Sentiment Analysis Using Artificial Neural Networks

Team Members :

Seyed Mohammad Hamidi
Amirreza Azadnik
Reza Shahriari Beny
Tiba Tabshiri Namin

Dr. Farzane Abdollahi

01 | Introduction

What is sentiment analysis ?

02 | PreProcessing

Normalizing Data
Tokenization
Word Embedding
Introducing Data

03 | Models

Classic Models
Depp NNs
Bert Model

04 | Realtime Answering

What is the sentiment of this sentence?

05 | Conclusion

Comparing Models

06 | Challenges & Future Works

Computations were eye watering ...

01 | Introduction

What a journey ...

Sentiment Analysis

Sentiment analysis is one of NLP applications and its purpose is to detect a sentence sentiment.

It has straight procedure :

- Normalizing sentences
- Tokenizing each sentence
- Word embedding
- Learning model using preprocessed data

Sentiment Analysis

I like my major !

Positive
73%

Negative
27%

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02 | PreProcessing

Where it all started ...

PreProcessing

1

Normalizing

Any sentence gathered in dataset from all comments has its own extra parts

2

Tokenizing

In order to asign values to a sentence, we need to split it into words

3

Word Embedding

Assigning numerical values to each word using pretrained embedding models

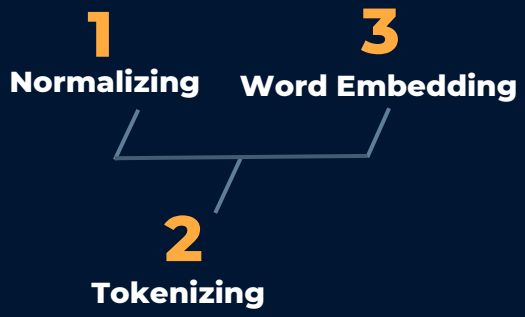
PreProcessing

1 | Normalizing

حالم از این زندگی بهم میخوره ☹☹☹☹☹.

→

حالم از این زندگی بهم میخوره.



PreProcessing

Tokenizing 2

حالم از این زندگی بهم میخوره.

['حالم', 'از', 'این', 'زندگی', 'بهم', 'میخوره', '.']

1 Normalizing

3 Word Embedding

2 Tokenizing

PreProcessing

3 | Word Embedding

1 Normalizing

2 Tokenizing

3 Word Embedding

PreProcessing

3 | Word Embedding

[‘.’,’میخوره’,’بهم’,’زندگی’,’این’,’از’,’حالم’]

3D Matrix of numbers

1 Normalizing

2 Tokenizing

3 Word Embedding

PreProcessing

Our Work

Approach 1

- Normalizing data with hazm
- Tokenizing normalized data with hazm
- Using facebook model to embed words

Approach 2

- Normalizing data with hazm
- Tokenizing normalized data with hazm
- Using hazm model to embed words

Approach 3

- Using Bag of words of TF-IDF vectorizer to preprocess data(used for classic models)
- Frequency Based Models

PreProcessing

Differences Between Word Embedding Models

	Context	Relation btw Words	Pos of Words	Output Dims	semantic meaning & syntactic structure of words
FaceBook	+	+	+	3D	+
Hazm	+	+	+	3D	+
Bag of Words	-	-	-	2D	-
TF-IDF	-	-	-	2D	-

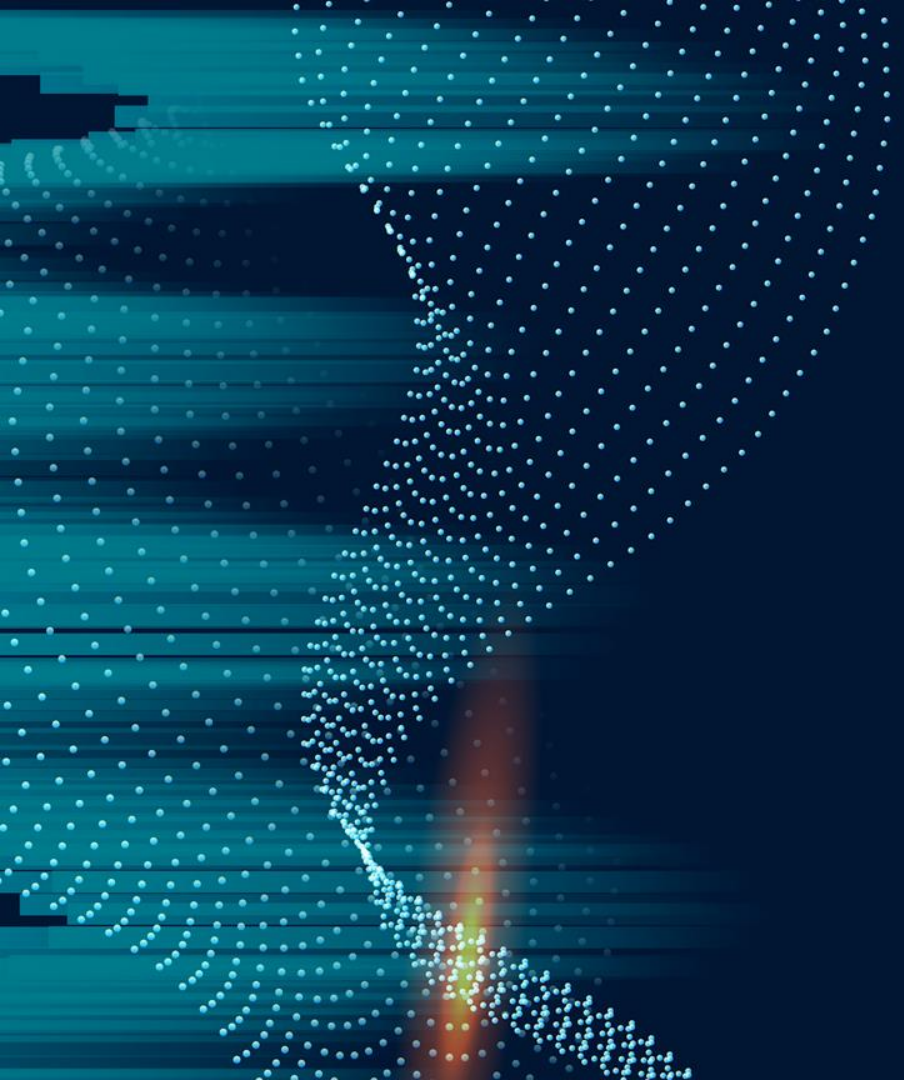
Our Data

Raw_Dataset_97P_107.csv

Digikala + SnappFood + Pars-ABSA

97% Data will be covered by 107 Tokens

Max Number of Tokens



11.6 MB

Text Data

37000 + 37000

9.5 GB

PreProcessed Data

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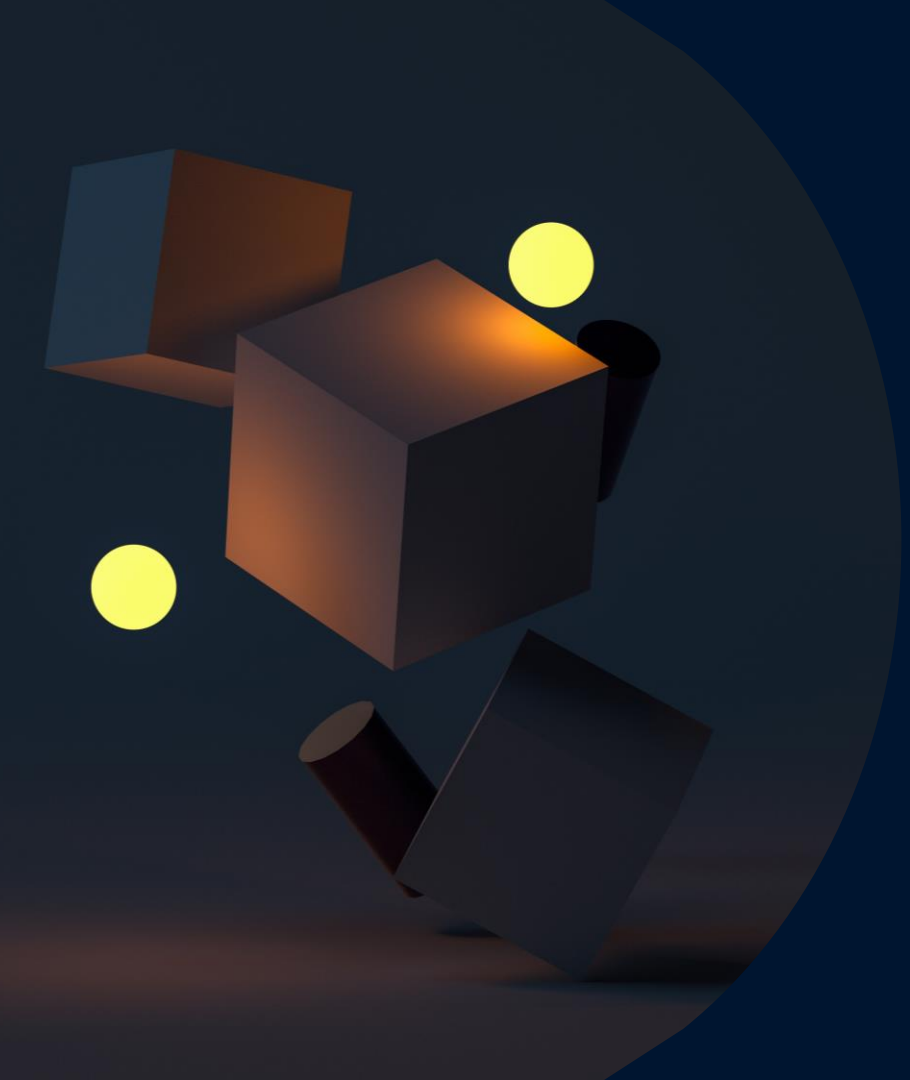


03 Models

Just learned a few models ...

