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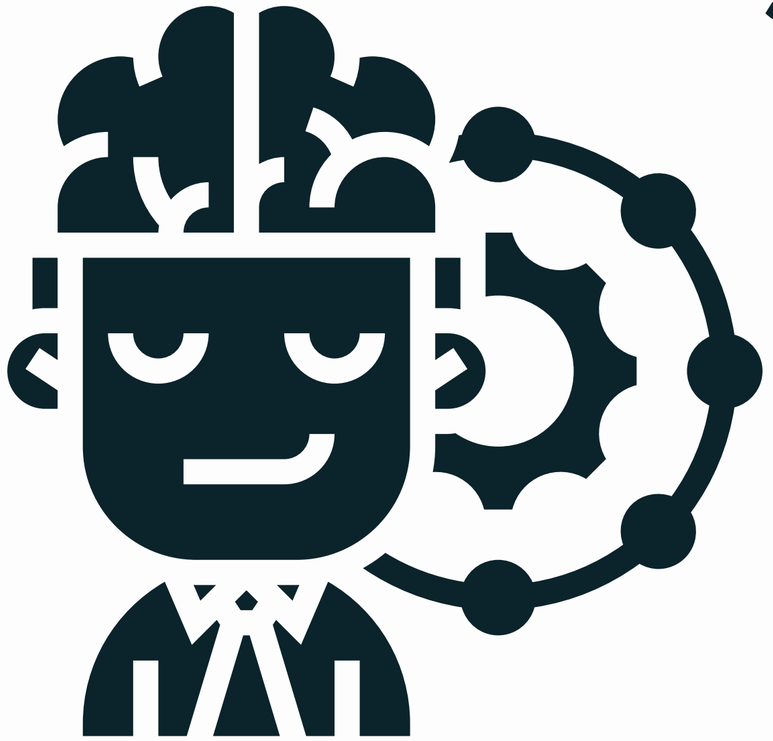
Sentiment Analysis Using Speech



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DATE OF PRESENTATION:
23 DECEMBER 2023

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Problem Statement

Understanding and interpreting the sentiments expressed in verbal communication has become more essential in a world where spoken language is the primary means of communication. To know ourselves and our close ones more ,we need our emotions to be expressed and labelled . The goal of this project is to use speech recognition technology to create a comprehensive and accurate sentiment analysis system.

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Our Solution

Develop a sentiment analysis machine learning model that leverages speech recognition technology to convert spoken words into text. Utilize a dataset of transcribed spoken conversations to train the model. Employ natural language processing techniques and sentiment analysis algorithms to classify the sentiment of the text data. Integrate the model into a user-friendly application for real-time sentiment analysis of spoken input, making it a valuable tool for understanding and responding to user emotions.

