

VISVESVARAYA TECHNOLOGICAL UNIVERSITY



BELAGAVI – 590018, Karnataka

INTERNSHIP REPORT

ON

“Voice Classification using ML”

Submitted in partial fulfilment for the award of degree(18CSI85)

BACHELOR OF ENGINEERING IN YOUR BRANCH

Submitted by:

ANANYA C

1SJ20IS002



Conducted at
COMPSOFT TECHNOLOGIES



SJC INSTITUTE OF TECHNOLOGY

Department of ISE

Accredited by NBA, New Delhi

Chikkaballapura

SJC INSTITUTE OF TECHNOLOGY
Department of ISE
Accredited by NBA, New Delhi
Chikkaballapura



CERTIFICATE

This is to certify that the Internship titled **“VOICE CLASSIFICATION USING ML”** carried out by **ANANYA C**, a bonafide student of SJC Institute of Technology, in partial fulfillment for the award of **Bachelor of Engineering**, in **ISE** under Visvesvaraya Technological University, Belagavi, during the year 2023-2024. It is certified that all corrections/suggestions indicated have been incorporated in the report.

The project report has been approved as it satisfies the academic requirements in respect of Internship prescribed for the course Internship / Professional Practice (18CSI85)

Signature of Guide

Signature of HOD

Signature of Principal

External Viva:

Name of the Examiner

Signature with Date

1) _____

2) _____

D E C L A R A T I O N

I, **ANANYA C**, final year student of ISE, SJCIT, declare that the Internship has been successfully completed, in **COMPSOFT TECHNOLOGIES**. This report is submitted in partial fulfillment of the requirements for award of Bachelor Degree in Branch name, during the academic year 2023-2024.

Date : 20-09-2023

:

Place :

Chikkaballapura

USN : 1SJ20IS002

NAME : ANANYA C

OFFER LETTER



Date: 11th August, 2023

Name: **Ananya C**

USN: **1SJ20IS002**

Placement ID: **TIE0408ML156**

Dear Student,

We would like to congratulate you on being selected for the **Machine Learning with Python (Research Based)** Internship position with **Compsoft Technologies**, effective Start Date **11th August, 2023**. All of us are excited about this opportunity provided to you!

This internship is viewed as being an educational opportunity for you, rather than a part-time job. As such, your internship will include training/orientation and focus primarily on learning and developing new skills and gaining a deeper understanding of concepts of **Machine Learning with Python (Research Based)** through hands-on application of the knowledge you learn while you train with the senior developers. You will be bound to follow the rules and regulations of the company during your internship duration.

Again, congratulations and we look forward to working with you!.

Sincerely,

Nithin K. S

Project Manager

COMPSOFT TECHNOLOGIES

No. 363, 19th main road,

1st Block Rajajinagar

Bangalore - 560010

A C K N O W L E D G E M E N T

This Internship is a result of accumulated guidance, direction and support of several important persons. We take this opportunity to express our gratitude to all who have helped us to complete the Internship.

We express our sincere thanks to our Principal, Dr. G T Raju, for providing us adequate facilities to undertake this Internship.

We would like to thank our Head of Dept Sateesh Chandra Reddy, for providing us an opportunity to carry out Internship and for his valuable guidance and support.

We express our deep and profound gratitude to our guide, Guide name, Assistant Prof Bhanumathi, for her keen interest and encouragement at every step in completing the Internship.

We would like to thank all the faculty members of our department for the support extended during the course of Internship.

We would like to thank the non-teaching members of our dept, for helping us during the Internship.

Last but not the least, we would like to thank our parents and friends without whose constant help, the completion of Internship would have not been possible.

ANANYA C

1SJ20IS002

ABSTRACT

Communication is the key to express one's thoughts and ideas clearly. Amongst all forms of communication, speech is the most preferred and powerful form of communications inhuman. The era of the Internet of Things (IoT) is rapidly advancing in bringing more intelligent systems available for everyday use. These applications range from simple wearables and widgets to complex self-driving vehicles and automated systems employed in various fields. Intelligent applications are interactive and require minimum user effort to function, and mostly function on voice-based input. This creates the necessity for these computer applications to completely comprehend human speech. A speech percept can reveal information about the speaker including gender, age, language, and emotion. Several existing speech recognition systems used in IoT applications are integrated with an emotion detection system in order to analyze the emotional state of the speaker. The performance of the emotion detection system can greatly influence the overall performance of the IoT application in many ways and can provide many advantages over the functionalities of these applications. This research presents a speech emotion detection system with improvements over an existing system in terms of data, feature selection, and methodology that aims at classifying speech percepts based on emotions, more accurately.