Models

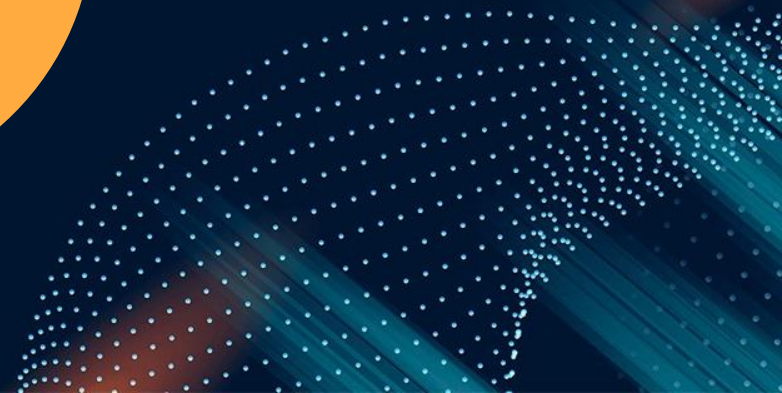
Bert

Fine Tune

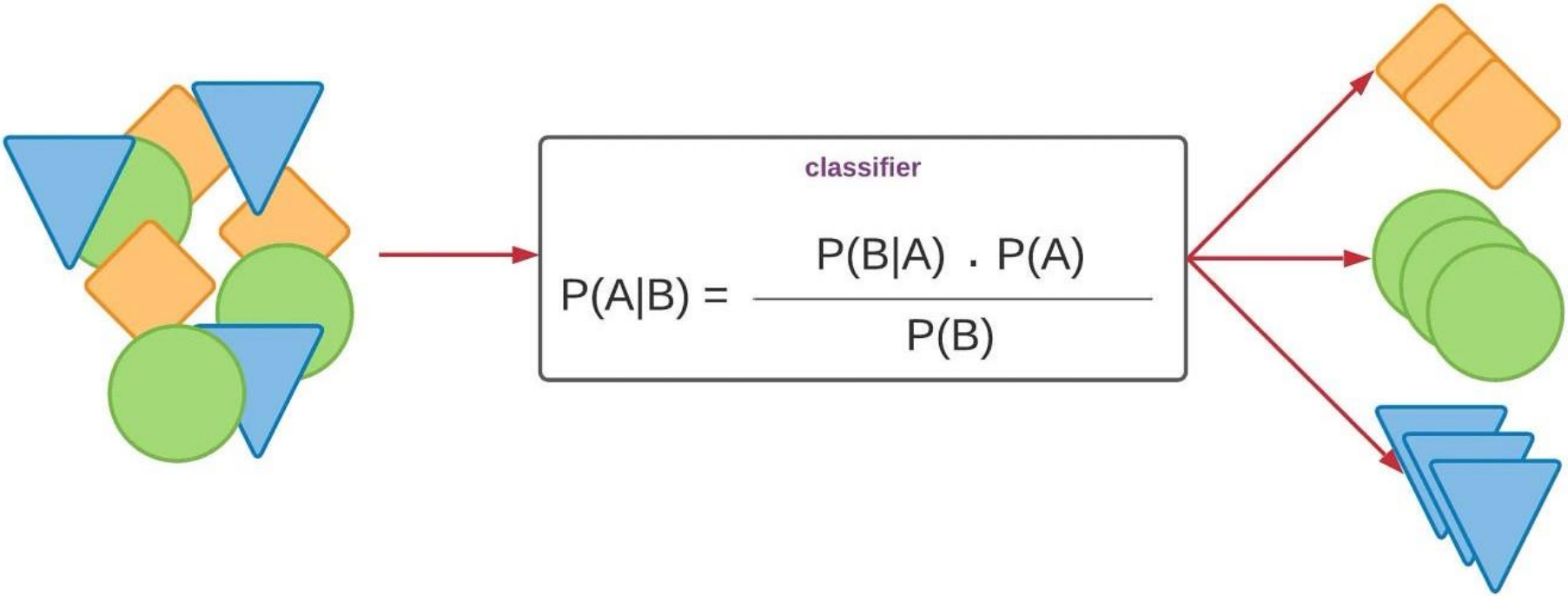
Deep NNs

Classic Models

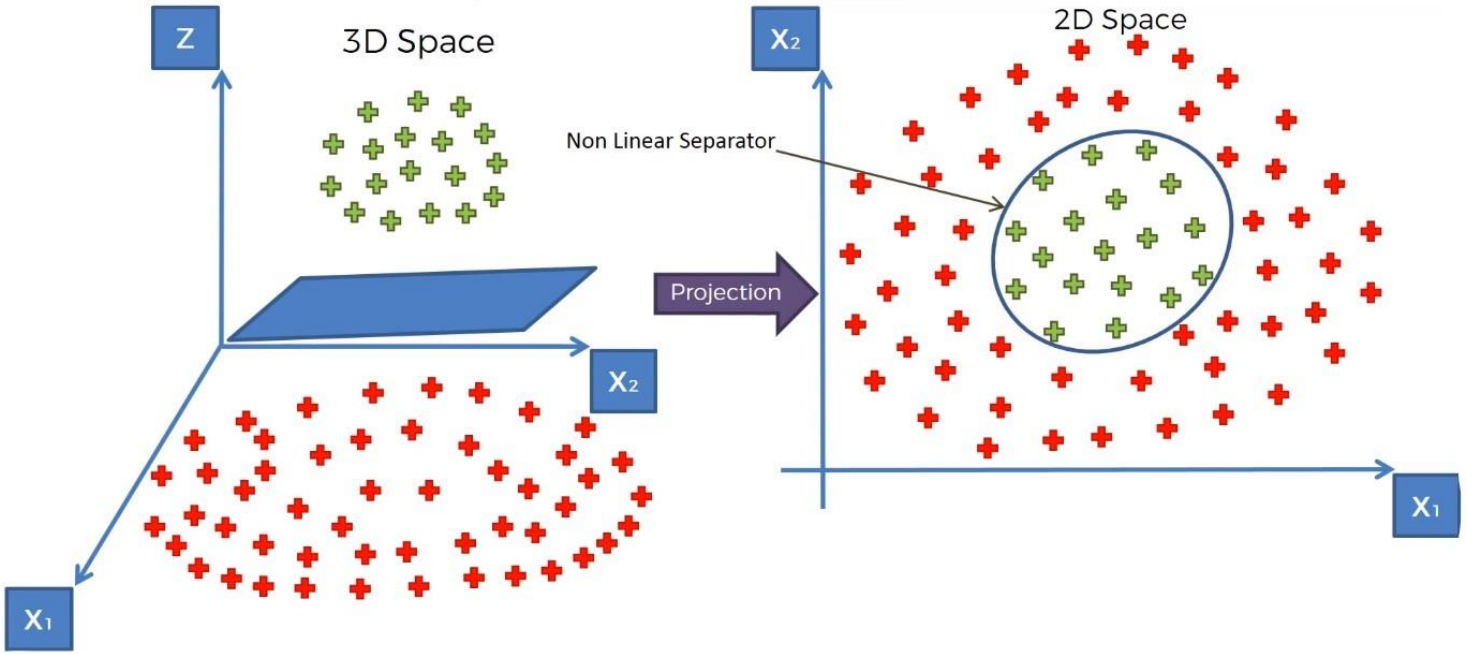
SVM ,Naïve Bayes

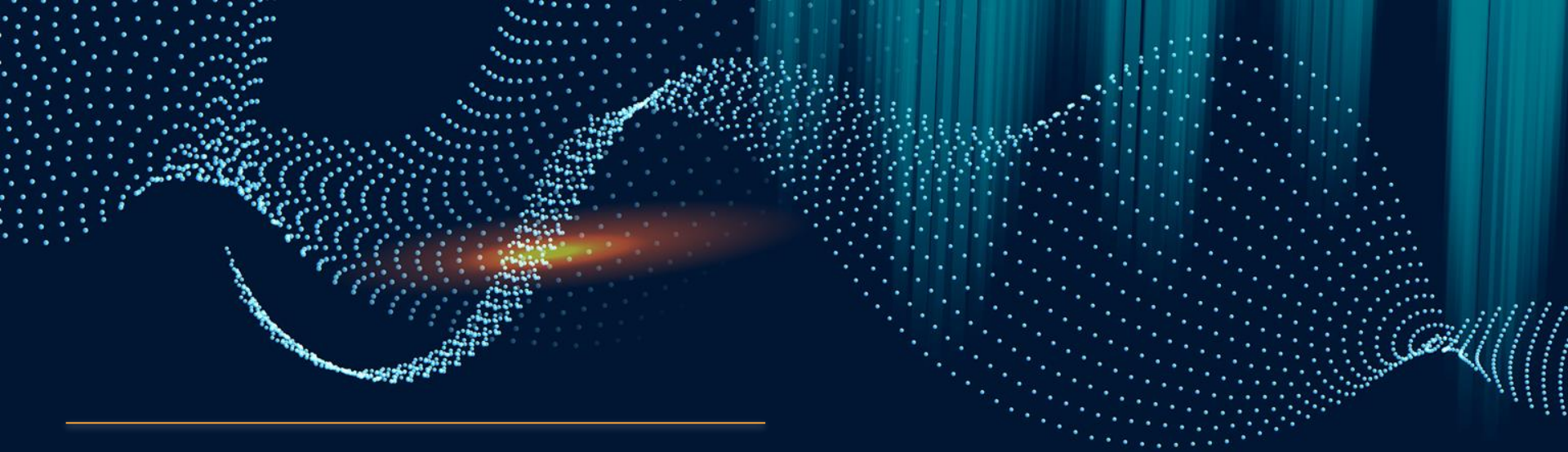


Model 1 : Naïve Baves



Model 2 : SVM


Z
3D Space
X2
X1
Projection
X2
2D Space
Non Linear Separator
X1

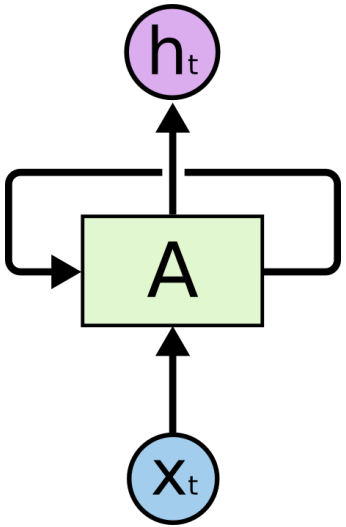


Notations :

- SF : Small Data + FaceBook Model
- SH : Small Data + Hazm Model
- LF : Large Data + FaceBook Model
- LH : Large Data + Hazm Model

