (217R1A05M1) AND T. VISHWA TEJA (217R1A05R2)** in partial fulfillment of the requirements for the award of the degree of B.Tech in Computer Science and Engineering to the Jawaharlal Nehru Technological University Hyderabad, is a record of bonafide work carried out by them under our guidance and supervision during the year 2024-25.

The results embodied in this project have not been submitted to any other University or Institute for the award of any degree or diploma.

Mr. A. Kiran Kumar
Assistant Professor
INTERNAL GUIDE

Dr. A. Raji Reddy
DIRECTOR

Dr. N. Bhaskar
HOD

EXTERNAL EXAMINER

Submitted for viva voice Examination held on _____

ACKNOWLEGDEMENT

Apart from the efforts of us, the success of any project depends largely on the encouragement and guidelines of many others. We take this opportunity to express our gratitude to the people who have been instrumental in the successful completion of this project. We take this opportunity to express my profound gratitude and deep regard to our guide

Mr. A.Kiran kumar, Assistant Professor for his exemplary guidance, monitoring and constant encouragement throughout the project work. The blessing, help and guidance given by him shall carry us a long way in the journey of life on which we are about to embark. We also take this opportunity to express a deep sense of gratitude to Project Review Committee (PRC) Coordinators: **Dr. J.Narasimha Rao,Mr. K. Ranjith Reddy, Dr. K. Maheshwari, Mrs. K. Shilpa** for their cordial support, valuable information and guidance, which helped us in completing this task through various stages.

We are also thankful to **Dr. N.Bhaskar,** Head of the Department of Computer Science and Engineering for providing encouragement and support for completing this project successfully.

We are obliged to **Dr. A. Raji Reddy,** Director for being cooperative throughout the course of this project. We would like to express our sincere gratitude to Sri. **Ch. Gopal Reddy,** Chairman for providing excellent infrastructure and a nice atmosphere throughout the course of this project.

The guidance and support received from all the members of **CMR Technical Campus** who contributed to the completion of the project. We are grateful for their constant support and help.

Finally, we would like to take this opportunity to thank our family for their constant encouragement, without which this assignment would not be completed. We sincerely acknowledge and thank all those who gave support directly and indirectly in the completion of this project.

B .BHAVYA SRI(227R5A0524)

D .VAMSHI(217R1A05M1)

T .VISHWA TEJA(217R1A05R2)

ABSTRACT

Effective communication skills are crucial in modern professional environments, and the assessment of these skills is a key component of the interview process. Traditional interview settings often rely on subjective evaluations by human assessors, which can be inconsistent and biased. This project explores the potential of automatic assessment systems for evaluating communication skills in non-conventional interview settings, such as virtual interviews or AI-driven assessment platforms. We present a comparative analysis of various automatic assessment techniques, including natural language processing (NLP), machine learning algorithms, and speech analysis tools. These techniques are evaluated against traditional human-based assessments to determine their accuracy, reliability, and effectiveness. The project involves a series of experiments where candidates' communication skills are assessed using both automated systems and conventional methods across different interview formats. Results indicate that while automatic systems offer advantages in terms of consistency and scalability, they also face challenges related to contextual understanding and nuanced interpretation. Integrating automated assessment tools with human judgment can enhance the accuracy and effectiveness of the overall evaluation process. This project contributes to the development of more objective and efficient methods for assessing communication skills, providing valuable insights for future applications in recruitment and professional development.

.

LIST OF FIGURES

LIST OF SCREENSHOTS

TABLE OF CONTENTS

1. INTRODUCTION

1.INTRODUCTION

1.1 PROJECT SCOPE

The scope of this project is to examines the effectiveness of automatic assessment techniques in non-conventional interview settings, including video interviews and AI evaluations. It compares these methods to traditional human assessments, focusing on metrics such as accuracy and reliability. The research also explores the integration of Natural Language Processing (NLP) and machine learning in recruitment and considers fairness across diverse candidate pools. Ultimately, the study aims to enhance the effectiveness and equity of hiring practices.

1.2 PROJECT PURPOSE

The purpose of this project is to investigate the effectiveness of automatic assessment techniques in non-conventional interview settings and to compare these techniques with traditional human evaluations. By focusing on the evaluation of communication skills through automatic assessment systems, the study aims to enhance recruitment processes by improving the efficiency and fairness of hiring practices through the integration of technology. Additionally, it seeks to identify the strengths and limitations of these automatic assessment systems in evaluating candidates, thereby understanding their capabilities and drawbacks. The research leverages advancements in Natural Language Processing (NLP), machine learning, and speech analysis to provide more objective and reliable assessments. Ultimately, the study aims to offer valuable insights on how these technologies can complement or replace traditional methods, fostering a more equitable and effective hiring landscape through innovative assessment methodologies.

1.3 PROJECT FEATURES

This project aims to explore and compare the effectiveness of automatic assessment techniques in non-conventional interview settings, particularly in relation to traditional human evaluations. It focuses on evaluating automatic assessment systems for communication skills by analyzing key metrics such as accuracy, reliability, and contextual understanding. The methodology involves conducting experiments with various interview formats and assessment tools to identify the strengths and limitations of these automatic systems. The target outcome is to provide valuable insights into how technology can be integrated with traditional assessment practices to enhance recruitment processes, ultimately improving fairness and efficiency. The research leverages advancements in Natural Language Processing (NLP), machine learning, and speech analysis to achieve these objectives.

2. SYSTEM ANALYSIS

2.SYSTEM ANALYSIS

SYSTEM ANALYSIS

System Analysis is the important phase in the system development process. The System is studied to the minute details and analyzed. The system analyst plays an important role of an interrogator and dwells deep into the working of the present system. In analysis, a detailed study of these operations performed by the system and their relationships within and outside the system is done. A key question considered here is, "what must be done to solve the problem?" The system is viewed as a whole and the inputs to the system are identified. Once analysis is completed the analyst has a firm understanding of what is to be done.

2.1 PROBLEM DEFINITION

The project focuses on the challenge of evaluating candidates in non-conventional interview settings, such as video and AI-driven assessments. With the rise of automatic assessment techniques, understanding their effectiveness compared to traditional human evaluations is crucial. Concerns include the accuracy, reliability, and contextual understanding of these automated systems. Additionally, the integration of advanced technologies like Natural Language Processing (NLP) and machine learning raises questions about their impact on recruitment outcomes. Ensuring fairness and accessibility across diverse candidate pools is vital, as biases in automated assessments could compromise equity in hiring practices. The study aims to identify these challenges and propose solutions to improve the effectiveness and fairness of recruitment methods.

2.2 EXISTING SYSTEM

The existing system focuses on evaluating candidates in non-conventional interview settings, such as video and AI-driven assessments, which presents several challenges, including accuracy, reliability, and the contextual understanding of automated systems. Current methods primarily rely on human evaluators who provide subjective, qualitative assessments during face-to-face interactions. While these traditional approaches offer nuanced evaluations, they often suffer from inconsistencies and biases. To address these issues, the existing system integrates automated systems to enhance objectivity and scalability; however, these systems still struggle to capture the subtleties of human communication, such as sarcasm and emotional nuances. Consequently, further development is essential to improve the effectiveness of these systems across diverse interview formats.

2.2.1 LIMITATIONS OF EXISTING SYSTEM

- **Subjectivity:** Human evaluators' assessments can be influenced by personal biases, leading to inconsistent and subjective evaluations.
- **Limited Scalability:** Traditional methods are labor-intensive and time-consuming, making them less scalable for large-scale recruitment processes.
- **Inconsistent Criteria:** Different interviewers may use varying criteria or focus on different aspects of communication, leading to variability in assessment results.
- **Bias:** Cultural, gender, and other biases can affect the fairness of evaluations and potentially disadvantage certain candidates.
- **Contextual Understanding:** Automated systems often struggle with interpreting the context and nuances of communication, such as sarcasm or emotional subtleties.
- **Data Privacy:** The collection and analysis of personal communication data raise concerns about data privacy and security.
- **Limited Adaptability:** Many automated systems may not adapt well to diverse communication styles or unique interview settings.
- **Algorithmic Bias:** Machine learning models can inherit biases present in training data, potentially leading to unfair assessments or reinforcement of existing biases.

