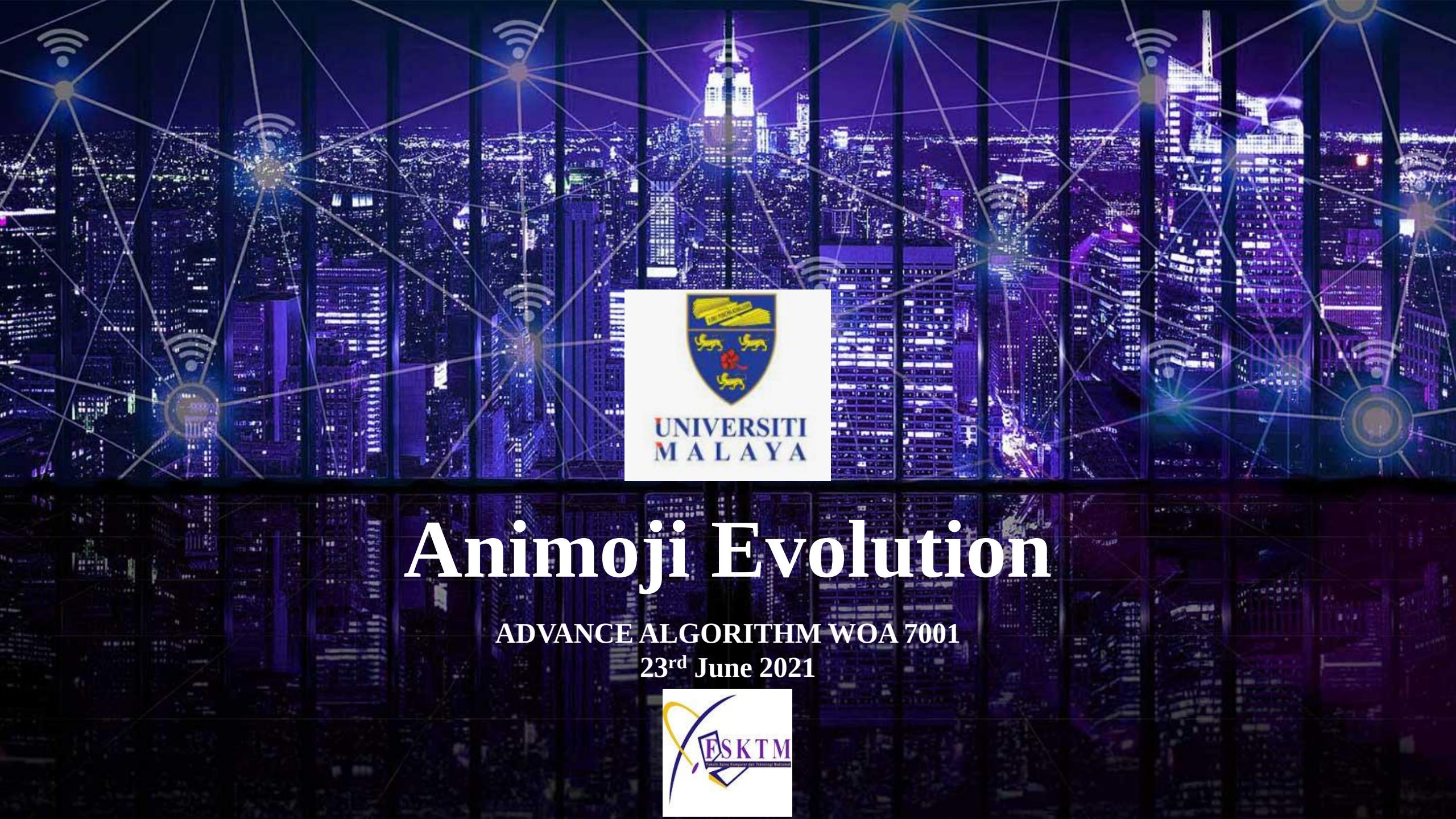

Animoji Evolution

ADVANCE ALGORITHM WOA 7001

23rd June 2021

Prepared by

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LECTURER : DR. RAJA JAMILAH BT RAJA YUSOF

SUBJECT : WOA7001 – ADVANCE ALGORITHM

SUBMISSION DATE : 23rd June 2021

Our Team Members

Three team members make up the Animoji Evolution Project. Each of us comes from a unique background and set of talents. Each team member complimented the others' shortfalls and worked cooperatively to ensure the project's success.

Zuha

SME Project Manager

Responsible for on going project planning and Python programming and full SDLC

Zayeem

Sr. Python Programmer

Responsible for Python programming, POC and full SDLC.

Flash

IT Analyst Web Designer

Responsible for web development and system testing.

PROJECT PLANNING AND IMPLEMENTATION

Group Contracts

We have outlined contracts agreed by the team members and acknowledged before the start of the project to avoid conflict or misconception during the project phase.

Contract Item: As a Team we agree to	
• Participation	All team members to attend weekly meeting/discussion and brainstorming session through MS Teams. Everyone shall contribute to the project need during each of the session.
• Communication	All team members shall communicate progress and blockers or difficulties through MS Teams and Whatsapp Group during on weekdays and Saturdays between 8am to 10pm.
• Meetings	Meeting shall be scheduled according to everyone's availability and attendees may not be all the team members for each meeting. Meetings shall be scheduled with contexts or topic detailed in the invites content.
• Conduct	All members within the team shall be courteous and respectful with each other.
• Deadlines	Deadlines will be defined in weekly basis to be able to produce deliverables. Each team members shall work towards meeting the deadline accordingly and to seek for support incase of any blockers ahead of the deadlines.
• Conflict	Each team members have the rights to argue and defer any suggestions – this shall be discussed in a professional manner and to be resolved with the project best interest.

Agenda

01 Introduction

- Overview of project requirement and objective
- Project scope and limitations
- Project planning and FILA forms
- High level process flow (program & testing)

02 Animoji

- Animoji Introduction
- Animoji Analysis
- Animoji Creation and Conversion

03 Program Design

- About the program
- How it is designed
- What methods is used
- Advantages of the program

04 Results & Discussion

- Test cases
- Test Results
- Discussions/Conclusions

01 INTRODUCTION

INTRODUCTION

- The purpose of this project is to implement a speech recognition program that detect the emotion of the input voice using DTW algorithm per below requirement statement by Dr Raja Jamilah
  - Each group is to implement an Animoji system that acts upon the type of speech sent in a recorded voice message
- Holistically this project has started with creation of a set of Animoji and developed a program using python programming language to detect the emotion of the input voice.
- This voice detection are started with training voices which will then be compared with the input voice though multiple test cases which will be discussed in detail in the testing result section.

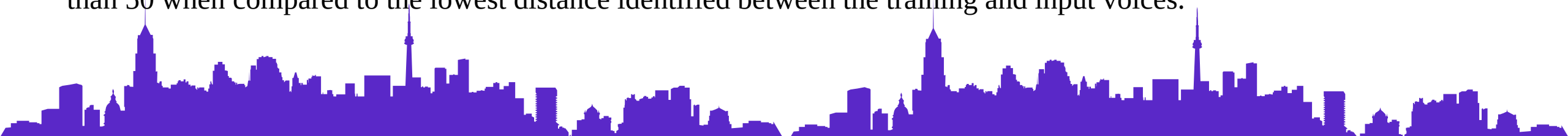
OBJECTIVE

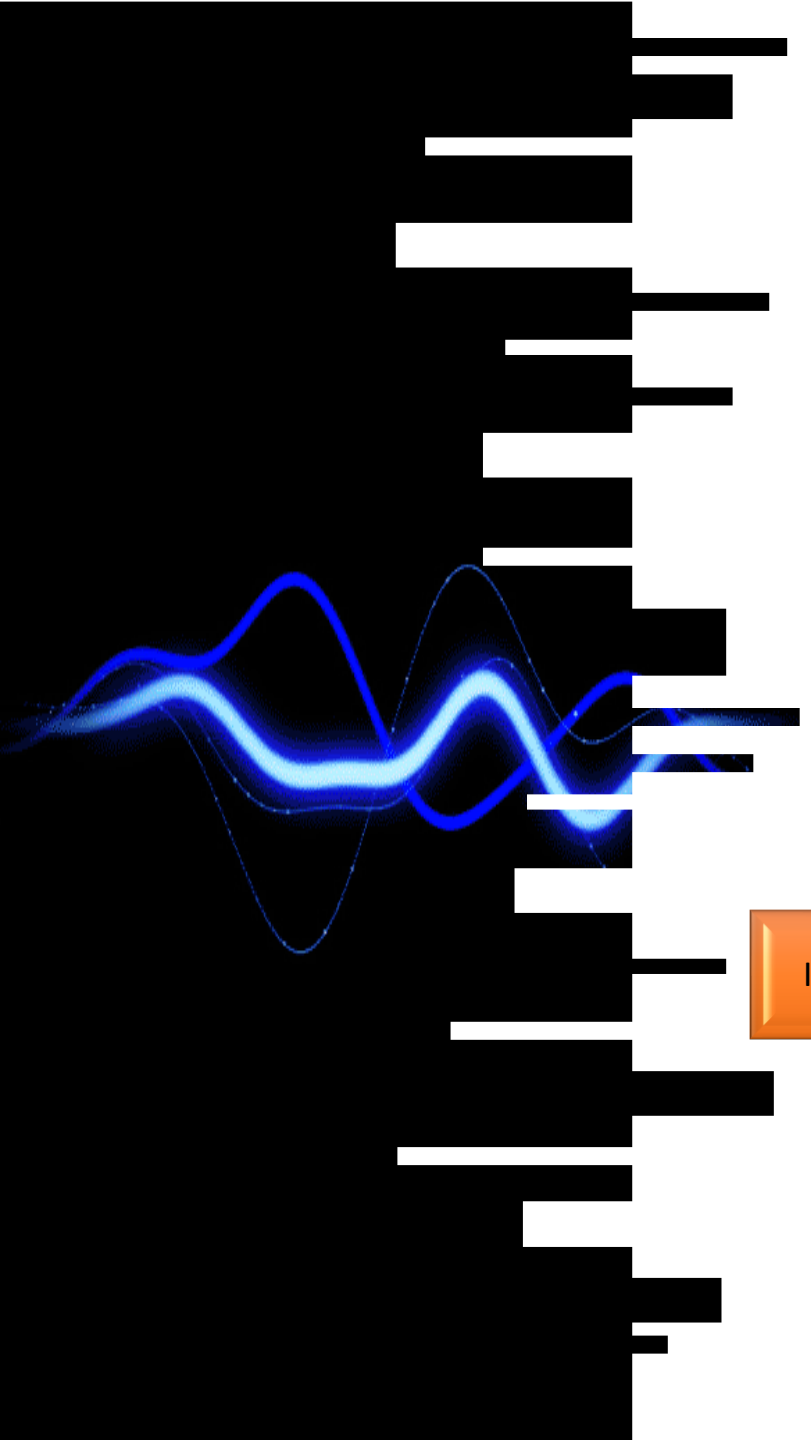
- To gain knowledge through hands-on experience on real-world projects with a condensed timetable and restricted resources.
- Demonstrate familiarity with major advanced algorithms.
- Apply advanced design and analysis techniques (DTW algorithm)
- Apply concepts and skills to develop information system by developing desktop application for emotion detection

PROJECT SCOPE AND LIMITATION

Dynamic programming is simple to implement, and DTW is a good demonstration of dynamic programming. While on its own, DTW has average speaker-independent performance. There needs to be practical training examples for the comparison to be made. When it comes to continual recognition activities, it is prone to failure. Despite having developed a straightforward voice recognition system utilizing DTW, we included a proof of concept by building a system that incorporated DTW along with other features such as word detection and MFCC features standard deviation for testing purpose. Limited by time and resource constraints, the project wasn’t able to extend the library of training voice as this would require extensive level of investigation and calculations.

After executing the programme and determining the appropriate emotion detection threshold values. We discovered that any voice with an MFFC value distance comparison of less than 50 had the correct sentiment. As a result, we have configured the algorithm to continue the loop process of identifying the correct emotions only if the DTW distance is less than 50 when compared to the lowest distance identified between the training and input voices.





WEEK1

Planning and Contract Signing

- Plan how to design and develop the program according to requirement
- Complete DS1 task
- Choose and create Animoji