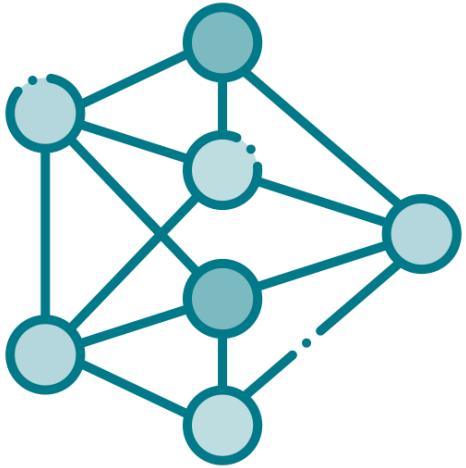
Model 3 : LSTM + FC

LSTM BRNN



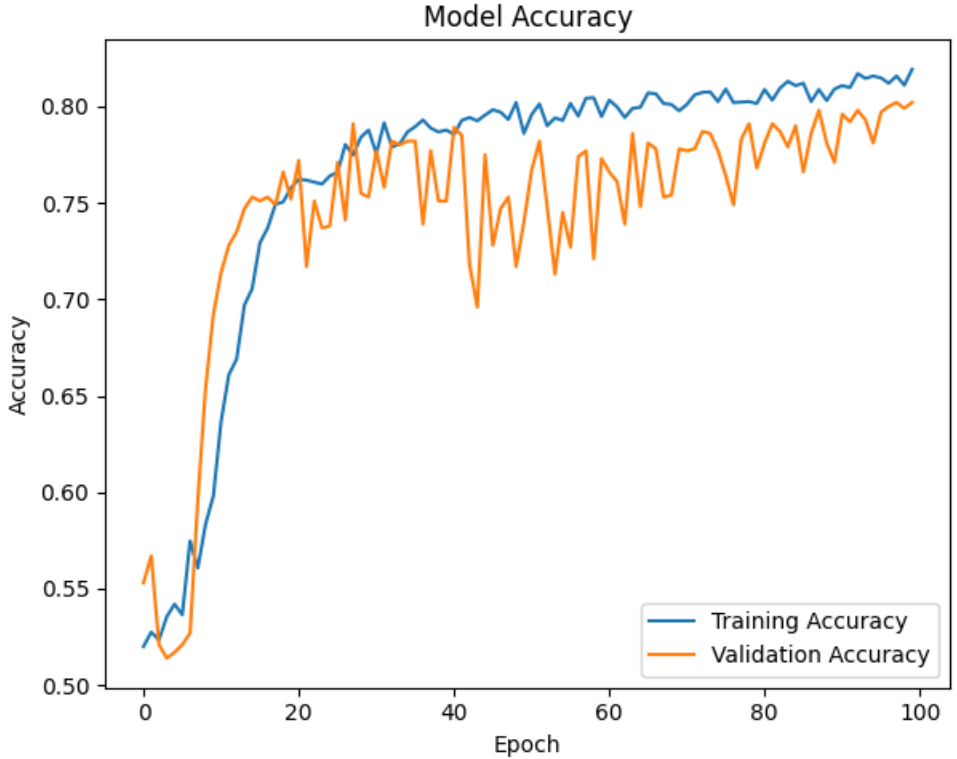
2X

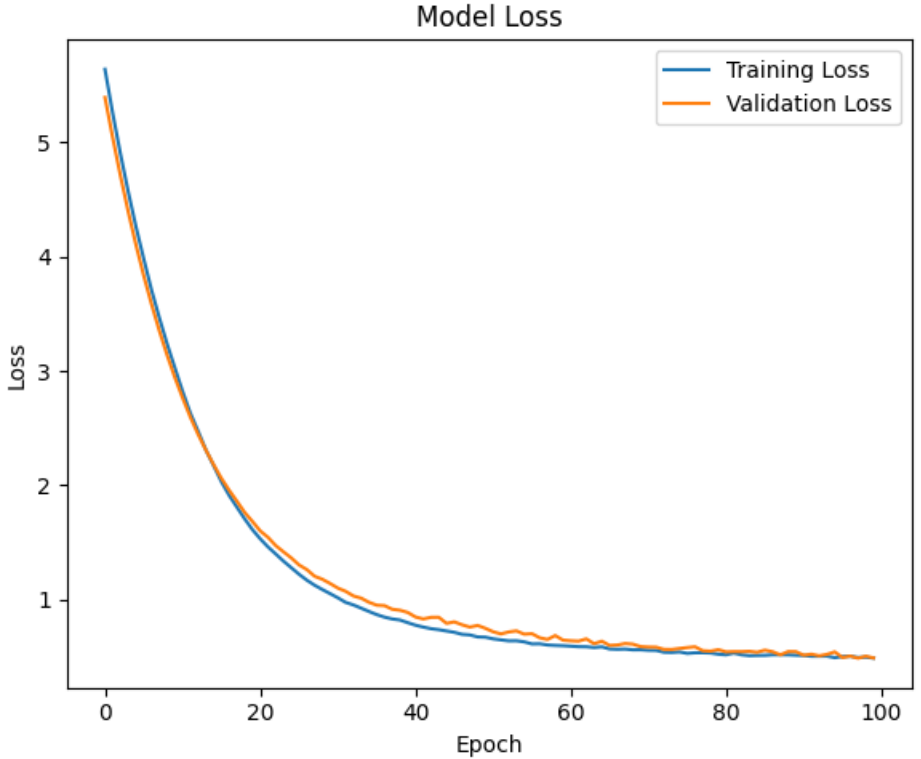
Dense



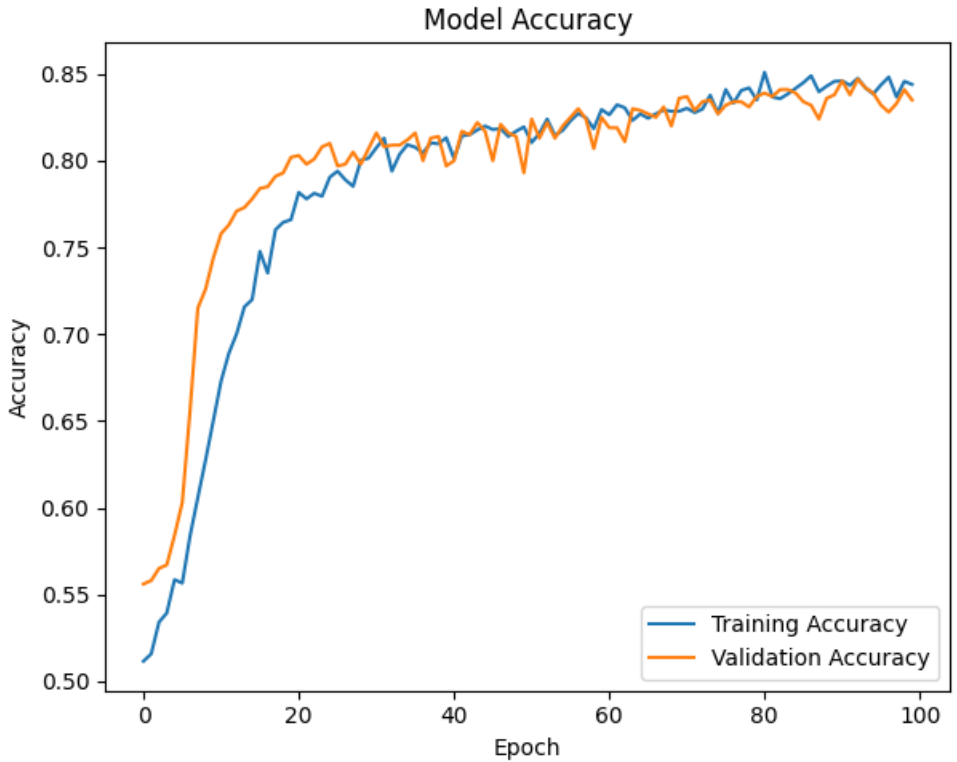
2X

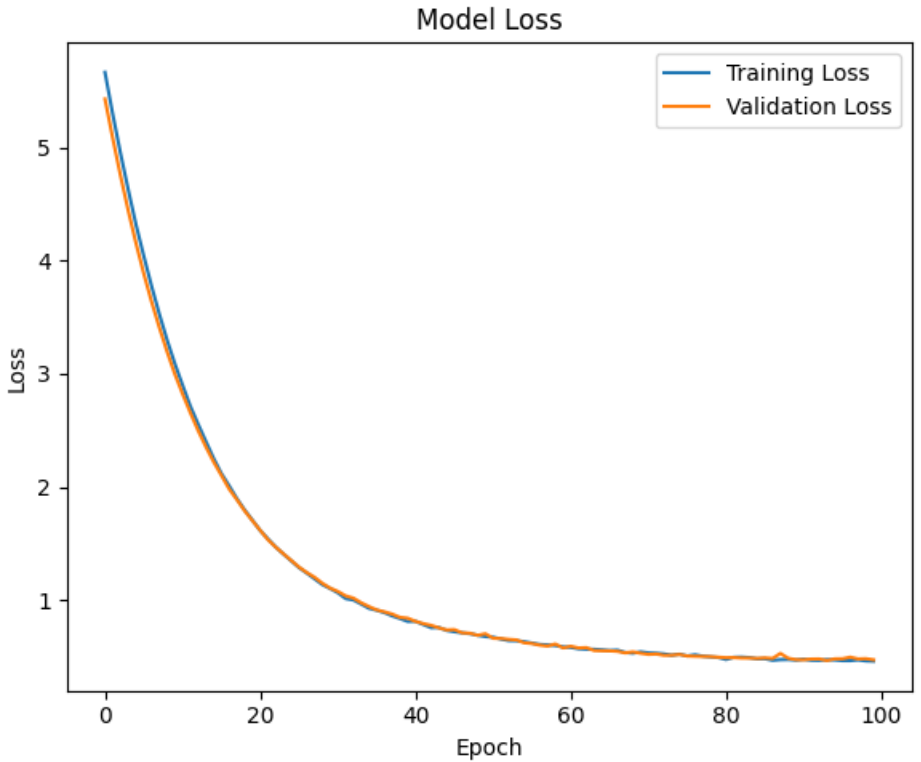
Model 3 : LSTM + FC - SF



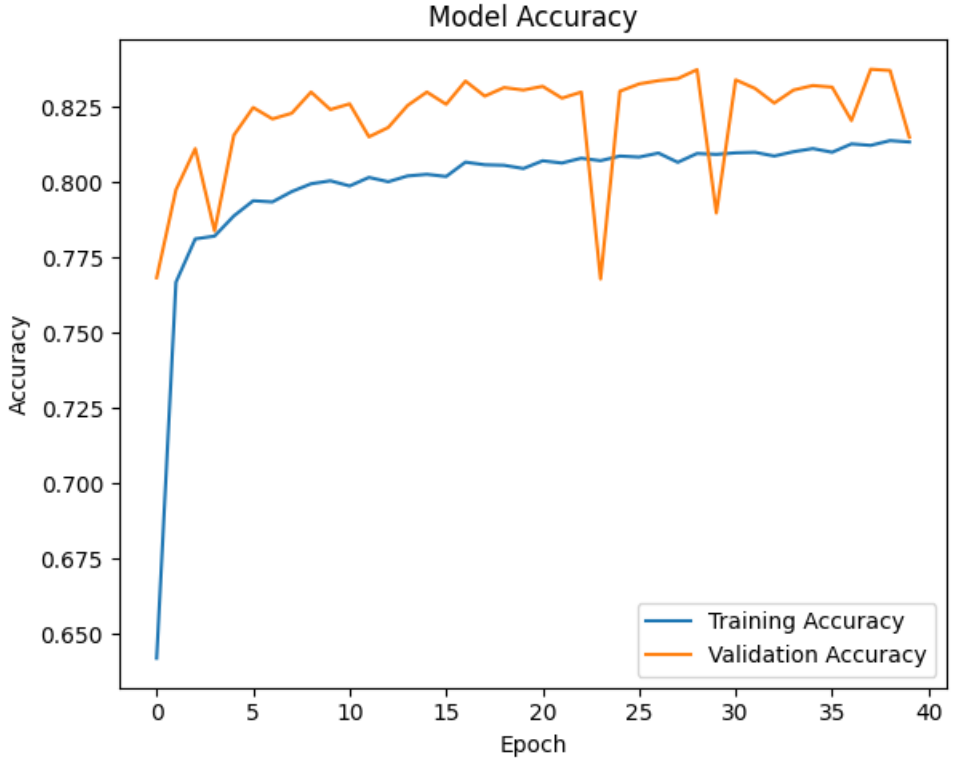


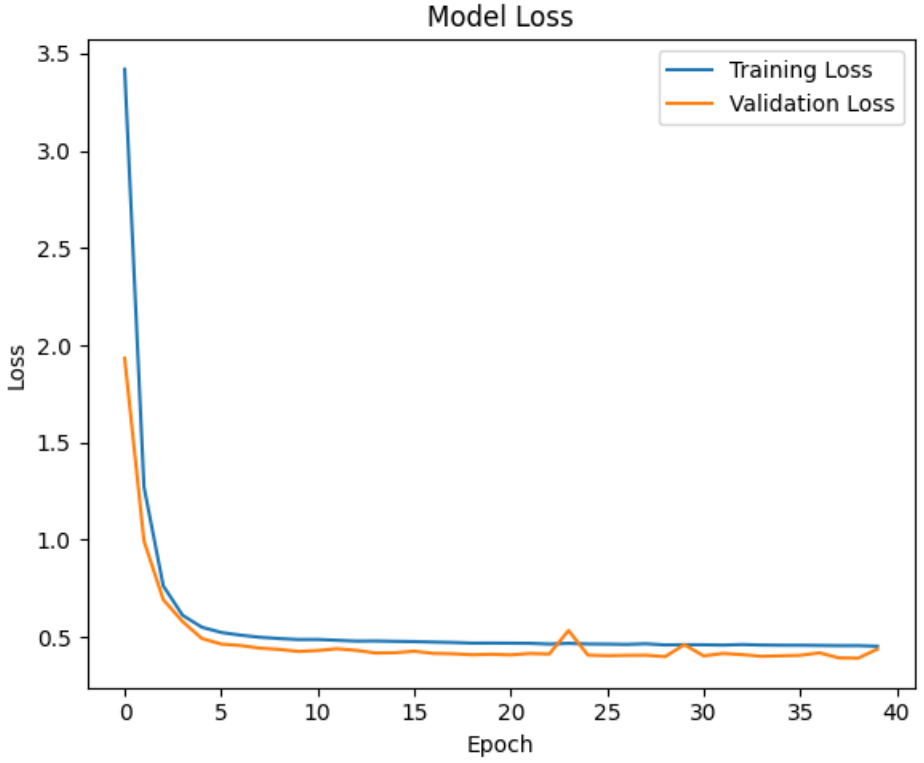
Model 3 : LSTM + FC - SH



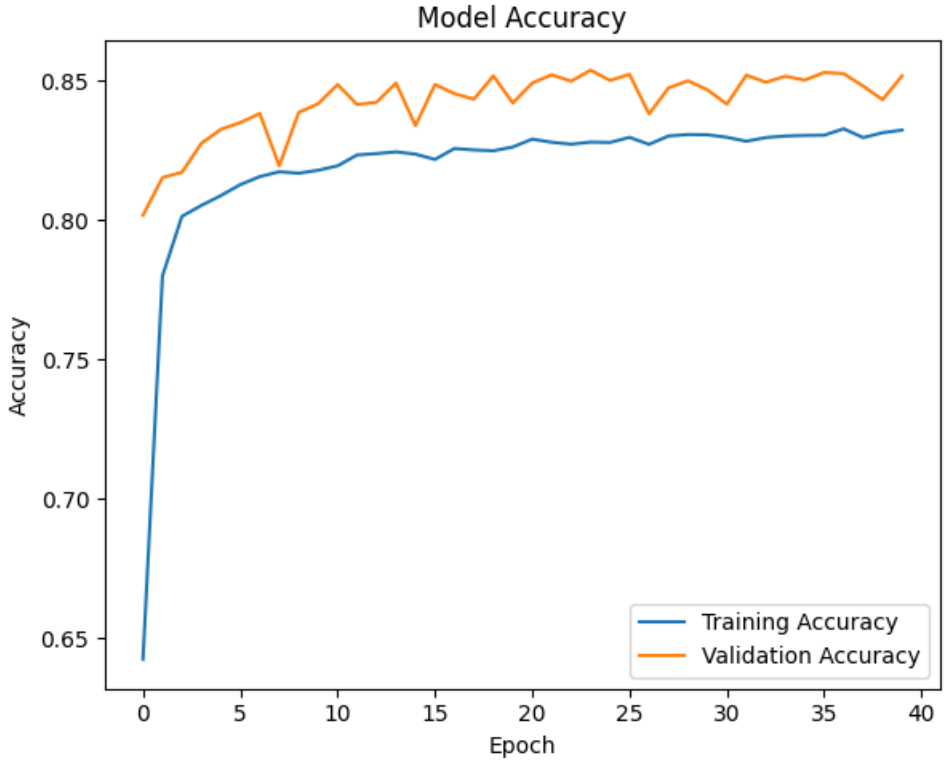


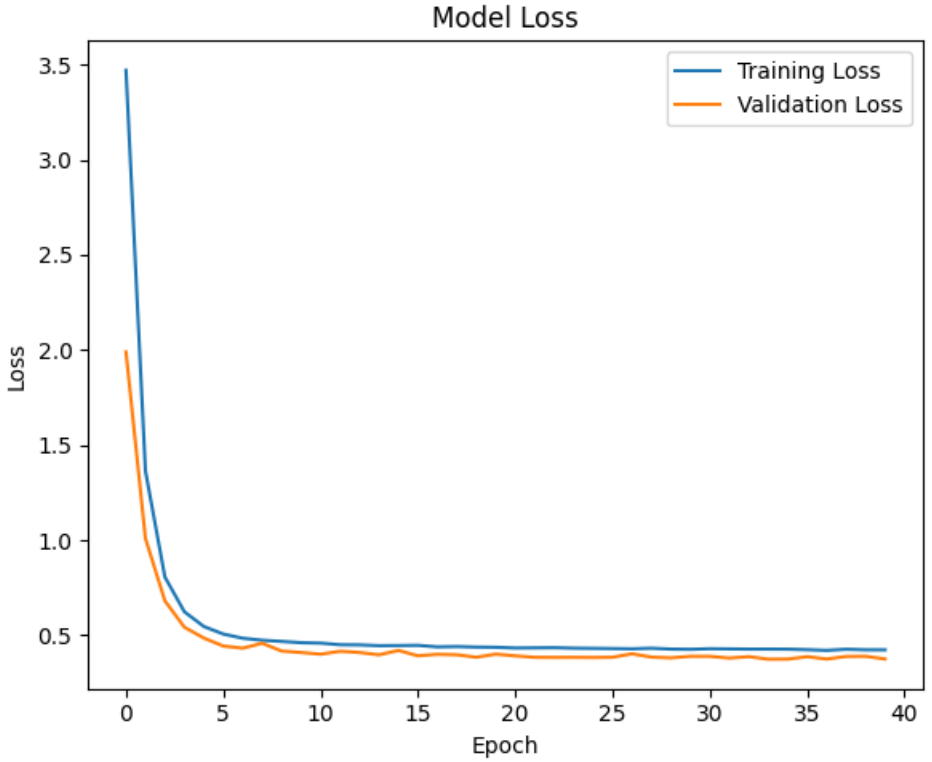
