SoC - Speech Emotion Recognition

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Contents

1 Week 1

In the first week, the task was based on python basics, and its libraries, numpy, matplotlib and pandas and also there was a guide for how to use Colab notebooks, which allows us to write and run code in separate cells, facilitating easier debugging. It's a hosted Jupyter notebook service with free access to computing resources, including GPUs and TPUs.

NumPy (Numerical Python) is a fundamental library for linear algebra in Python. It plays a crucial role in AI/ML and data science by enabling efficient mathematical and logical operations on arrays.
Matplotlib is Python's essential plotting library, widely used for data visualization. It supports various types of plots and is the foundation for other visualization packages like pandas and Seaborn.
Pandas is a Python library used for working with datasets. It is a fast, powerful, flexible and easy to use open source data analysis and manipulation tool. Pandas has data structures for data analysis. The most commonly used data structures are Series and DataFrame. Series is one-dimensional. It consists of one column. DataFrame is two dimensional. It consists of rows and columns.
The resources given were:

- https://youtu.be/kqtD5dpn9C8?feature=sharedPython Basics Video
- https://www.w3schools.com/python/W3Schools Python Tutorial
- https://youtube.com/playlist?list=PLzMcBGfZo4-mFu00qxl0a67RhjjZj3jXmfeature=sharedPython Basics Playlist
- https://youtu.be/iMlMfrXJYSg?feature=sharedIntroduction to colab
- https://numpy.org/doc/stable/user/quickstart.htmlNumPy Quickstart Tutorial
- https://www.w3schools.com/python/numpy/default.aspNumPy W3Schools Tutorial
- https://youtu.be/QUT1VHiLmmI?feature=sharedNumPy Video Tutorial
- https://www.w3schools.com/python/matplotlib$_intro.aspMatplotlibW3SchoolsIntrohttps://matplotli$
- https://youtu.be/OZOOLe2imFo?feature=sharedMatplotlib Video Tutorial
- https://pandas.pydata.org/Pandas Documentation
- https://www.w3schools.com/python/pandas/default.aspW3Schools Pandas Tutorial
- https://youtu.be/vmEHCJofslg?feature=sharedPandas Video Tutorial

2 Week 2

Here we had to study different types of regression, linear regression, logistic regression and ridge regression, and two types of classifications, Naive Bayes Classifier, and Support vector Machines (SVM). Then we had to implement codes of Logistic regression and SVM. Also there was one article and a video for clearing that why logistic regression is used in classification but still called as regression.
The resources for second week were:

- https://www.javatpoint.com/regression-vs-classification-in-machine-learningDifference between Classification and Regression explanation
- https://ashish-mehta.medium.com/why-is-logistic-regression-called-regression-if-it-is-a-classification-algorithm-9c2a166e7b74An Interesting Article on why logistic regression is used in classification and still called as regression
- https://youtu.be/7ArmBVF2dCs?si=A9VVZMGBa51alAIJVideo Tutorial of Linear regression
- https://www.geeksforgeeks.org/linear-regression-implementation-from-scratch-using-python/Article of Linear regression
- https://youtu.be/yIYKR4sgzI8?si=h-myOtJxpLLIoXB-Video Tutorial of Logistic regression
- https://www.geeksforgeeks.org/implementation-of-logistic-regression-from-scratch-using-python/Article of Logistic regression
- https://youtu.be/Q81RR3yKn30?si=PSsC-qxrluSk$_{e}LpVideoTutorialofRidgeregressionhttps://www.$
- https://youtu.be/O2L2Uv9pdDA?si=gIi$_{v}dJOZmGimaJ-VideoTutorialofNaiveBayesClassifierhttp$
- https://youtu.be/ny1iZ5A8ilA?si=3wjFV4-fxQjY5mVTVideo Tutorial of SVM

- https://youtu.be/$_{P}whiWxHK8oMITOCWlectureonSVMshttps://medium.com/@gallettilance/support-$

3 Week 3

Here we studied Neural networks, and Recurrent Neural networks, and also implemented their models from scratch. We were also given a question pdf for which we had to submit an answer pdf.
The resources were:

- https://youtu.be/mlk0rddP3L4?si=QmF$_{h}b_{x}rwac3trXNeuralNetworkPlaylisthttps://mattmazur.co$
- https://youtu.be/AsNTP8Kwu80?si=$_{L}AOfQkt0frmINXMRNNhttps://youtu.be/YCzL96nL7j0?s$

- https://www.cse.iitb.ac.in/ swaprava/courses/cs217/scribes/CS217$_{2}024_{l}ec13.pdfRNNpdfhttps://youtu.be/3$

4 Week 4

In this week we had to complete the code on the basis of librosa library. We also studied that why do we do audio preprocessing.

Audio preprocessing is essential for improving the quality and consistency of audio data, which enhances the performance of machine learning models. Key steps include noise reduction to remove unwanted sounds, normalization to standardize audio levels, and segmentation to break audio into manageable chunks. Feature extraction, such as obtaining MFCCs, transforms raw audio into meaningful representations. These steps help reduce overfitting, improve computational efficiency, and ensure that the models focus on relevant audio features, leading to better accuracy and reliability in tasks like speech and music recognition.
Some more terms were:
Sampling Rate: Number of audio samples per second; higher rates capture more detail.
Amplitude: Loudness of the audio signal; higher amplitude means louder sound.
Frequency: Number of wave cycles per second; determines pitch.
Waveforms: Show amplitude variations over time.
Spectrograms: Display frequency content over time, useful for detailed audio analysis.
The resources for librosa were:

- https://librosa.org/doc/latest/index.htmlDocumentation
- https://youtu.be/MhOdbtPhbLU?si=jgJOd2vQDj8f7RdtVideo Tutorial

5 Week 5 and 6

These weeks were the main project. We used tensorflow.keras library for models. Along with printing the accuracy, we also had to print a classification report using classification$_r eport function from sklearn.metrics$.
$They also gave some knowledge about callbacks$.

6 Week 7 and 8

These two weeks were for fun. Here we had to make our own tic-tac-toe AI bot. This was also a slight introduction to AI and Game theory.

This was all that we did. I learned many new things and really enjoyed it a lot.