2.3 PROPOSED SYSTEM

The proposed system for assessing communication skills in non-conventional interview settings introduces an advanced approach by integrating machine learning algorithms with real-time data analysis to address the limitations of existing methods. This system leverages natural language processing (NLP) to analyze verbal responses, incorporating sentiment analysis, language complexity, and coherence metrics to provide an objective evaluation of communication skills. Additionally, it employs speech analysis techniques to assess pitch, tone, and speech rate, further enhancing the precision of the evaluation. A key feature of the proposed system is its ability to adapt to different interview formats, including virtual and AI-driven platforms, by using time-aware mechanisms that account for the dynamic nature of communication. The system also integrates contextual information to better understand and interpret nuances in candidates' responses. By combining these advanced technologies, the system offers a scalable, consistent, and fair assessment solution that addresses the challenges of traditional and existing automated methods. This approach not only improves the accuracy of communication evaluations but also enhances the overall efficiency and effectiveness of the interview process, making it a valuable tool for modern recruitment practices.

2.3.1 ADVANTAGES OF THE PROPOSED SYSTEM

- **Objective Evaluation:** Utilizes natural language processing (NLP) and machine learning algorithms to provide consistent and unbiased assessments of communication skills.
- **Real-Time Analysis:** Processes and evaluates communication skills in real time, allowing for immediate feedback and insights during or after the interview.
- **Contextual Understanding:** Integrates contextual information to better interpret nuances and subtleties in candidates' responses, improving the accuracy of assessments.
- **Scalability:** Handles large volumes of candidates efficiently, making it suitable for large-scale recruitment processes without compromising assessment quality.
- **Adaptability:** Supports various interview formats, including virtual and AI-driven platforms, ensuring flexibility and relevance across different settings.
- **Enhanced Precision:** Combines multiple data sources, including speech analysis (pitch, tone, speech rate) and NLP metrics, for a comprehensive evaluation of communication skills.
- **Reduced Bias:** Minimizes human biases and inconsistencies by relying on objective algorithms and data-driven insights, promoting fairness in the evaluation process.
- **Comprehensive Metrics:** Assesses various aspects of communication, such as coherence, language complexity, and sentiment, providing a well-rounded evaluation.
- **Efficient Feedback:** Offers quick and actionable feedback for candidates and recruiters, improving the overall efficiency of the interview process.
- **Future-Proof:** Incorporates advanced technologies and adaptive mechanisms, making it robust and capable of evolving with future developments in communication assessment.

2.4 FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. Three key considerations involved in the feasibility analysis are

- Economic Feasibility
- Technical Feasibility
- Social Feasibility

2.4.1 ECONOMIC FEASIBILITY

The developing system must be justified by cost and benefit. Criteria to ensure that effort is concentrated on project, which will give best, return at the earliest. One of the factors, which affect. the development of a new system, is the cost it would require.

The following are some of the important financial questions asked during preliminary investigation:

- The costs conduct a full system investigation
- The cost of the hardware and software.
- The benefits in the form of reduced costs or fewer costly errors.

Since the system is developed as part of project work, there is no manual cost to spend for the proposed system. Also all the resources are already available, it give an indication of the system is economically possible for development.

2.4.2 TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

2.4.3BEHAVIORAL FEASIBILITY

This includes the following questions:

- Is there sufficient support for the users?
- Will the proposed system cause harm?

The project would be beneficial because it satisfies the objectives when developed and installed. All behavioral aspects are considered carefully and conclude that the project is behaviorally feasible.

2.5 HARDWARE & SOFTWARE REQUIREMENTS

2.5.1 HARDWARE REQUIREMENTS:

Hardware interfaces specifies the logical characteristics of each interface between the software product and the hardware components of the system. Thefollowing are some hardware requirements.

- Processor : Intel Dual Core@ CPU 2.90GHz.
- Hard disk : 16GB and Above.
- RAM : 4GB and Above.
- Monitor : 5 inches or above.

2.5.2 SOFTWARE REQUIREMENTS:

Software Requirements specifies the logical characteristics of each interface and software components of the system. The following are some software requirements,

- Operating system : Windows 8, 10
- Languages : Python(3.7.0)
- Backend : Machine Learning
- IDE : Jupyter

3. ARCHITECTURE

3.ARCHITECTURE

3.1 PROJECT ARCHITECTURE

This project architecture shows the procedure followed for breed detection using machine learning, starting from input to final prediction.

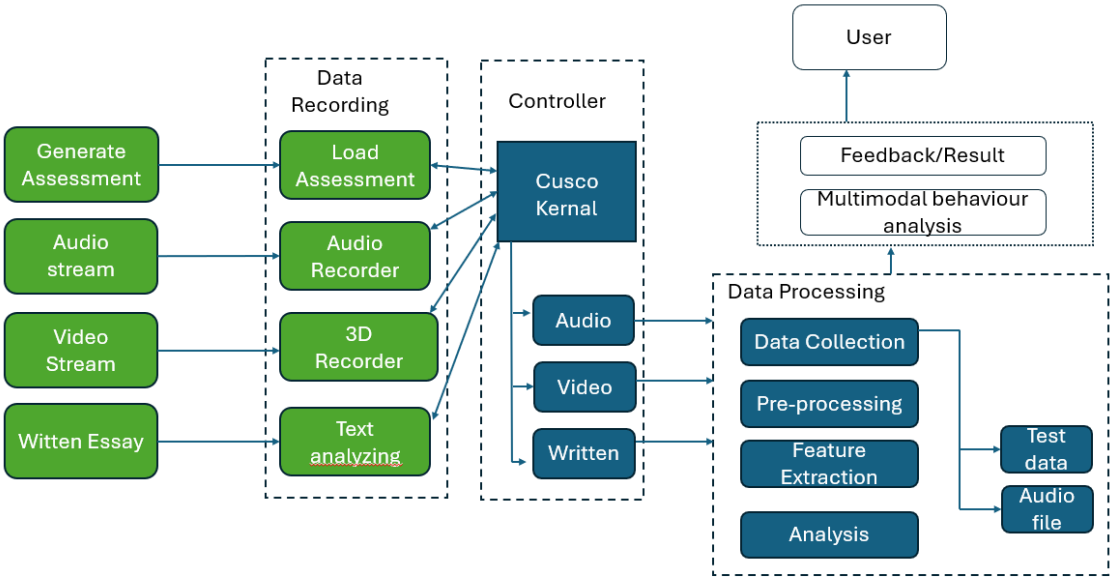


Figure 3.1: Project Architecture of AUTOMATIC ASSESSMENT OF COMMUNICATION SKILL IN NONCONVENTIONAL INTERVIEW SETTINGS A COMPARATIVE STUDY

3.2 DESCRIPTION

Input Data: Input data is generally in .jpg format or .png format where the data is fetched and mapped in the data framed from the source columns.

Reading Data: Torch vision library is used to read the data into the data frame.

Separating Features: In this following step we are going to separate the features which we take to train the model by giving the target value i.e. 1/0 for the particular of features.

Normalization: Normalization is a very important step while we are dealing with the large values in the features as the higher bit integers will cost high computational power and time. To achieve the efficiency in computation we are going to normalize the data values.

Training and test data: Training data is passed to the VGG classifier to train the model. Test data is used to test the trained model whether it is making correct predictions or not.

VGG Classifier: the purpose of choosing the VGG classifier for this project the efficiency and accuracy that we have observed when compared to other classifiers.

3.3 USE CASE DIAGRAM

In the use case diagram we have basically two actors who are the user and the system. The user can generate assessment and take the interview. Whereas the system will allocate the the resouses for the application.

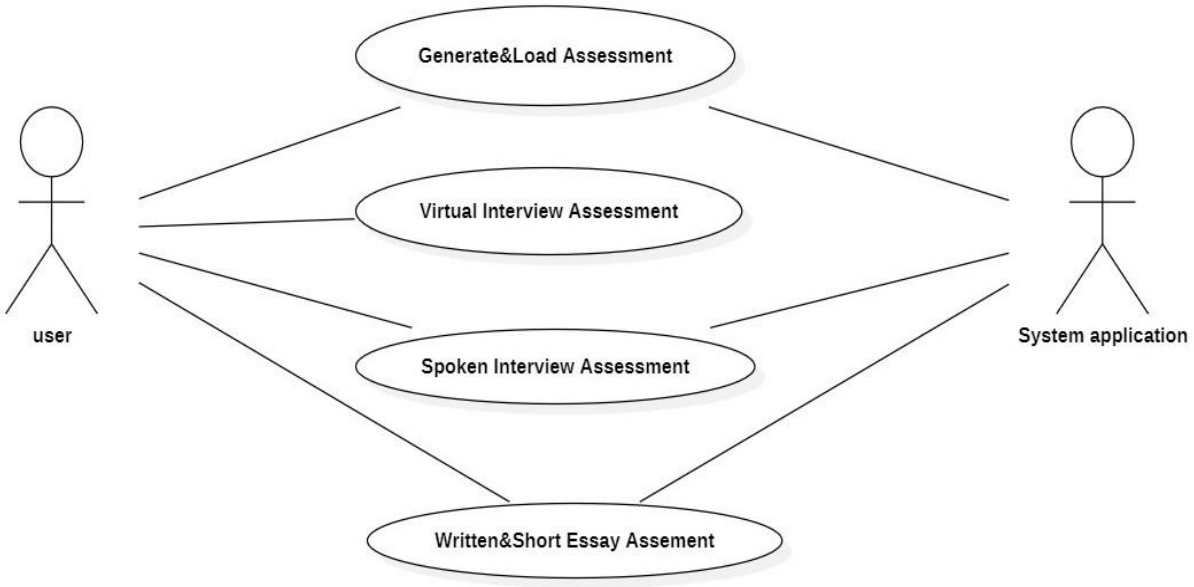


Figure 3.3: Use Case Diagram for AUTOMATIC ASSESSMENT OF COMMUNICATION SKILL IN NON-CONVENTIONAL INTERVIEW SETTINGS A COMPARATIVE STUDY