Model 3 : LSTM + FC - LF





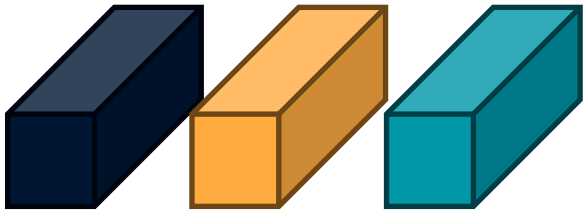
Model 3 : LSTM + FC - LH





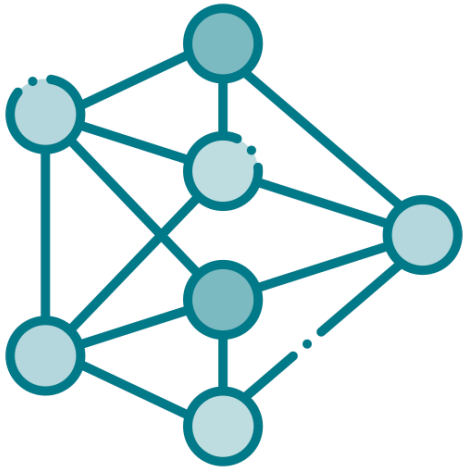
Model 4 : CNN + FC

Conv 1D



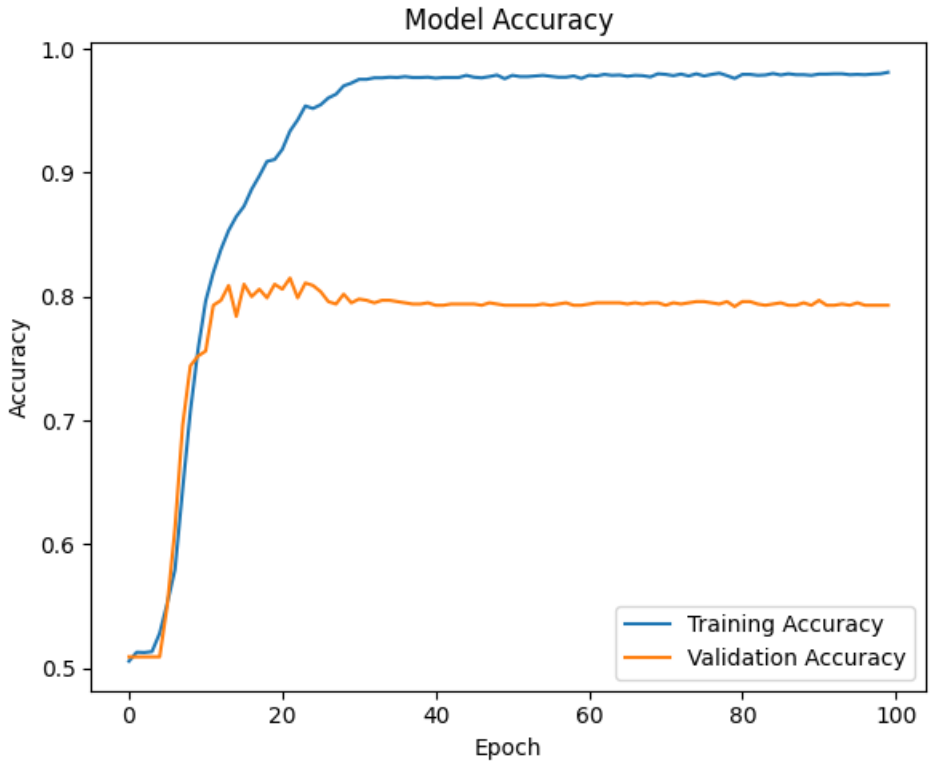
3X

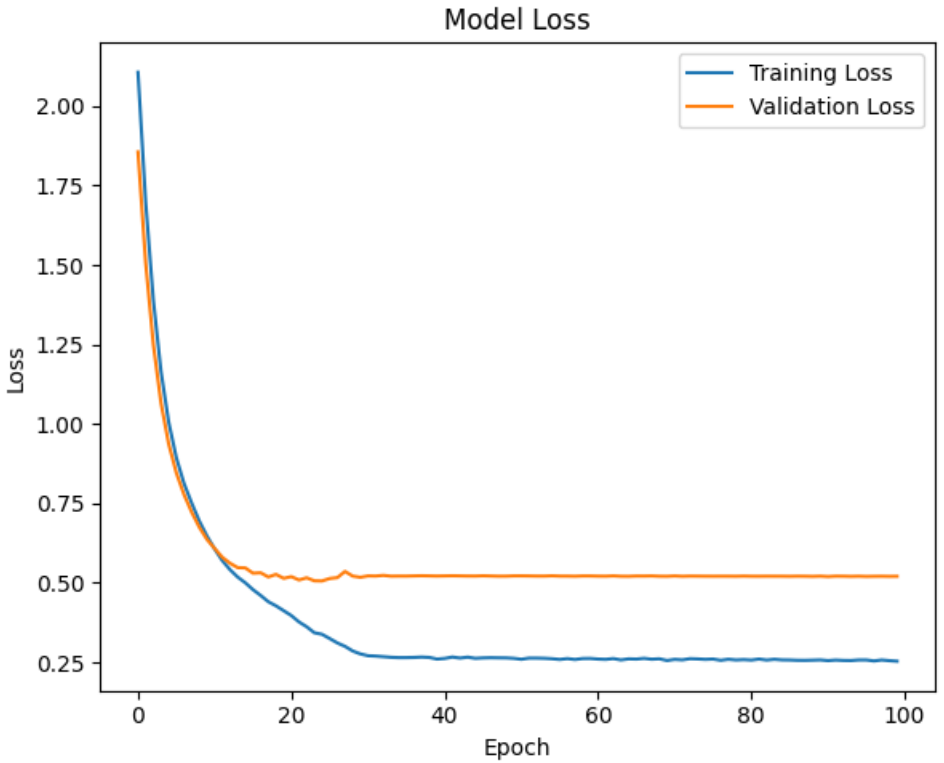
Dense



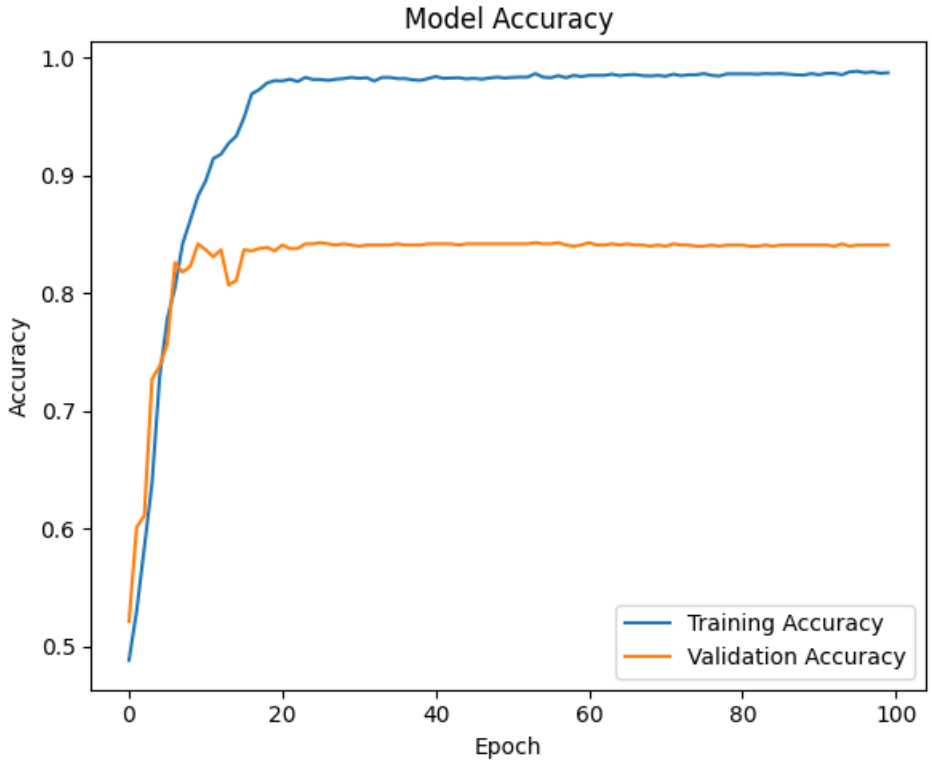
4X

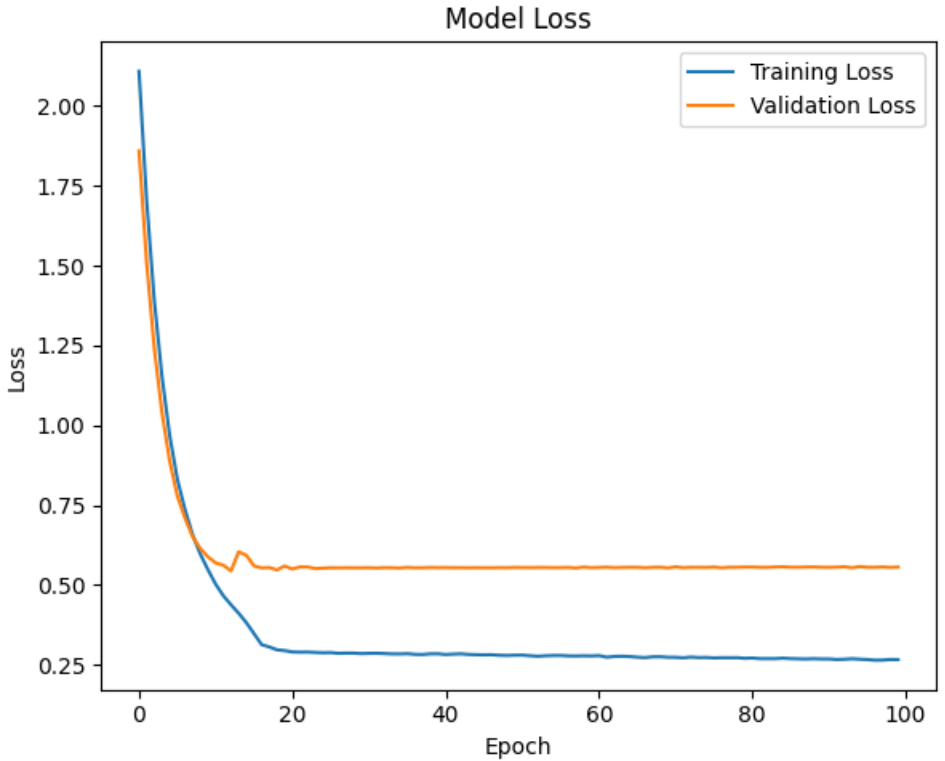
Model 4 : CNN + FC + SF



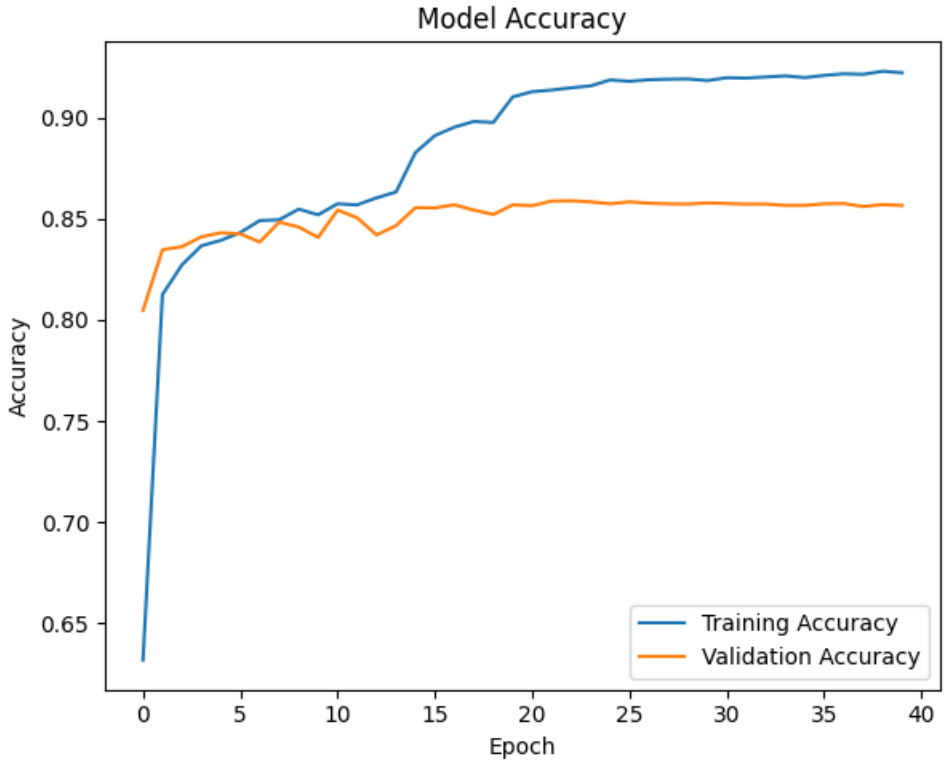


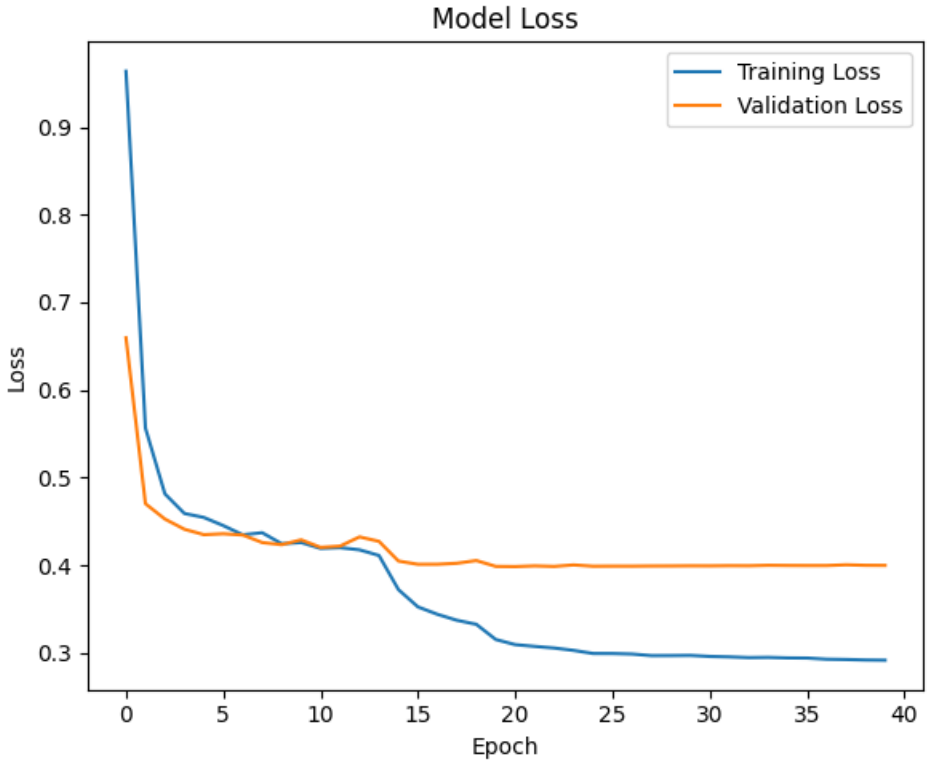
Model 4 : CNN + FC + SH



