CSE 676: Deep Learning

Modeling MOOCs dropouts using Various AI Models

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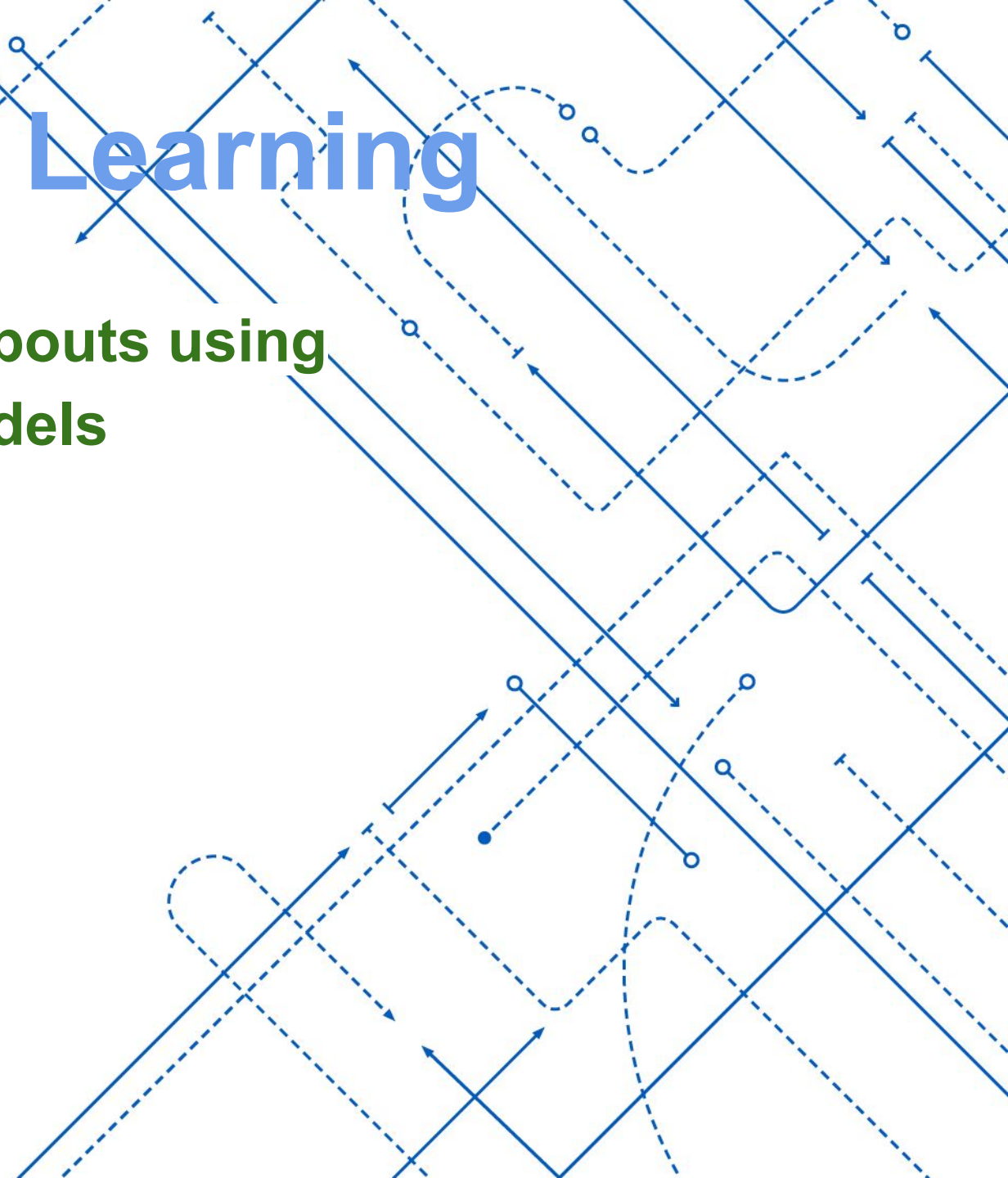