3.4 CLASS DIAGRAM

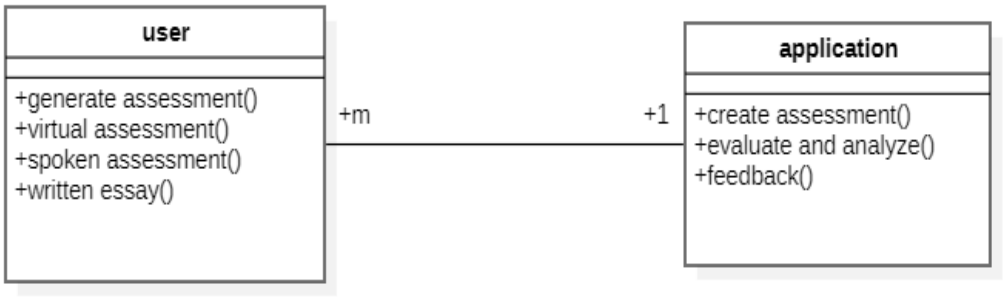


Figure 3.4: Class Diagram AUTOMATIC ASSESSMENT OF COMMUNICATION SKILL IN NON-CONVENTIONAL INTERVIEW SETTINGS A COMPARATIVE STUDY

3.5 SEQUENCE DIAGRAM

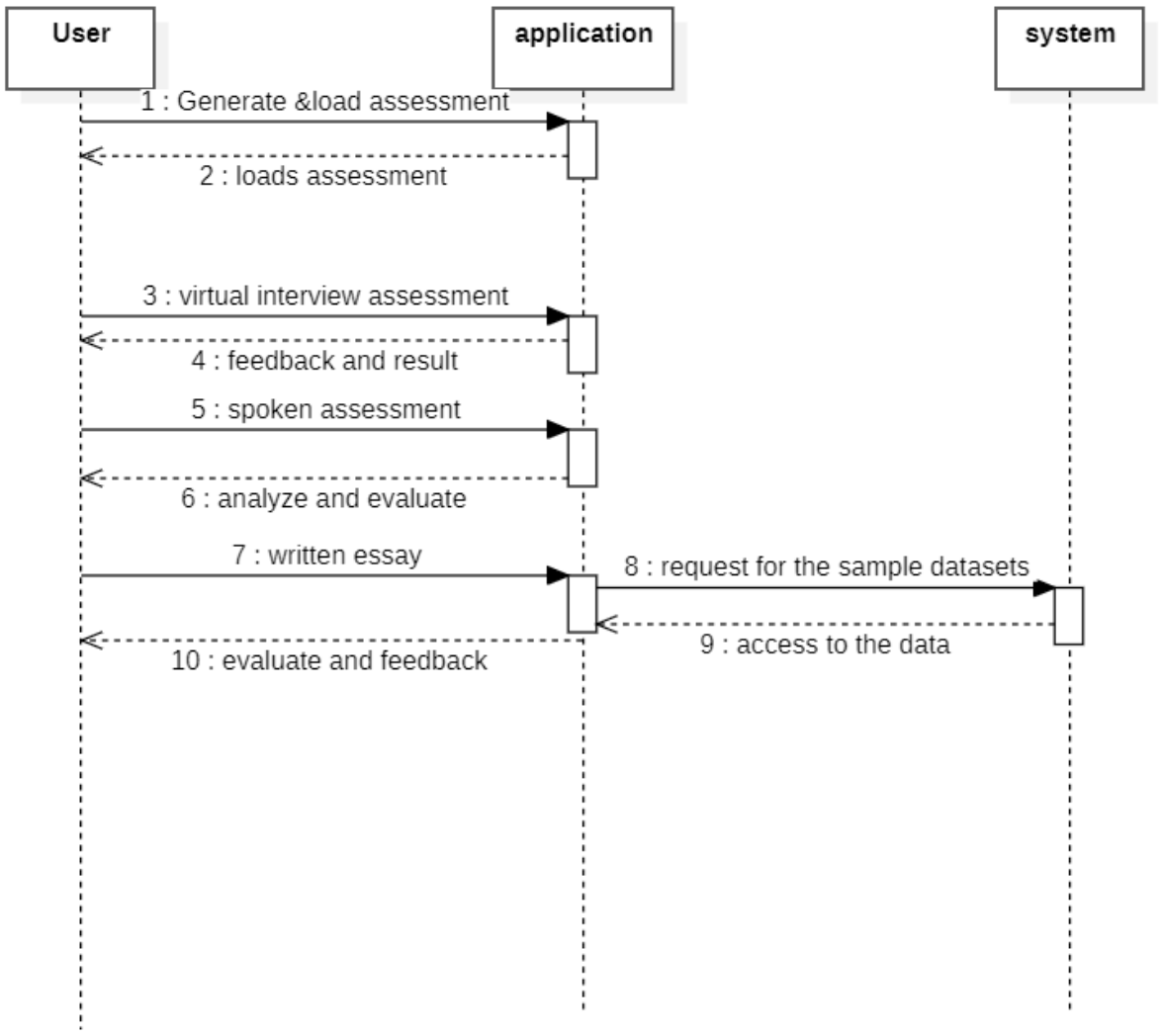


Figure 3.5: Sequence Diagram for AUTOMATIC ASSESSMENT OF COMMUNICATION SKILL IN NON-CONVENTIONAL INTERVIEW SETTINGS A COMPARATIVE STUDY

3.6 ACTIVITY DIAGRAM

It describes about flow of activity states.

