Deep Learning Project

Classifying Heart Condition

Raghad Alarifi
Reef Alturki

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01. Objectives

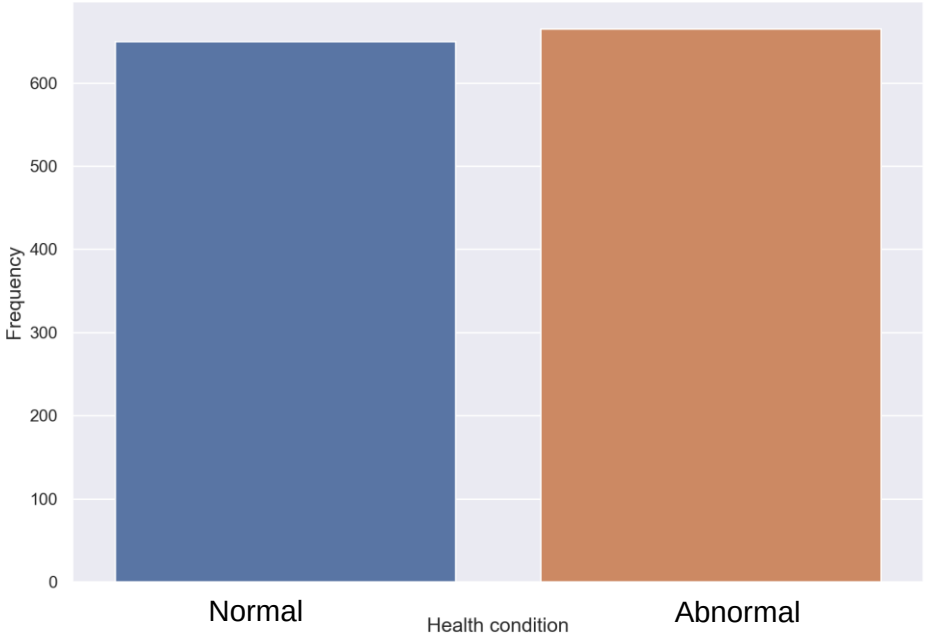
- Approximately 29% of the global deaths are caused by Cardiovascular diseases.
- The main goal of this project is to classify the heart condition from a heart rate audio.

02.
Dataset and EDA

Dataset

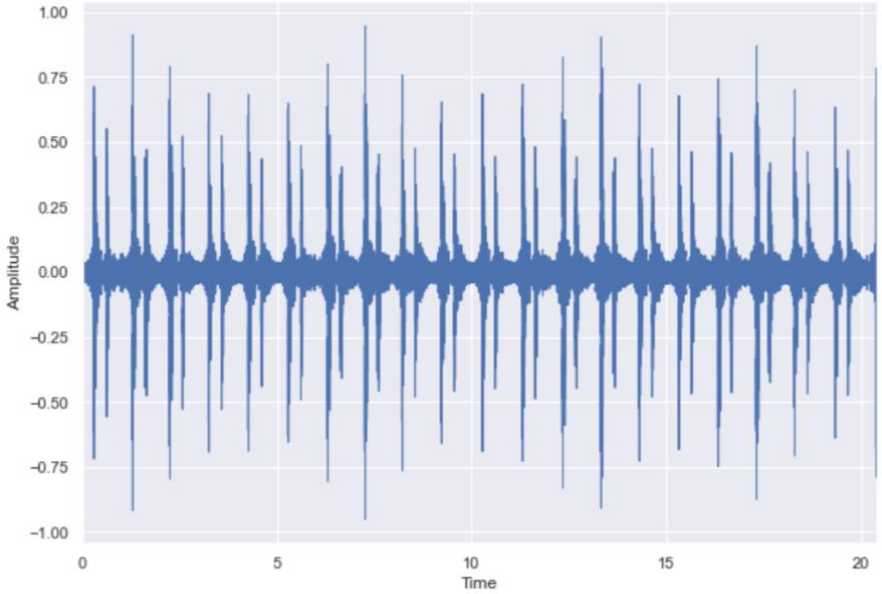
- Heart sound dataset was collected from physioNet website.
- The dataset contains 1315 original PCG recordings in .wav format.
- Audio files are labeled as 0 "Normal Heart Sound" and 1 "Abnormal Heart Sound".