WEEK2

DS2 & D3

- Complete DS and DS3 task
- Show working DTW algorithm with voice input

WEEK3

D3 & D4

- Show working DTW algorithm with voice input and Animoji

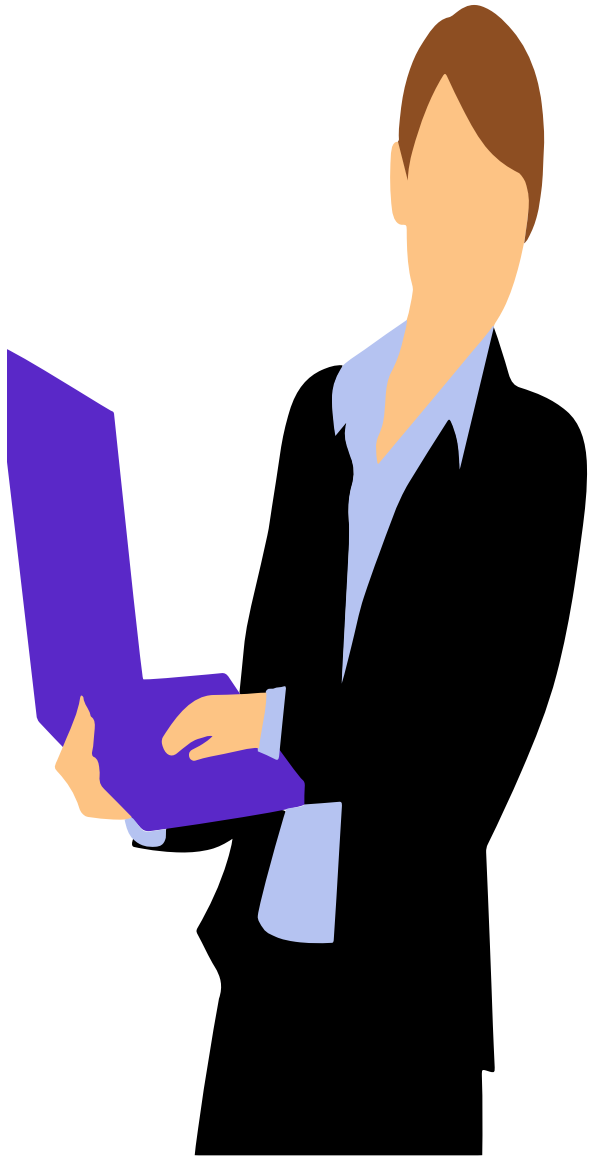
WEEK4

Final touch up/ Testing and Presentation

- Show working code and updated resources in repository, presentation slides

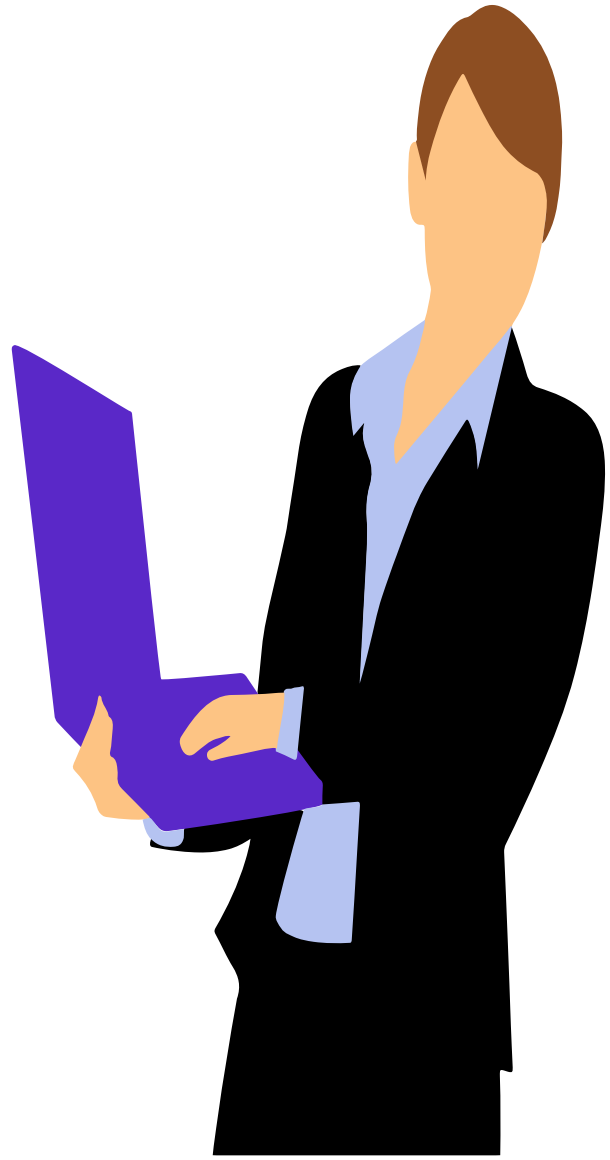
FILA FORM WEEK 1

FACTS	IDEAS	LEARNING ISSUES	ACTION	DATELINE
What we know about the task	What do we need to find out?		Who is going to do it?	02/06/2021
Planning	Define & Update group contract		Zuha	02/06/2021
	Define project planning		Zuha/Zayeem/Flash	02/06/2021
	Select emotion for the project		Zuha/Zayeem/Flash	02/06/2021
	Animoji program design process flow		Zuha/ Zayeem/Flash	02/06/2021
	Consolidate content in the report		Zuha/ Zayeem	02/06/2021
	Create FILA form		Zuha	02/06/2021
DS1: Define& Analyze Animoji	Introduction		Zayeem	02/06/2021
	Project background/Literature Review		Zuha/Zayeem	02/06/2021
	Animoji Analysis		Zuha/Zayeem/Flash	02/06/2021
	References		Zayeem	02/06/2021
DS2: Create Animoji	Create Anger, Disgust, Neutral, Unidentified Memoji		Zuha	02/06/2021
	Record Memoji Anger, Disgust, Neutral, and Unidentified		Zuha	02/06/2021
	Convert Memoji video into Animoji GIF		Zuha	02/06/2021
DS3: DTW Algorithm	Research on DTW		Zuha/Zayeem/Flash	02/06/2021
DS4: Program coding	Research on existing speech recognition program		Zuha/Zayeem/Flash	02/06/2021



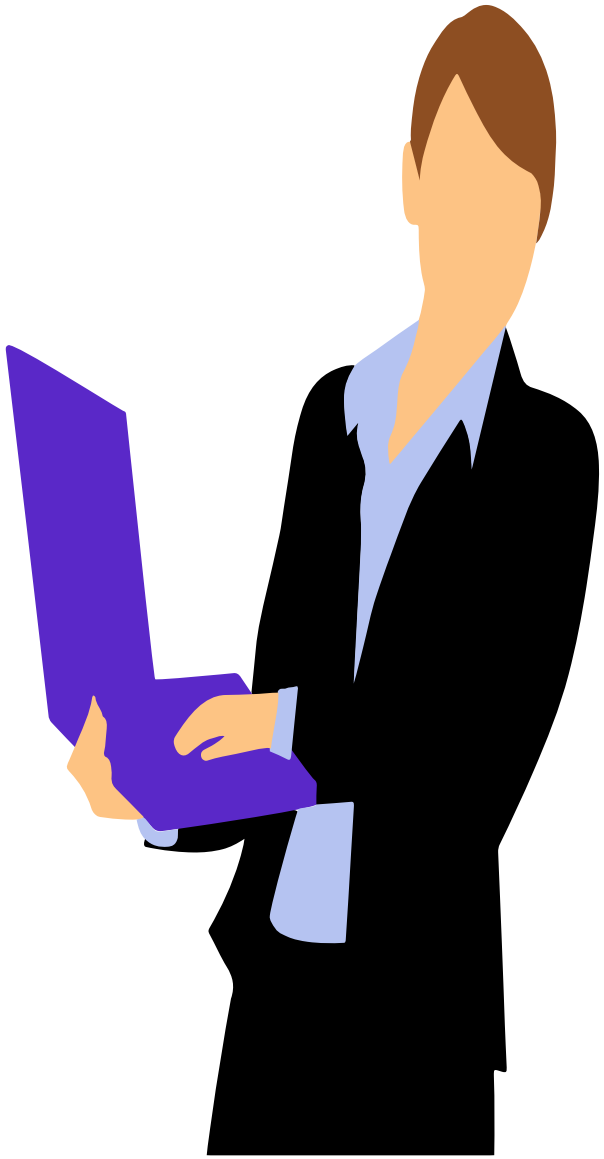
FILA FORM WEEK 2

FACTS	IDEAS	LEARNING ISSUES	ACTION	DATELINE
What we know about the task	What do we need to find out?		Who is going to do it?	09/06/2021
Planning	Project week 2 task planning		Zuha	09/06/2021
	Create/Update FILA form		Zuha	09/06/2021
	Upload progress file on Github		Zuha	09/06/2021
	Create website (Front end)		Flash	09/06/2021
	Upload and create links for team's progress		Flash	09/06/2021
DS1: Define& Analyze Animoji	Animoji Analysis Update		Zuha	09/06/2021
DS2: Create Animoji	Update and convert Animoji into GIF		Zuha	09/06/2021
DS3: DTW Algorithm	Report: Speech Recognition and process flow		Zuha/Zayeem	09/06/2021
	Report: MFCC		Zayeem	09/06/2021
	Report: DTW Background		Zuha/Zayeem	09/06/2021
	Report: DTW Algorithm Pseudocode		Zuha/Zayeem	09/06/2021
	Report: DTW Time Complexity /Weakness		Zuha	09/06/2021
	Report: Project Scope limitation DTW Implementation		Zuha/Zayeem	09/06/2021
	Python code: implementation (part 1 – voice to text input)		Zayeem	09/06/2021
	Python code: implementation (part 2 – Animoji GIF output)		Zuha	09/06/2021
	Python code: implementation (part 3 – detecting the pitch/frequency/amplitude)		Zuha/Zayeem	09/06/2021
	Python code: implementation (part4 – implementing DTW part1)		Zayeem	09/06/2021
	Python code: implementation (part5 – implementing DTW part2)		Zuha	09/06/2021
	Testing: Python program testing and quality control		Flash	09/06/2021
	Testing: Python speech recognition testing method		Flash	09/06/2021



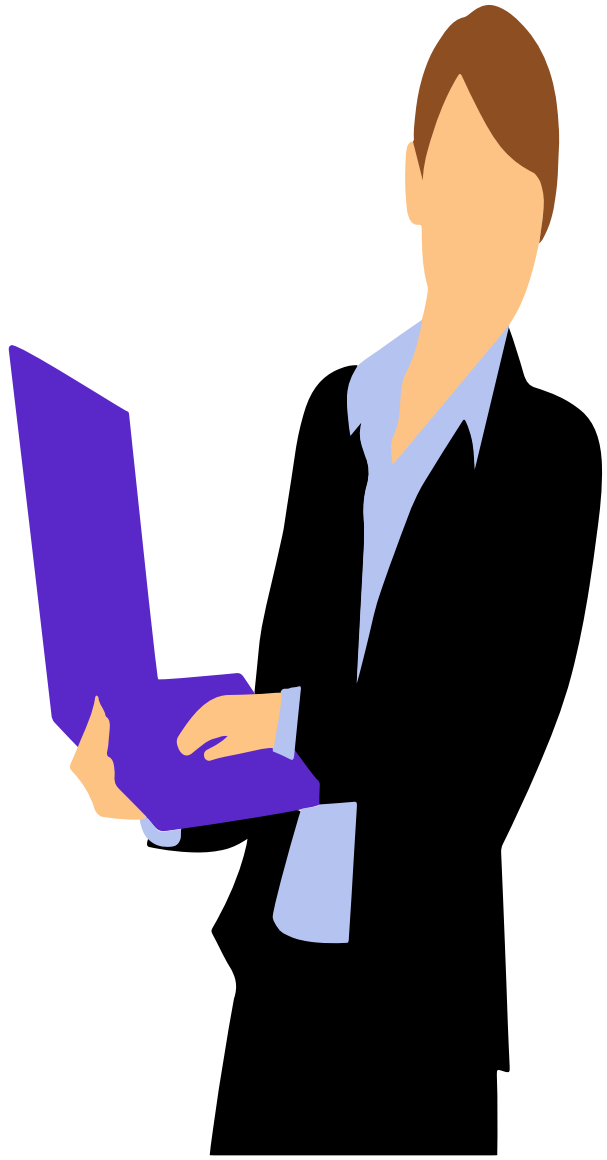
FILA FORM WEEK 3

FACTS	IDEAS	LEARNING ISSUES	ACTION	DATELINE
What we know about the task	What do we need to find out?		Who is going to do it?	16/06/2021
Planning	Project week 3 task planning		Zayeem	16/06/2021
	Create/Update FILA form		Zuha	16/06/2021
	Upload progress file on Github		Zuha	16/06/2021
	Update website (Front end)		Flash	16/06/2021
	Upload and create links for team's progress on website		Flash	16/06/2021
DS1: Define& Analyze Animoji	Animoji Analysis Update		Zayeem	16/06/2021
DS2: Create Animoji	Update and convert Animoji into GIF		Zuha	16/06/2021
DS3: DTW Algorithm	Report: MFCC		Zayeem	16/06/2021
	Report: DTW Algorithm Pseudocode		Zuha/Zayeem	16/06/2021
	Report: DTW Time Complexity /Weakness		Zuha	16/06/2021
	Report: Project Scope limitation DTW Implementation		Zuha	16/06/2021
DS4: Program integration	Python code: Code optimization		Zuha/Zayeem	16/06/2021
	Python code: GUI improvement (part1- input)		Zuha	16/06/2021
	Python code: GUI improvement (part2 – output consolidation)		Zayeem	16/06/2021
	Python code: Implementation update to improve Animoji output		Zuha	16/06/2021
	Python code: Explore how to make python program to exe		Zuha	16/06/2021
	Python code: Explore standard deviation calculation to improve accuracy		Zayeem	16/06/2021
	Testing: Testing the input and output Animoji		Zuha/Zayeem/Flash	16/06/2021

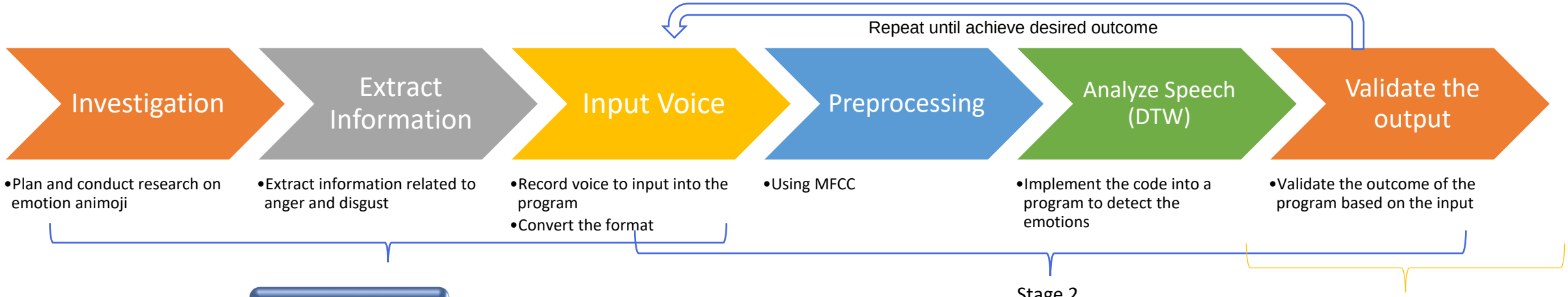


FILA FORM WEEK 4

FACTS	IDEAS	LEARNING ISSUES	ACTION	DATELINE
What we know about the task	What do we need to find out?		Who is going to do it?	23/06/2021
Planning	Project week 4 task planning		Zayeem	23/06/2021
	Create/Update FILA form		Zuha	23/06/2021
	Upload progress file on Github		Zuha	23/06/2021
	Upload and create links for team's progress on website		Flash	23/06/2021
DS3: DTW Algorithm	Report Writing: Overall report consolidation		Zuha/Zayeem	23/06/2021
	Report Writing: Part1		Zuha	23/06/2021
	Report Writing: Part 2		Zayeem	23/06/2021
	Report Writing: Test cases and result		Flash	23/06/2021
DS4: Program integration	Python code: Code optimization – Only DTW distance for detection		Zuha	23/06/2021
	Python code: Code optimization – DTW & Word Detection		Zuha/Zayeem	23/06/2021
	Python code: Code optimization – DTW & Std Deviation		Zayeem	23/06/2021
	Python code: Code optimization – DTW & word & std deviation		Zuha/Zayeem	23/06/2021
	Testing: Only DTW distance		Zuha/Flash	23/06/2021
	Testing: Only DTW distance & word		Zuha/Flash	23/06/2021
	Testing: DTW & Std Deviation		Zayeem/Flash	23/06/2021
	Testing: DTW & word & std deviation		Zayeem/Flash	23/06/2021
Presentation Slide	Consolidation of Slide		Zuha	23/06/2021
	Slide preparation Part 1		Zuha	23/06/2021
	Slide preparation Part 2		Zayeem	23/06/2021
	Slide preparation Part 3		Flash	23/06/2021



