

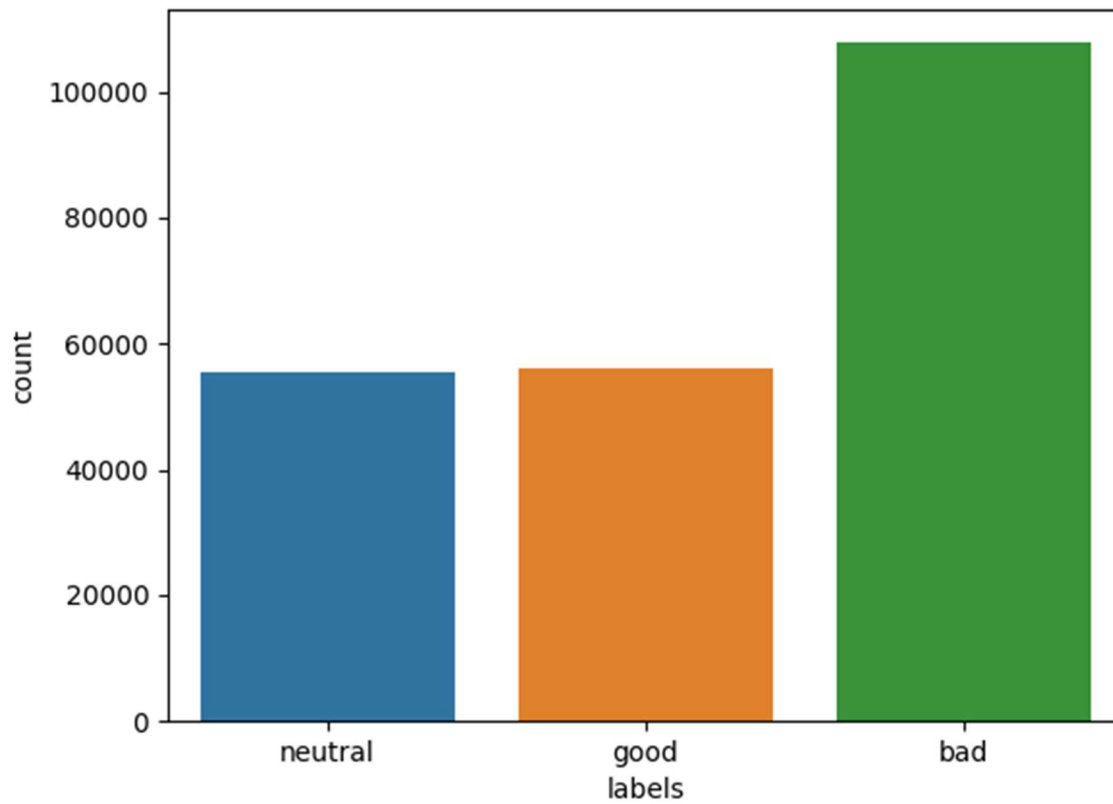
ChatGPT Sentiment Analysis Report

Date: 15/5/2023

Time: 22:11:08

Authors: Khaled Ashraf, Samah Moustafa

Majority of tweets



CNN Models

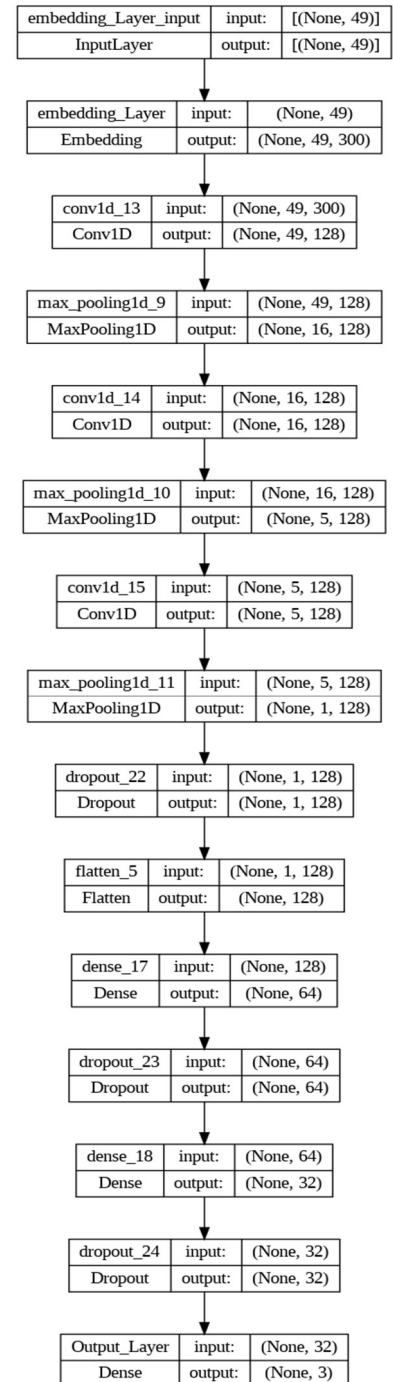
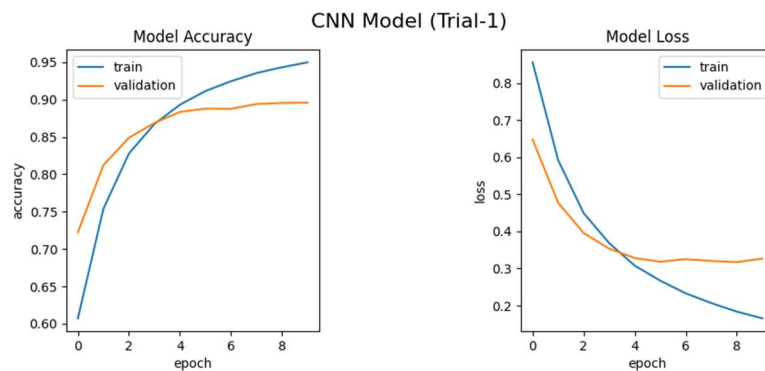
Trial-1