EDA: Distribution of class

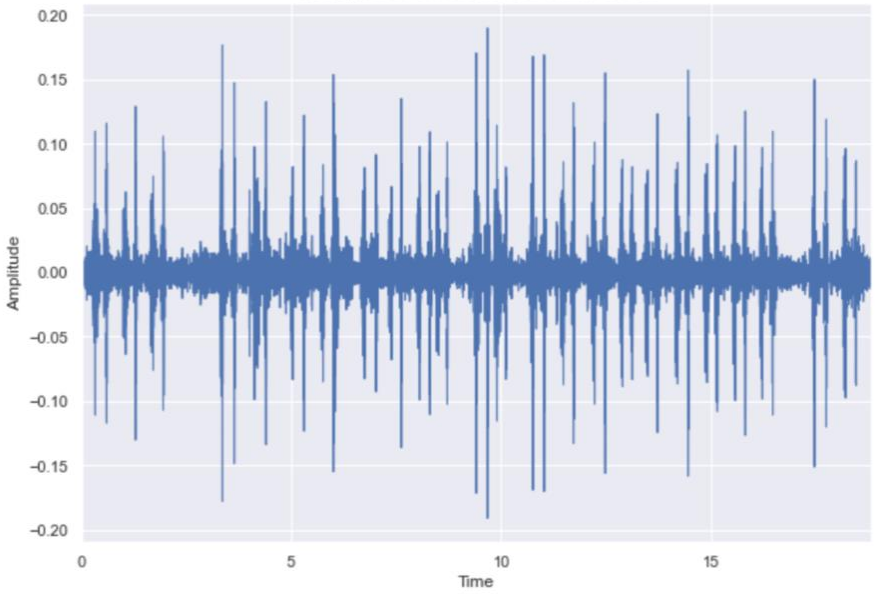


EDA: Waveplots

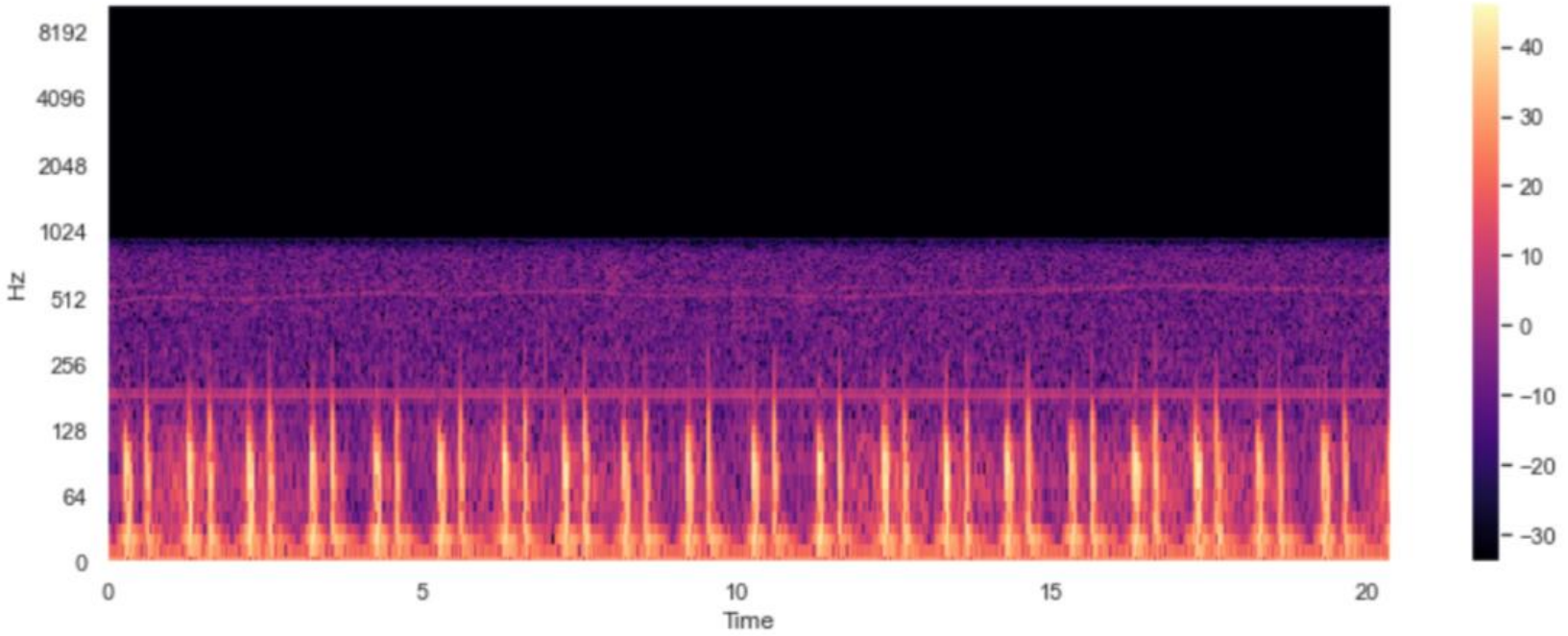
Normal



Abnormal



EDA: Spectrogram



03.
Model Baseline

Classification Metric

Recall

“the probability that a sick patient is detected by the classifier”.