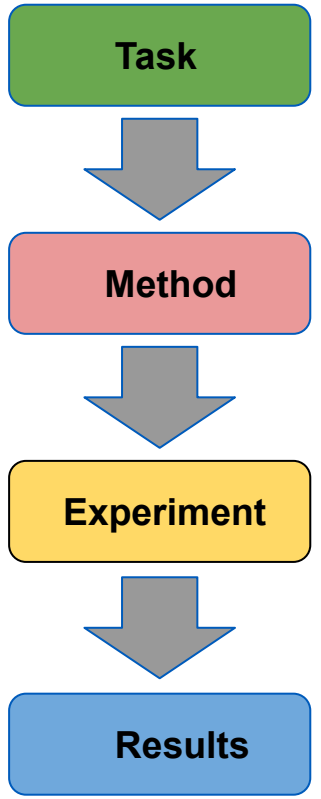
Introduction

- Massive Open Online Course(MOOCs) has captured the attention of many people with its increasing popularity all over the world.
- Millions of students registering in the online courses and new courses are adding at a rapid rate suggests that in the incoming years, Online courses will supersize the traditional classroom programs.
- It aims to provide higher education to the world by offering online courses from various universities for free or at very low fees and has attracted millions of students from a variety of age groups, nationality and educational background.
- Despite its success, MOOCs face a major problem which is the low completion rate. Many people join the course but they don't complete the course(Dropout) which is the major hindrance of MOOCs success.

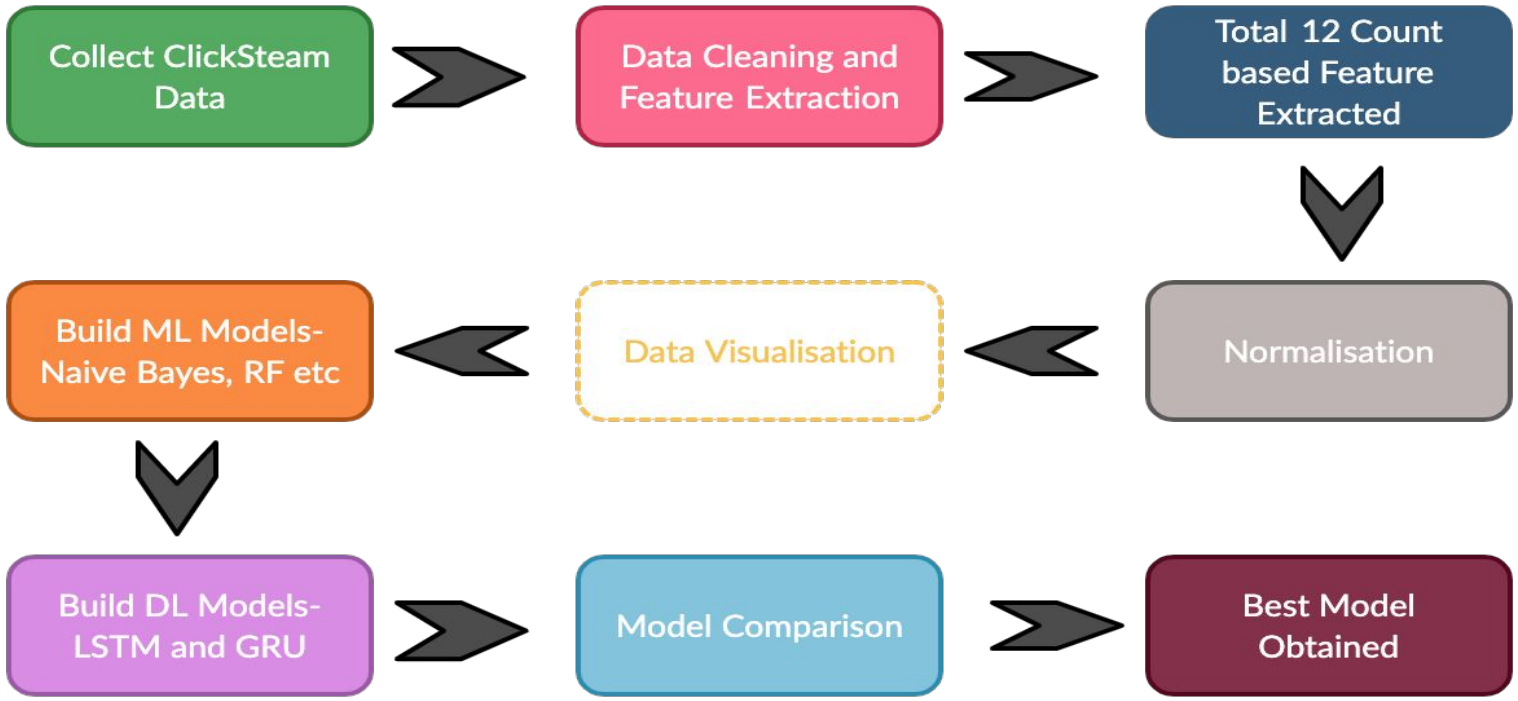
https://static.aminer.cn/upload/pdf/program/555048d445ce0a409eb71cc5_0.pdf