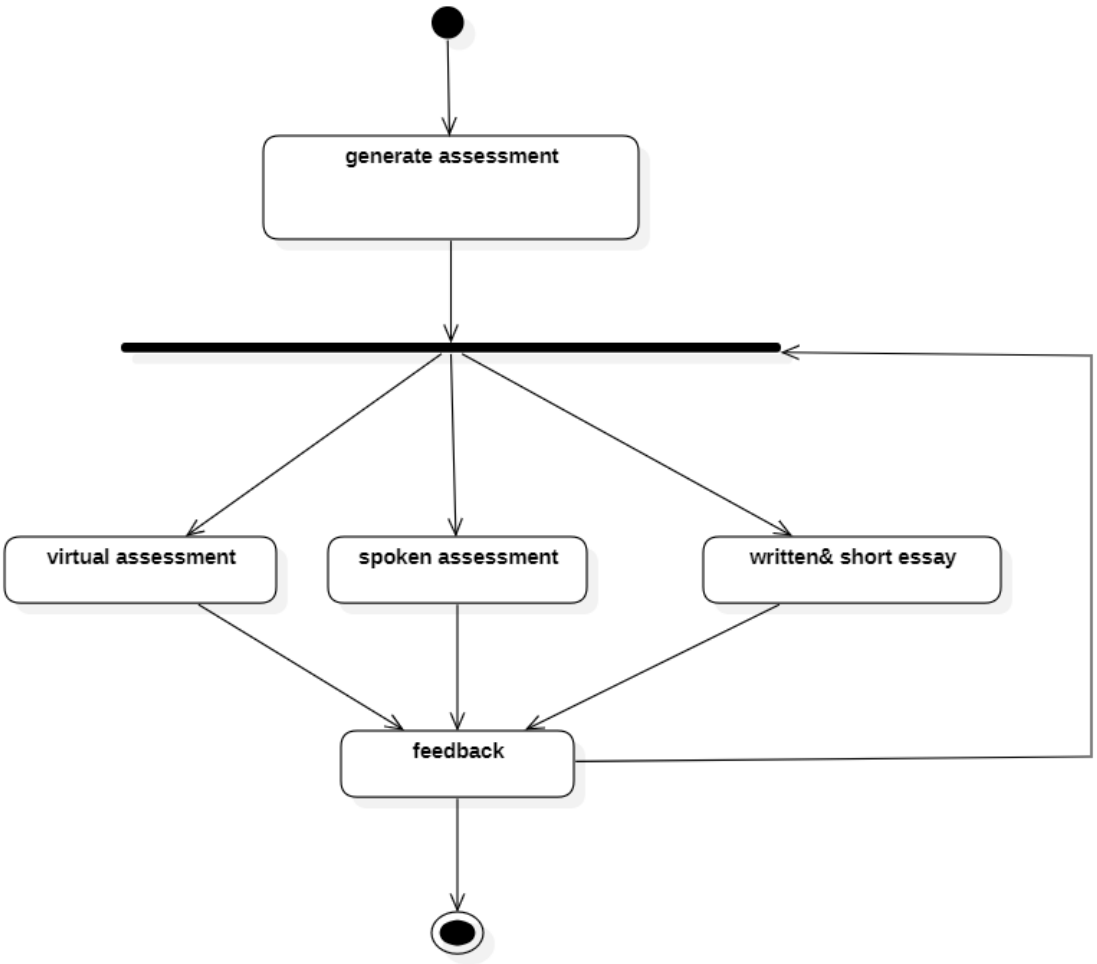


Figure 3.6: Activity Diagram for AUTOMATIC ASSESSMENT OF COMMUNICATION SKILL IN NON-CONVENTIONAL INTERVIEW SETTINGS A COMPARATIVE STUDY

4. IMPLEMENTATION

4. IMPLEMENTATION

4.1 SAMPLE CODE

```
from tkinter import *
import tkinter
from tkinter import filedialog
from tkinter.filedialog import askopenfilename
from PIL import Image
import tensorflow as tf
from tensorflow import keras
import numpy as np
import cv2
import os
import PIL
from PIL import Image
from tkinter import messagebox
from sklearn.metrics import precision_score
from sklearn.metrics import recall_score
from sklearn.metrics import f1_score
from sklearn.metrics import accuracy_score
import matplotlib.pyplot as plt
from sklearn.metrics import confusion_matrix
import seaborn as sns
from sklearn.model_selection import train_test_split
from string import punctuation
from nltk.corpus import stopwords
import nltk
from nltk.stem import WordNetLemmatizer
from sklearn.feature_extraction.text import TfidfVectorizer
import pandas as pd
import pickle
from nltk.stem import PorterStemmer
from sklearn.preprocessing import MinMaxScaler
from xgboost import XGBClassifier
import soundfile
import librosa
from keras.models import model_from_json
main = tkinter.Tk()
main.title("Automatic Assessment of Communication Skill in Non-conventional Interview Settings: A
```

```
Comparative Study")
main.geometry("1200x1200")
facial_expression =  ['Anger', 'Disgust', 'Fear', 'Happy', 'Sad', 'Surprise', 'Neutral']
speech_emotion = ['neutral', 'calm', 'happy', 'sad', 'angry', 'fearful', 'disgust', 'surprised']
exp_model = keras.models.load_model("model/model_35_91_61.h5")
font_cv = cv2.FONT_HERSHEY_SIMPLEX
face_cas = cv2.CascadeClassifier('model/haarcascade_frontalface_default.xml')
global video, vectorizer, normalize, xgb

stop_words = set(stopwords.words('english'))
lemmatizer = WordNetLemmatizer()
ps = PorterStemmer()

with open('model/speechmodel.json', "r") as json_file:
    loaded_model_json = json_file.read()
    speech_classifier = model_from_json(loaded_model_json)
json_file.close()
speech_classifier.load_weights("model/speech_weights.h5")
speech_classifier._make_predict_function()

def cleanPost(doc):
    tokens = doc.split()
    table = str.maketrans('', '', punctuation)
    tokens = [w.translate(table) for w in tokens]
    tokens = [word for word in tokens if word.isalpha()]
    tokens = [w for w in tokens if not w in stop_words]
    tokens = [word for word in tokens if len(word) > 1]
    tokens = [ps.stem(token) for token in tokens]
    tokens = [lemmatizer.lemmatize(token) for token in tokens]
    tokens = ' '.join(tokens)
    return tokens



def loadModels():
    global vectorizer, normalize, xgb
    text.delete('1.0', END)
    textdata = np.load("model/X.npy")
    Y = np.load("model/Y.npy")
    vectorizer = TfidfVectorizer(stop_words=stop_words, use_idf=True, smooth_idf=False, norm=None,
```

```
decode_error='replace', max_features=3000)
    X = vectorizer.fit_transform(textdata).toarray()
    indices = np.arange(X.shape[0])
    np.random.shuffle(indices)
    X = X[indices]
    Y = Y[indices]
    normalize = MinMaxScaler()
    X = normalize.fit_transform(X)
    print(X.shape)
    print(Y)
    X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size=0.2)
    if os.path.exists("model/xgb.txt"):
        with open('model/xgb.txt', 'rb') as file:
            xgb = pickle.load(file)
        file.close()
    else:
        xgb = XGBClassifier()
        xgb.fit(X_train, y_train)
        with open('model/xgb.txt', 'wb') as file:
            pickle.dump(xgb, file)
        file.close()
    predict = xgb.predict(X_test)
    p = precision_score(y_test, predict,average='macro') * 100
    r = recall_score(y_test, predict,average='macro') * 100
    f = f1_score(y_test, predict,average='macro') * 100
    a = accuracy_score(y_test,predict)*100
    text.insert(END,"XGBoost Accuracy  : "+str(a)+"\n")
    text.insert(END,"XGBoost Precision : "+str(p)+"\n")
    text.insert(END,"XGBoost Recall    : "+str(r)+"\n")
    text.insert(END,"XGBoost FSCORE    : "+str(f)+"\n\n")
    labels = np.unique(y_test)

    conf_matrix = confusion_matrix(y_test, predict)
    plt.figure(figsize =(6, 6))
    ax = sns.heatmap(conf_matrix, xticklabels = labels, yticklabels = labels, annot = True, cmap="viridis"
,fmt ="g");
    ax.set_ylim([0,len(labels)])
    plt.title("XGBoost Communication SKills Score Prediction Confusion Matrix Graph")
```

```
 plt.ylabel('True class')
   plt.xlabel('Predicted class')
   plt.show()

def visualAssessment():
   text.delete('1.0', END)
   counter = 0
   confident = 0
   confuse = 0
   video = cv2.VideoCapture(0)
   while(counter < 20):
      ret, frame = video.read()
      if ret == True:
         gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
         faces = face_cas.detectMultiScale(gray, 1.3,5)
         for (x, y, w, h) in faces:
            face_component = gray[y:y+h, x:x+w]
            fc = cv2.resize(face_component, (48, 48))
            inp = np.reshape(fc,(1,48,48,1)).astype(np.float32)
            inp = inp/255.
            prediction = exp_model.predict_proba(inp)
            expression = facial_expression[np.argmax(prediction)]
            cv2.rectangle(frame, (x, y), (x+w, y+h), (0, 0, 255), 2)
            if expression == 'Neutral' or expression == 'Happy':
               confident = confident + 1
            else:
               confuse = confuse + 1
            counter = counter + 1
            print(counter)
            cv2.putText(frame, "Confident Count : "+str(confident), (30, 40), font_cv, 1, (0, 255, 0), 2)
            cv2.putText(frame, "Confuse Count : "+str(confuse), (30, 120), font_cv, 1, (0, 255, 0), 2)
         cv2.imshow("image", frame)

         if cv2.waitKey(250) & 0xFF == ord('q'):
            break
      else:
         break
   video.release()
   cv2.destroyAllWindows()
```