Program Development Process Flow



Stage 2

Voice Recognition

Training - This is where we create a library of sample voices:
1. Female voice
2. Male voice
3. Combination of male and female voice (for future projects)

Testing - Here we ensure the stored voice match with the reference and recognition model

Test Scenario
1. Testing using random word
2. Testing using predefined words
3. Testing comparing same gender's voice
4. Testing comparing different gender voice

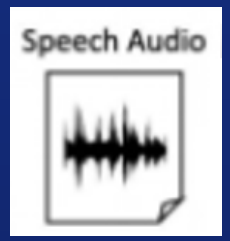
Total test cases (3x4 = 12)

- Detection using DTW distance
- Detection using DTW distance & Std Deviation
- Detection using word matching & DTW distance

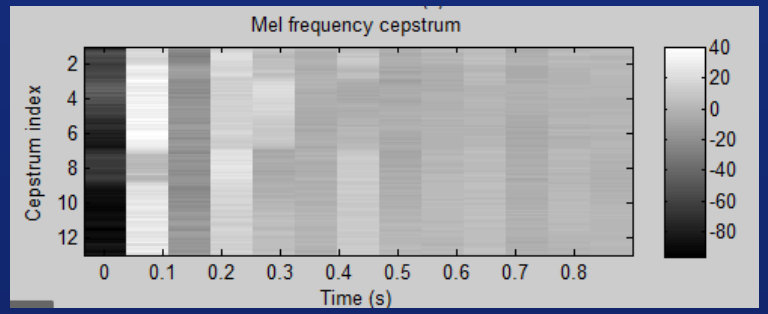
Test Process Flow

Testing was conducted in accordance with the procedure outlined in the following figure. Although the procedure is straightforward, the total process involves extensive test quality validation by all team members

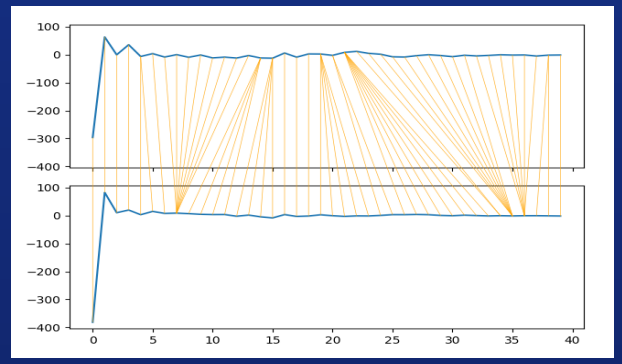
Input Speech Audio written into a file

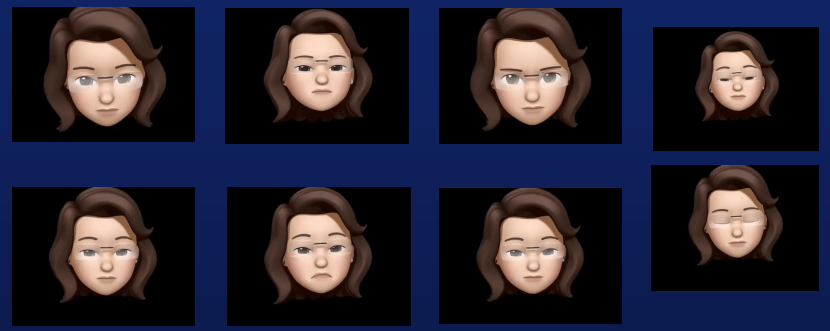


MFCC Features Extraction

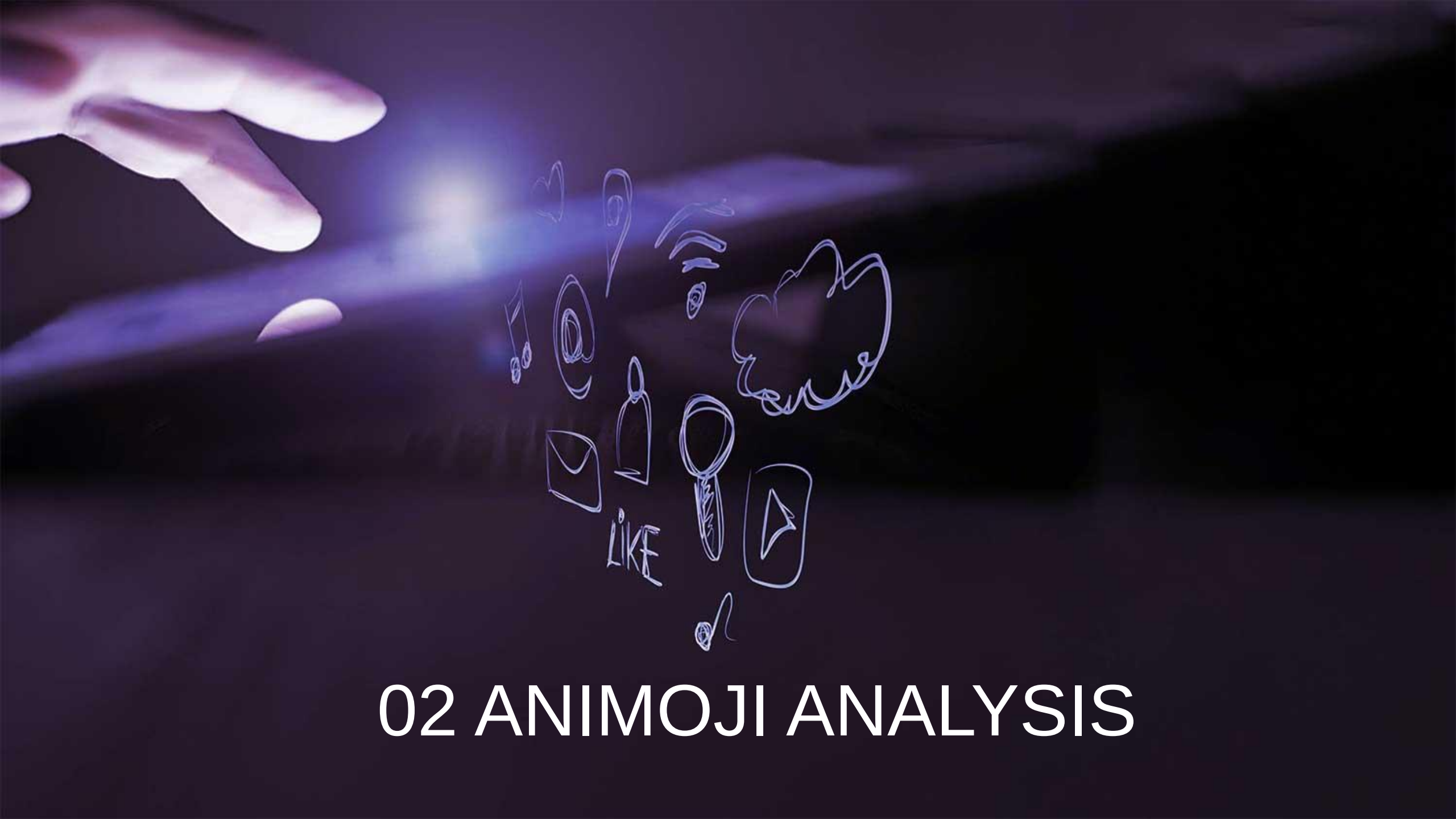


DTW Distance calculation





Animoji detection based on distance calculation



02 ANIMOJI ANALYSIS

Animoji Analysis

In this project the below emotions were focused.

- ANGER
- DISGUST

According to Cherry, K.(2020) ***Anger*** and ***Disgust*** emotions are expressed by using the following facial expressions

ANGER

Frowning or glaring

DISGUST

Wrinkling the nose and curling the upper lip

The Project also investigates different levels of emotions conveyed in the given speech and tries to identify separate levels of the detected emotion.

ANGER 1 | ANGER 2 | ANGER 3 | DISGUST 1 | DISGUST 2 | DISGUST 3 | NEUTRAL

UNIDENTIFIED

ANIMOJI








LEVELS OF ANGER

According to Seunagal, G. (2021), a profound writer in the field of mental health and psychological therapy defines anger into 4 levels. They are **ANNOYANCE, FRUSTRATION, HOSTILITY,**

DESIGN OF DIFFERENT LEVELS

ANGER 1

POTRAYS ANNOYANCE

ANGER 2

POTRAYS FRUSTRATION

ANGER 3

POTRAYS HOSTILITY

ANIMOJI: Anger Expression

Anger Level 1 “Annoyance”

- ✓ Annoyance can be defined as the first level of anger.
- ✓ It subsides easily compared to other levels of anger.
- ✓ An individual can be annoyed by small things though this topic can be subjective.
- ✓ Some good examples of this level of anger are traffic jams, hearing constantly to someone making unnecessary sounds etc.
- ✓ This level of anger can be regulated easily.

ANIMOJI: Anger Expression

Anger Level 2 “Frustration”

- ✓ If annoyance lasts longer for an individual, it goes to the second level of anger, which is frustration.
- ✓ It is also impacts on the individual’s concentration level.
- ✓ It can linked to negative thinking or emotional state.
- ✓ It takes longer to go away compared to anger level 1 “Annoyance”.

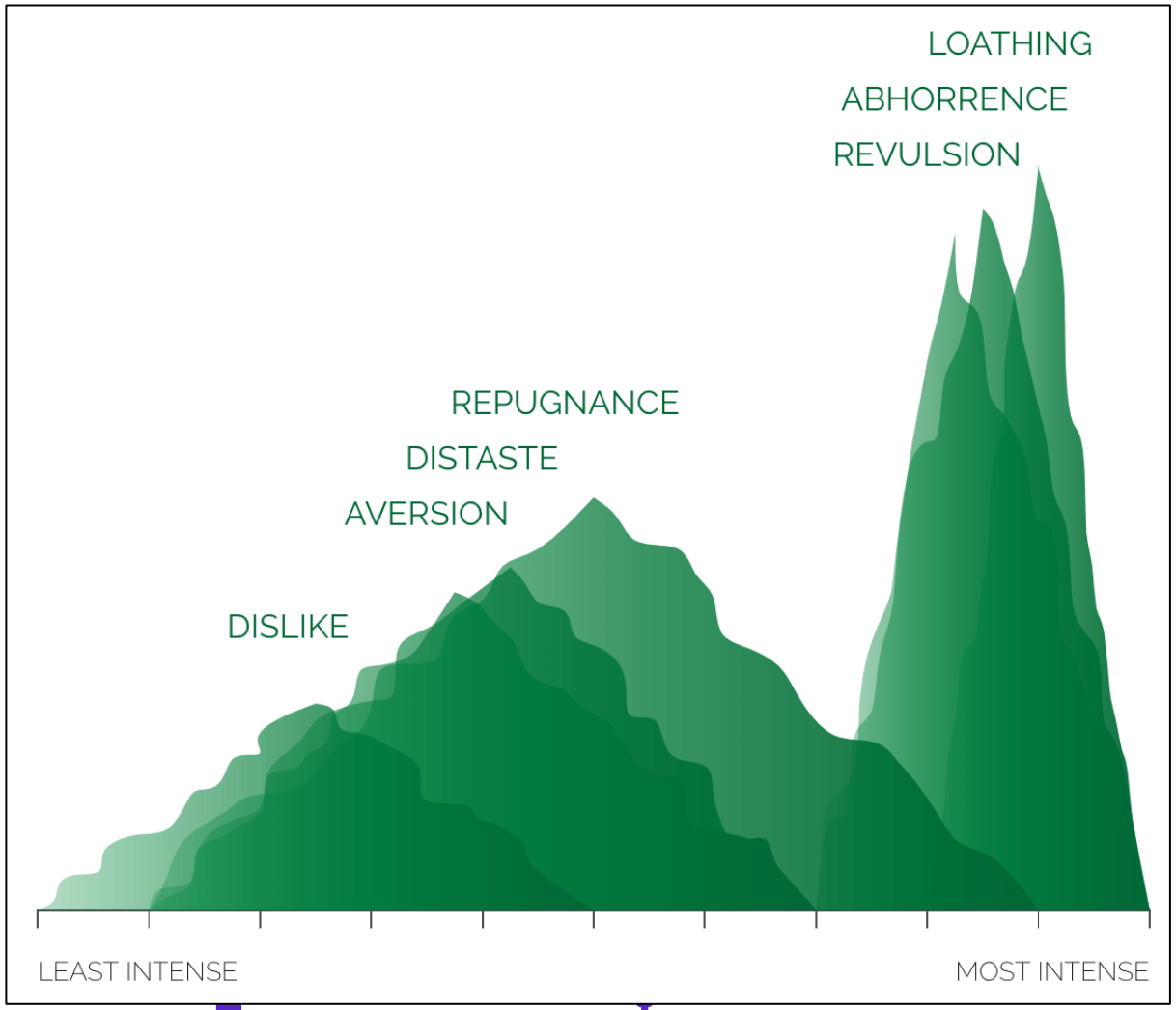
ANIMOJI: Anger Expression

Anger Level 3 “Hostility”

- ✓ It appears to an individual when someone is constantly or consistently exposed to displeasing or threatening situations.
- ✓ An expression of hostility is screaming, Finger pointing, Hands on hips, Fingers clenched into a fist.
- ✓ This level of anger leads to the next level which is called Rage.

LEVELS OF DISGUST

According to Ekman, P. (2021) there are different intensities of disgust. Namely – **DISLIKE**, **AVERSION**, **DISTASTE**, **REPUGNANCE**, **REVULSION**, **ABHORRENCE**, **LOATHING**. *DISLIKE* being the least intense and *LOATHING* being the highest level of disgust. The different intensities of disgust as described by Pail Ekman can be depicted in the figure beside.(Ekman, P., 2021)



LEVELS OF DISGUST(CONTD.)

DIFFERENT LEVELS OF DISGUST

DISGUST 1

POTRAYS DISLIKE

DISGUST 2

POTRAYS DISTASTE

DISGUST 3

POTRAYS LOATHING

LEVELS OF DISGUST(CONTD.)

Disgust Level 1
“Dislike”

This is when someone feel distaste for or hostility towards something.

Disgust Level 2
“Revulsion”

This is a strong pulling or drawing away from something. It could also be a sense of utter distaste or repugnance.

Disgust Level 3
“Abhorrence”

This is the highest state disgust. A feeling of intense dislike or disgust thereby causing hatred.

ANIMOJI: Neutral & Unidentified

Neutral Face

This is a face with simple, open eyes and a flat, closed mouth. Intended to depict a neutral sentiment but often used to convey mild irritation and concern or a deadpan sense of humor.

Unidentified

This pops up when the input voice does not match any of the library words.