Table of Contents

Sl no	Description	Page no
1	Company Profile	8-9
2	About the Company	10-13
3	Introduction	14-15
4	System Analysis	16-17
5	Requirement Analysis	18-19
6	Design Analysis	20-21
7	Implementation	22-23
8	Snapshots	24-27
9	Conclusion	27-28
10	References	29

CHAPTER 1

COMPANY PROFILE

1. COMPANY PROFILE

A Brief History of Company

Compsoft Technologies, was incorporated with a goal “To provide high quality and optimal Technological Solutions to business requirements of our clients”. Every business is a different and has a unique business model and so are the technological requirements. They understand this and hence the solutions provided to these requirements are different as well. They focus on clients requirements and provide them with tailor made technological solutions. They also understand that Reach of their Product to its targeted market or the automation of the existing process into e-client and simple process are the key features that our clients desire from Technological Solution they are looking for and these are the features that we focus on while designing the solutions for their clients.

Compsoft. is a Technology Organization providing solutions for all web design and development, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever increasing automation requirements, Compsoft Technologies. specialize in ERP, Connectivity, SEO Services, Conference Management, effective web promotion and tailor-made software products, designing solutions best suiting clients requirements.

Compsoft Technologies, strive to be the front runner in creativity and innovation in software development through their well-researched expertise and establish it as an out of the box software development company in Bangalore, India. As a software development company, they translate this software development expertise into value for their customers through their professional solutions.

They understand that the best desired output can be achieved only by understanding the clients demand better. Compsoft Technologies work with their clients and help them to define their exact solution requirement. Sometimes even they wonder that they have completely redefined their solution or new application requirement during the brain storming session, and here they position themselves as an IT solutions consulting group comprising of high caliber consultants.

They believe that Technology when used properly can help any business to scale and achieve new heights of success. It helps Improve its efficiency, profitability, reliability; to put it in one sentence “Technology helps you to Delight your Customers” and that is what we want to achieve.

CHAPTER 2

ABOUT THE COMPANY

2. ABOUT THE COMPANY

We are a Technology Organization providing solutions for all web design and development, Researching and Publishing Papers to ensure the quality of most used ML Models, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever increasing automation requirements, Compsoft Technologies specialize in ERP, Connectivity, SEO Services, Conference Management, effective web promotion and tailor-made software products, designing solutions best suiting clients requirements. The organization where they have a right mix of professionals as stakeholders to help us serve our clients with best of our capability and with at par industry standards. They have young, enthusiastic, passionate and creative Professionals to develop technological innovations in the field of Mobile technologies, Web applications as well as Business and Enterprise solution. Motto of our organization is to “Collaborate with our clients to provide them with best Technological solution hence creating Good Present and Better Future for our client which will bring a cascading a positive effect in their business shape as well”. Providing a Complete suite of technical solutions is not just our tag line, it is Our Vision for Our Clients and for Us, We strive hard to achieve it.

Services provided by Compsoft Technologies.

- Core Java and Advanced Java
- Research and Development/Improvise of ML Models
- Web services and development
- Dot Net Framework
- Python
- Selenium Testing
- Conference / Event Management Service
- Academic Project Guidance
- On The Job Training
- Software Training