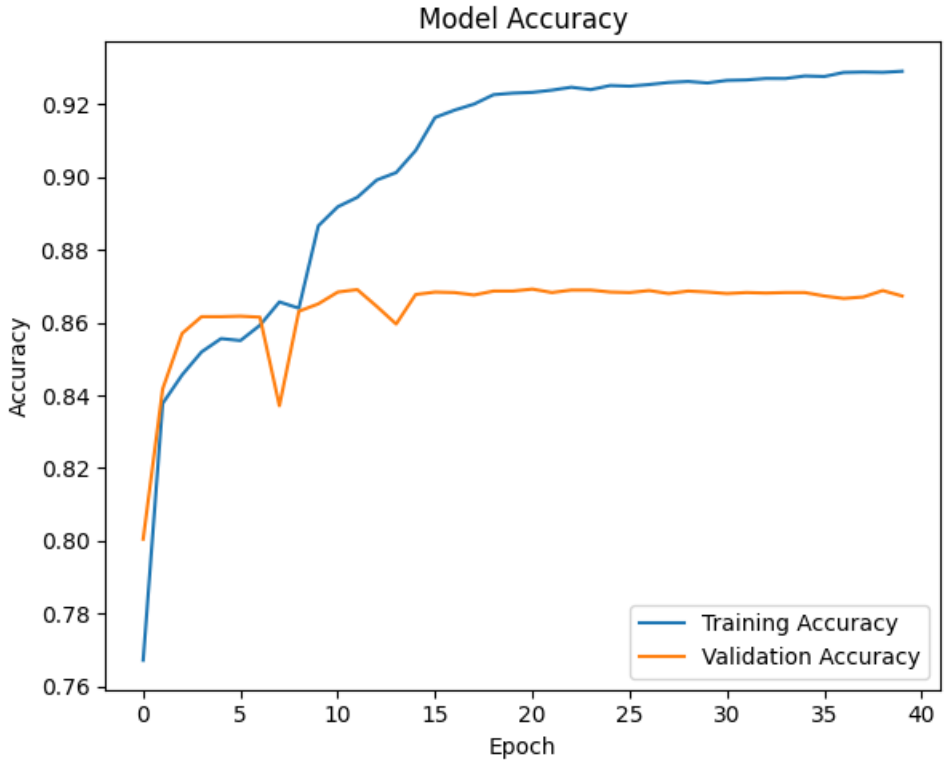


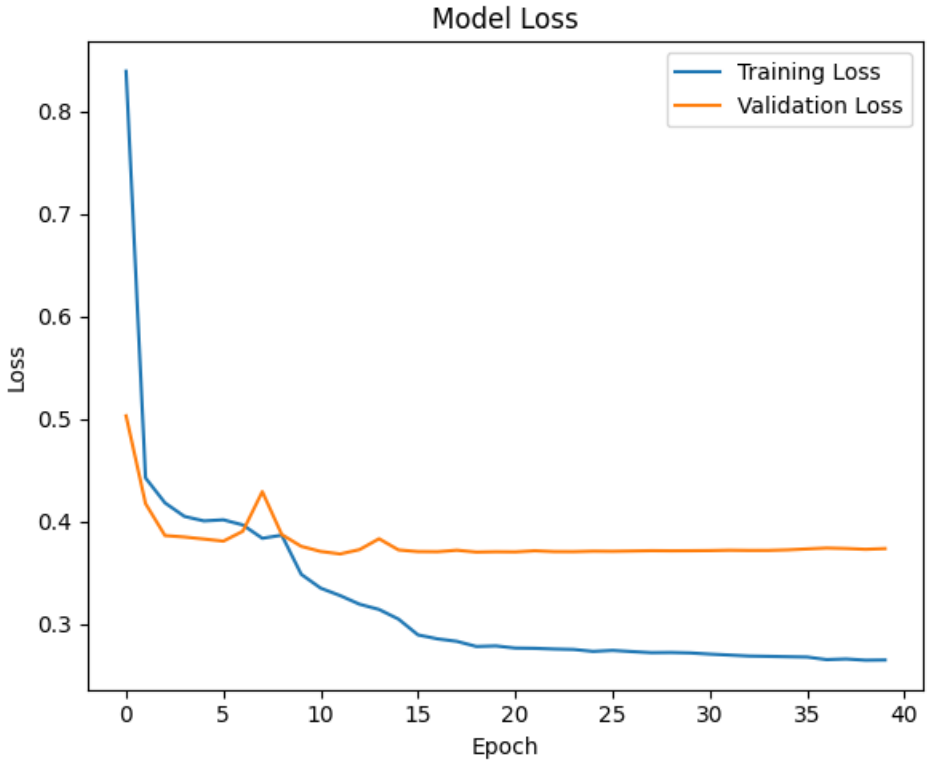
Model 4 : CNN + FC + LF



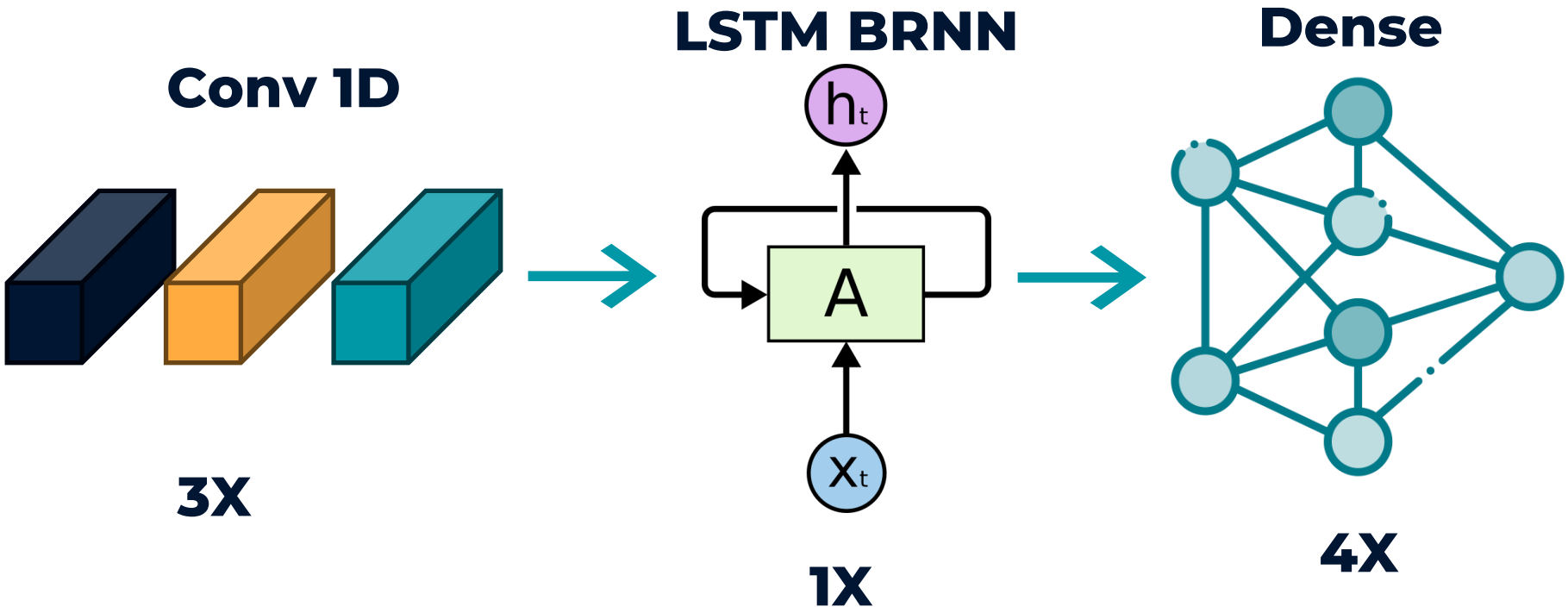


Model 4 : CNN + FC + LH

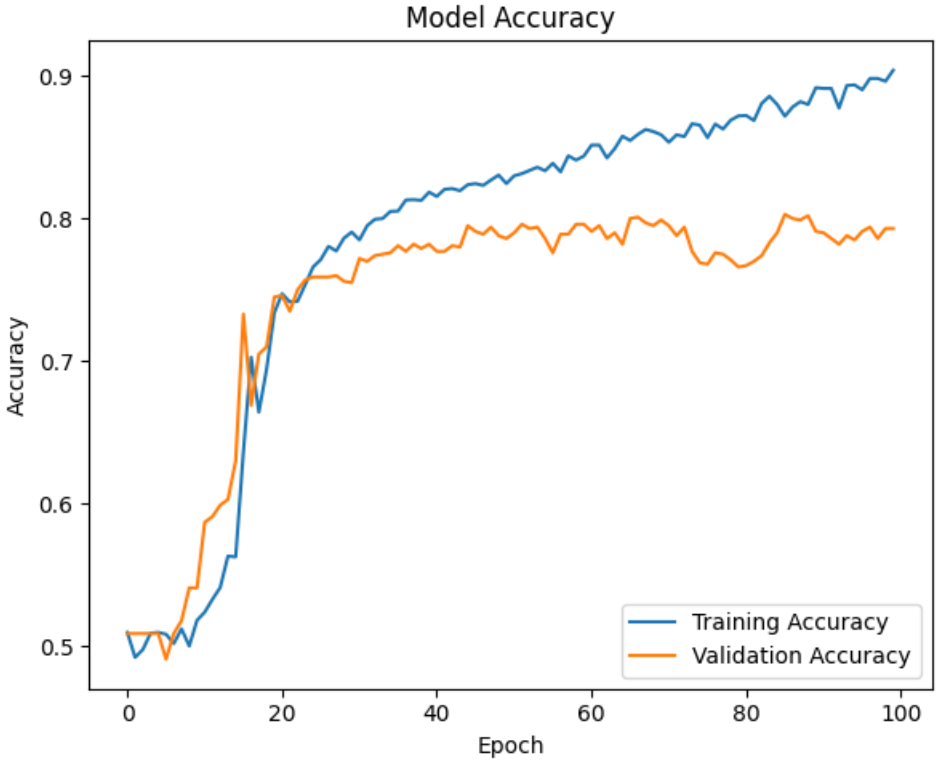


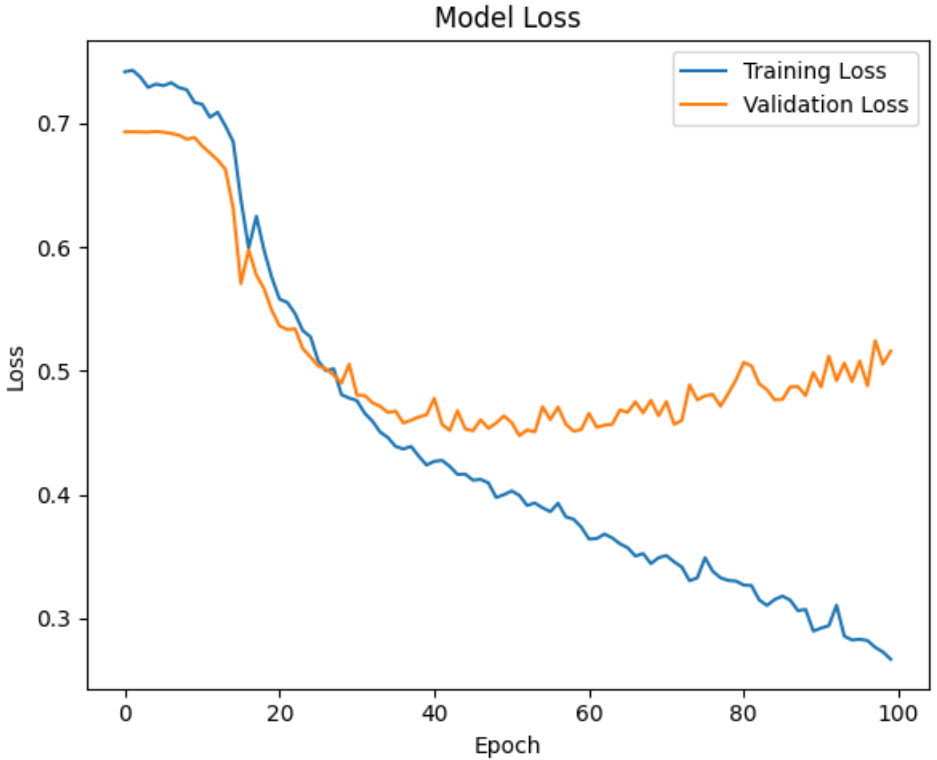


Model 5 : CNN + LSTM + FC

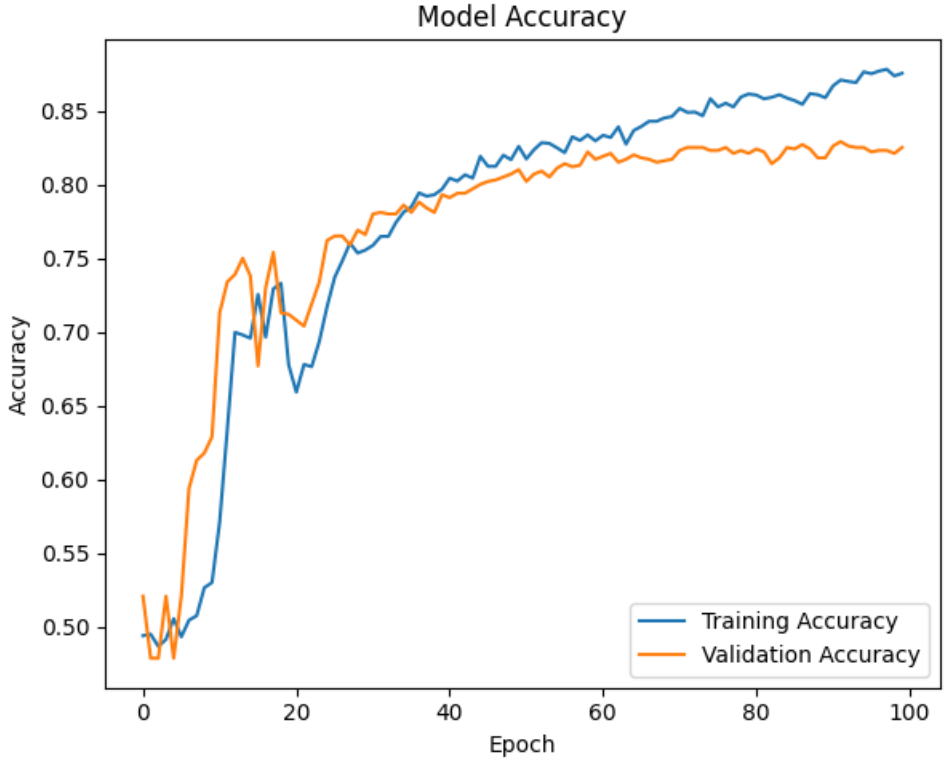


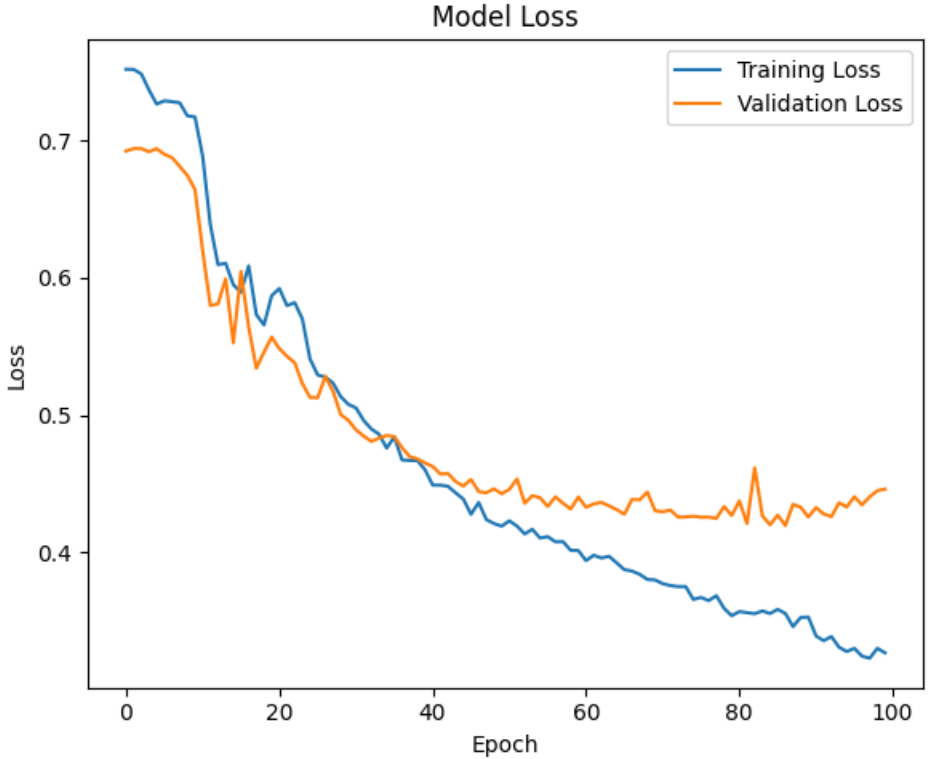
Model 5 : CNN + LSTM + FC - SF



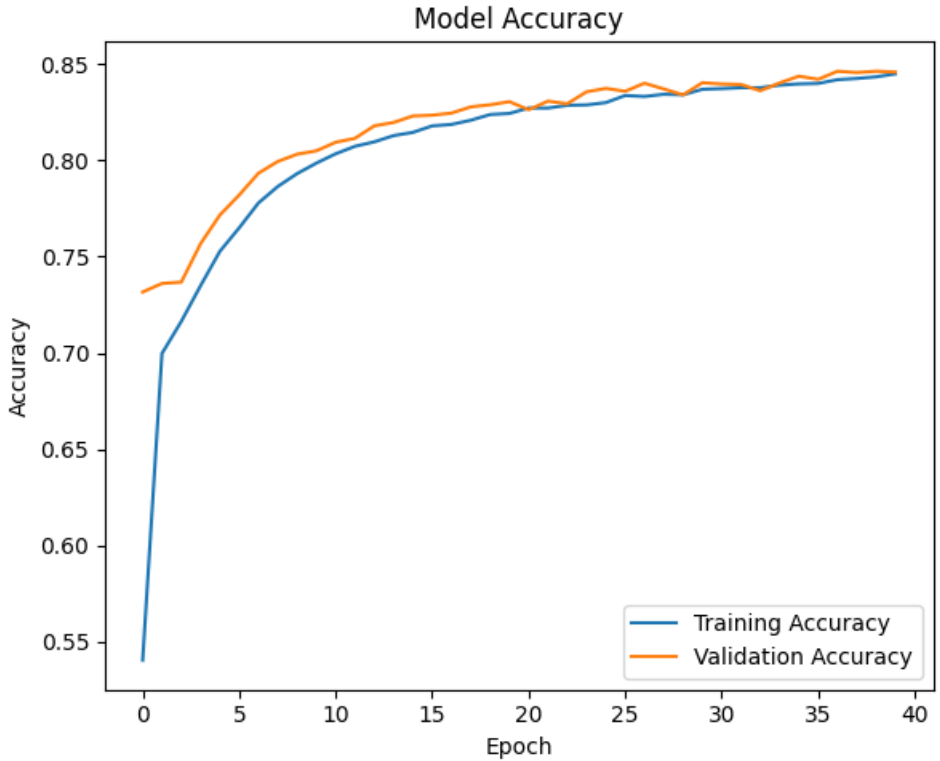


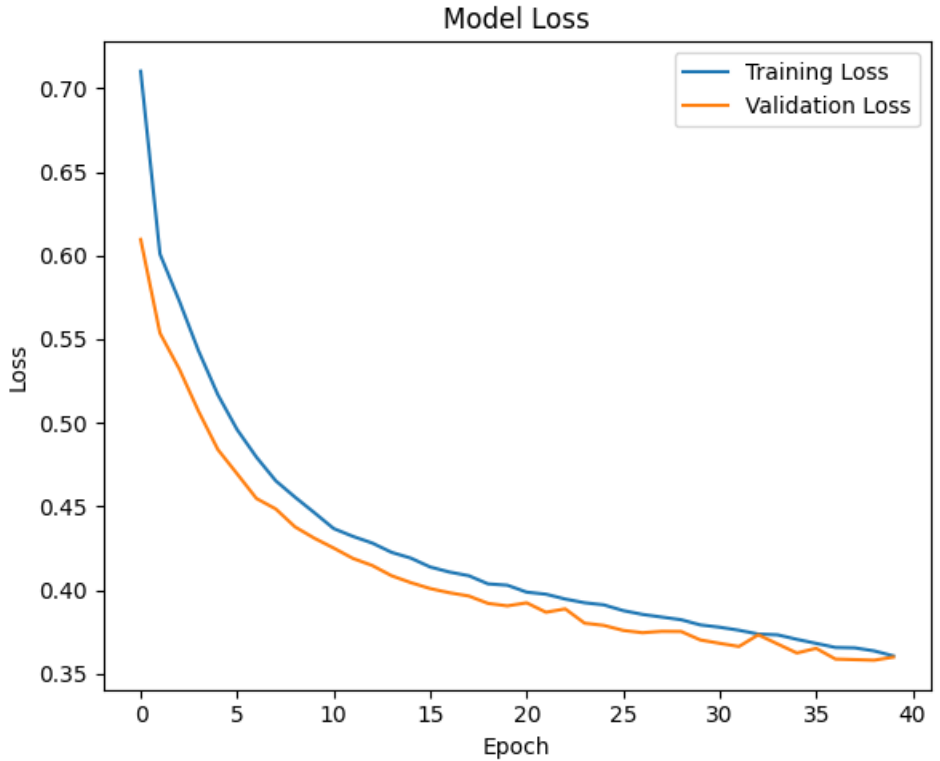