- **3 Layers of:-**

Conv1D(128 , 16 , padding = 'same', activation = 'relu')

- **Embedding trainable=True**
- **learning rate=0.0001**
- **two hidden layers with ReLU Activation Function:-**
 1. **64 units with 0.2 Dropout**
 2. **32 units with 0.2 Dropout**
- **Optimizer=Adam**

Model Accuracy and Loss



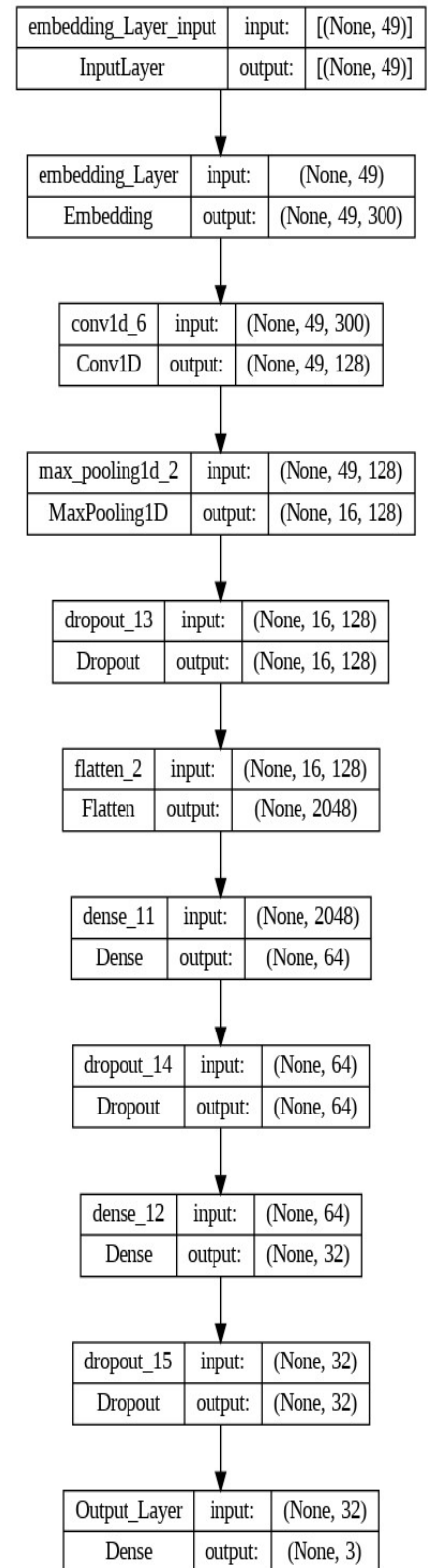
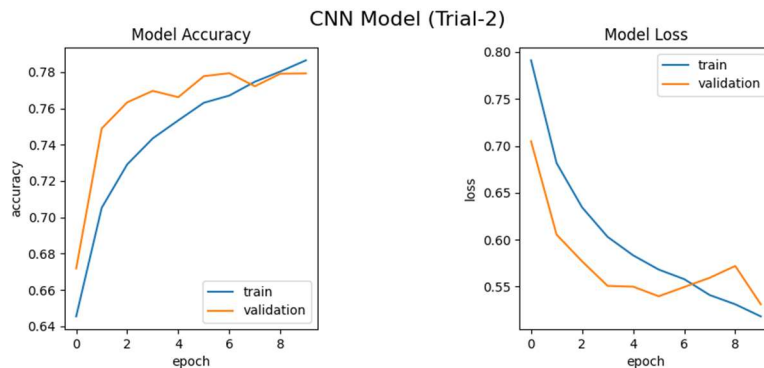
Trial-2

- **1 Layer of:-**

Conv1D(128 , 16 , padding = 'same',activation = 'relu')

- **Embedding trainable=False**
- **learning rate=0.01**
- **two hidden layers with ReLU Activation Function:-**
 1. **64 units with 0.2 Dropout**
 2. **32 units with 0.2 Dropout**
- **Optimizer=Adam**

Model Accuracy and Loss



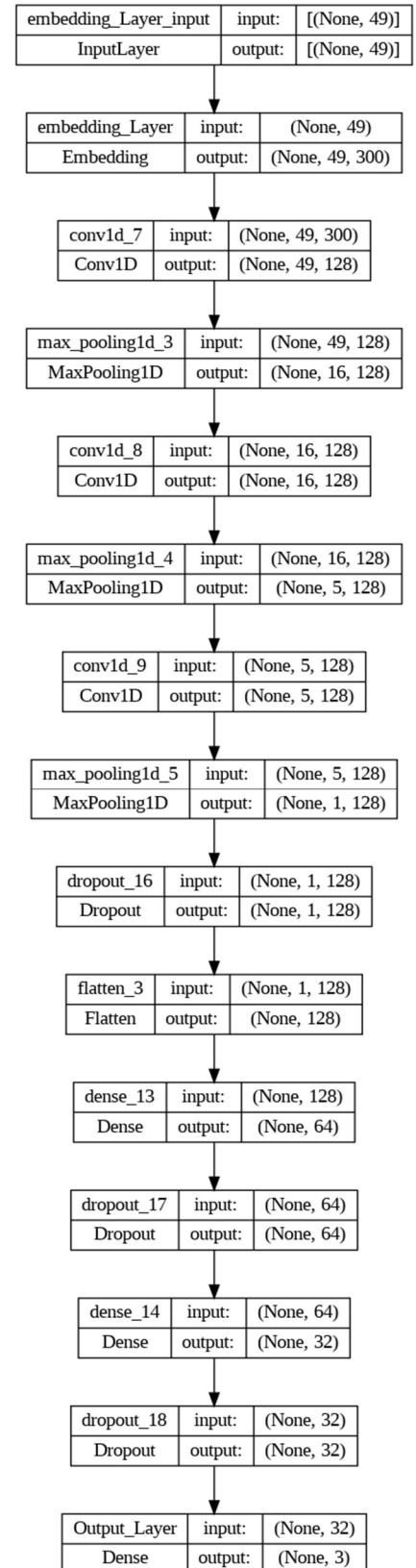
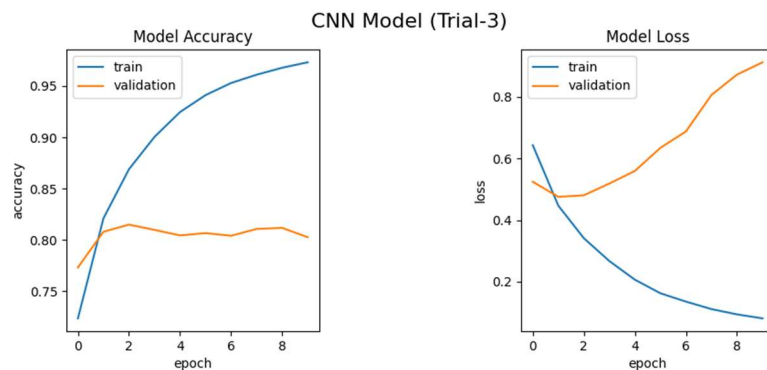
Trial-3