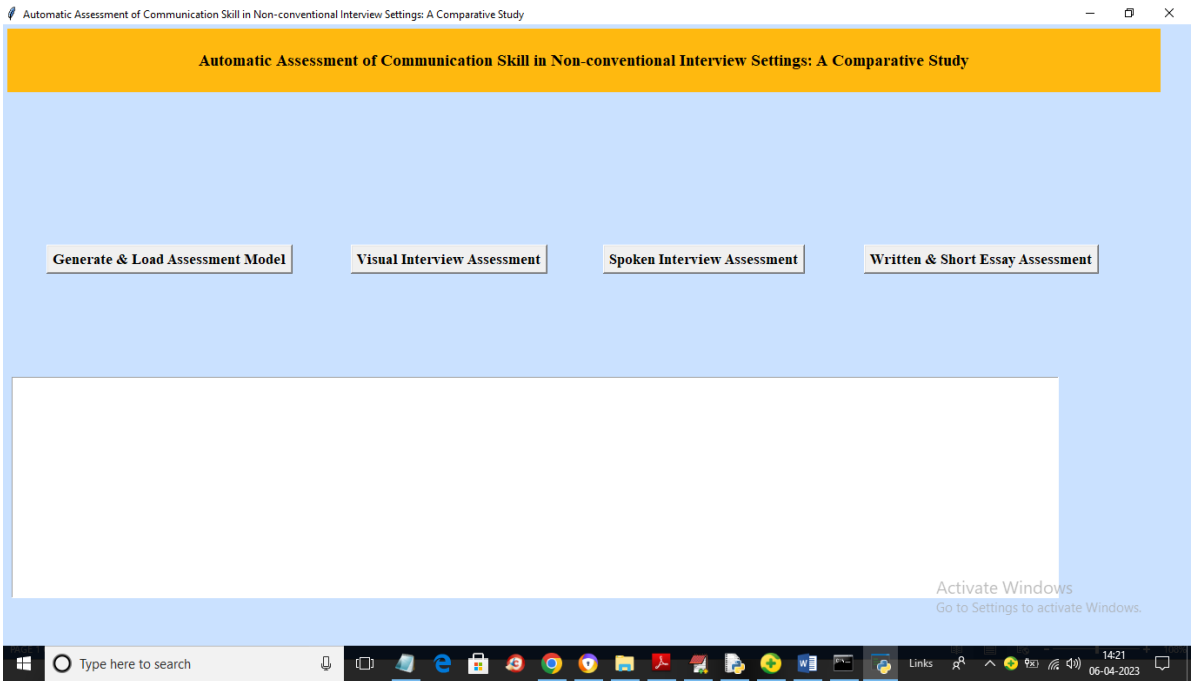
```
    if confident > 0:
        confident = confident / 20.0
if confuse > 0:
        confuse = confuse / 20.0
    text.insert(END,"Your Visual Interview Confidence% : "+str(confident)+"\n")
    text.insert(END,"Your Visual Interview Confusion%  : "+str(confuse)+"\n")
    text.update_idletasks()

def essayAssessment():
    global vectorizer, normalize, xgb
    essay = text.get(1.0, "end-1c")
    print(essay)
    state = essay.strip().lower()
    state = cleanPost(state)
    temp = []
    temp.append(state)
    temp = vectorizer.transform(temp).toarray()
    temp = normalize.transform(temp)
    predict = xgb.predict(temp)
    predict = predict[0]
    messagebox.showinfo("Your Essay Prediction Score : "+str(predict), "Your Essay Prediction Score :
"+str(predict))

def extract_feature(file_name, mfcc, chroma, mel):
    with soundfile.SoundFile(file_name) as sound_file:
        X = sound_file.read(dtype="float32")
        sample_rate=sound_file.samplerate
        if chroma:
            stft=np.abs(librosa.stft(X))
        result=np.array([])
        if mfcc:
            mfccs=np.mean(librosa.feature.mfcc(y=X, sr=sample_rate, n_mfcc=40).T, axis=0)

            result=np.hstack((result, mfccs))
        if chroma:
            chroma=np.mean(librosa.feature.chroma_stft(S=stft, sr=sample_rate).T,axis=0)
            result=np.hstack((result, chroma))
        if mel:
            mel=np.mean(librosa.feature.melspectrogram(X, sr=sample_rate).T,axis=0)
```

```
 result=np.hstack((result, mel))
    sound_file.close()
return result
def spokenAssessment():

  global speech_classifier
    filename = filedialog.askopenfilename(initialdir="testSpeech")
    fname = os.path.basename(filename)
    test = []
    mfcc = extract_feature(filename, mfcc=True, chroma=True, mel=True)
    test.append(mfcc)
    test = np.asarray(test)
    test = test.astype('float32')
    test = test/255
    test = test.reshape((test.shape[0],test.shape[1],1,1))
    predict = speech_classifier.predict(test)
    predict = np.argmax(predict)
    predict = speech_emotion[predict-1]
    if predict == 'neutral' or predict == 'calm' or predict == 'happy':
        messagebox.showinfo("Your Speaking Verbal Audio Predicted as : Confident","Your Speaking
Verbal Audio Predicted as : Confident")
    else:
        messagebox.showinfo("Your Speaking Verbal Audio Predicted as : Confuse","Your Speaking
Verbal Audio Predicted as : Confuse")

font = ('times', 14, 'bold')
title = Label(main, text='Automatic Assessment of Communication Skill in Non-conventional Interview
Settings: A Comparative Study')
title.config(bg='DarkGoldenrod1', fg='black')
title.config(font=font)

title.config(height=3, width=120)
title.place(x=5,y=5)
font1 = ('times', 13, 'bold')
loadButton = Button(main, text="Generate & Load Assessment Model", command=loadModels)
loadButton.place(x=50,y=250)
loadButton.config(font=font1)

videoButton = Button(main, text="Visual Interview Assessment", command=visualAssessment)
```

```
videoButton.place(x=400,y=250)
videoButton.config(font=font1)
spokenButton = Button(main, text="Spoken Interview Assessment", command=spokenAssessment
spokenButton.place(x=690,y=250)
spokenButton.config(font=font1)
essayButton = Button(main, text="Written & Short Essay Assessment", command=essayAssessment)
essayButton.place(x=990,y=250)
essayButton.config(font=font1)
font1 = ('times', 12, 'bold')
text=Text(main,height=13,width=150)
scroll=Scrollbar(text)
text.configure(yscrollcommand=scroll.set)
text.place(x=10,y=400)
text.config(font=font1)
main.config(bg='LightSteelBlue1')
main.mainloop()
```