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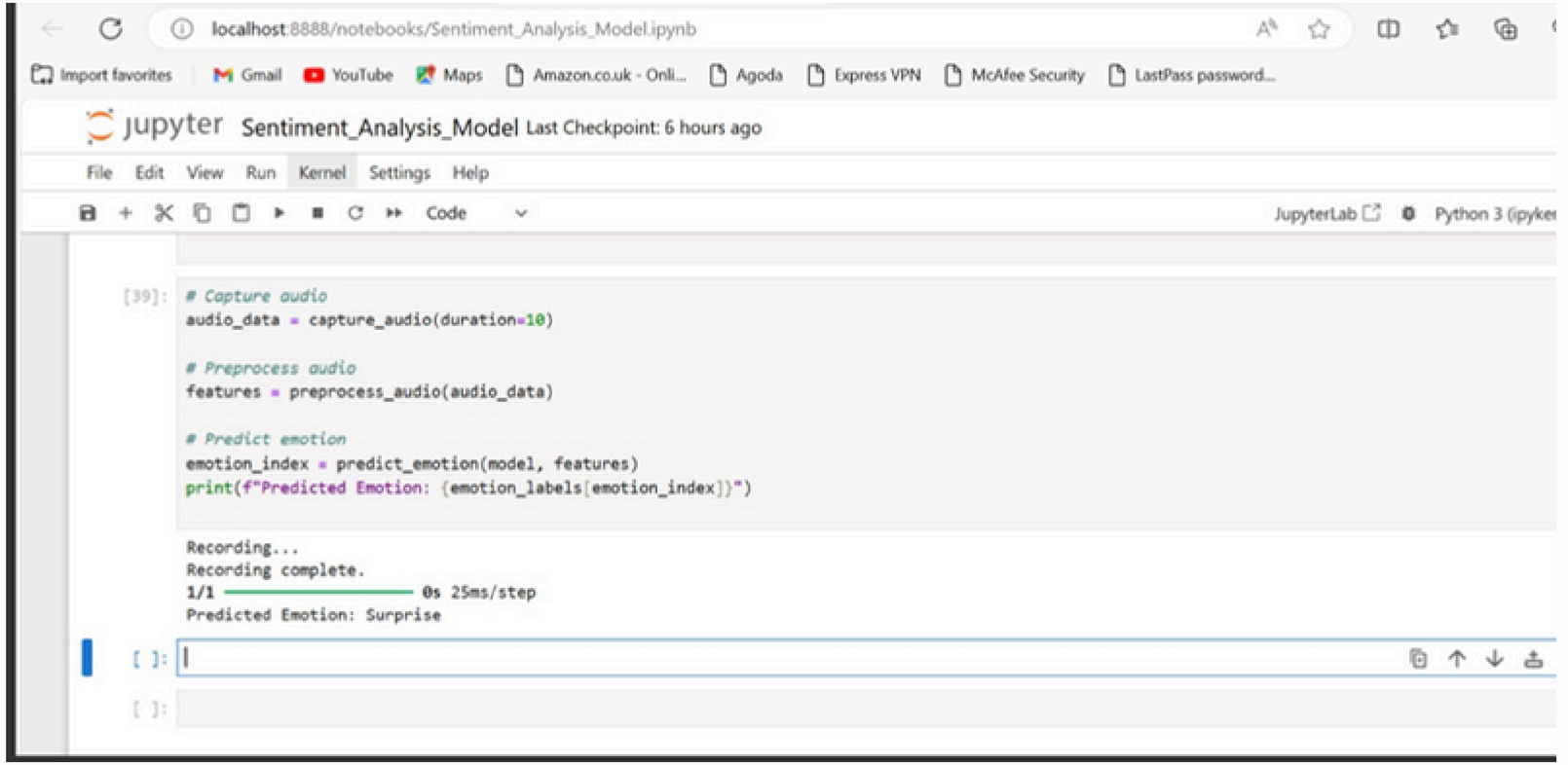
Objective

- The idea behind creating this project is to build a machine learning model that could detect emotions from the speech we have with each other all the time.
- Implement a sentiment analysis algorithm to determine the sentiment (positive, negative, neutral) of the transcribed text.
- Create a user-friendly interface to input spoken content and visualize sentiment results.
- Develop a robust speech recognition system to convert spoken language into text.


localhost:8888/notebooks/Sentiment_Analysis_Model.ipynb
Import favorites
Gmail
YouTube
Maps
Amazon.co.uk - Onli...
Agoda
Express VPN
McAfee Security
LastPass password...
jupyter
Sentiment_Analysis_Model
Last Checkpoint: 6 hours ago
File
Edit
View
Run
Kernel
Settings
Help
Code
JupyterLab
Python 3 (ipyke
[39]:
# Capture audio
audio_data = capture_audio(duration=10)
# Preprocess audio
features = preprocess_audio(audio_data)
# Predict emotion
emotion_index = predict_emotion(model, features)
print(f"Predicted Emotion: {emotion_labels[emotion_index]}")
Recording...
Recording complete.
1/1 0s 25ms/step
Predicted Emotion: Surprise
[ ]:
[ ]:

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TIMELINE

LEARNING — SEPT 23'-NOV 23'

DEC 23' — CREATING MACHINE LEARNING MODEL

USER INTERFACE — JAN 24' - FEB 24'