- **3 Layer of:-**

Conv1D(128 , 16 , padding = 'same',activation = 'relu')

- **Embedding trainable=False**
- **learning rate=0.001**
- **two hidden layers with ReLU Activation Function:-**
 1. **64 units with 0.2 Dropout**
 2. **32 units with 0.2 Dropout**
- **Optimizer=Adam**

Model Accuracy and Loss



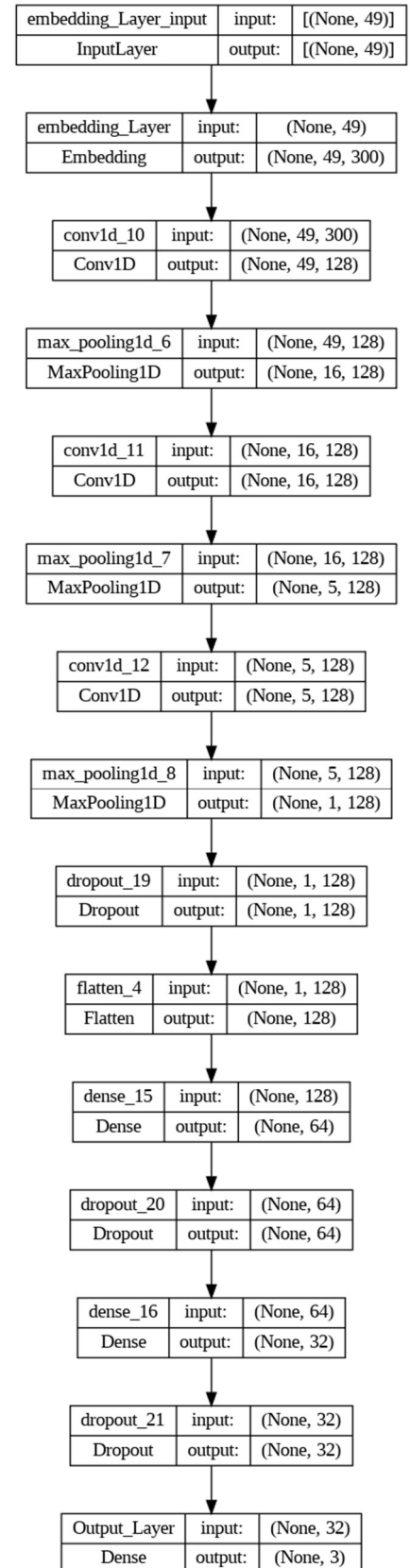
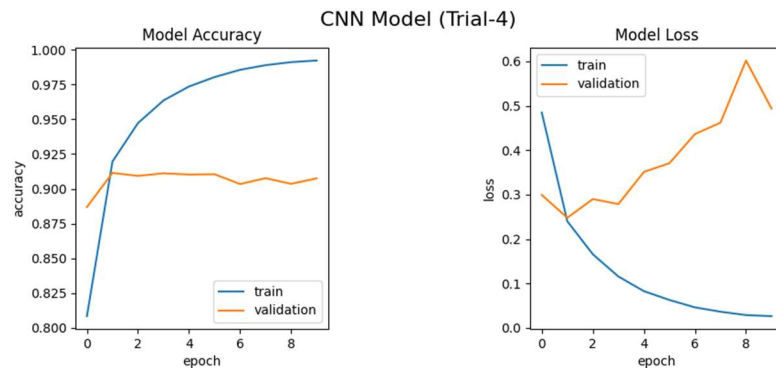
Trial-4

- **3 Layer of:-**

Conv1D(128 , 16 , padding = 'same',activation = 'relu')

- **Embedding trainable=True**
- **learning rate=0.001**
- **two hidden layers with ReLU Activation Function:-**
 1. **64 units with 0.2 Dropout**
 2. **32 units with 0.2 Dropout**
- **Optimizer=Adam**