03 PROGRAM DESIGN

PROGRAM DESIGN

THE PROGRAM DESIGN SECTION CAN BE DESCRIBED FROM TWO PERSPECTIVES

USER PERSPECTIVE

USER RUNS THE APPLICATION

RECORDS SPEECH

APPLICATION SHOWS ANIMOJI

DEVELOPER PERSPECTIVE

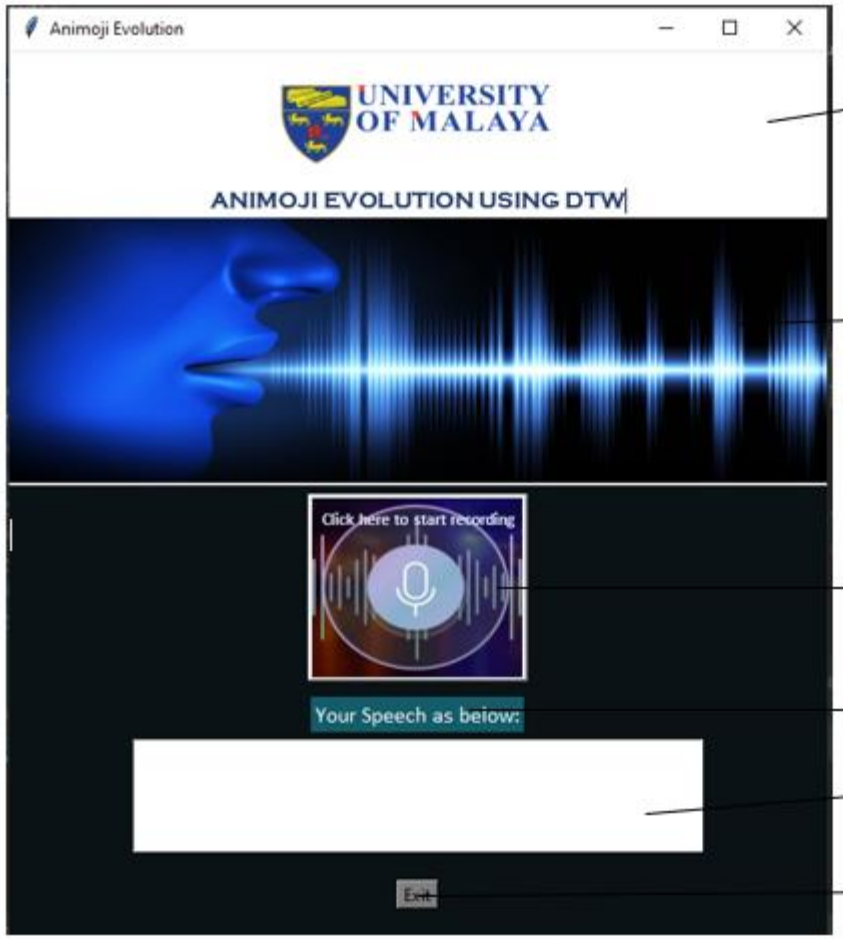
SPEECH GETS RECORDED

CALCULATES THE MFCC VALUES

COMPARES WITH THE LIBRARY

IF MATCHED, SHOWS THE ANIMOJI

PROGRAM GUI



Logo

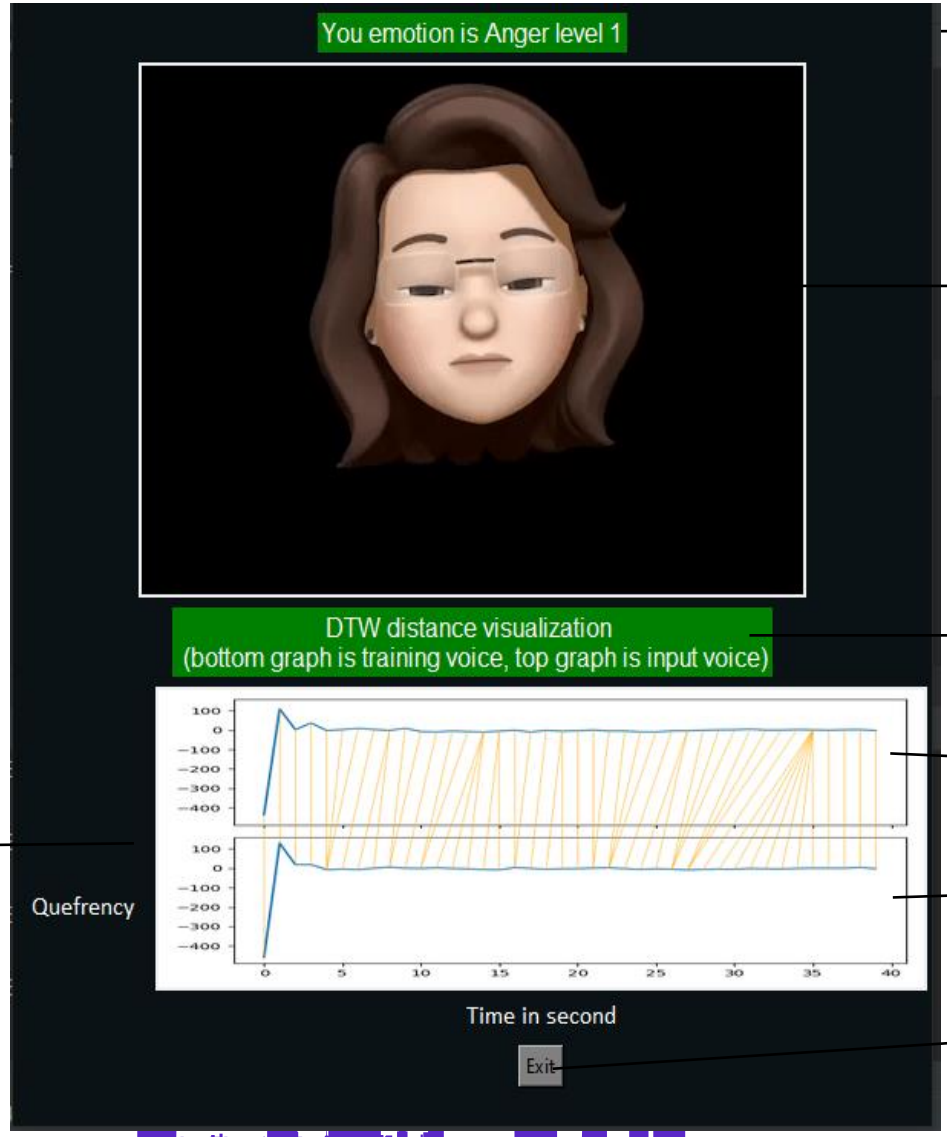
Static Image – can be improved to reflect the real-time voice input waves

Voice recording button

Static Label

Text converted from input speech

Exit button



Emotion Description

Animoji GIF

Label for time warping graph

Recorded voice graph

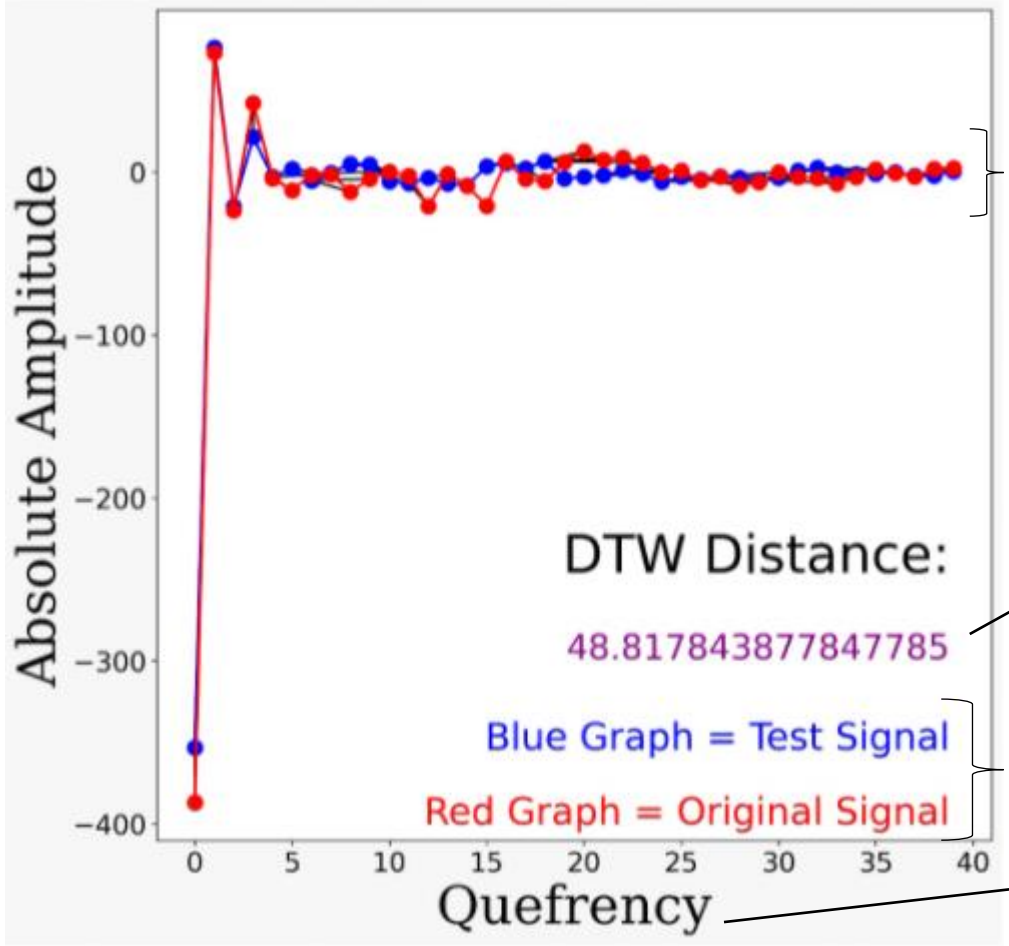
Training voice graph

Time warping graph's X axis label

EXIT button

Time warping

Additional Output File



Time warping graphical representation of 2 voices

The lowest DTW distance

Legends

The frequency of frequency is referred to as Quefrency.
When we calculate the MFCC of speech, we begin with the DFT, then the logarithm of the entire spectrum, and finally the inverse Fourier transform. This is how the quefrency is obtained.

PROGRAM DESIGN (CONTD.)