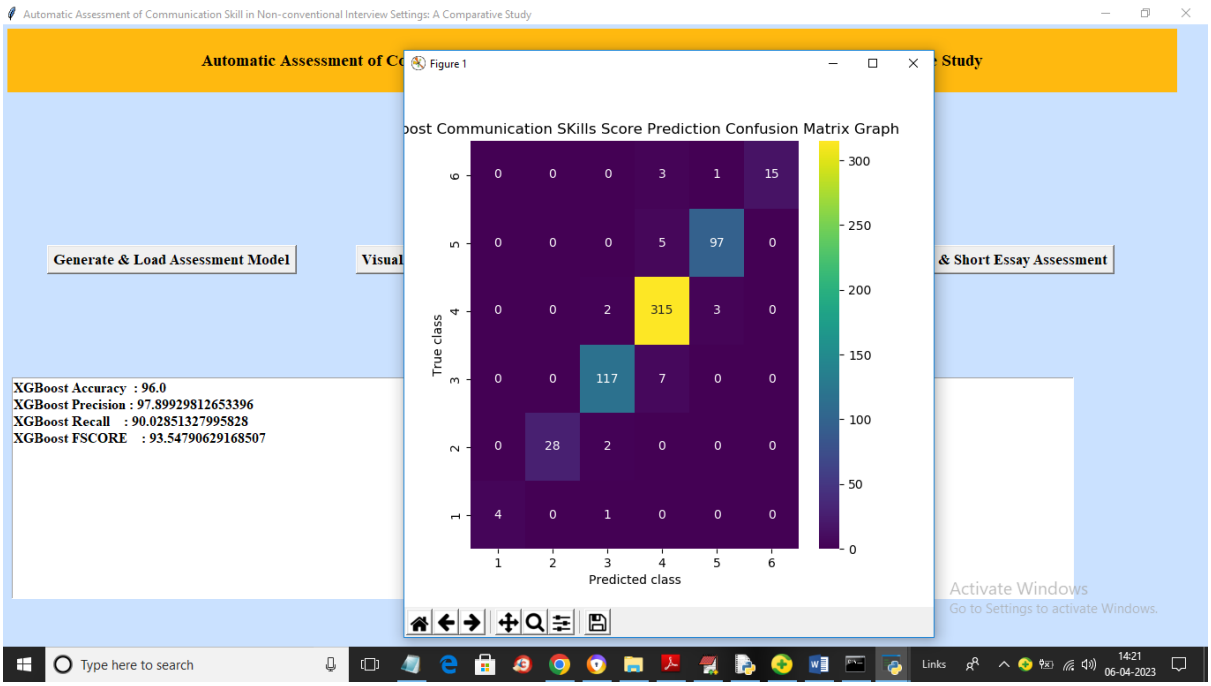
5. SCREENSHOT

5.1 GENERATE ASSESSMENT&LOAD ASSESSMENT



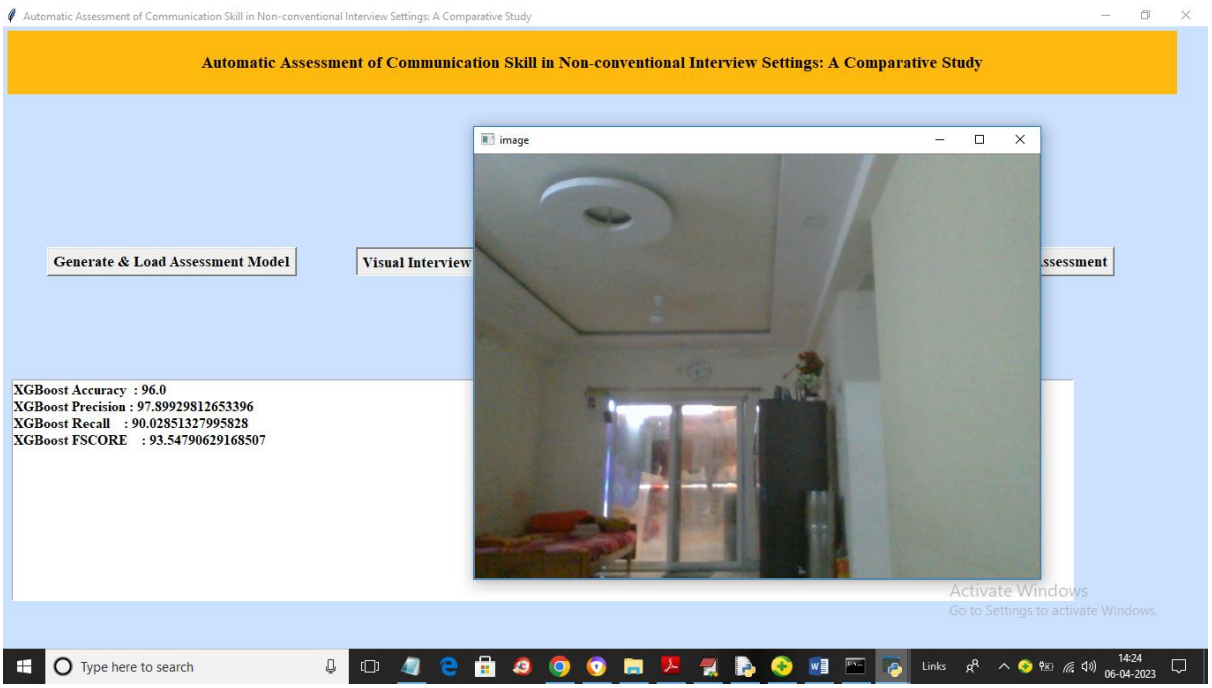
Screenshot 5.1: Screenshot for generating Assessment

5.2 GENERATE ASSESSMENT&LOAD ASSESSMENT



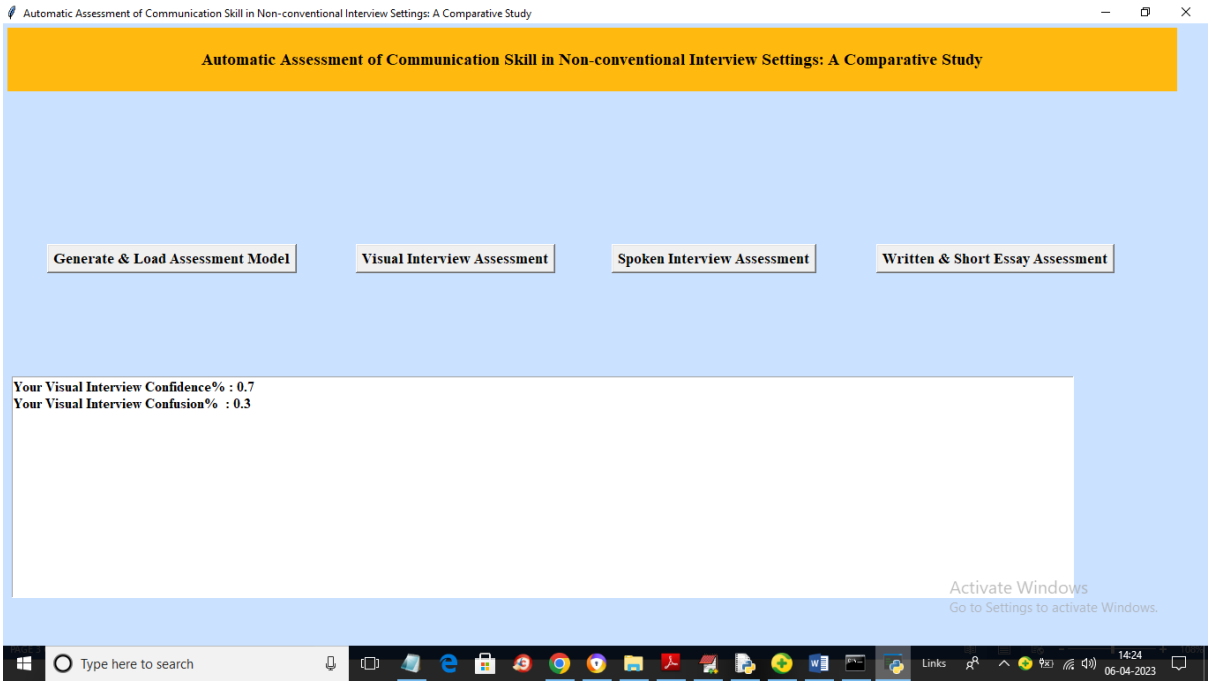
Screenshot 5.2: In above screen the virtual assessment started and give confident &confusion score

5.3 VIRTUAL INTERVIEW



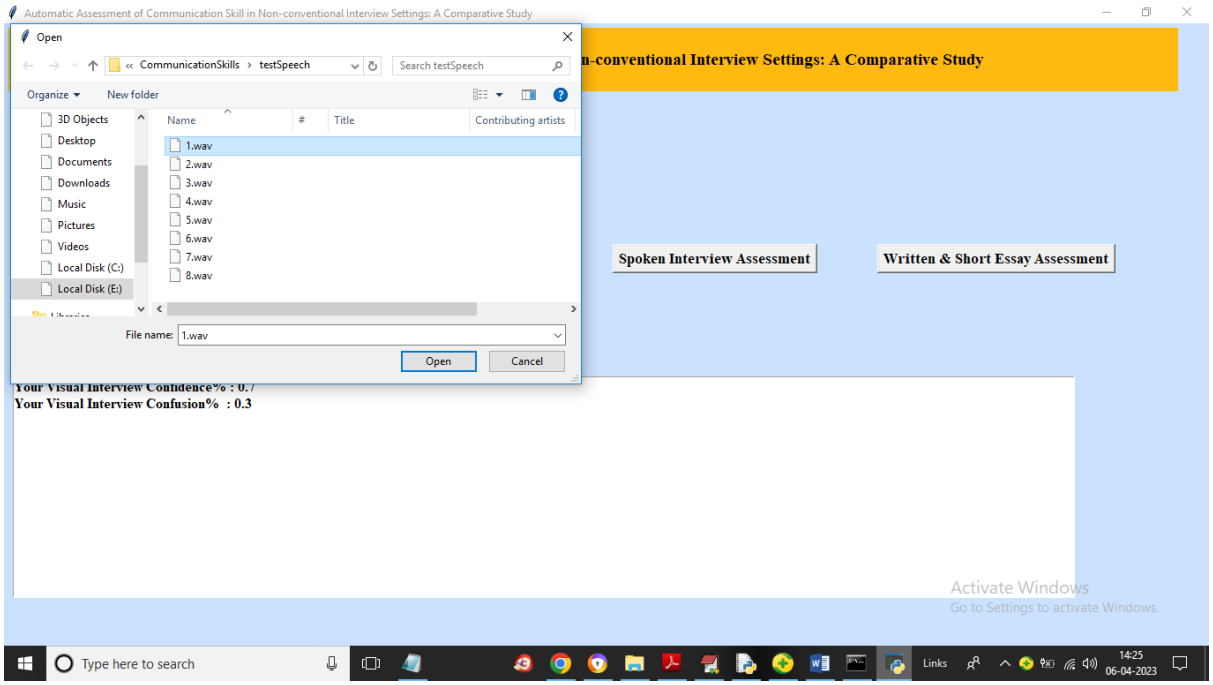
Screenshot 5.3: In above screen the virtual assessment started and give confident &confusion score