Model Accuracy and Loss



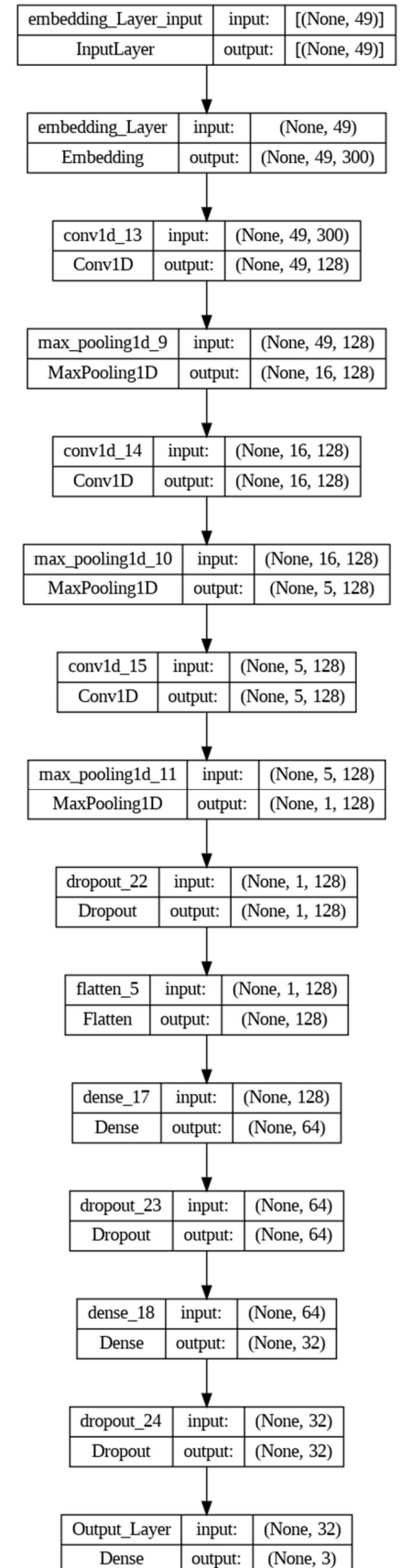
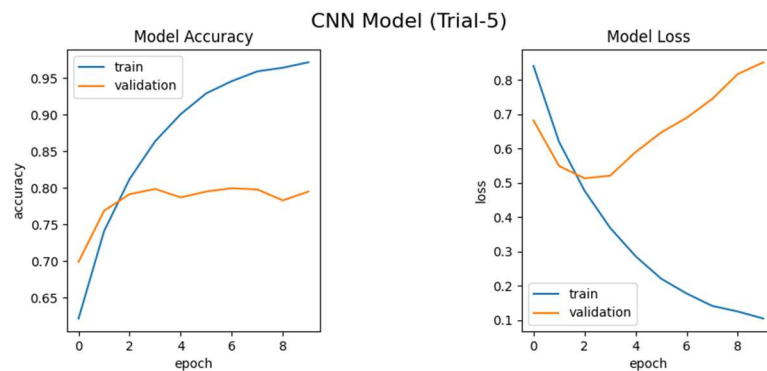
Trial-5

- **3 Layer of:-**

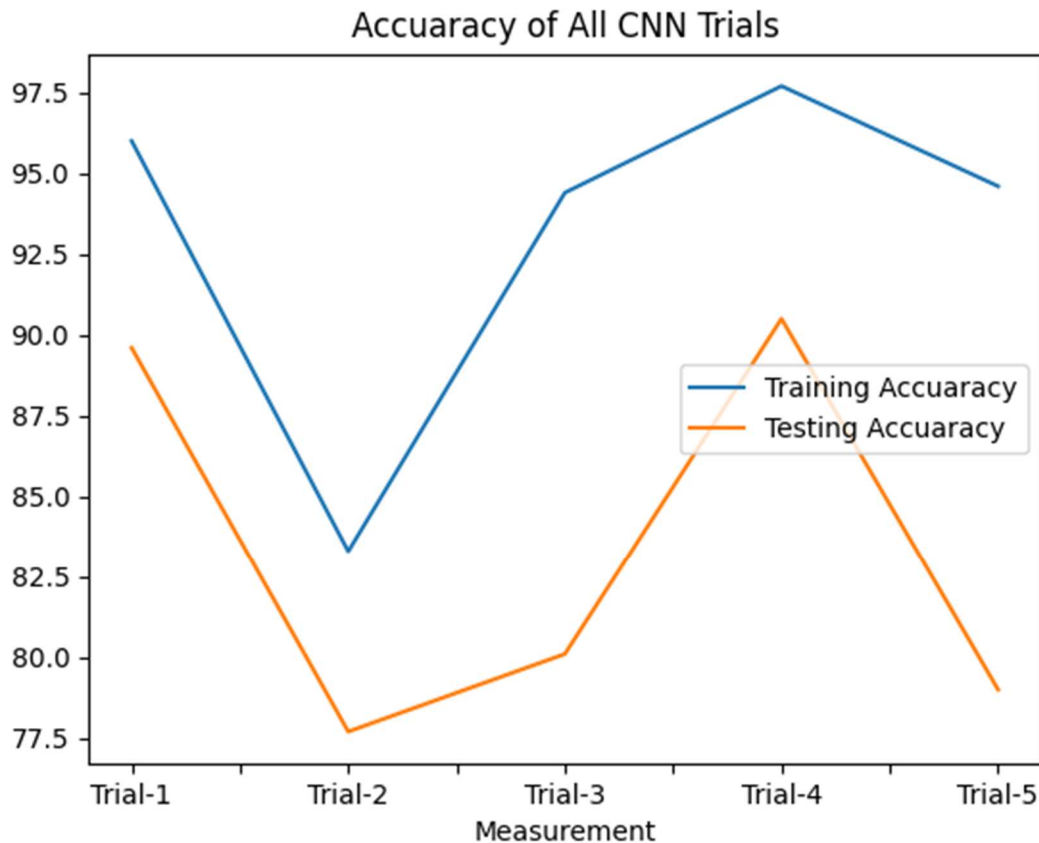
Conv1D(128 , 16 , padding = 'same',activation = 'relu')

- **Embedding trainable=True**
- **learning rate=0.0001**
- **two hidden layers with ReLU Activation Function:-**
 1. **64 units with 0.2 Dropout**
 2. **32 units with 0.2 Dropout**
- **Optimizer=Adam**