MFCC MEANS

```
(venv) C:\Users\Zuha\PycharmProjects\AnimojiEvolution>python
[-4.4876694e+02  1.0109952e+02 -3.3746083e+00  3.1109591e+01
 -1.0717710e+00  1.1564893e+01  4.8446374e+00  7.0536180e+00
 -1.6756659e+00  1.2610603e+01 -4.1651793e+00  2.3055232e-01
 -7.1498160e+00 -9.5813398e+00 -3.1372120e+00 -7.0607796e+00
 -8.7929744e-01 -3.6327257e+00  7.1240294e-01 -3.3427670e+00
 -2.4896905e+00 -1.3634344e+00 -1.3618975e+00 -5.1387339e+00
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  5.0221887e+00  2.6576712e+00  8.6756306e+00  5.2579322e+00
 -8.6216366e-01 -3.1181982e+00 -4.5208230e+00 -2.8624134e+00
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```
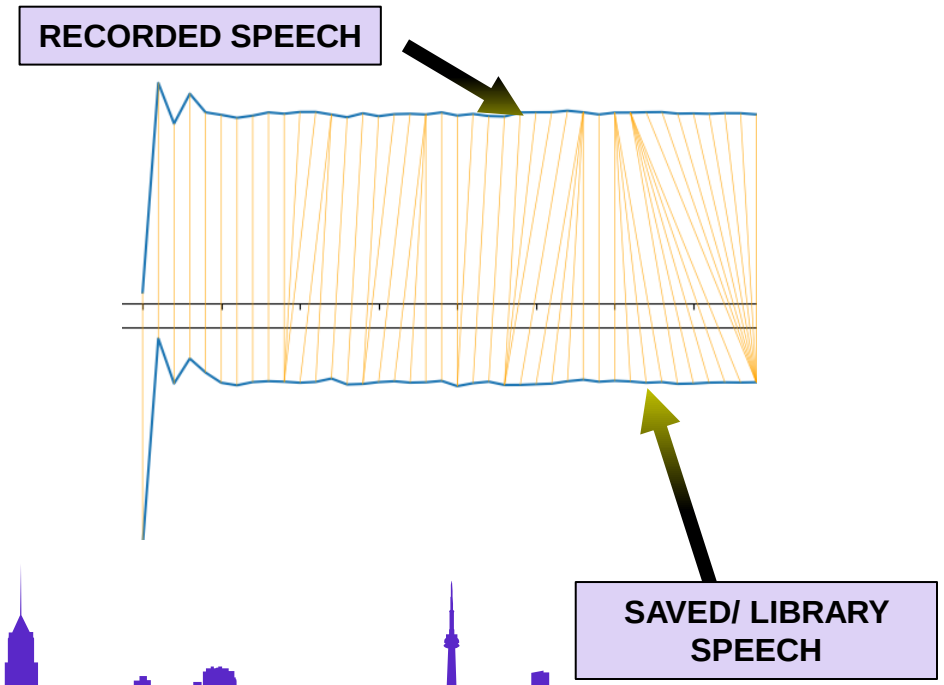

DTW DISTANCE VISUALIZATION



MFCC – MEL FREQUENCY CEPSTRAL COEFFICIENTS

MFCC or Mel Frequency Cepstral Coefficients, is basically the coefficients of the '***Cepstrum***' of the audio signal. The usage of MFCC features dates way back in 1960s and is also used in music processing. Mel-frequency cepstral coefficients (MFCCs) are the coefficients which make up an MFC collectively for the signal.

Cepstrum:
Considering X(t) is a speech signal in the time domain, applying DFT to the signal takes the signal from time domain to frequency domain. a spectrum. After applying logarithm, we get the amplitude spectrum of the signal. Finalyy applying IFT to the result gives cepstrum of the signal.

$$C\big(x(t)\big) = F^{-1}\left[log\big(F[x(t)]\big)\right]$$

MFCC – MEL FREQUENCY CEPSTRAL COEFFICIENTS

REASONS OF USING MFCCs FOR SPEECH RECOGNITION

Two parts in our vocal system:

1) Vocal Tract Frequency
2) Glottal pulse

By Applying MFCC we can clear out the glottal part and retrieve the important features of vocal part such as - formants, phonemes, timbre etc.

MFCC – MEL FREQUENCY CEPSTRAL COEFFICIENTS

FLOW OF RETRIEVING MFCCs

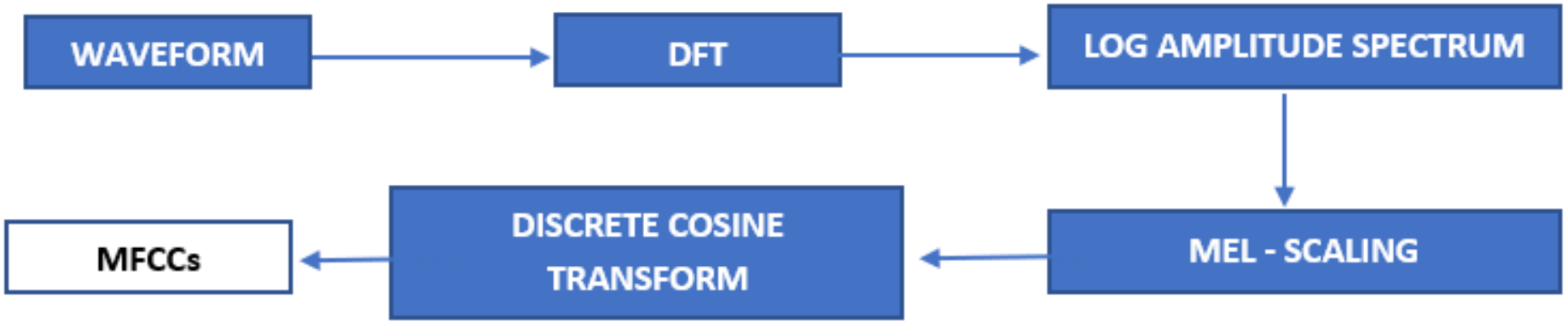
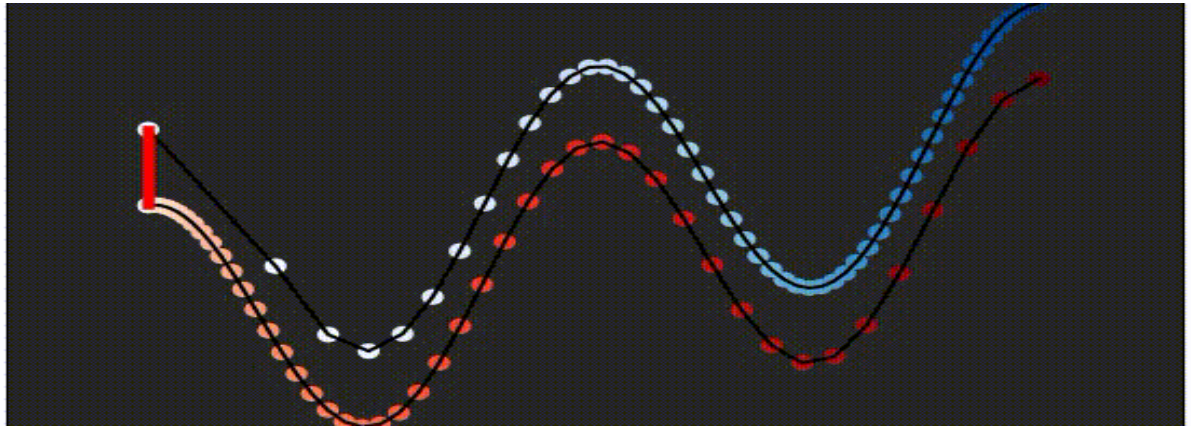
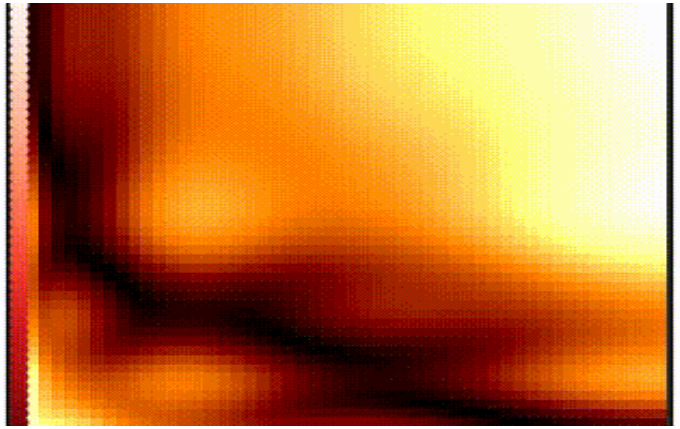
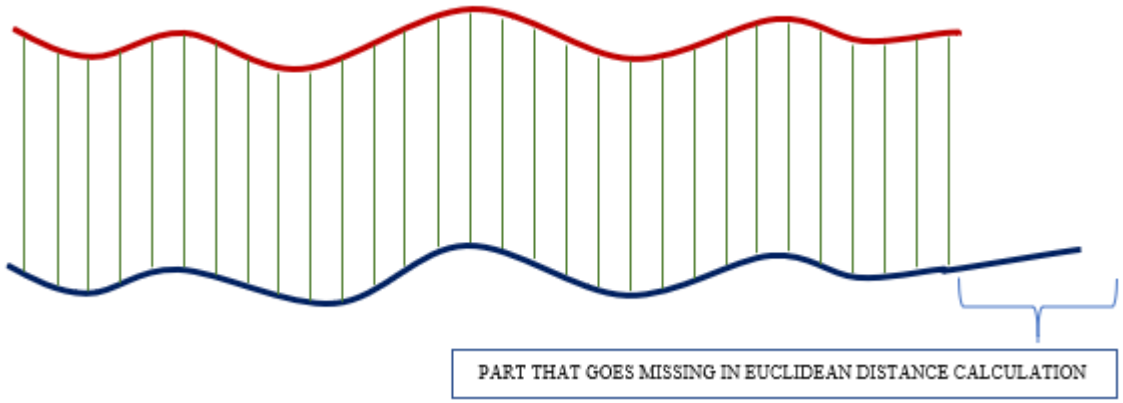


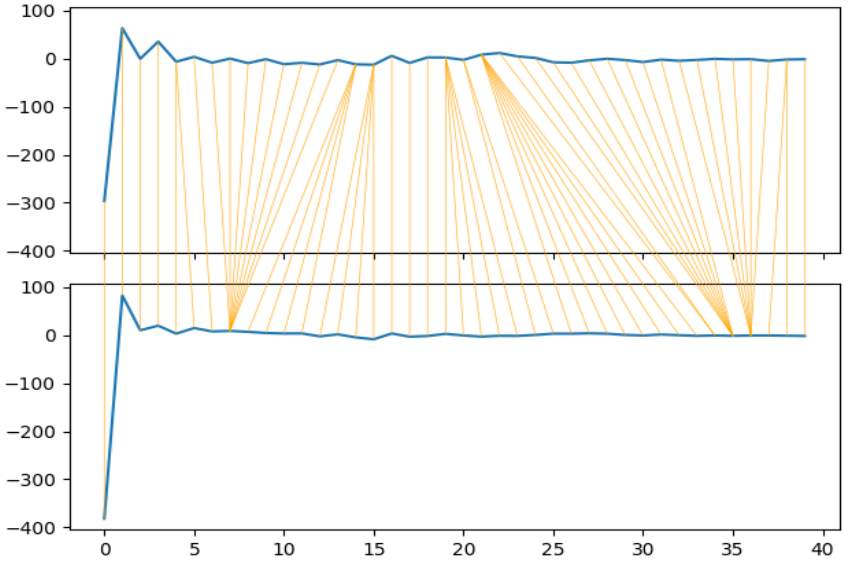
Figure: Flowchart of retrieving MFCCs from speech signal

DTW ALGORITHM









DTW ALGORITHM

To explain further about DTW algorithm with simple example, two time series can be taken into consideration. Let,

A = [1,2,5,8,9,2,1,5,7,3]

B= [1,5,3,4,1,9,4,3,6,3]

The time series A is plotted in the vertical axis and the time series B is plotted in the horizontal axis. The first step in the algorithm is to take a matrix of size m x n,

Where, m = no. of values in A

n = no. of values in B.

After taking the matrix, all the indices are assigned a higher value, hypothetically infinity.

DTW ALGORITHM

The pseudocode of the first step is as follows:

```
for i = 1 to m
    for j = 1 to n
        DTW [ i, j] = infinity;
```

It becomes easier to compute the values of the first row and column if the initial value is set to a larger value. As we iterate through the whole matrix by two for loops, the calculation for each index follows the pseudocode below:

$$|A_i - B_j| + \min \begin{cases} D[i-1, j-1], \\ D[i-1, j], \\ D[i, j-1] \end{cases}$$

For the chosen two time series, calculation of the DTW matrix is depicted as below:

3	33	19	17	16	17	23	18	17	17	14
7	31	17	17	15	18	17	17	18	14	17
5	25	15	13	12	15	15	14	14	13	15
1	21	15	11	12	11	19	13	12	16	17
2	21	11	9	11	12	15	10	11	15	16
9	20	8	10	11	14	8	13	18	19	22
8	12	4	6	6	10	8	12	17	16	20
5	5	1	2	3	7	11	12	14	15	17
2	1	3	4	6	7	14	16	17	21	22
1	0	4	6	9	9	17	20	22	27	29
	1	5	3	4	1	9	4	3	6	3

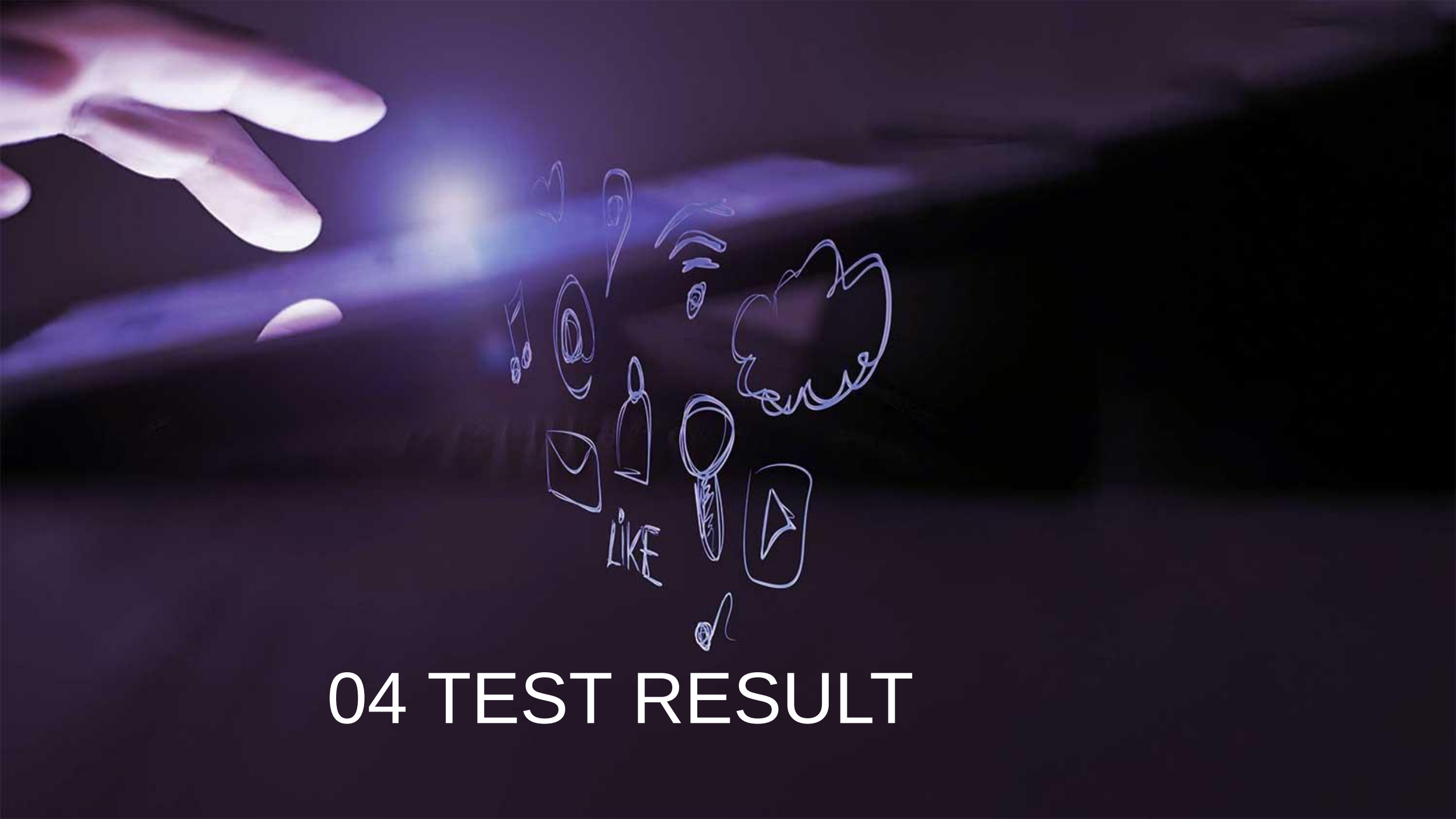
The path pairs of the two analysed time series calculated via DTW algorithm are as follows:

[(0, 0), (1, 0), (2, 1), (2, 2), (2, 3), (2, 4), (3, 5), (4, 5), (5, 6), (6, 7), (7, 8), (8, 8), (9, 9)]

OUR PROGRAM ADVANTAGES

PROGRAM ADVANTAGE

- The program used dynamic time warping distance to detect the amplitude of the 2 voices each time to detect the emotions
- Based on the program design, library of the recorded speech are expandable
- Enriching the library and using the MFCC features to detect the emotion gives quite an accurate result



04 TEST RESULT

TEST CASES AND TEST SCENARIOS

Test Scenario:

1. Testing using random word
2. Testing using predefined words
3. Testing comparing same gender's voice
4. Testing comparing different gender voice

- Detection using DTW distance
- Detection using DTW distance & Std Deviation
- Detection using word matching & DTW distance

SPECIFIC WORDS TEST

Female to female Voice Comparison

Test Case	Anger1	Anger2	Anger3	Disgust1	Disgust2	Disgust3	Neutral
DTW Lowest Distance	16	17	10	17	17	17	18
DTW Lowest Distance & Std Deviation	11	10	7	8	8	9	9
DTW distance and word detection	11	9	6	13	12	7	18

Male to male Voice Comparison

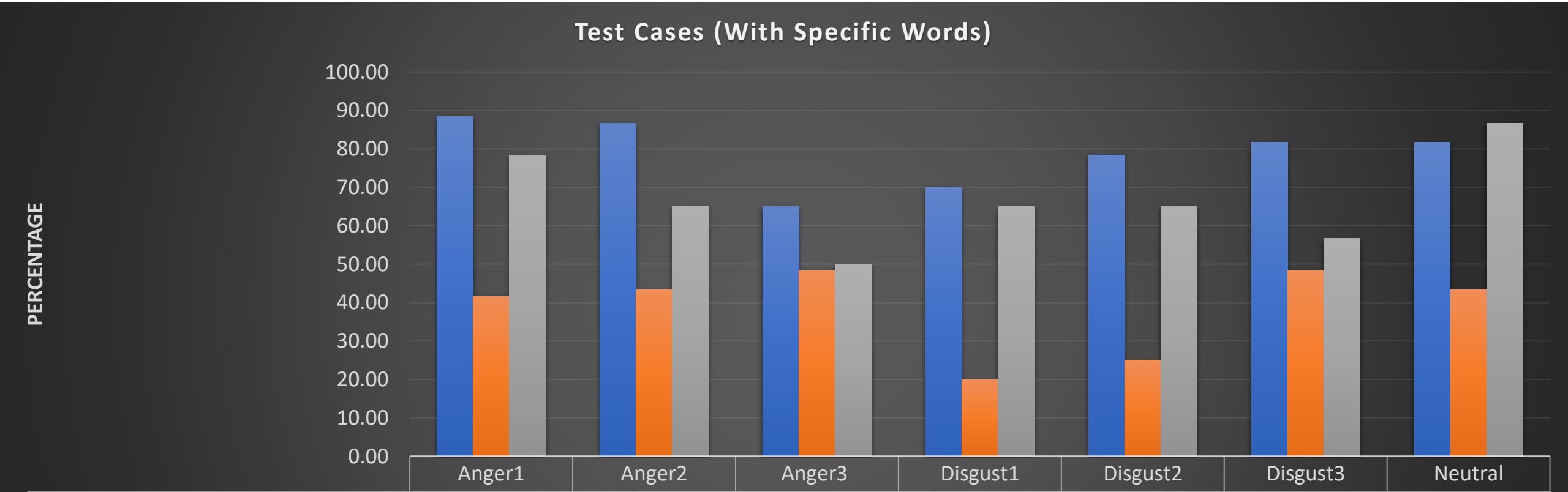
Test Case	Anger1	Anger2	Anger3	Disgust1	Disgust2	Disgust3	Neutral
DTW Lowest Distance	20	18	17	10	15	17	13
DTW Lowest Distance & Std Deviation	4	8	16	0	2	16	1
DTW distance and word detection	18	19	18	19	19	18	18

Male to female Voice Comparison

Test Case	Anger1	Anger2	Anger3	Disgust1	Disgust2	Disgust3	Neutral
DTW Lowest Distance	6	3	6	2	5	6	12
DTW Lowest Distance & Std Deviation	4	3	6	2	3	3	9
DTW distance and word detection	0	0	0	0	0	0	0

Test Cases and Result

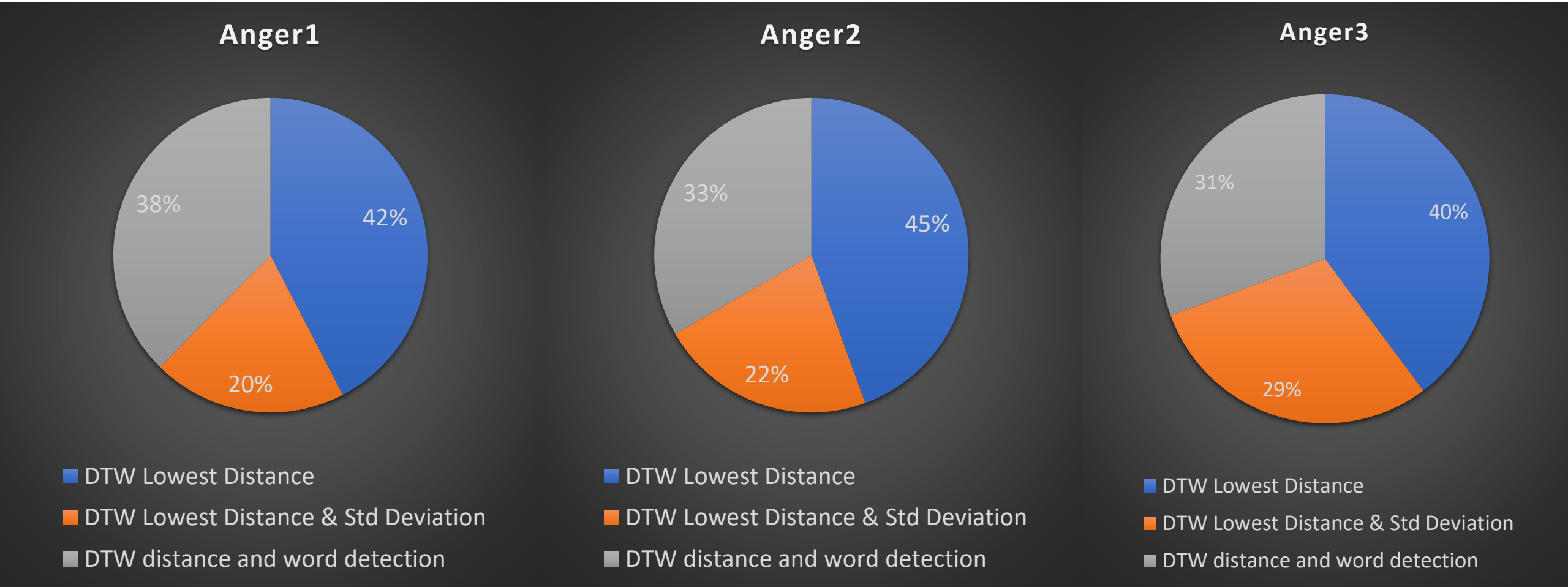
With Specific Words



	Anger1	Anger2	Anger3	Disgust1	Disgust2	Disgust3	Neutral
DTW Lowest Distance	88.33	86.67	65.00	70.00	78.33	81.67	81.67
DTW Lowest Distance & Std Deviation	41.67	43.33	48.33	20.00	25.00	48.33	43.33
DTW distance and word detection	78.33	65.00	50.00	65.00	65.00	56.67	86.67

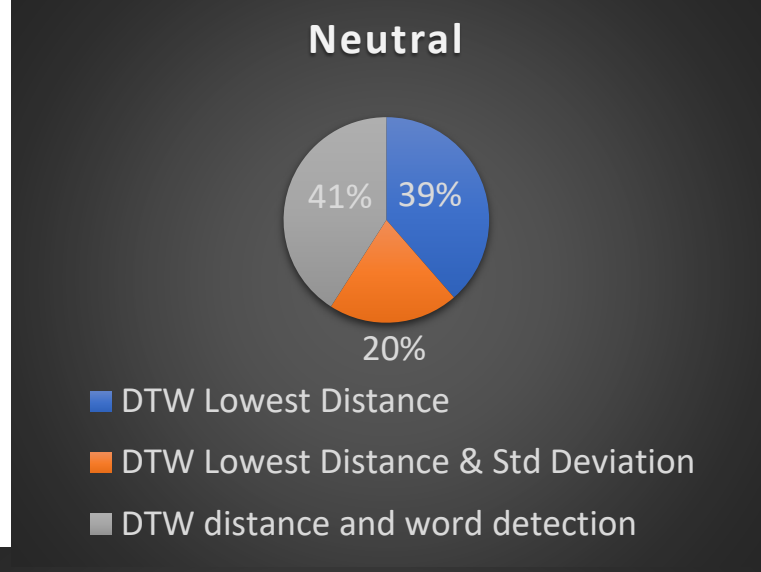
4 Test Cases and Result

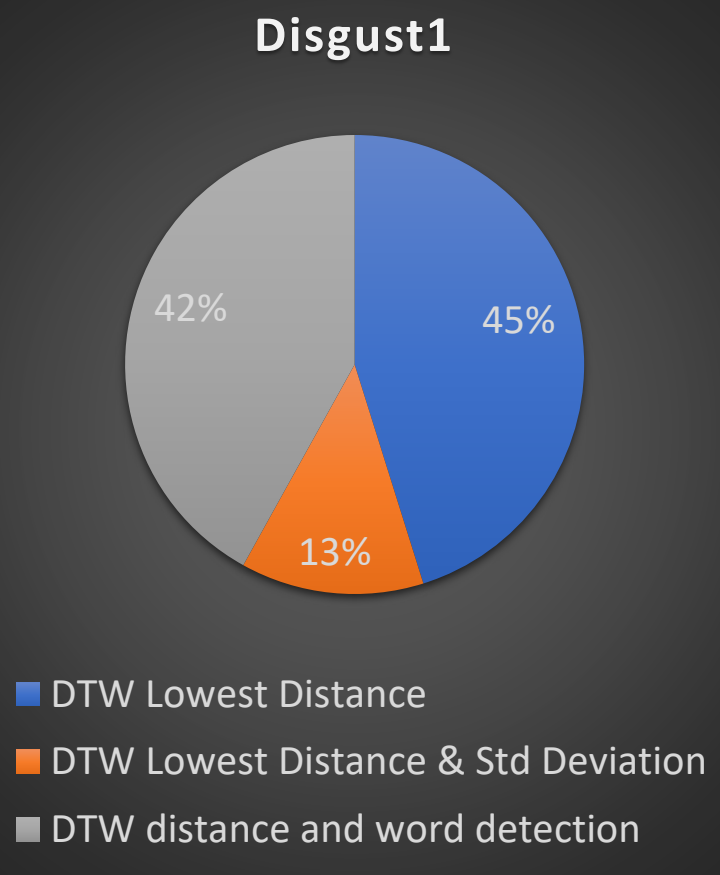
Anger Emotion Specific Words

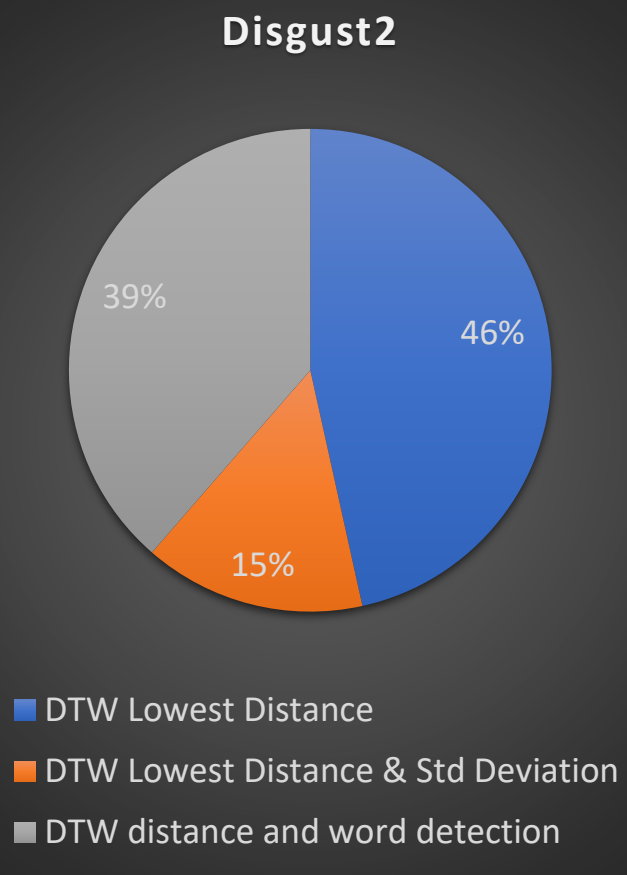


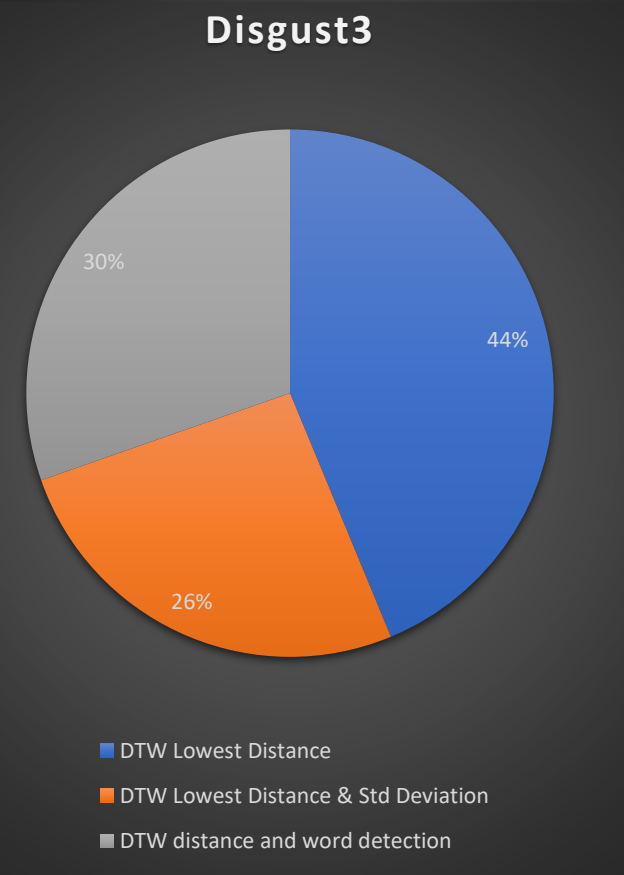
4 Test Cases and Result

Disgust/Neutral Emotion Specific Words









RANDOM WORDS TEST

Female to female Voice Comparison

Test Case	Anger1	Anger2	Anger3	Disgust1	Disgust2	Disgust3	Neutral
DTW Lowest Distance	18	16	12	18	17	17	15