Task

- The goal of the study is to identify the students at the risk by identifying their click pattern across various modules of the course.
- By predicting the early dropout, the instructor can come with some interventions to prevent the dropout of students from the course.
- If early prediction of user's dropout can be analyzed then using proper intervention, dropout of the users can be hampered. This can lead to a great success of the MOOCs.
- The goal of the project is to build various Machine Learning and Deep Learning models to predict the early dropout of the users on the basis of clickstream data. Then, compare between various models and find the best model for this study.



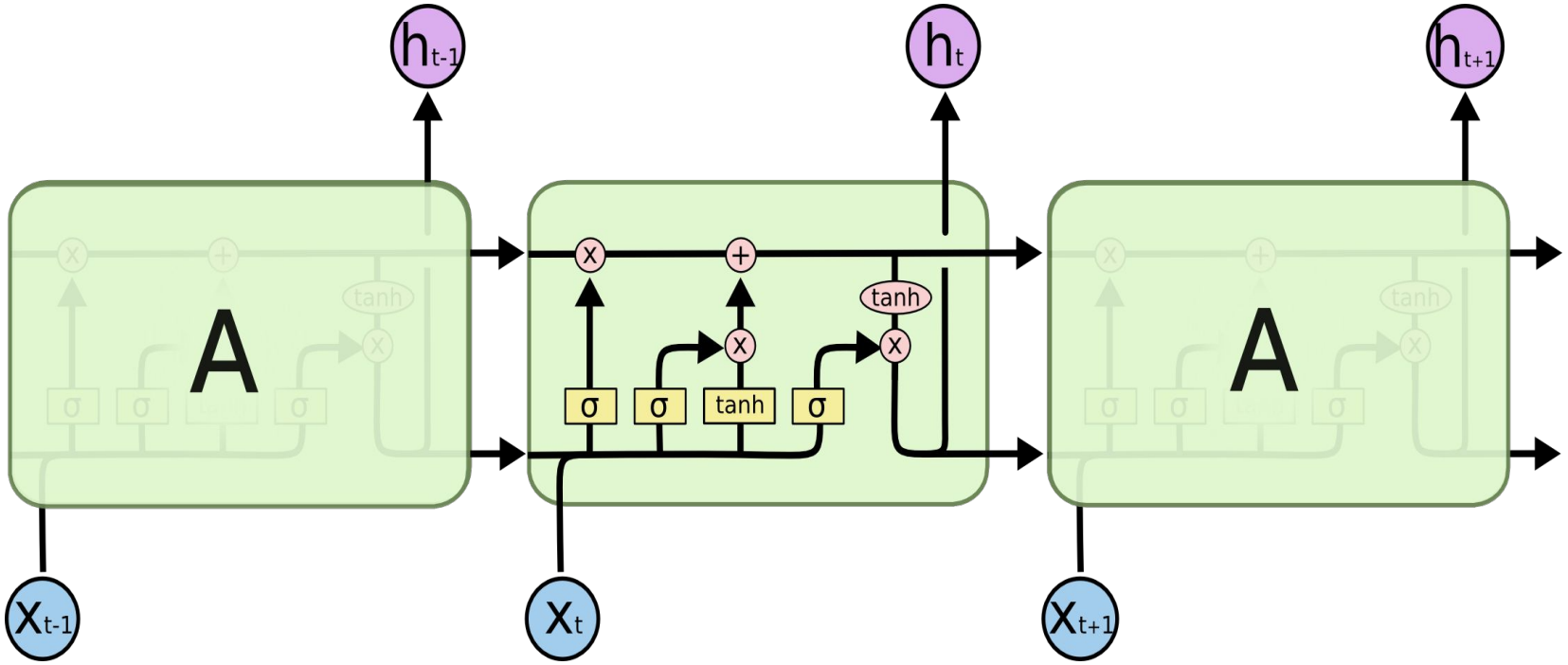
FLOWCHART



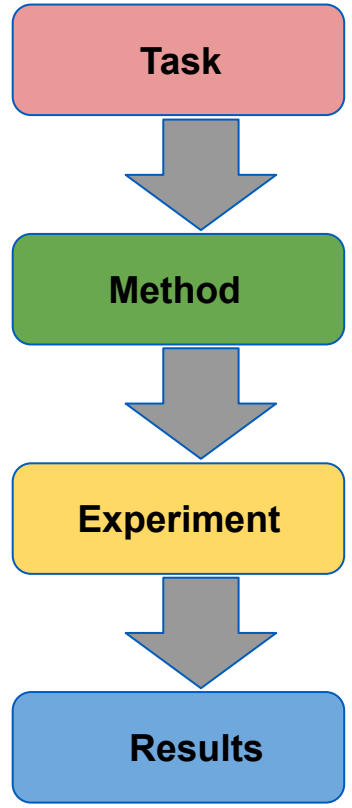
Date was collected from KDD Cup 2015 and it doesn't provide any contextual information. Lots of Feature processing is performed to draw the contextual information and created one dataset having 12 count based features to implement various Machine Learning and Deep Learning Models.