CHAPTER 3

INTRODUCTION

3. INTRODUCTION

Introduction to ML

According to a report from the United Nations (22), an increasing number of people will interact with a voice assistance machine than with their partners in the next five years. With proliferation of Virtual Personal Assistants (VPA) such as Siri, Alexa and Google Assistant in our day-to-day interactions, they fill a role of answering our questions and fulfilling our requests quickly and accurately. Though these assistants understand our commands, they are not proficient enough in recognizing our mood and reacting accordingly. Therefore, it is pertinent to develop an efficient emotion recognition system which can enhance the capabilities of these assistants and revolutionize the whole industry. Speech is a rich, dense form of communication that can convey information effectively. It contains two types of information, namely linguistic and paralinguistic. The former refers to the verbal content, the underlying language code, while the latter refers to the implicit information such as body language, gestures, facial expressions, tone, pitch, emotion etc. Paralinguistic characteristics can help understand the mental state of the person (emotion), gender, attitude, dialect, and more (24). Recorded speech has key features that can be leveraged to extract information, such as emotion, in a structured way. To get such information would be invaluable in facilitating more natural conversations between the virtual assistant and the user since emotion color everyday human interactions. There are two widely used representations of emotion: continuous and discrete. In the continuous representation, the emotion of an utterance can be expressed as continuous values along multiple psychological dimensions. According to Ayadi, Kamel, & Karray (2011) (1), “emotion can be characterized in two dimensions: activation and valence.” Activation is the “amount of energy required to express a certain emotion” (p. 573) and research has shown that joy, anger, and fear can be linked to high energy and pitch in speech, whereas sadness can be linked to low energy and slow speech. Valence gives more nuance and helps distinguish between emotions like being angry and happy since increased activation can indicate both (p. 573). In the discrete representation, emotions can be discretely expressed as specific categories, such as angry, sad, happy, etc.

Problem Statement

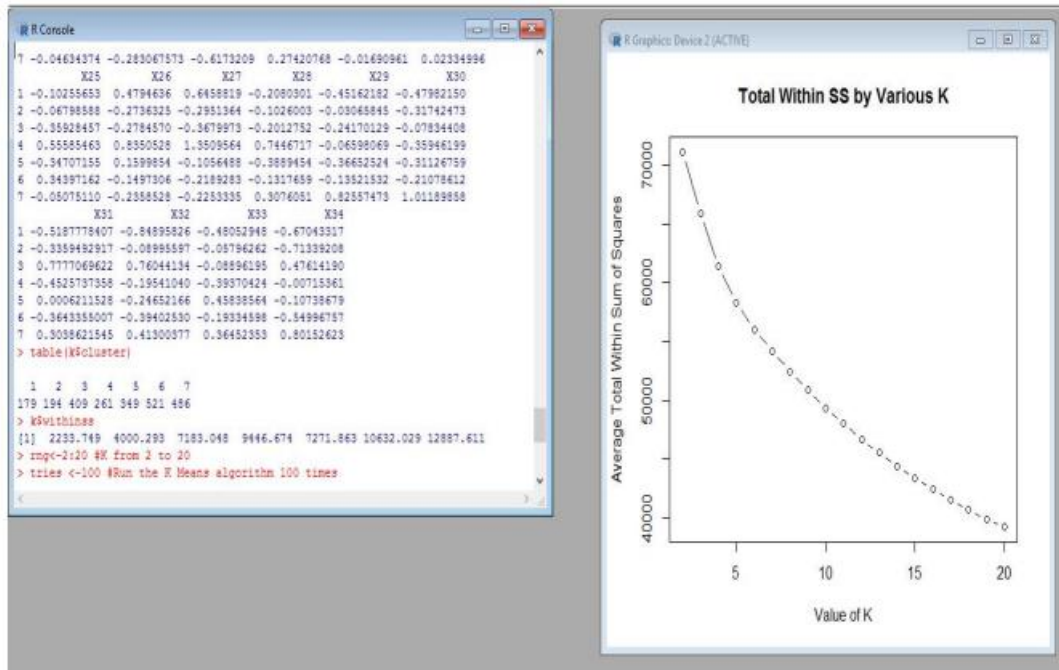
Voice Classification using ML that analyses the sentiment behind the tone of the voice and predicts the sentiment involved

CHAPTER 4

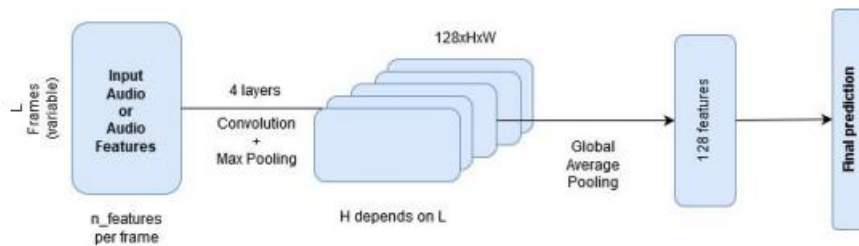
SYSTEM ANALYSIS

4. SYSTEM ANALYSIS

1. Existing System



2. Proposed System



3. Objective of the System

		Predicted class	
Actual Class		Class = Yes	Class = No
	Class = Yes	True Positive	False Negative
	Class = No	False Positive	True Negative