Model 5 : CNN + LSTM + FC - SH



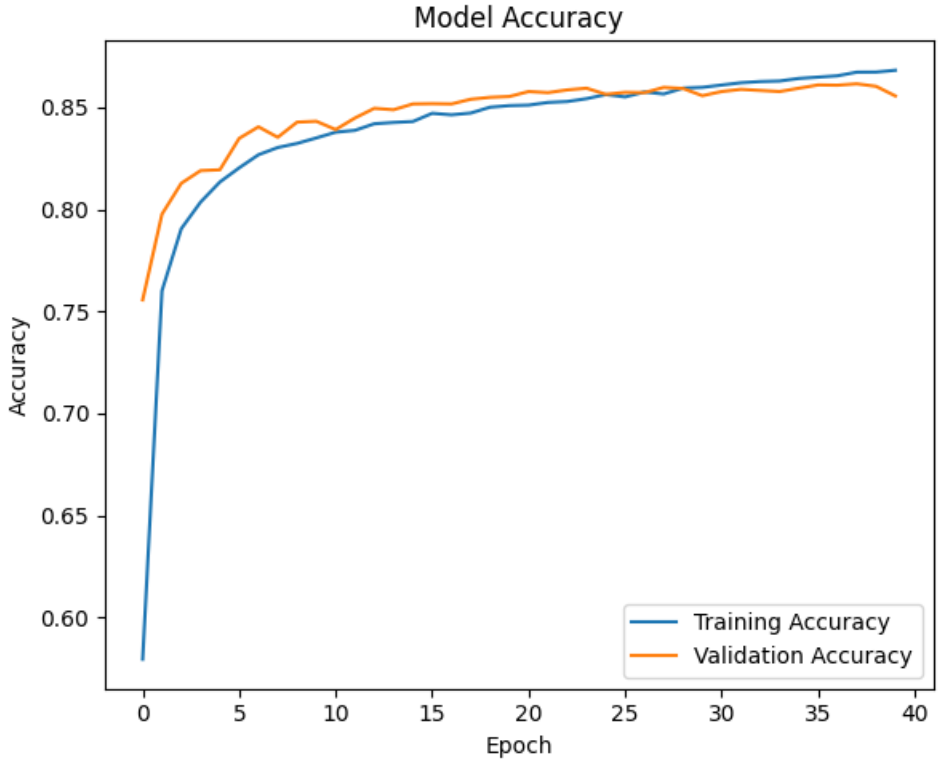


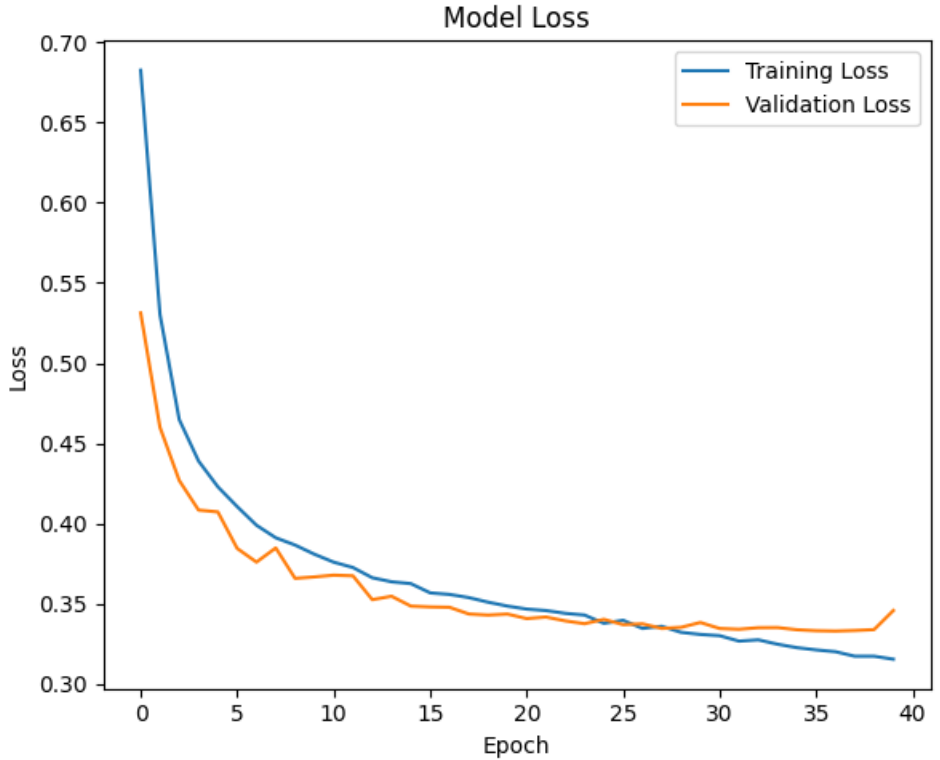
Model 5 : CNN + LSTM + FC - LF





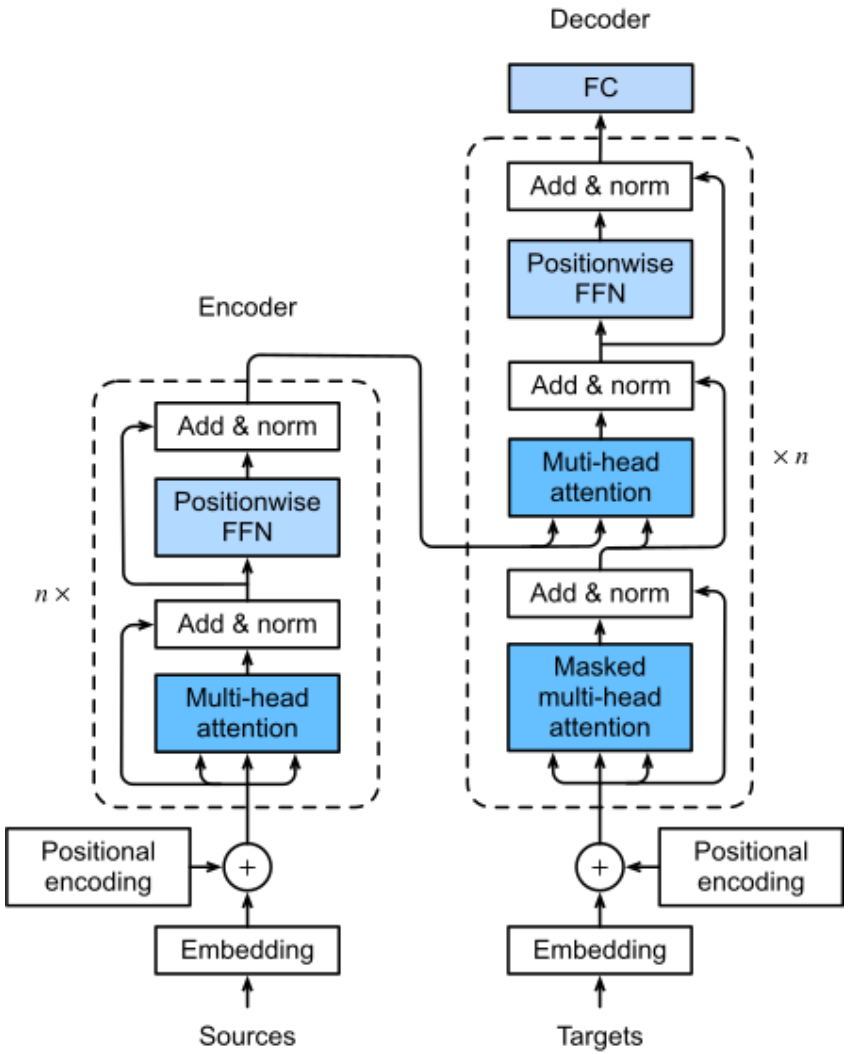
Model 5 : CNN + LSTM + FC - LH



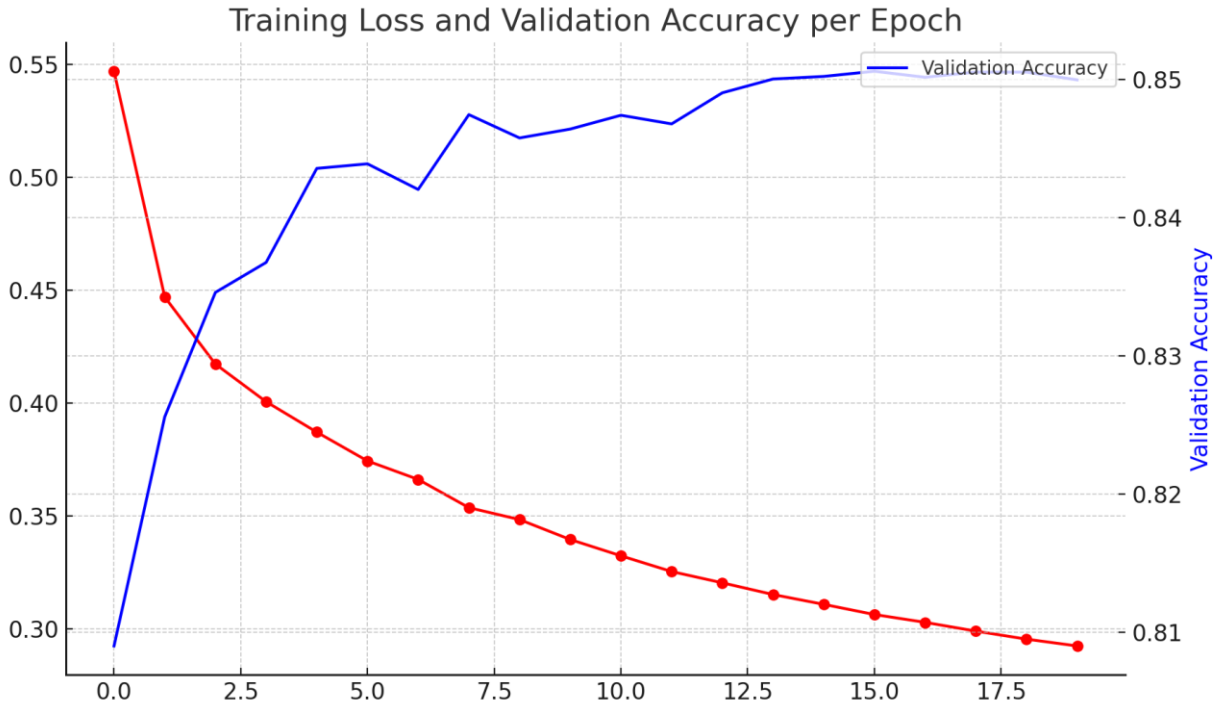


Model 6 : Bert-Mini

- Bert-Mini model contains 4 layers
- Constructing Data Loader
- Fine Tunning
- Accuracy : 85%



Model 6 : Bert-Mini



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05 Conclusion