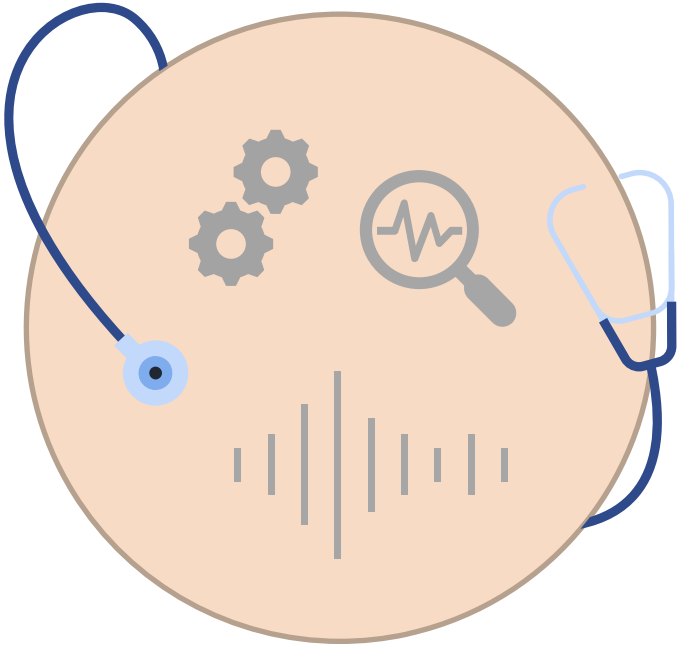
Classification Model

K-Nearest Neighbors

Recall score: **0.6998**

04.

Data Preprocessing



Tools

Data Preprocessing

Data Cleaning

Dropping long audio files

Noise Removal

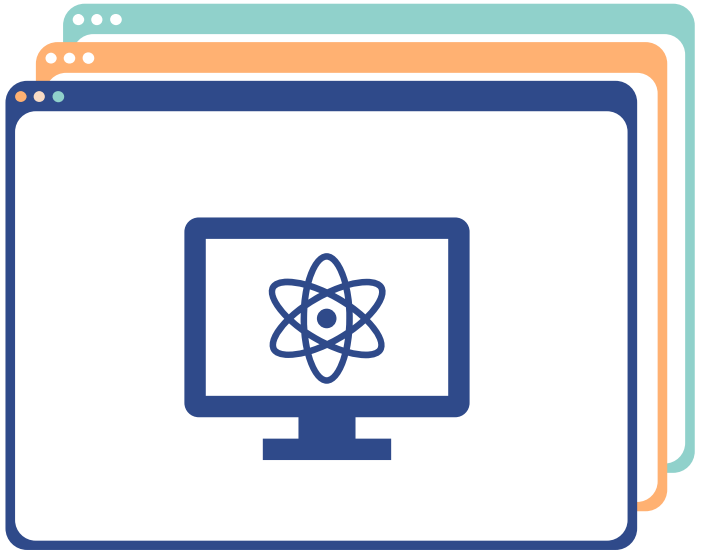
Use noisereduce to remove noise from audio files

Standardize Duration

Making all audio files the same length

05.

Neural Network Models



Neural Network Models

- Feed Forward Neural Network
- Long Short-Term Memory Neural Network
- Convolutional Neural Network