https://github.com/Siddhant085/modelling-MOOC-dropout

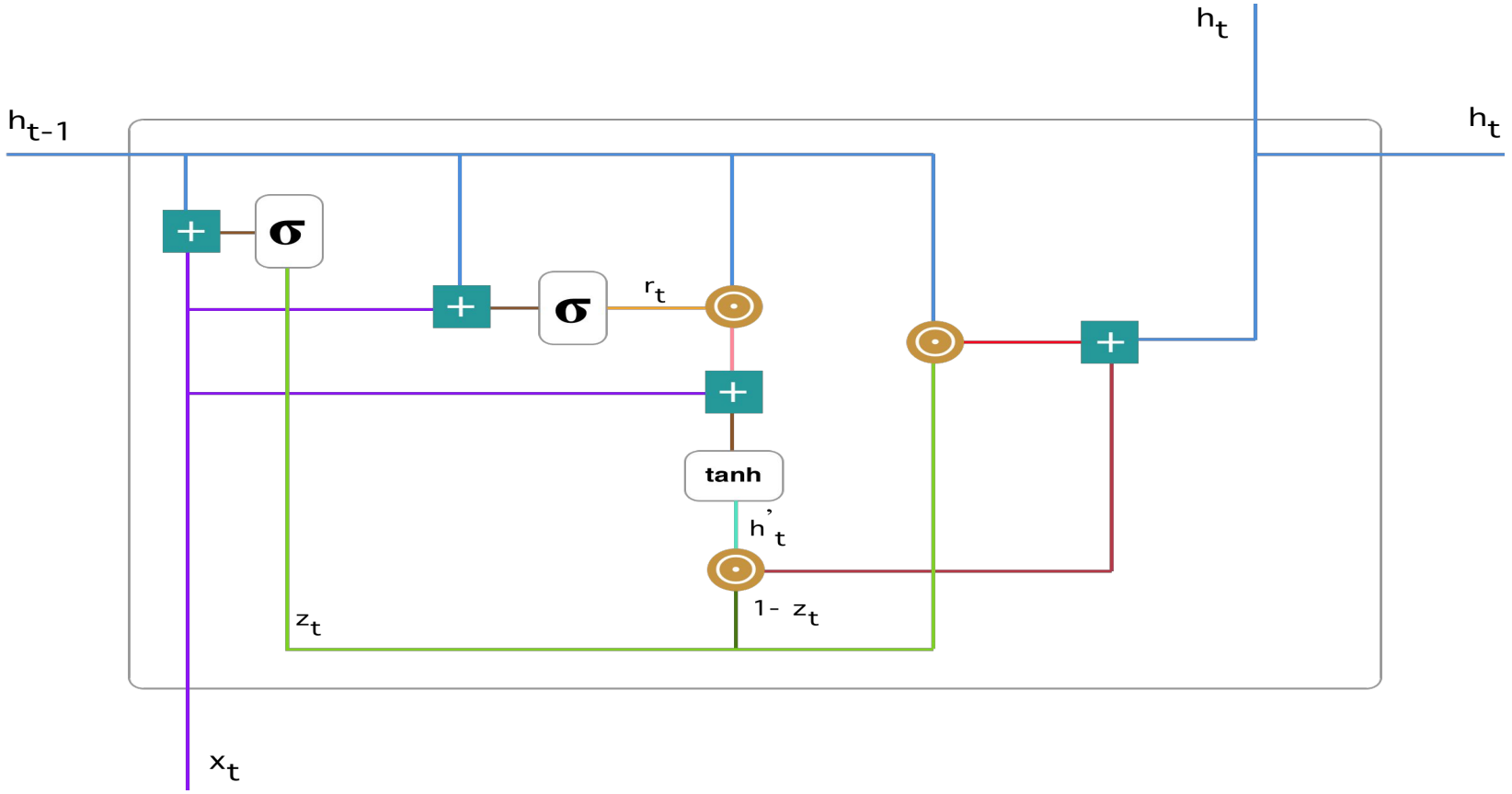
Method



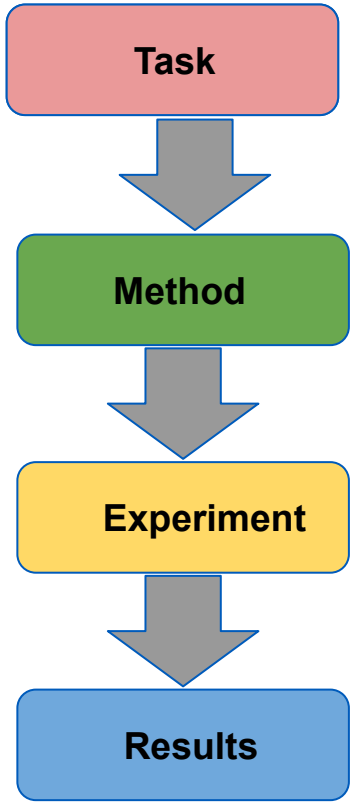
LSTM Architecture



https://colah.github.io/posts/2015-08-Understanding-LSTMs/



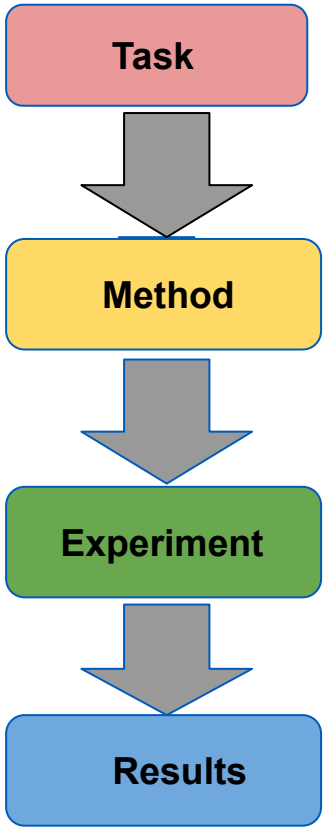
Gated Recurrent Network Architecture



https://towardsdatascience.com/understanding-gru-networks-2ef37df6c9be

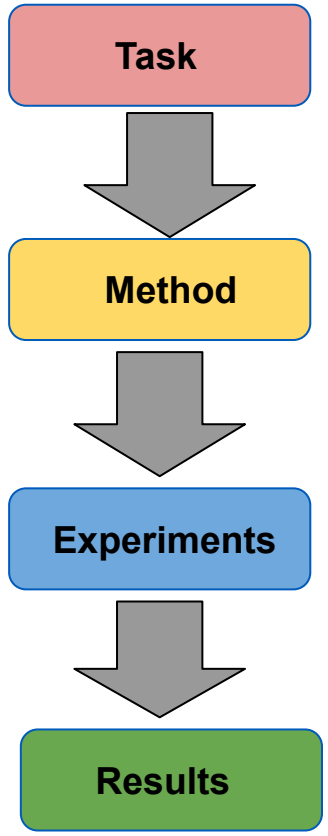
Experiment

- Obtained the clean dataset by performing the feature processing on KDD Cup 2015 dataset.
- Normalized the cleaned dataset.
- Implemented LSTM, GRU, Logistic Regression, SVM, MLP, Decision Tree and Random Forest using various optimizers like Sgd, Adam and RmsProp and tanh, relu activation function.
- Applied Early Stopping with the patience value as 35.
- Trained the model for 100 epochs.
- Tuned the various models in order to achieve the better performance of the models.