CHAPTER 5

REQUIREMENT ANALYSIS

5. REQUIREMENT ANALYSIS

Hardware Requirement Specification

ALGORITHM	APPROAC H 1	APPROAC H 2	APPROAC H 3
SVM	83%	77%	90%
Decision Tree	71%	65%	68%
KNN	80%	80%	87%
Logistic Regression	70%	77%	86%
Random Forest	76%	69%	72%
Gaussian Naïve Bayes	74%	73%	75%
Gradient Boosting Trees	77%	69%	75%

```
train_img, test_img, train_lbl, test_lbl = train_test_split( x, y, test_size=1/7.0, random_state=0)
```

```
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
# Fit on training set only.
scaler.fit(train_img)
# Apply transform to both the training set and the test set.
train_img = scaler.transform(train_img)
test_img = scaler.transform(test_img)
```

```
from sklearn.decomposition import PCA
# Make an instance of the Model
pca = PCA(.95)
```

```
pca.fit(train_img)
```

```
PCA(copy=True, iterated_power='auto', n_components=0.95, random_state=None,
    svd_solver='auto', tol=0.0, whiten=False)
```

```
print(pca.n_components_ )
```

```
25
```

```
train_img = pca.transform(train_img)
test_img = pca.transform(test_img)
```

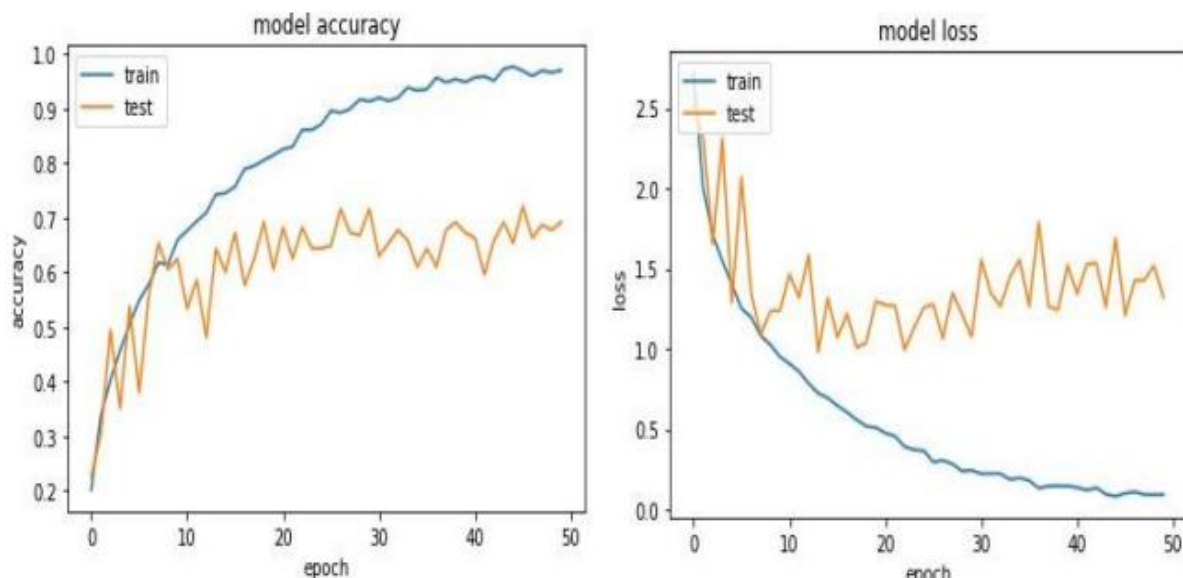
CHAPTER 6

DESIGN ANALYSIS

6. DESIGN & ANALYSIS

1D CNNs and 2D CNNs were implemented on 6 emotion class classification and 12 gender+emotion class classification parallelly and it was observed that including gender gave better performance. Since CNNs are natural feature extractors, 1DCNN and 1DCNN-LSTM architectures were trained on the raw audio input.