Model Accuracy and Loss



Model Accuracy For all Trials



So, The Best Accuracy is Trial-4

Training Accuracy (Trial 4): 97.7%

Testing Accuracy (Trial 4): 90.5%

```
Trial 4
Training Accuracy (Trial 4): 97.7%
Testing Accuracy (Trial 4): 90.5%
5483/5483 [=====] - 24s 4ms/step - loss: 0.2227 - accuracy: 0.9456 - f1_m: 0.9456 - precision_m: 0.9458 - recall_m: 0.9453
1371/1371 [=====] - 6s 4ms/step - loss: 0.8698 - accuracy: 0.7901 - f1_m: 0.7899 - precision_m: 0.7905 - recall_m: 0.7893
```

LSTM Models

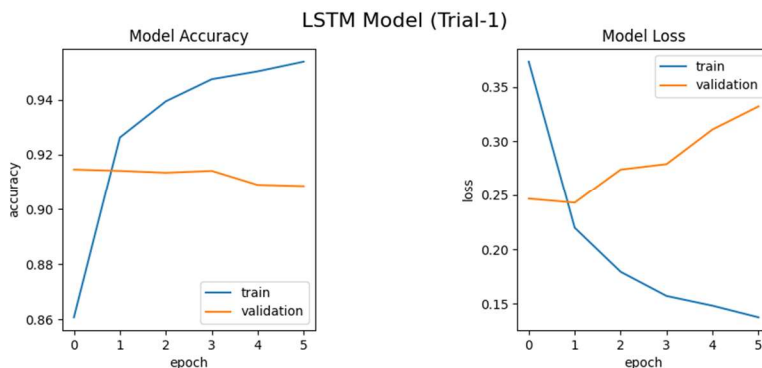
Trial-1

- **No Layers of:-**

Conv1D(64 , 8 ,activation = 'relu')

- **Embedding trainable=True**
- **learning rate=0.01**
- **one hidden layer with ReLU Activation Function:-**
 1. 64 units with 0.5 Dropout
- **Optimizer=Adam**
- **LSTM Units=64**

Model Accuracy and Loss



embedding_Layer_input	input:	[(None, 49)]
InputLayer	output:	[(None, 49)]

embedding_Layer	input:	(None, 49)
Embedding	output:	(None, 49, 300)

bidirectional_5(lstm_5)	input:	(None, 49, 300)
Bidirectional(LSTM)	output:	(None, 128)

dense_2	input:	(None, 128)
Dense	output:	(None, 64)

dropout_2	input:	(None, 64)
Dropout	output:	(None, 64)

Output_Layer	input:	(None, 64)
Dense	output:	(None, 3)

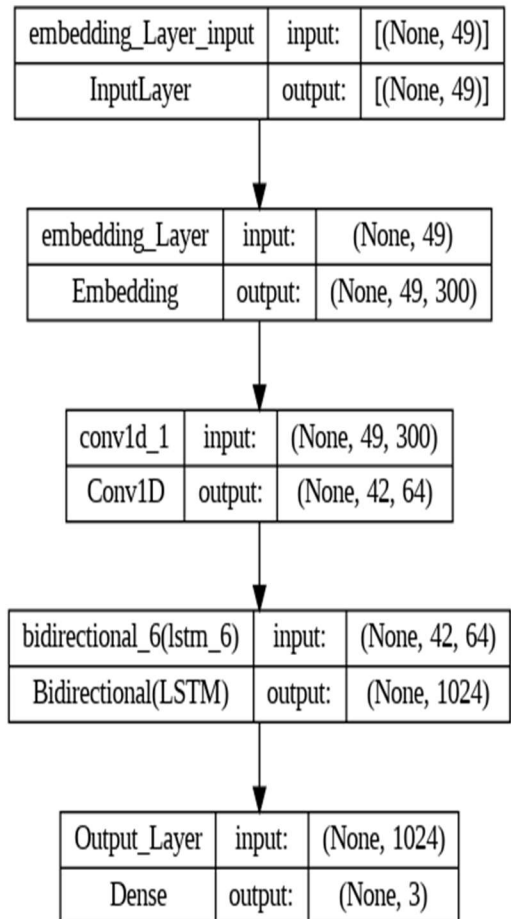
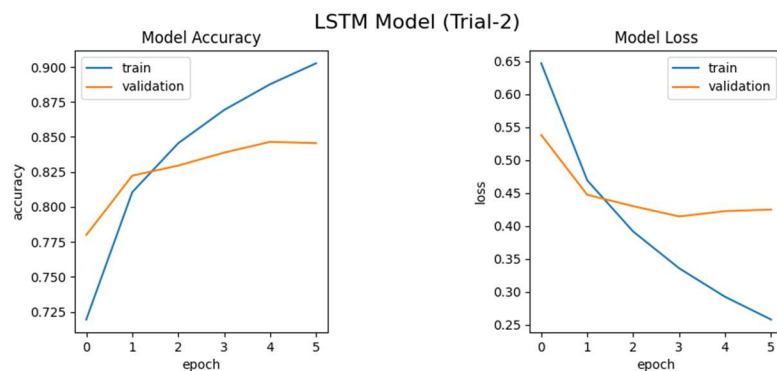
Trial-2

- **one Layer of:-**

Conv1D(64 , 8 ,activation = 'relu')

- **Embedding trainable=False**
- **learning rate=0.001**
- **no dense hidden layers.**
- **Optimizer=Adam**
- **LSTM Units=512**