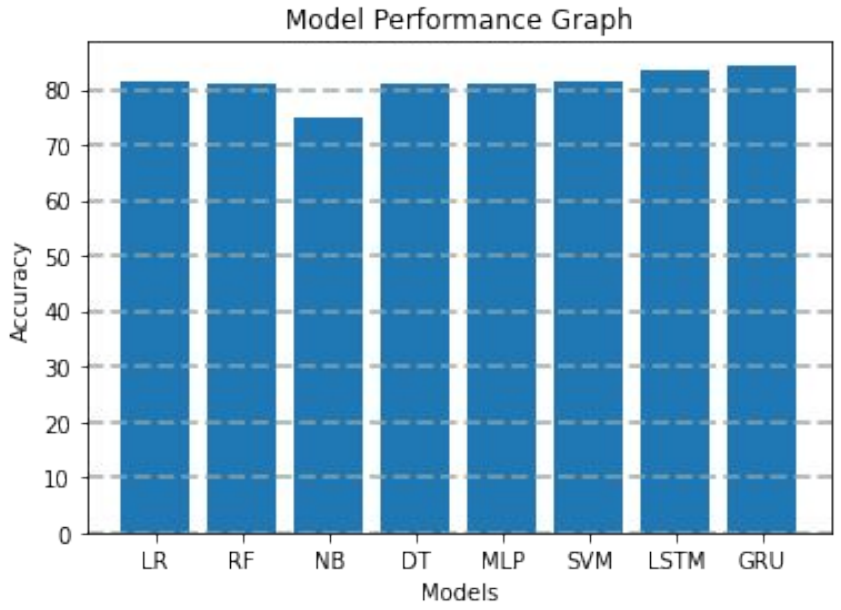


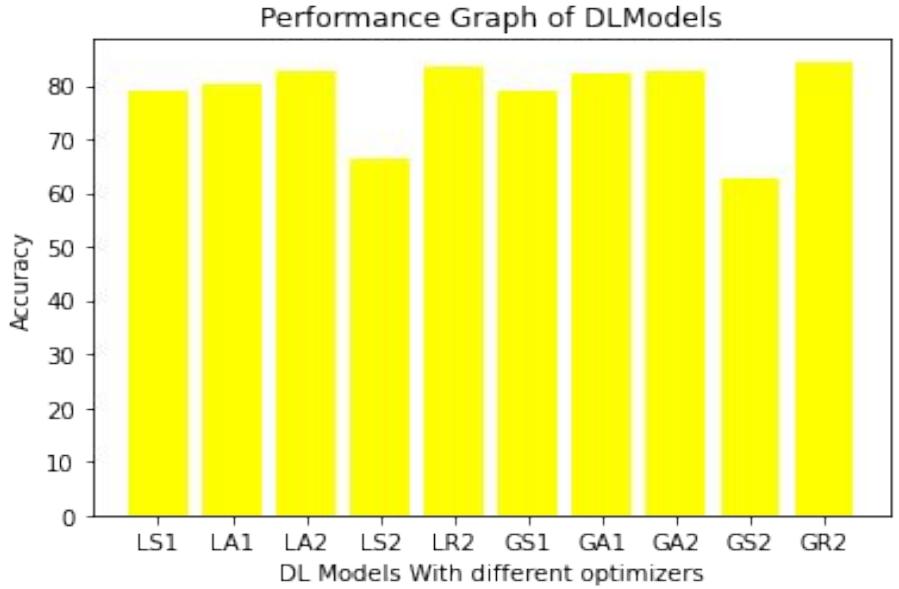
Results

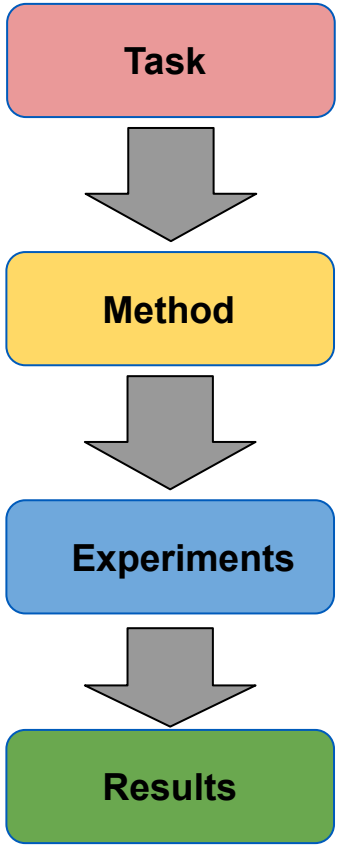
	Accuracy	Precision	Recall
LSTM_SGD_NoReg	0.790	0.791	0.897
LSTM_Adam_WithReg	0.827	0.837	0.919
LSTM_RMSPROP	0.834	0.858	0.892
GRU_SGD_NoReg	0.791	0.818	0.860
GRU_Adam_WithReg	0.827	0.850	0.897
GRU_RMSPROP	0.844	0.881	0.896
Logistic Regression	0.812	0.810	0.812
Random Forest	0.809	0.808	0.809
MLP	0.808	0.806	0.808
SVM	0.814	0.812	0.814
Decision Tree	0.809	0.807	0.809



Results


Model Performance Graph
Accuracy
0
10
20
30
40
50
60
70
80
LR
RF
NB
DT
MLP
SVM
LSTM
GRU
Models


Performance Graph of DLModels
Accuracy
0
10
20
30
40
50
60
70
80
LS1
LA1
LA2
LS2
LR2
GS1
GA1
GA2
GS2
GR2
DL Models With different optimizers


Task
Method
Experiments
Results

Conclusion

- A model is proposed which is mainly based on click based features and counts to predict the dropout of the student's in the MOOCs environment.
- Several classification algorithm are used to predict if a user will drop the course or not using Long Short Term Memory, GRU, Logistic Regression, SVM, Multi-layer perceptron, Decision Tree, Naïve Bayes and Random Forest by observing the clickstream data.
- GRU performs best with an accuracy of 84.4 % with respect to all other models that are used in this study.
- Deep Learning models performs better than the Machine Learning in this study.
- GRU is better than LSTM and faster to train the GRU than the LSTM.

Thank you