2D CNNs were implemented on the engineered features such as MFCCs and Log-mel spectrogram. The training of 2D CNNs started with 2 convolutional layers with 3 filters and max pooling with 2 filters with stride 2. They were tuned by adding more convolutional layers and increasing the filter sizes in the initial layers. It was found that increasing the depth beyond 4 layers did not improve performance. Also the champion model on 14 class prediction was obtained with 12×12 filters and 7×7 filters in the first and second layers respectively. Also, the final 2 layers had 3×3 filters.



CHAPTER 7

IMPLEMENTATION

7. IMPLEMENTATION

Implementation is the stage where the theoretical design is turned into a working system. The most crucial stage in achieving a new successful system and in giving confidence on the new system for the users that it will work efficiently and effectively.

The system can be implemented only after thorough testing is done and if it is found to work according to the specification. It involves careful planning, investigation of the current system and its constraints on implementation, design of methods to achieve the change over and an evaluation of change over methods as a part from planning.

Two major tasks of preparing the implementation are education and training of the users and testing of the system. The more complex the system being implemented, the more involved will be the system analysis and design effort required just for implementation.

The implementation phase comprises of several activities. The required hardware and software acquisition is carried out. The system may require some software to be developed. For this, programs are written and tested. The user then changes over to his new fully tested system and the old system is discontinued.

TESTING

The testing phase is an important part of software development. It is the Information zed system will help in automate process of finding errors and missing operations and also a complete verification to determine whether the objectives are met and the user requirements are satisfied. Software testing is carried out in three steps:

1. The first includes unit testing, where in each module is tested to provide its correctness, validity and also determine any missing operations and to verify whether the objectives have been met. Errors are noted down and corrected immediately.
2. Unit testing is the important and major part of the project. So errors are rectified easily in particular module and program clarity is increased. In this project entire system is divided into several modules and is developed individually. So unit testing is conducted to individual modules.
3. The second step includes Integration testing. It need not be the case, the software whose modules when run individually and showing perfect results, will also show perfect results when run as a whole.