DTW Lowest Distance & Std Deviation	8	6	4	4	6	7	8
DTW distance, Word detection and Standard Deviation	0	0	0	0	0	0	0

Male to male Voice Comparison

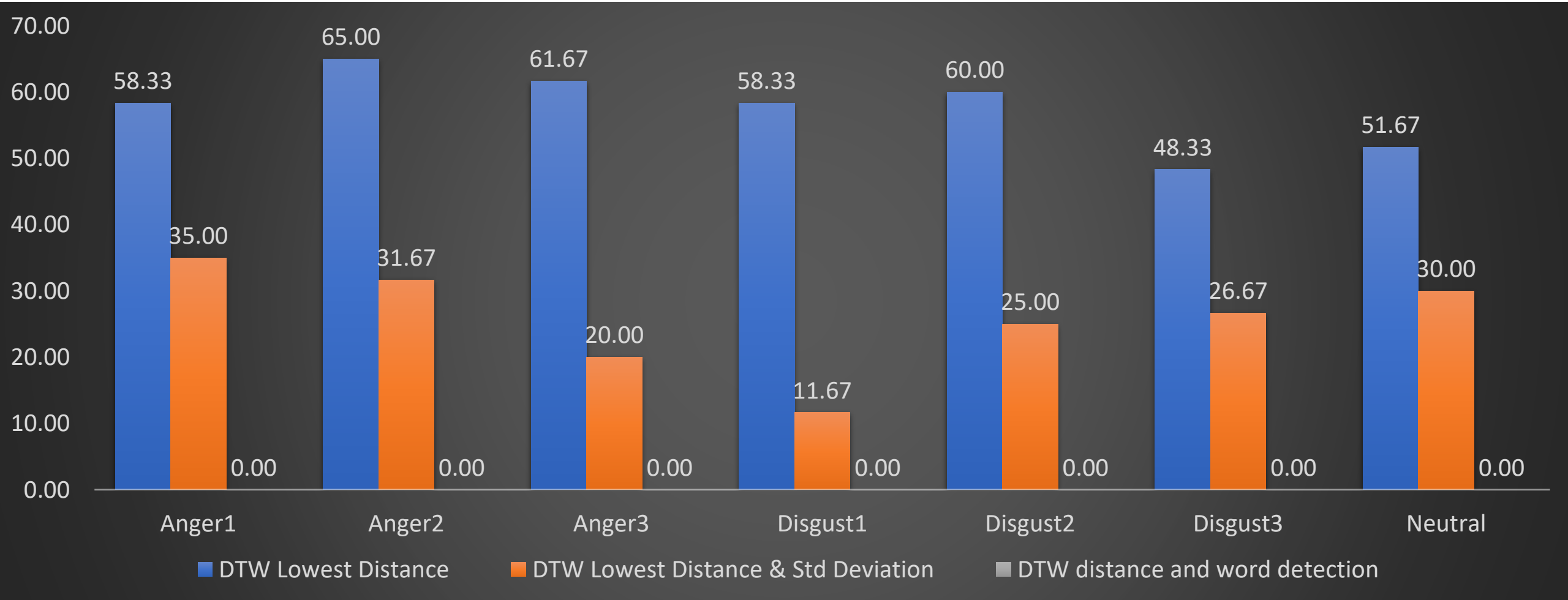
Test Case	Anger1	Anger2	Anger3	Disgust1	Disgust2	Disgust3	Neutral
DTW Lowest Distance	4	9	14	1	5	5	4
DTW Lowest Distance & Std Deviation	1	4	1	0	4	3	1
DTW distance and word detection	0	0	0	0	0	0	0

Male to female Voice Comparison

Test Case	Anger1	Anger2	Anger3	Disgust1	Disgust2	Disgust3	Neutral
DTW Lowest Distance	13	14	11	16	14	7	12
DTW Lowest Distance & Std Deviation	12	9	7	3	5	6	9
DTW distance and word detection	0	0	0	0	0	0	0

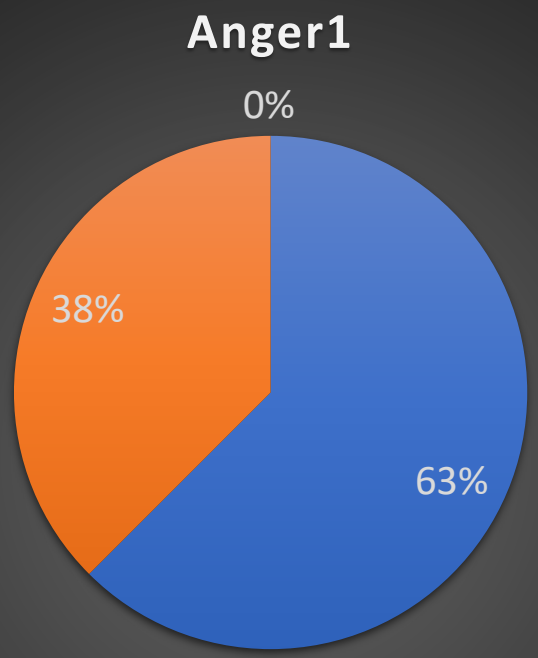
Test Cases and Result

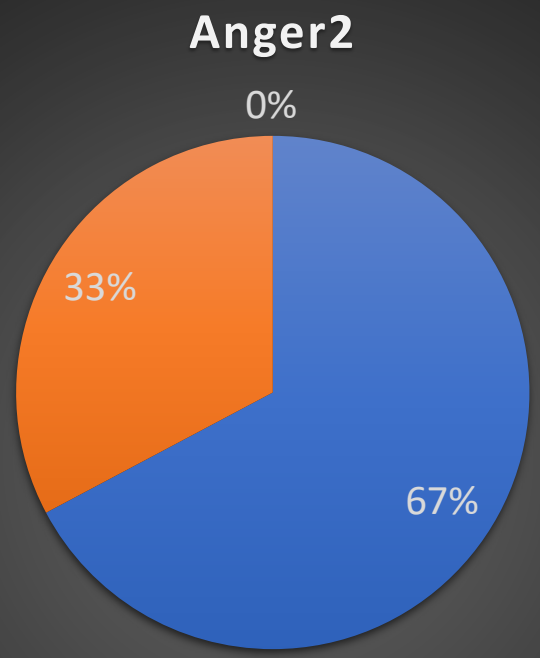
With Random Words

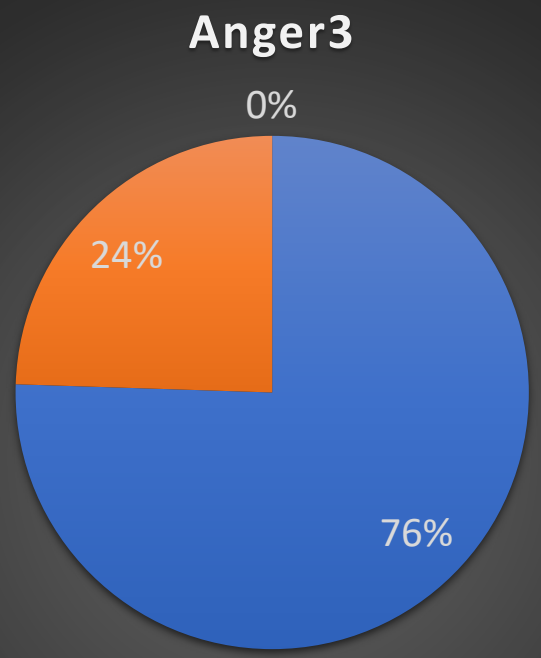


4 Test Cases and Results

Anger Emotion Random Words

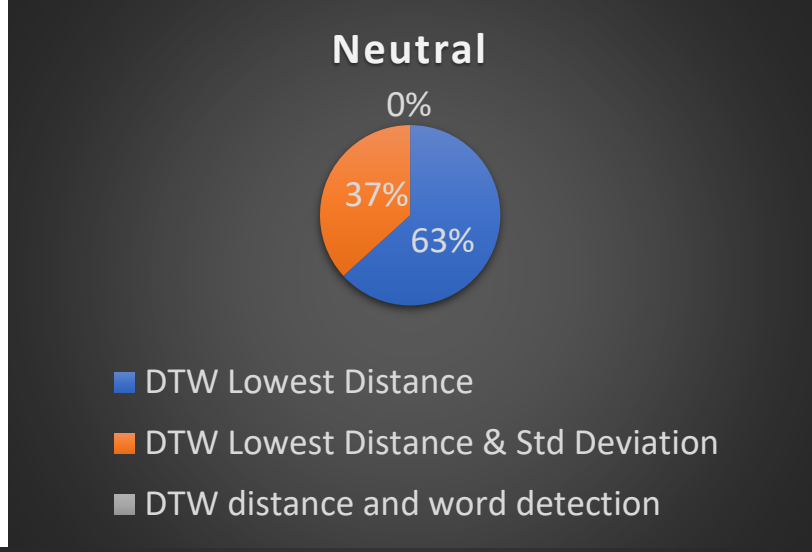


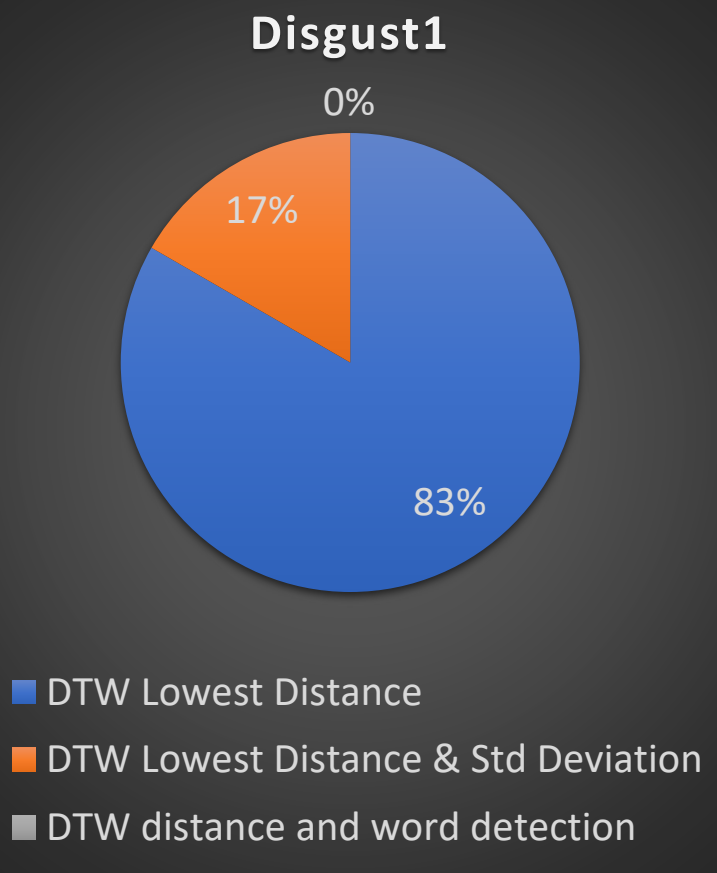


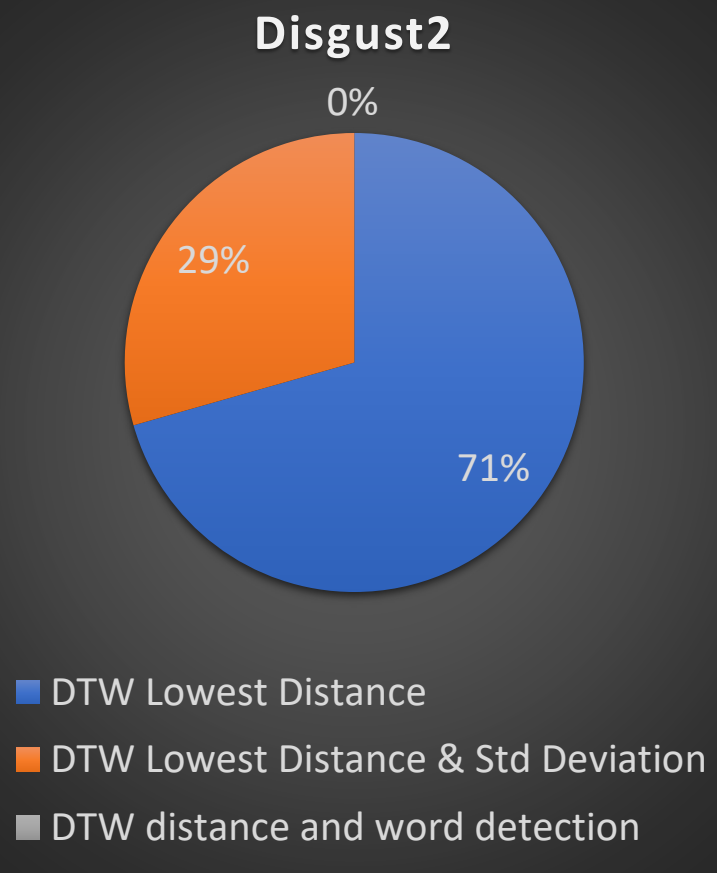


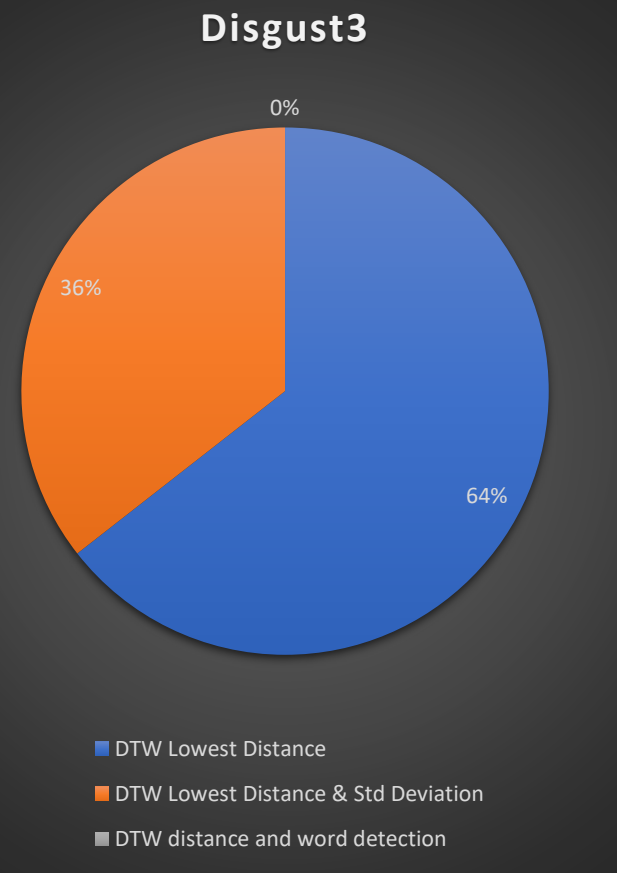
4 Test Cases and Result

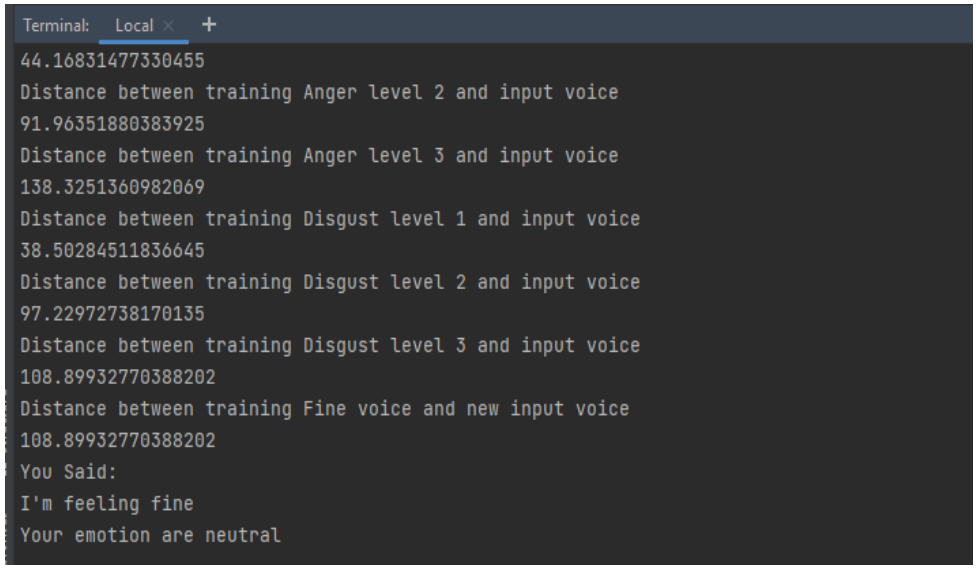
Disgust/Neutral Emotion Specific Words

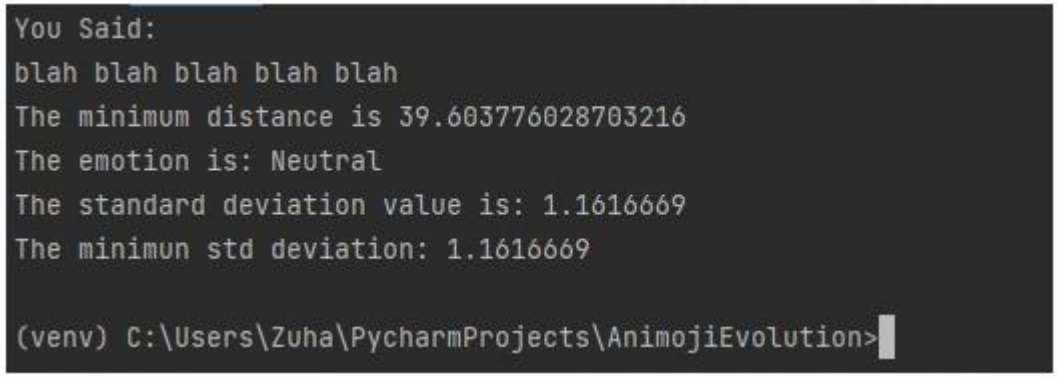


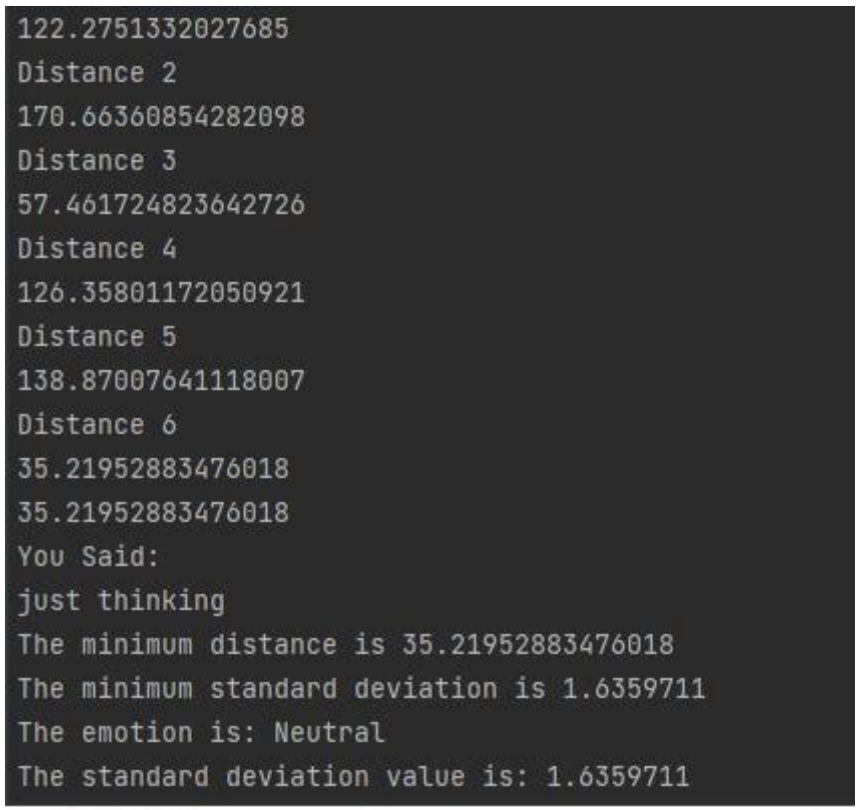


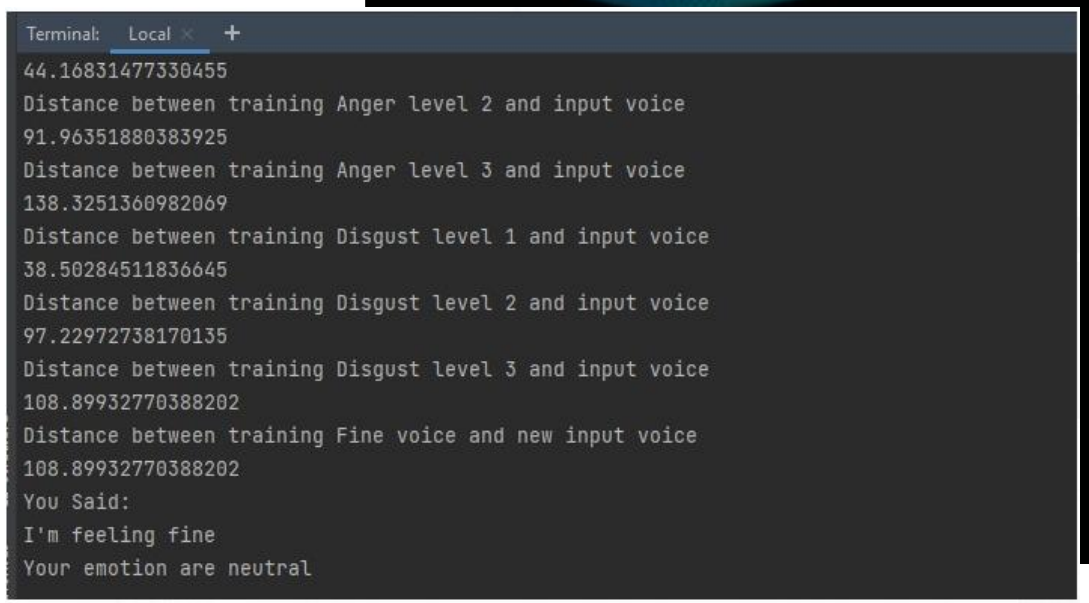





Terminal: Local
44.16831477330455
Distance between training Anger level 2 and input voice
91.96351880383925
Distance between training Anger level 3 and input voice
138.3251360982069
Distance between training Disgust level 1 and input voice
38.50284511836645
Distance between training Disgust level 2 and input voice
97.22972738170135
Distance between training Disgust level 3 and input voice
108.89932770388202
Distance between training Fine voice and new input voice
108.89932770388202
You Said:
I'm feeling fine
Your emotion are neutral


You Said:
blah blah blah blah blah
The minimum distance is 39.603776028703216
The emotion is: Neutral
The standard deviation value is: 1.1616669
The minimun std deviation: 1.1616669
(venv) C:\Users\Zuha\PycharmProjects\AnimojiEvolution>


122.2751332027685
Distance 2
170.66360854282098
Distance 3
57.461724823642726
Distance 4
126.35801172050921
Distance 5
138.87007641118007
Distance 6
35.21952883476018
35.21952883476018
You Said:
just thinking
The minimum distance is 35.21952883476018
The minimum standard deviation is 1.6359711
The emotion is: Neutral
The standard deviation value is: 1.6359711

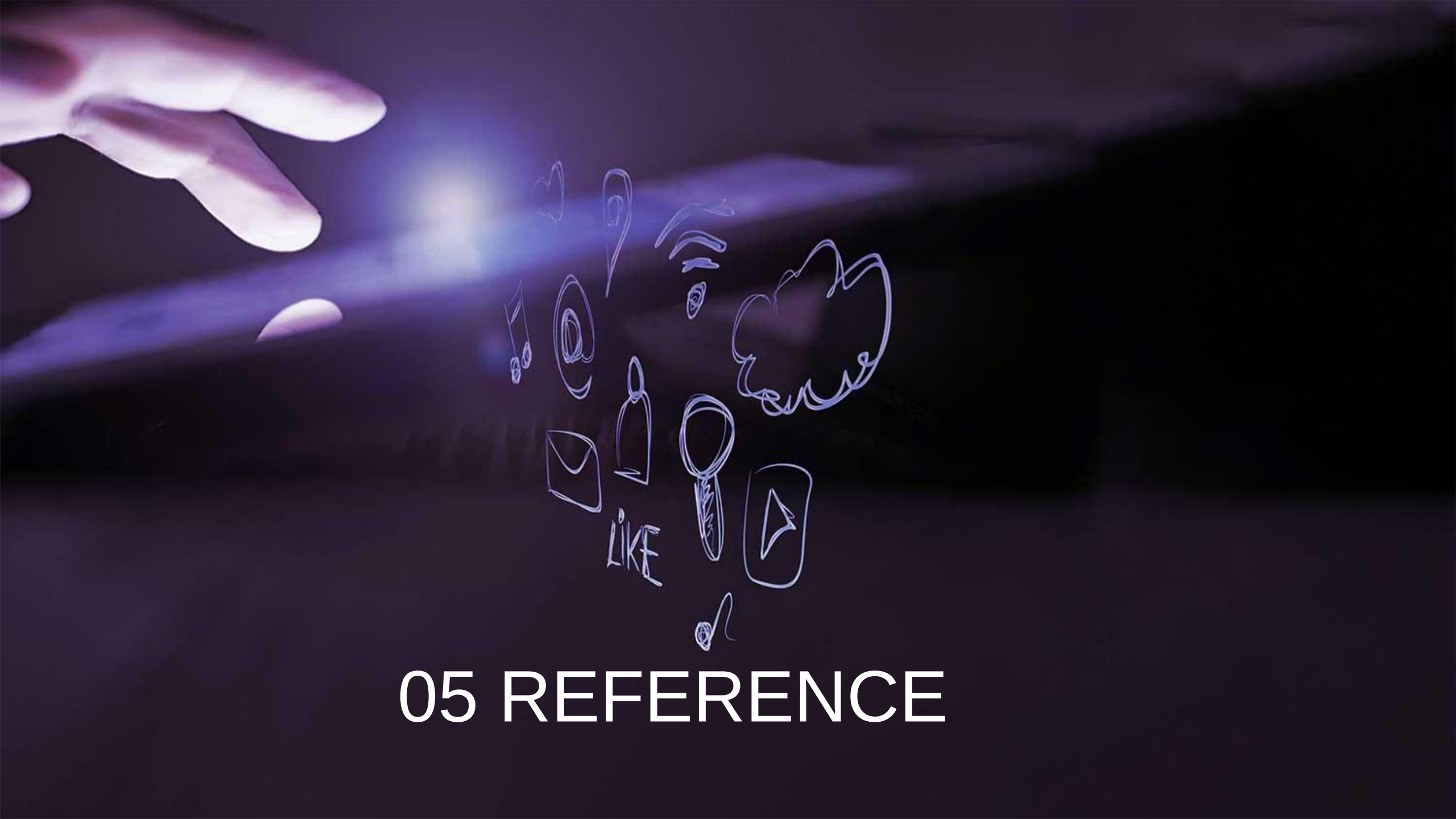

Terminal: Local
44.16831477330455
Distance between training Anger level 2 and input voice
91.96351880383925
Distance between training Anger level 3 and input voice
138.3251360982069
Distance between training Disgust level 1 and input voice
38.50284511836645
Distance between training Disgust level 2 and input voice
97.22972738170135
Distance between training Disgust level 3 and input voice
108.89932770388202
Distance between training Fine voice and new input voice
108.89932770388202
You Said:
I'm feeling fine
Your emotion are neutral

04 DISCUSSION

Discussions/Conclusions

Based on the 3 options of conditions namely DTW distance (of MFCC features) and word detection, DTW distance (of MFCC features) and standard deviation (of MFCC features), and DTW distance only has shown variety of results has shows significant accuracy rate for the program that considers only DTW distance. Although the voice match favours more to the same gender's trained voice, we could improve the library and program condition to calculate the optimal values of the trained voice versus the recorded voice. This extensive research and study can done as part as a future work of this project.