Feed Forward Neural Network

Hyperparameters

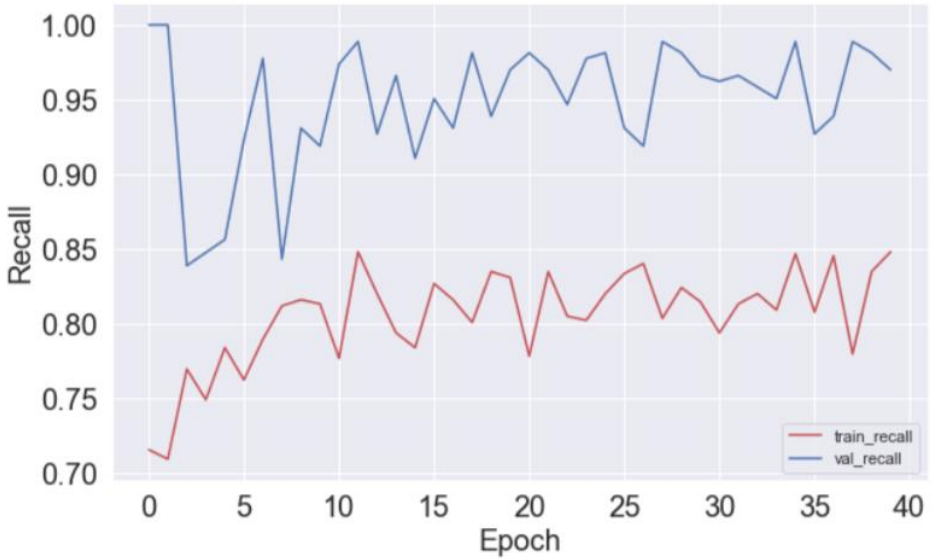
Hidden Layers: 2

Units: 100

Epochs: 40

Batch Size: 32

Dropout: 0.5



Recall Score : 0.94

Long Short-Term Memory Neural Network

Hyperparameters

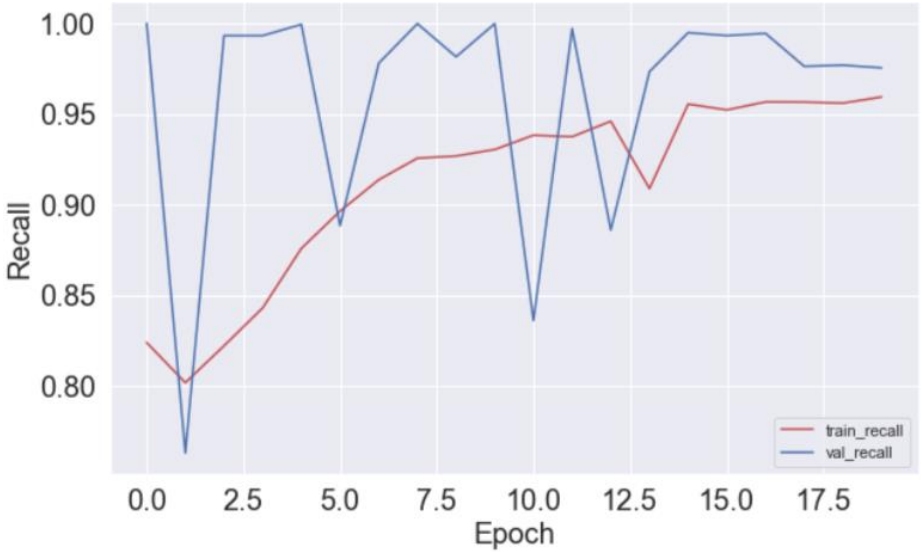
Hidden Layers: 3

Units: 64, 128

Epochs: 20

Batch Size: 32

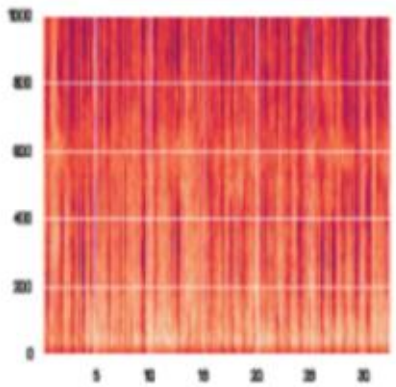
Dropout: 0.3, 0.5



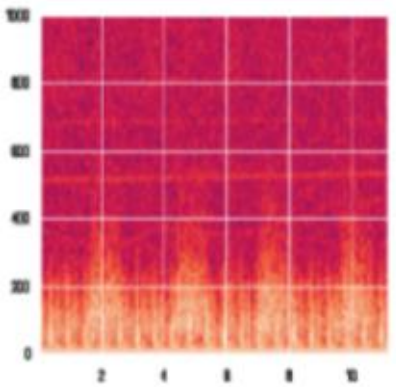
Recall Score : 0.96

Convolutional Neural Network

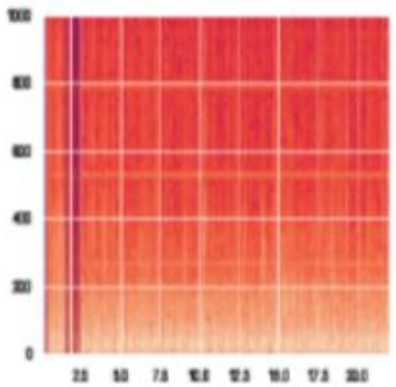
1



0



1



Convolutional Neural Network

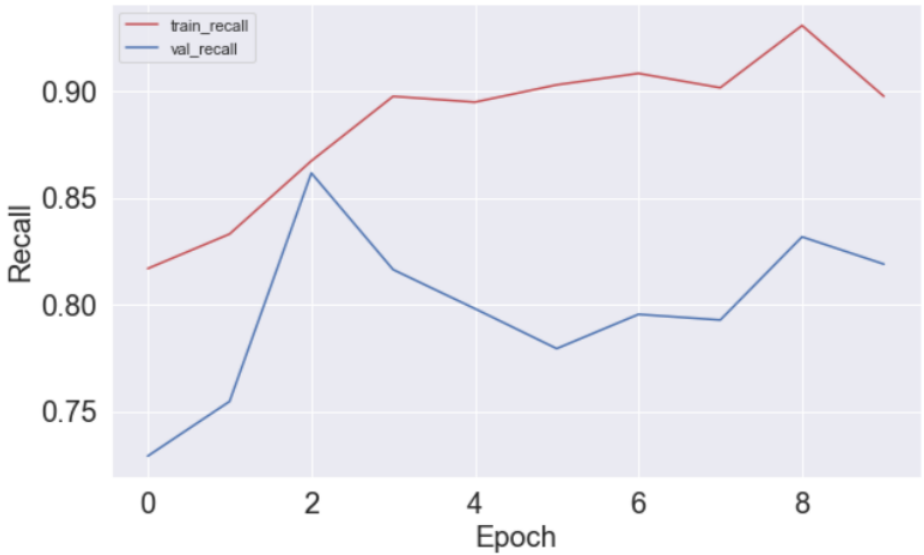
Hyperparameters

Hidden Layers: 2

Units: 64

Epochs: 10

Dropout: 0.3



Neural Network Optimization