MAR 24' — INTEGRATING WITH APPLICATION AND DEPLOYMENT

APRIL 24' — RESEARCH PAPER

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Literature Review

S.No	Journals	year	Techniques	Findings	Shortcomings
1	Sentiment Analysis on Speaker Specific Speech Data	2017	Review paper	The paper proposes a generic model that accepts audio conversations as input and converts them to text as well as recognizes speakers.The system performs well with artificially created data but is limited in its ability to handle conversations between two speakers in which only one person talks at a time.The technology is incapable of comprehending simultaneous speech from both speakers.Future work will try to solve these limits, increase accuracy, and scale the system. This entails gathering a larger dataset.	The system is accurate in comprehending the sentiment of the speakers in conversational dialogue, it suffers some flaws, right now the system can handle a conversation between two speakers and in the conversation only one speaker should talk at a given time, it cannot understand if two people talk simultaneously. Our future work would address these issues and improve the accuracy and scalability of the system.
2	Sentiment Analysis and Emotion Recognition from Speech Using Universal Speech Representations	2022	article	1. Understanding sentiment and emotion in speech is a difficult undertaking, especially when dealing with multimodal language. 2. In some cases, such as phone calls, only audio data is available for analysis, making sentiment and emotion analysis difficult. 3. Binary sentiment analysis produced the best findings, with weighted and unweighted accuracy scores of 81% and 73%, respectively.	The evaluation of large-scale pre-trained speech embeddings (UniSpeech-SAT Large) on these affective speech tasks consistently resulted in superior performance among other variants; however, this was only feasible for two-task sentiment analysis. The other tasks were not feasible (UA < 60%), which could have been caused by several possible factors, mainly influenced by the unbalanced distribution of the data.

S.No	Jounrals	year	Techniques	Findings	Shortcomings
3	Speech Emotion Analysis Using Machine Learning for Depression Recognition	2022	Literature Reviuew	Depression is a serious medical disease that the suggested method is designed to detect in humans. The approach is intended to reduce the requirement for human intervention in the diagnosis of depression. Speech analysis is an important part of the method for detecting depression. The lack of publicly available speech resources made developing a well-trained model for depression recognition difficult. The depression identification system was built using Keras and Scikit Learn.The proposed technology will be integrated into a real-time depression detection software to provide emotional support.	Dataset biases such as gender bias or age bias might have an impact on the effectiveness of the final machine learning model trained on such datasets to analyze emotions or depression. It's also crucial to keep a healthy ratio between sad and nondepressed data, as well as across samples related to other emotions, so that the model isn't distorted by majority sample bias.

S.No	Jounrals	year	Techniques	Findings	Shortcomings
4	SPEECH SENTIMENT ANALYSIS VIA PRE-TRAINED FEATURES FROM END-TO-END ASR MODELS	2020	Research Paper	1. Performance Boost: Using pre-trained ASR features significantly improved sentiment analysis accuracy—71.7% on IEMOCAP and 70.10% on SWBD-sentiment—surpassing prior methods. 2. Effective Fusion of Acoustic and Text: Integrating ASR models blended acoustic and language cues, enhancing sentiment classification results by capturing emotional signals more accurately.	1. Interpretability Challenge: While achieving high accuracy, understanding how the model reaches decisions for sentiment analysis remains complex despite attempts to visualize attention weights. 2. Dataset Impact: The approach's success might rely on dataset characteristics; for example, the imbalanced class distribution in SWBD-sentiment raises concerns about real-world applicability and robustness.

S.No	Jounrals	year	Techniques	Findings	Shortcomings
5	**A Machine Learning Model for Automatic Emotion Detection from Speech**	**2021**	Research Paper	1. **Imbalanced Data Impact: Dataset imbalances significantly affected model performance, particularly in detecting less frequent emotions like anger, disgust, and fear. Balancing the dataset improved accuracy for these emotions.** 2. **Deep Learning Superiority: Deep learning methods, CNN and LSTM networks, outperformed classical algorithms in capturing complex emotional nuances from text.**	1. **Complex Imbalance Handling: Addressing dataset imbalances to enhance model accuracy was challenging, requiring intricate oversampling or undersampling techniques, potentially introducing biases.** 2. **Limited Emotional Spectrum: The model's discrete emotional categories might overlook nuanced or transitional emotions, indicating a need for refining emotion categorization.**

S.No	Jounrals	year	Techniques	Findings	Shortcomings
6	**Speech Emotion Recognition using Machine Learning Algorithms**	**2021**	Research Paper	1. **Feature Importance: Identified crucial acoustic features (pitch, intensity, MFCCs) contributing to accurate emotion recognition from speech.** 2. **Model Comparison: Compared SVM, Random Forest, and neural network models, highlighting neural networks' superiority in capturing nuanced speech emotions.**	• **Limited Training Data: Restricted dataset size hindered capturing diverse speech emotions, potentially limiting model generalization.** • **Overfitting Challenges: Complex models like neural networks encountered overfitting issues due to the limited dataset, requiring regularization techniques.**

Advancements in Sentimental Analysis : A Comprehension Review

Software Requirements Specifications

Emotion Recognition using Speech

Thank You