Through this Animoji project, we receive exposure to complex techniques such as Dynamic Time Warping and Python, as well as to rapid project development. Our group was given four weeks to complete our works, which is considered a rapid development cycle. We met every alternate days to review progress and provide input on any concerns that occurred. DTW is excellent for voice recognition as it can adapt to various speech rates. Each week, Dr. Raja Jamilah interviewed us about our progress; by attending such sessions, we were able to pick up new skills and swiftly fill up the gaps identified by Dr Raja Jamilah based on her vast experience in this field. We feel that this procedure, guided by Dr. Raja Jamilah, has increased our knowledge and practical experience. We appreciate the collaboration and efforts of our group members in technical areas such as coding, testing, integration, and accuracy enhancement. Despite the limits of the project, we group gave it our all.



05 REFERENCE

REFERENCES

Umamaheswari, J., & Akila, A. (2019, February). An enhanced human speech emotion recognition using hybrid of PRNN and KNN. In *2019 International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (COMITCon)* (pp. 177-183). IEEE.

Kexin, T., Yongming, H., Guobao, Z., & Lin, Z. (2019, November). Research on Emergency Parking Instruction Recognition Based on Speech Recognition and Speech Emotion Recognition. In *2019 Chinese Automation Congress (CAC)* (pp. 2933-2937). IEEE.

Cherry, K. (2020, January 13). *The 6 Types of Basic Emotions and Their Effect on Human Behavior.* verywellmind. of-emotions-4163976

El-Yamri, M., Romero-Hernandez, A., Gonzalez-Riojo, M., & Manero, B. (2019). Designing a VR game for public speaking based on speakers features: a case study. *Smart Learning Environments*, *6*(1), 1-15.

Cowen, A. S., & Keltner, D. (2017). Self-report captures 27 distinct categories of emotion bridged by continuous gradients. *Proceedings of the National Academy of Sciences*, *114*(38), E7900- E7909.

Koops, T. "One More Thing…"–A critical approach to the Apple 2017 Keynote Presentation.

Blagdon, J. (2013). How emoji conquered the world. *The Verge*, *4*.

Evans, *Emojis actually make our language better.* nypost.

Likitha, M. S., Gupta, S. R. R., Hasitha, K., & Raju, A. U. (2017, March). Speech based human emotion recognition using MFCC. In *2017 international conference on wireless communications, signal processing and networking (WiSPNET)* (pp. 2257-2260). IEEE.

XinXing, J., Xu, S. (2012). Speech Recognition Based on Efficient DTW Algorithm and Its DSP Implementation. In International Workshop on Information and Electronics Engineering (IWIEE). Elsevier.

Simon, D., Becker, M., Mothes-Lasch, M., Miltner, W.H.R., Starube, T. (2016). Loud and angry: sound intensity modulates amygdala activation to angry voices in social anxiety disorder. . NCBI.

Chen, X., Yang, J.,Gan, S., Yang, Y. (2012). The Contribution of Sound Intensity in Vocal Emotion Perception: Behavioral and Electrophysiological Evidence.. NCBI.