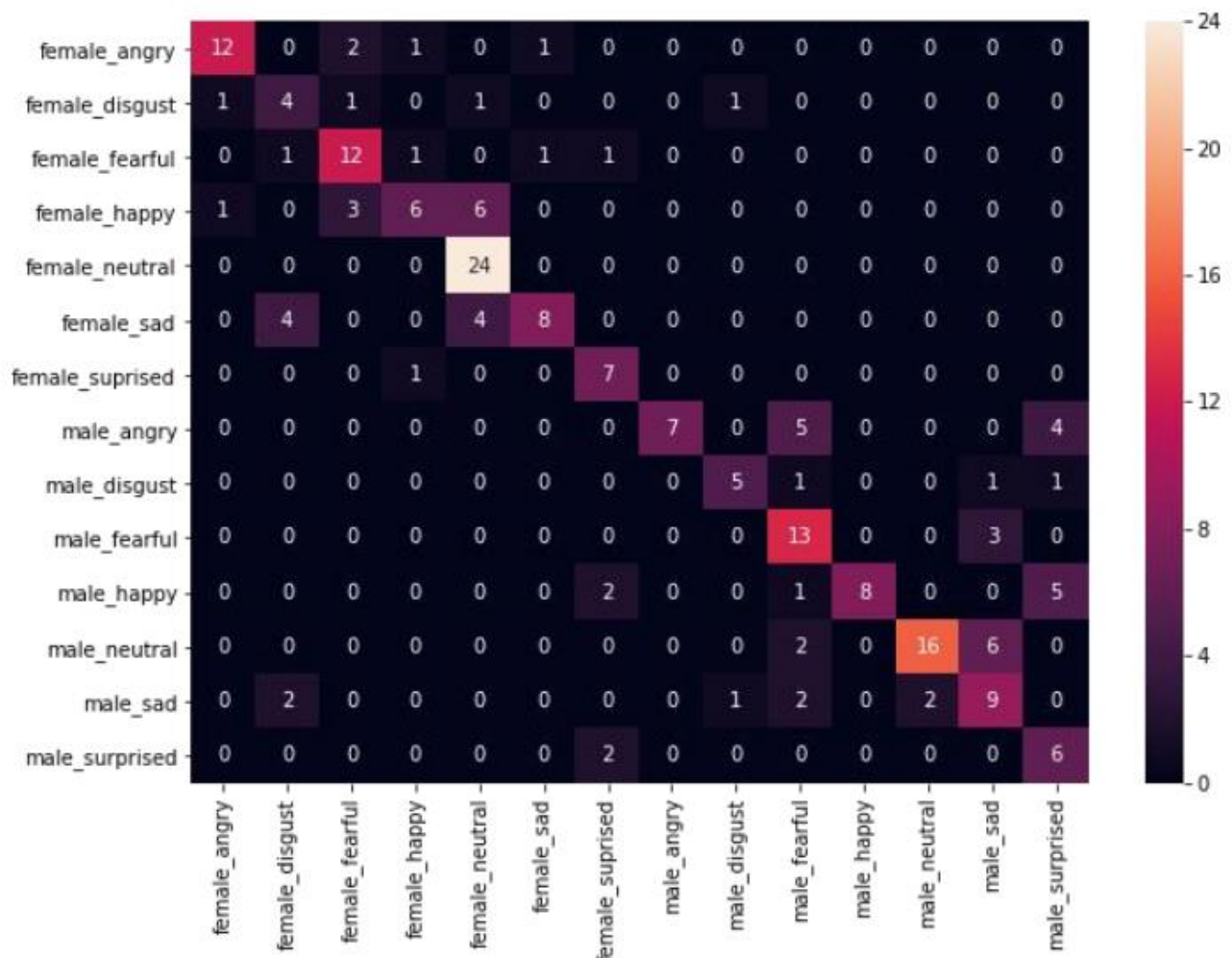
CHAPTER 8

SNAPSHOTS

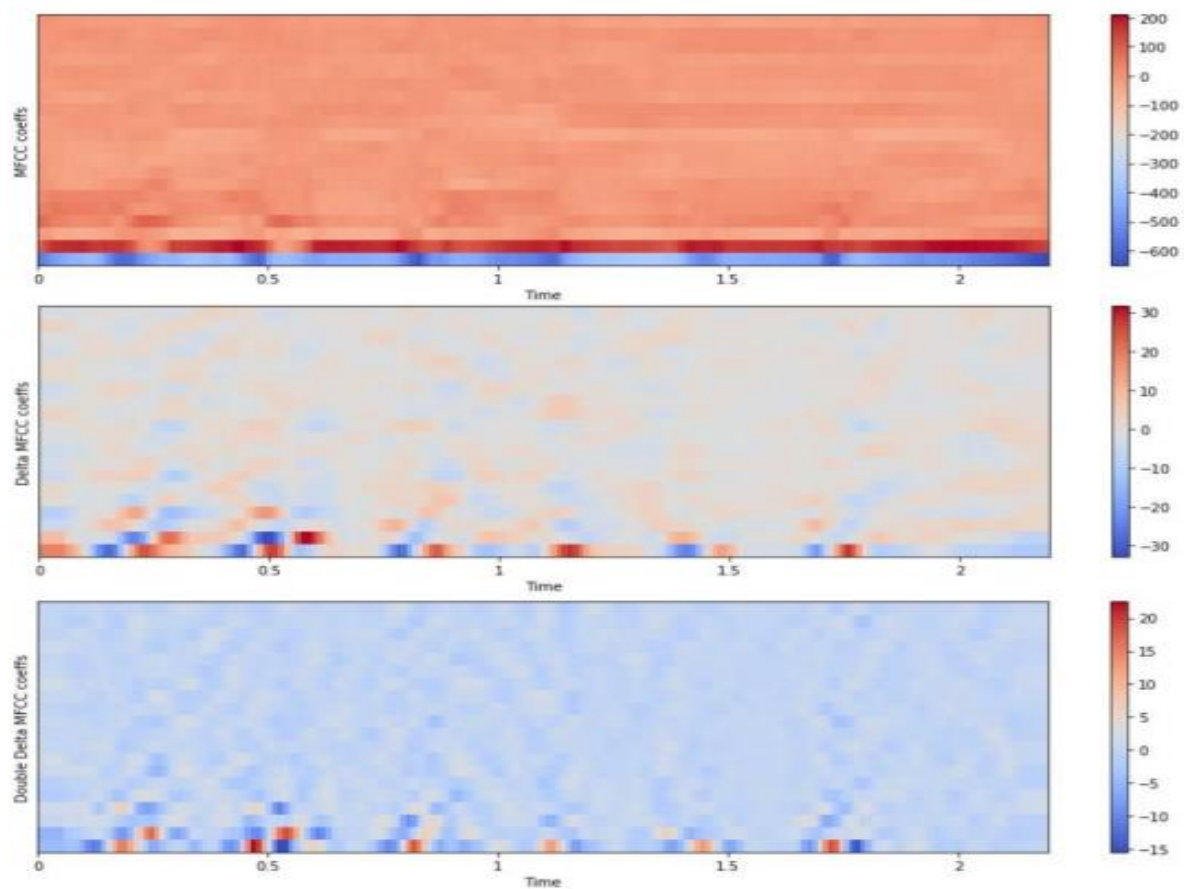
8. SNAPSHOTS

Voice Claasification Using ML and Emotion Recognition Compsoft Technology

Team :



```
[+] Number of training samples: 504  
[+] Number of testing samples: 168  
[+] Number of features: 180  
[*] Training the model...  
Accuracy: 75.00%
```



CHAPTER 9

CONCLUSION

9. CONCLUSION

The emerging growth and development in the field of AI and machine learning have led to the new era of automation. Most of these automated devices work based on voice commands from the user. Many advantages can be built over the existing systems if besides recognizing the words, the machines could comprehend the emotion of the speaker (user). Some applications of a speech emotion detection system are computer-based tutorial applications, automated call center conversations, a diagnostic tool used for therapy and automatic translation system.

In this thesis, the steps of building a speech emotion detection system were discussed in detail and some experiments were carried out to understand the impact of each step. Initially, the limited number of publically available speech database made it challenging to implement a well-trained model. Next, several novel approaches to feature extraction had been proposed in the earlier works, and selecting the best approach included performing many experiments. Finally, the classifier selection involved learning about the strength and weakness of each classifying algorithm with respect to emotion recognition. At the end of the experimentation, it can be concluded that an integrated feature space will produce a better recognition rate when compared to a single feature.

The package was designed in such a way that future modifications can be done easily. The following conclusions can be deduced from the development of the project:

- ❖ For future advancements, the proposed project can be further modeled in terms of efficiency, accuracy, and usability. Additional to the emotions, the model can be extended to recognize feelings such as depression and mood changes. Such systems can be used by therapists to monitor the mood swings of the patients. A challenging product of creating machines with emotion is to incorporate a sarcasm detection system. Sarcasm detection is a more complex problem of emotion detection since sarcasm cannot be easily identified using only the words or tone of the speaker.

10. REFERENCE

[1] Soegaard, M. and Friis Dam, R. (2013). The Encyclopedia of Human-Computer Interaction. 2nd ed.

[2] Developer.amazon.com. (2018). Amazon Alexa. [online]

Available at: <https://developer.amazon.com/alexa>

[3] Store.google.com. (2018). Google Home Tips & Tricks – Google Store. [online]

Available at: https://store.google.com/product/google_home_learn

[4] Apple. (2018). iOS - Siri. [online]

Available at: <https://www.apple.com/ios/siri/>

[5] The Official Samsung Galaxy Site. (2018). What is S Voice?. [online]

Available at: <http://www.samsung.com/global/galaxy/what-is/s-voice/> [Accessed 2 May 2018].

[6] Gartner.com. (2018). Gartner Says 8.4 Billion Connected. [online]

Available at: <https://www.gartner.com/newsroom/id/3598917>.

[7] H. Cao, R. Verma, and A. Nenkova, “Speaker-sensitive emotion recognition via ranking: Studies on acted and spontaneous speech,” *Comput. Speech Lang.*, vol. 28, no. 1, pp. 186–202, Jan. 2015.

[8] L. Chen, X. Mao, Y. Xue, and L. L. Cheng, “Speech emotion recognition: Features and classification models,” *Digit. Signal Process.*, vol. 22, no. 6, pp. 1154–1160, Dec. 2012. [9] T. L. Nwe, S. W. Foo, and L. C. De Silva, “Speech emotion recognition using hidden Markov models,” *Speech Commun.*, vol. 41, no. 4, pp. 603–623, Nov. 2003