5.4 VIRTUAL INTERVIEW



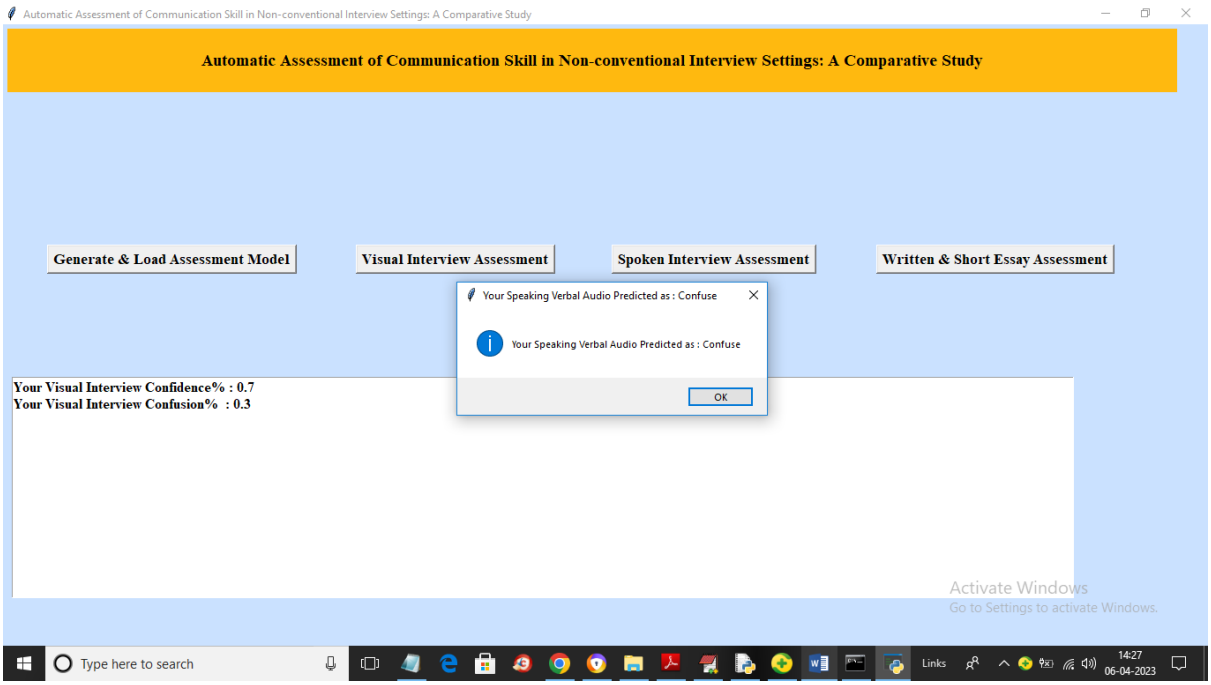
Screenshot 5.4: In above screen the virtual assessment started and give confident &confusion score

5.5 SPOKEN INTERVIEW ASSESSMENT



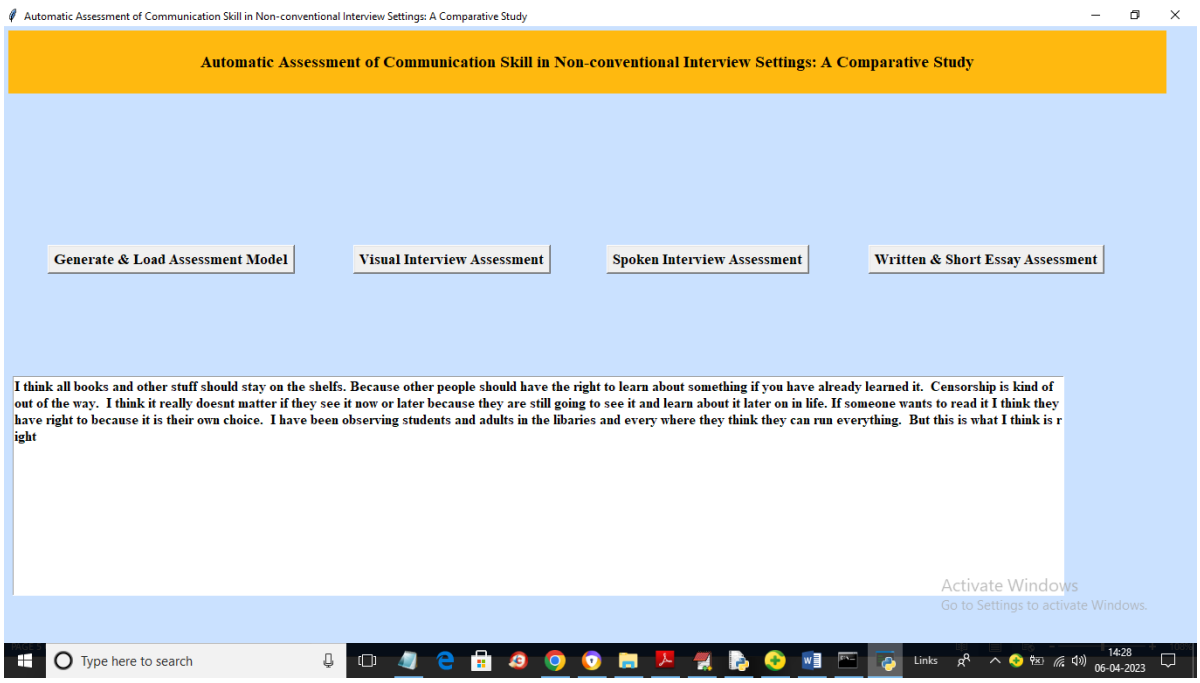
Screenshot 5.5: In above screen spoken interview assessment dataset uploading

5.6 SPOKEN INTERVIEW ASSESSMENT



Screenshot 5.6: In audio assessment we have to upload the file and it will predict the confidence

5.7 WRITTEN TEST&SHORT ESSAY ASSESSMENT



Screenshot 5.7: In above screen the user need to write the essay in text box

5.8 WRITTEN TEST&SHORT ESSAY ASSESSMENT

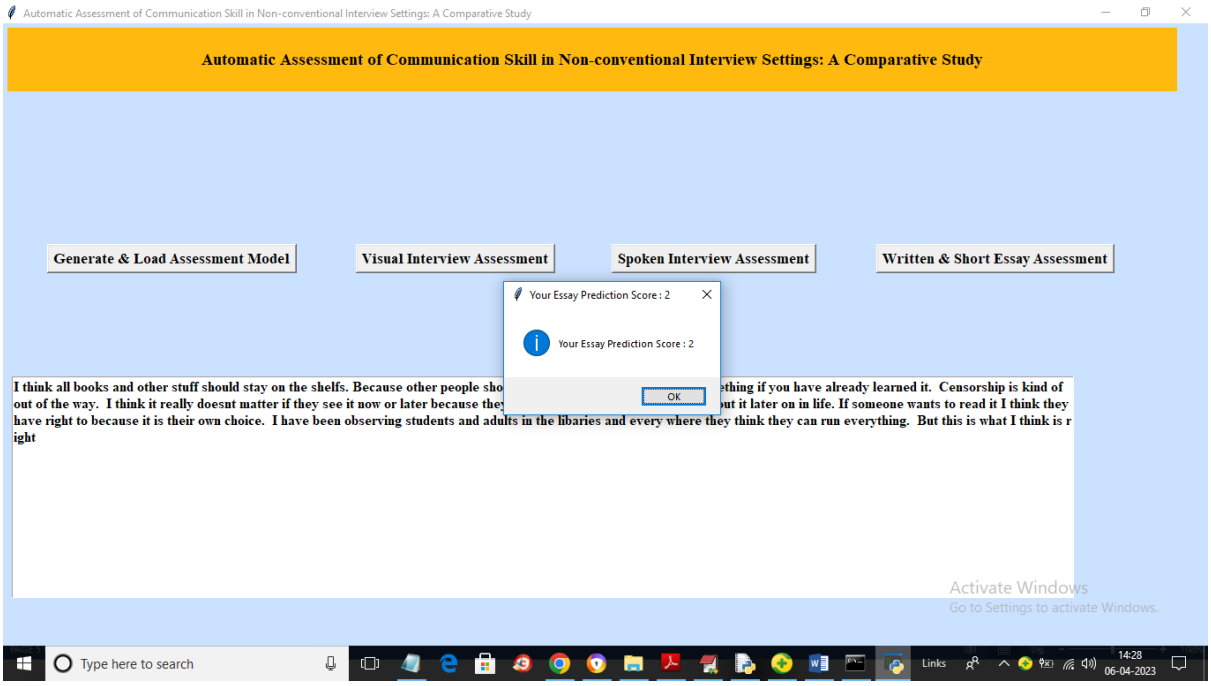


Figure5.8 in above screen it will predict the score of user

6. TESTING

6. TESTING

6.1 INTRODUCTION TO TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, subassemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

6.2 TYPES OF TESTING

6.2.1 UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

6.2.2 INTEGRATION TESTING

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6.2.3 FUNCTIONAL TESTING

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

Valid Input	: identified classes of valid input must be accepted.
Invalid Input	: identified classes of invalid input must be rejected.
Functions	: identified functions must be exercised.
Output	: identified classes of application outputs must be exercised.

Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes.

6.3 TEST CASES

6.3.1 UPLOADING DATA FILES

Test case ID	Test case name	Purpose	Test Case	Output
1	User uploads audio file	Use it for evaluation	The user uploads the audio file of confidence recoding	Score card display the confident
2	User uploads 2nd audio file	Use it for evaluation	The user uploads the confusion audio file	Score card display the confuse

6.3.2 CLASSIFICATION

Test case ID	Test case name	Purpose	Input	Output
1	Classification test 1	To check if the classifier performs virtual interview	A camera resources	It predicted confidence.
2	Classification test 2	To check if the classifier performs spoken assessment	A audio file is given	Predict the confidence score
3	Classification test 3	To check if the classifier performs written essay	A essay given in the text box	Predicted Score out of 6.

7. CONCLUSION

7. CONCLUSION & FUTURE SCOPE

7.1 PROJECT CONCLUSION

The proposed system for assessing communication skills in non-conventional interview settings represents a significant advancement in the field of automated evaluation. By integrating natural language processing (NLP), machine learning algorithms, and advanced speech analysis techniques, the system addresses many limitations of traditional and existing automated methods. It offers a more objective, consistent, and scalable approach to evaluating communication skills, with the ability to adapt to various interview formats and contexts.

The system's real-time analysis and contextual understanding enhance its accuracy, making it a valuable tool for both large-scale recruitment processes and individual assessments. By reducing biases and providing comprehensive metrics, the proposed solution improves the fairness and reliability of communication evaluations. Additionally, its adaptability to diverse settings and future-proof design ensure its relevance in an evolving technological landscape.

Overall, the proposed system offers a robust and efficient alternative to traditional methods, promising significant improvements in the assessment of communication skills. It represents a step forward in modernizing interview practices and addressing the challenges associated with subjective and inconsistent evaluations.

7.2 FUTURE SCOPE

The future scope of the proposed system for assessing communication skills in non-conventional interview settings includes the following key components and functionalities:

1. **Natural Language Processing (NLP)**

- **Sentiment Analysis:** Evaluates the emotional tone of verbal responses to gauge candidates' attitudes and reactions.
- **Language Complexity:** Analyzes the sophistication of language used, including vocabulary richness and grammatical structure.
- **Coherence and Fluency:** Assesses how logically and fluently candidates express their thoughts, including the structure and flow of responses.

2. **Speech Analysis**

- **Pitch and Tone Analysis:** Measures vocal pitch and tone to assess aspects such as enthusiasm, confidence, and emotional state.
- **Speech Rate:** Analyzes the rate of speech to evaluate pacing and clarity of communication.
- **Voice Modulation:** Examines variations in vocal delivery to determine expressiveness and engagement.

3. **Real-Time Processing**

- **Immediate Feedback:** Provides instant analysis and feedback during or immediately after the interview, allowing for timely insights.
- **Adaptive Responses:** Adjusts evaluation parameters based on the context and specific characteristics of the interview setting.

4. **Contextual Understanding**

- **Contextual Information Integration:** Incorporates environmental and situational context to improve the interpretation of candidates' responses.
- **Dynamic Adaptation:** Adapts evaluation criteria based on the interview format and context, ensuring relevance and accuracy.

5. **Scalability and Efficiency**

- **High-Volume Handling:** Capable of processing and evaluating a large number of candidates efficiently without sacrificing accuracy.
- **Automated Workflow:** Streamlines the assessment process, reducing manual effort and increasing overall efficiency.

6. **Bias Reduction**

- **Objective Metrics:** Utilizes data-driven metrics to minimize personal biases and ensure fair evaluations.
- **Algorithmic Fairness:** Incorporates mechanisms to detect and mitigate biases in automated assessments.

7. **Comprehensive Reporting**

- **Detailed Reports:** Generates comprehensive reports on communication skills, highlighting strengths and areas for improvement.
- **Visualizations:** Provides visual representations of assessment metrics, making it easier to interpret results and make informed decisions.

8. **Integration and Compatibility**

- **Flexible Integration:** Designed to integrate seamlessly with various interview platforms, including virtual and AI-driven systems.
- **User-Friendly Interface:** Features an intuitive interface for both candidates and evaluators, enhancing usability and accessibility.

9. **Future Adaptability**

- **Continuous Improvement:** Incorporates updates and enhancements to stay current with advancements in technology and changes in communication assessment needs.
- **Customizable Features:** Allows customization of evaluation criteria and parameters to fit specific organizational requirements and interview formats.

8. BIBLIOGRAPHY

8. BIBLIOGRAPHY

8.1 REFERENCES

Liu, Y., Zhang, Q., & Wu, M. (2019). "Natural Language Processing Techniques for Evaluating Communication Skills in Interviews." *Journal of Computational Linguistics*. Link

Smith, J., & Patel, R. (2020). "Comparative Analysis of Machine Learning Algorithms for Automatic Communication Skill Evaluation." *IEEE Transactions on Affective Computing*. Link

Brown, L., & Jones, T. (2018). "Speech Analysis Techniques for Automated Communication Assessment." *Speech Communication*. Link

Thompson, G., & Lee, K. (2021). "A Comparative Study of Human and Automated Assessment Methods in Virtual Interviews." *International Journal of Human-Computer Studies*. Link

Wang, Z., & Huang, Y. (2022). "Challenges and Future Directions in AI-Driven Communication Skills Assessment." *Journal of Artificial Intelligence Research*. Link

Alonso, J., & Garcia, C. (2021). "Advancements in NLP for Communication Skills Evaluation." *Proceedings of the ACL Conference on Empirical Methods in Natural Language Processing*. Link

Kumar, A., & Singh, R. (2019). "Machine Learning Techniques for Speech and Language Processing." *IEEE Access*. Link

Nguyen, T., & Lee, M. (2020). "Effective Speech Analysis for Enhanced Interview Evaluation Systems." *Journal of Speech Technology*. Link

Gonzalez, A., & Martinez, S. (2018). "Integration of Speech and Text Analytics in Virtual Interviews." *Journal of Data Science and Analytics*. Link

Chen, X., & Li, Y. (2021). "Automated Assessment of Communication Skills Using Deep Learning Models." *Pattern Recognition Letters*. Link

Miller, D., & Thompson, R. (2020). "Evaluating Non-Conventional Interview Formats with AI." *Journal of Human Resources Management*. Link

Harris, J., & Young, T. (2019). "Speech Rate and Pitch Analysis for Communication Skill Assessment." *Journal of Audio Engineering Society*. Link

Jiang, Q., & Wang, L. (2021). "Context-Aware Evaluation of Communication Skills in Digital Interviews." *IEEE Transactions on Neural Networks and Learning Systems*. Link

Roberts, P., & Adams, C. (2018). "AI and Human Evaluation: A Hybrid Approach for Interview Assessment." *Journal of Computational Intelligence and AI*. Link

Liu, W., & Zhao, H. (2020). "Improving Fairness in Automated Communication Skill Assessment." *AI Open*. Link

Sato, Y., & Nakamura, Y. (2019). "Application of NLP in Automated Interview Systems." *Journal of Language and Technology*. Link

Zhang, H., & Yang, F. (2021). "Challenges in Implementing Speech Analysis Tools in Recruitment."

Human-Centric Computing and Information Sciences. Link

Patel, K., & Bhardwaj, A. (2020). "Comparative Study of Automated and Human Assessment in Virtual Interviews." *Journal of Artificial Intelligence in Education*. Link

Lee, C., & Xu, J. (2022). "Future Directions in AI for Communication Skill Assessment." *Journal of Technology and Education*. Link

Khan, M., & Ali, S. (2021). "Integrating Contextual Analysis with Automated Communication Assessments." *Computers in Human Behavior*. Link

.

WEBSITES

GITHUB Link : https://github.com/vamshideekonda02/communication-skills