Model Accuracy and Loss



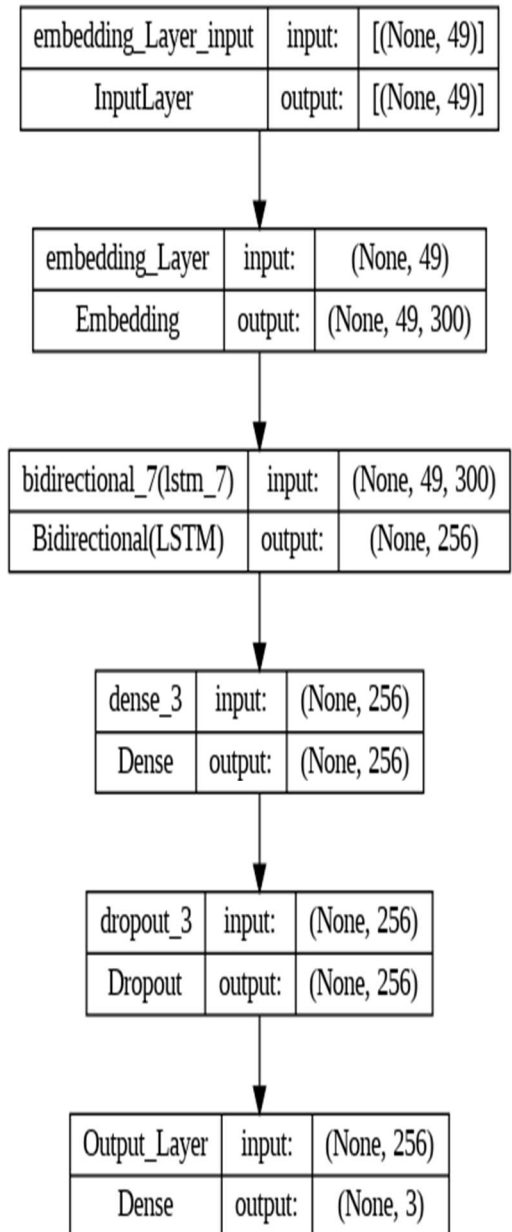
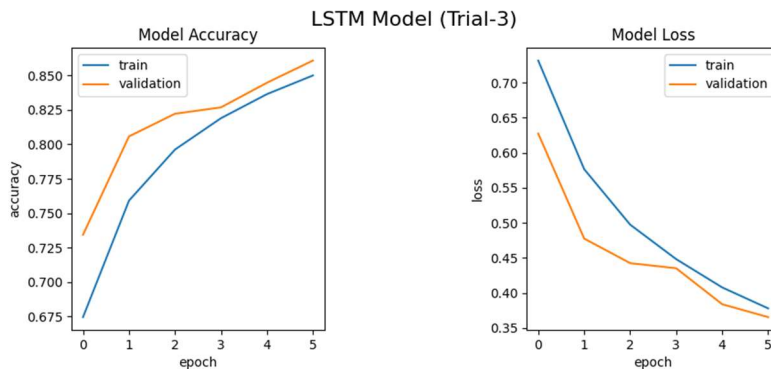
Trial-3

- **No Layers of:-**

Conv1D(64 , 8 ,activation = 'relu')

- **Embedding trainable=False**
- **learning rate=0.001**
- **one hidden layer with ReLU Activation Function:-**
 1. **256 units with 0.5 Dropout**
- **Optimizer=Rmsprop**
- **LSTM Units=128**

Model Accuracy and Loss



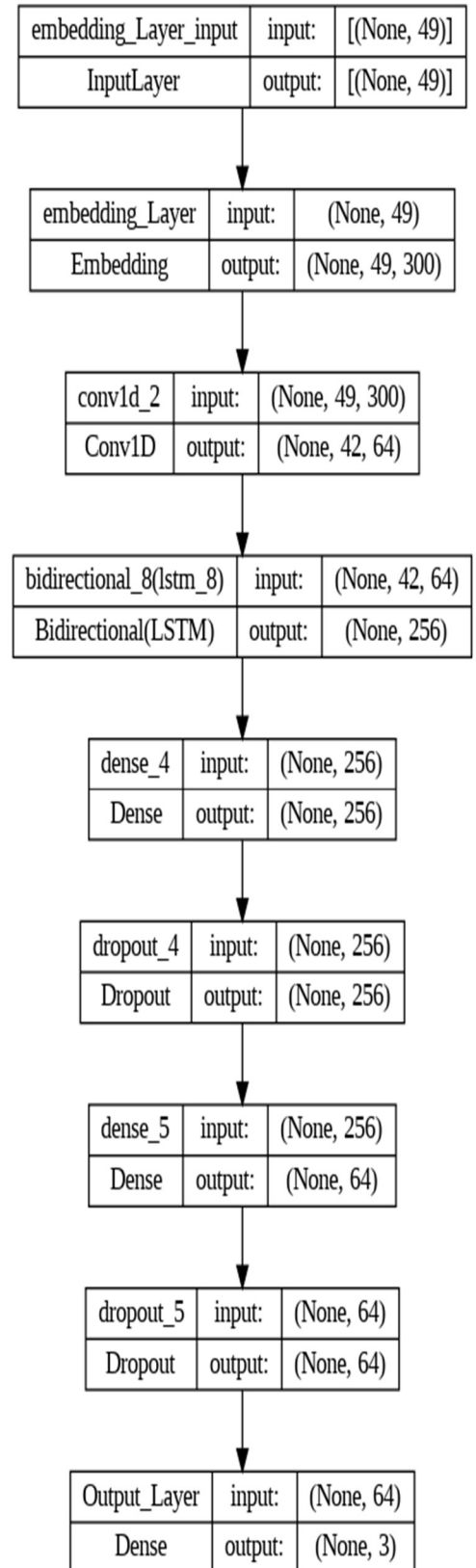
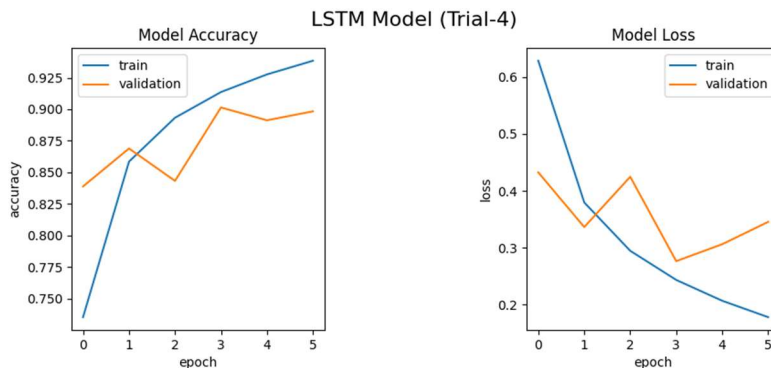
Trial-4