- GridSearchCV : Hyperparameter tuning for Feed Forward Neural Network Model

Hyperparameters

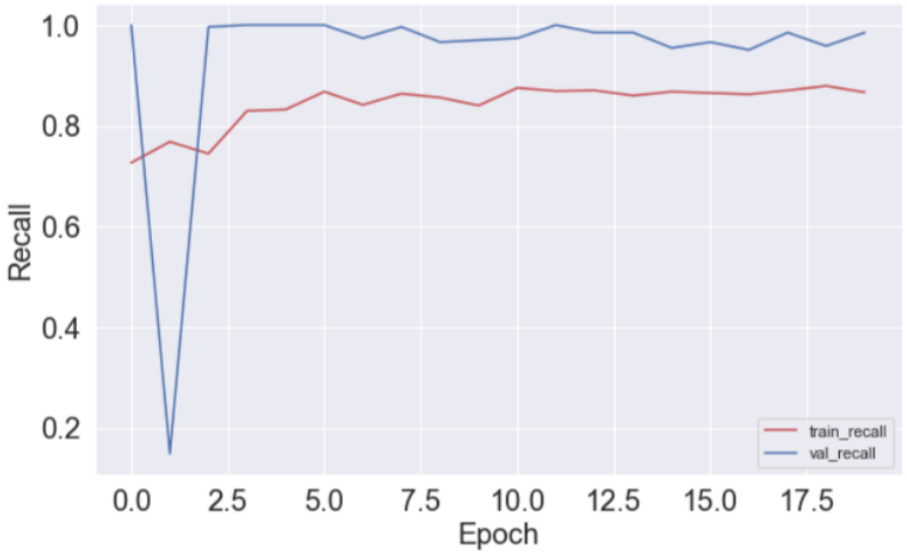
Hidden Layers: 2

Units: 100, 32

Epochs: 20

Batch Size: 4

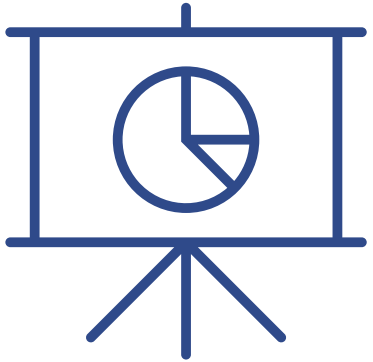
Dropout: 0.3



Recall Score : 0.96

Conclusion

In conclusion, LSTM neural network model has the best performance on classifying heart conditions through audio. While the feed-forward neural network model provides high recall, it suffers from overfitting. We can see that the validation recall of the feed-forward model is always close to one, Which indicates that the model is not learning. On the other hand, CNN performed poorly because it's designed to work effectively on image data.



THANKS!

Do you have any questions?