Let’s compare !

Conclusion

	Train Loss	Validation Loss	Train Accuracy %	Validation Accuracy %	Description
NB	-	-	-	82	-
SVM	-	-	-	80	-
LSTM	0.48	0.48	81	80	SF
LSTM	0.45	0.47	84	83.5	SH
LSTM	0.45	0.43	81	81	LF
LSTM	0.42	0.37	83	85	LH
CNN	0.25	0.52	98	79	SF
CNN	0.26	0.55	98	84	SH

Conclusion

	Train Loss	Validation Loss	Train Accuracy	Validation Accuracy	Description
CNN	0.29	0.39	92	85	LF
CNN	0.26	0.37	92	86.7	LH
LSTM + CNN	0.26	0.51	90.4	79.3	SF
LSTM + CNN	0.32	0.44	87.5	82.5	SH
LSTM + CNN	0.36	0.35	84.4	84.5	LF
LSTM + CNN	0.31	0.34	86.8	85.5	LH
Model Bert	0.29	-	-	85	Fine Tune (complete data)

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Computations were eye watering ...

06 Challenges & Future Works

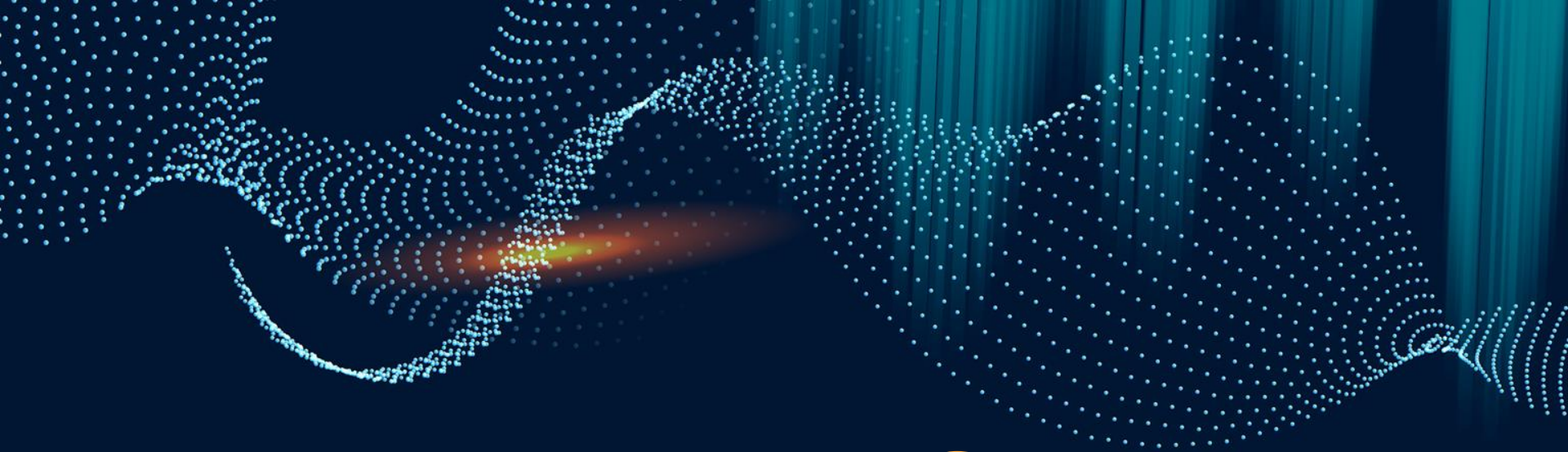
Almost there ...

“Computations were EYE WATERING”

—Sam Altman

Future Works

- Design transformers models instead of CNN and RNN
- Fine tune on Bert base-uncased instead of Bert-mini



THANKS!

Do you have any questions?