- **One Layer of:-**

Conv1D(64 , 8 ,activation = 'relu')

- **Embedding trainable=True**
- **learning rate=0.001**
- **two hidden layers with ReLU Activation Function:-**
 1. **256 units with 0.5 Dropout**
 2. **64 units with 0.5 Dropout**
- **Optimizer= Rmsprop**
- **LSTM Units=128**

Model Accuracy and Loss



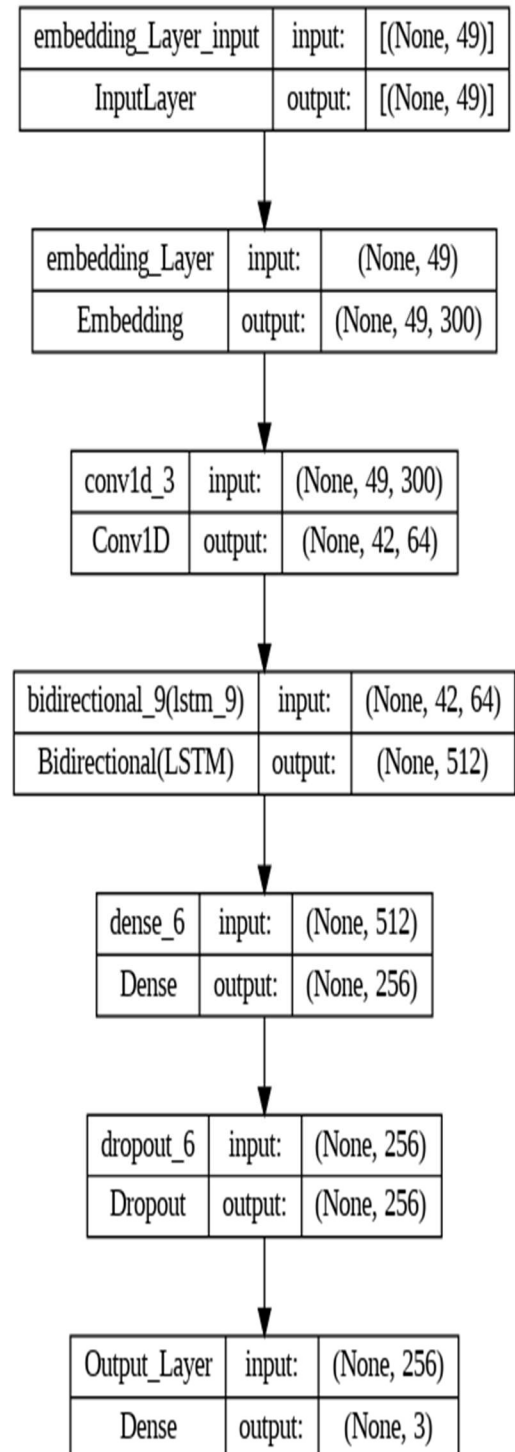
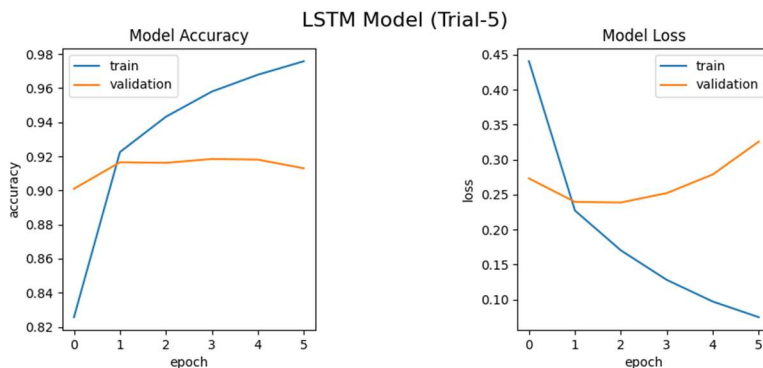
Trial-5

- **One Layer of:-**

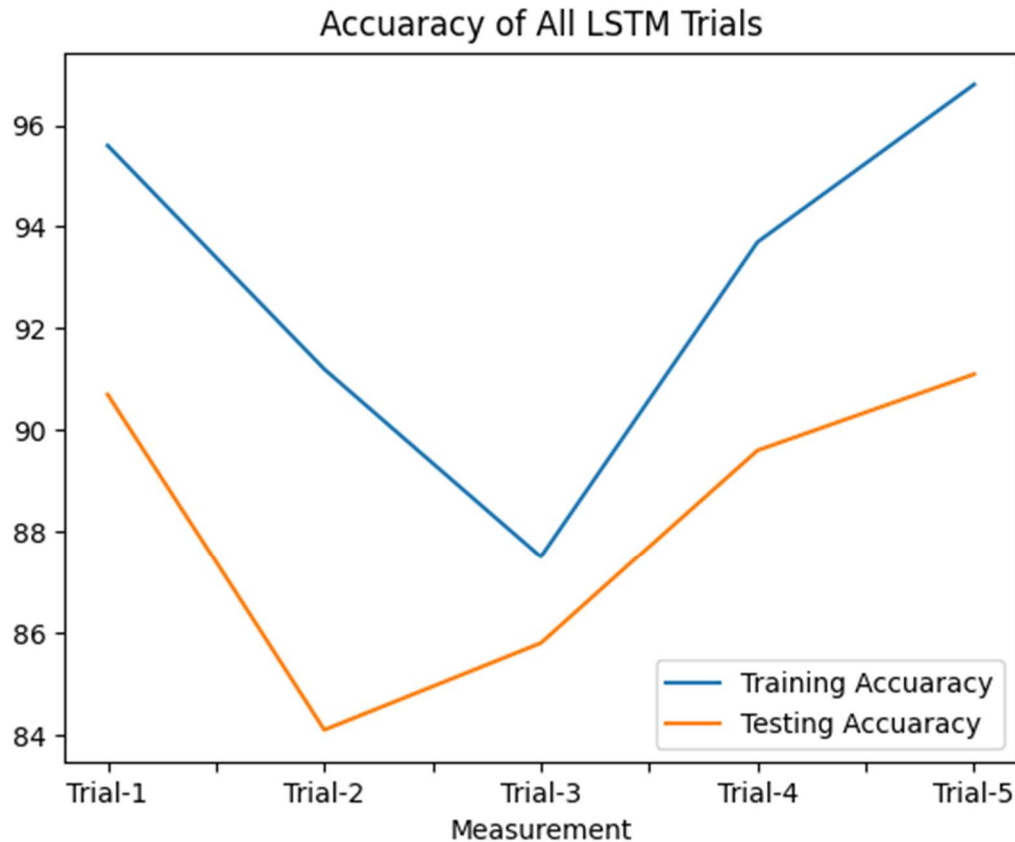
Conv1D(64 , 8 ,activation = 'relu')

- **Embedding trainable=True**
- **learning rate=0.001**
- **one hidden layer with ReLU Activation Function:-**
 1. **256 units with 0.5 Dropout**
- **Optimizer= Adam**
- **LSTM Units=256**

Model Accuracy and Loss



Model Accuracy For all Trials



So, The Best Accuracy is Trial-5

Training Accuracy (Trial 5): 96.8%

Testing Accuracy (Trial 5): 91.1%

```
5483/5483 [=====] - 158s 29ms/step - loss: 0.1077 - accuracy: 0.9681 - f1_m: 0.9681 - precision_m: 0.9691 - recall_m: 0.9671
1371/1371 [=====] - 39s 29ms/step - loss: 0.3362 - accuracy: 0.9106 - f1_m: 0.9106 - precision_m: 0.9117 - recall_m: 0.9096

Trial 5
Training Accuracy (Trial 5): 96.8%
Testing Accuracy (Trial 5): 91.1%
```

New Tweets Sample Inputs

Using CNN Model (Trial 4)

```
cnn_model = tf.keras.models.load_model('/content/drive/MyDrive/Colab Notebooks/ChatGPT_SentimentAnalysis/Saved Models/CNN/CNN_model_trial4_Saved',  
                                         custom_objects={"f1_m": f1_m, "precision_m": precision_m, "recall_m": recall_m })  
cnn_model.summary()
```

```
1/1 [=====] - 0s 43ms/step  
Text: High quality pants. Very comfortable and great for sport activities. Good price for nice quality! I recommend to all fans of sports  
Label ID: 1  
Label Name: positive  
Polarity: 0.9909900426864624  
  
1/1 [=====] - 0s 41ms/step  
Text: Sooo SAD I will miss you here in San Diego  
Label ID: 0  
Label Name: negative  
Polarity: 0.9999892711639404  
  
1/1 [=====] - 0s 53ms/step  
Text: My daughter went to a Bday party today caled, 'Grace' of Cakes...the little girl is named Grace & they made cupcakes!  
Label ID: 2  
Label Name: neutral  
Polarity: 0.8654656410217285
```

Using LSTM Model (Trial 5)

```
lstm_model = tf.keras.models.load_model('/content/drive/MyDrive/Colab Notebooks/ChatGPT_SentimentAnalysis/Saved Models/LSTM/LSTM_model_trial5_Saved',  
                                         custom_objects={"f1_m": f1_m, "precision_m": precision_m, "recall_m": recall_m })  
lstm_model.summary()
```

```
1/1 [=====] - 1s 985ms/step  
Text: High quality pants. Very comfortable and great for sport activities. Good price for nice quality! I recommend to all fans of sports  
Label ID: 1  
Label Name: positive  
Polarity: 0.997701108455658  
  
1/1 [=====] - 0s 53ms/step  
Text: Sooo SAD I will miss you here in San Diego  
Label ID: 0  
Label Name: negative  
Polarity: 0.9965170621871948  
  
1/1 [=====] - 0s 47ms/step  
Text: My daughter went to a Bday party today caled, 'Grace' of Cakes...the little girl is named Grace & they made cupcakes!  
Label ID: 2  
Label Name: neutral  
Polarity: 0.9750921130180359
```

CNN Model Training Trials Comparison

Measurement	Training Accuracy	Testing Accuracy	Embedding layer Trainable
Trial-1	94.6	79	Yes
Trial-2	83.3	77.7	No
Trial-3	94.4	80.1	No
Trial-4	97.7	90.5	Yes
Trial-5	94.6	79.75	No

LSTM Model Training Trials Comparison

Measurement	Training Accuracy	Testing Accuracy	Embedding layer Trainable
Trial-1	95.6	90.7	Yes
Trial-2	91.2	84.1	No
Trial-3	87.5	85.8	No
Trial-4	93.7	89.6	Yes
Trial-5	96.8	91.1	Yes

Note:-

All Models Saved in this Link:

drive.google.com/drive/folders/1vGm25u2dFp-rjsmF9MfZbMRFnh_6FzbE