MAHASARAKHAM UNIVERSITY

A Machine Learning Approach for Detecting Distributed Denial of Service Attacks

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Presentation is Divided Into Five Parts:

First part : Introduction.

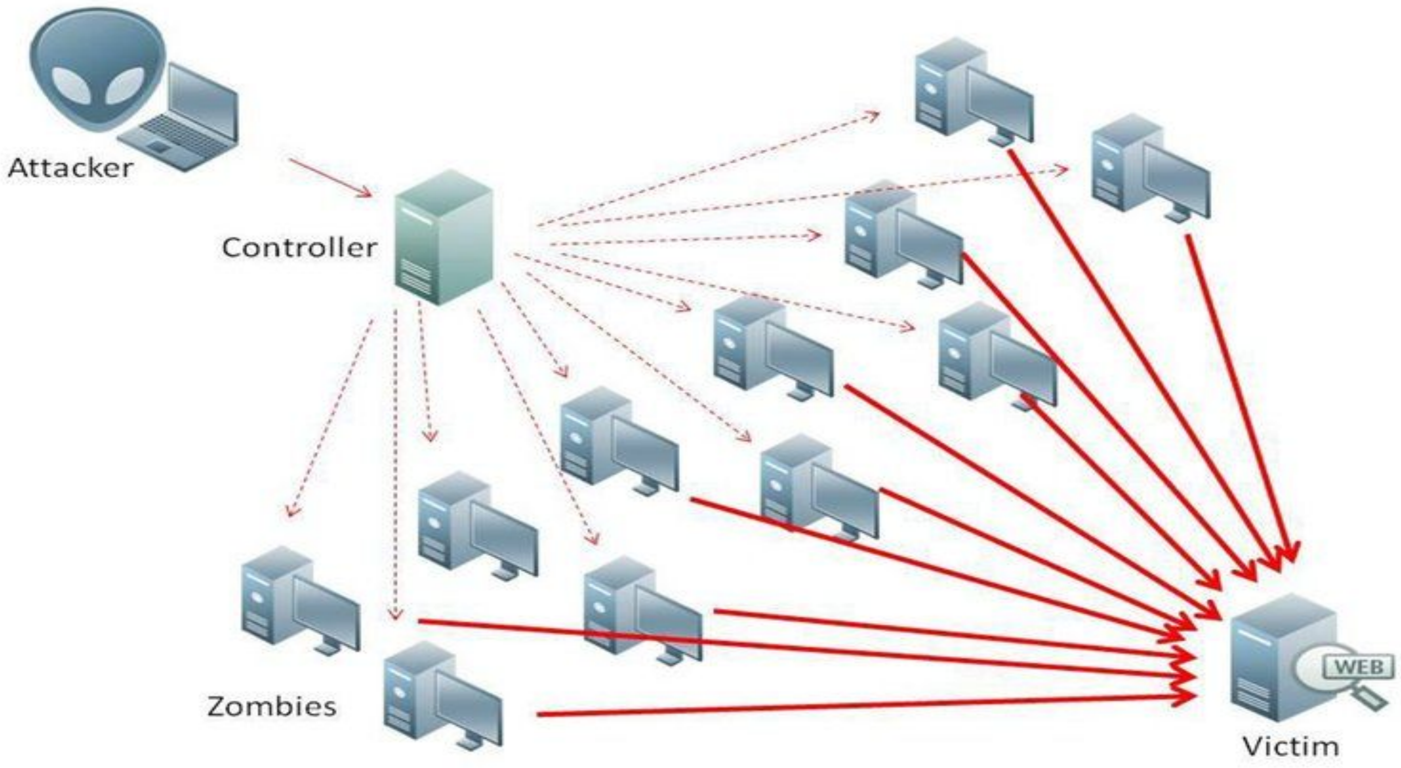
Second part : Method for classifying.

Third part : Describe.

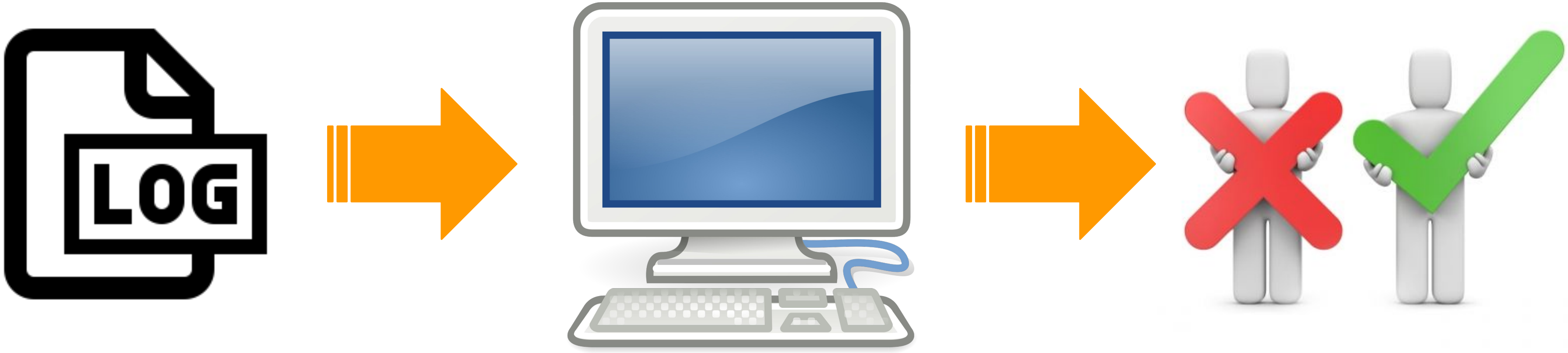
Fourth part : Experience and Results.

Final part : Summarize.

Introduction



Method for Classifying

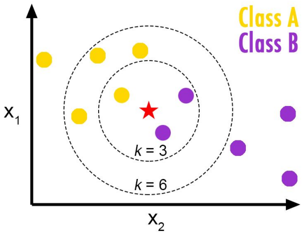


Network Security Information

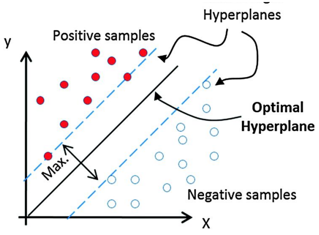
Machine Learning

Classifying DDoS Attack

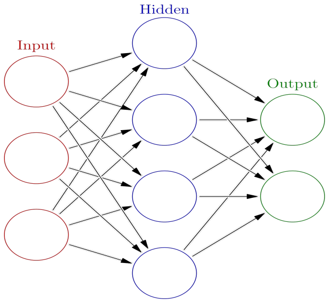
Technique for Classification



The K-Nearest-Neighbor (KNN)



Support Vector Machine (SVM)

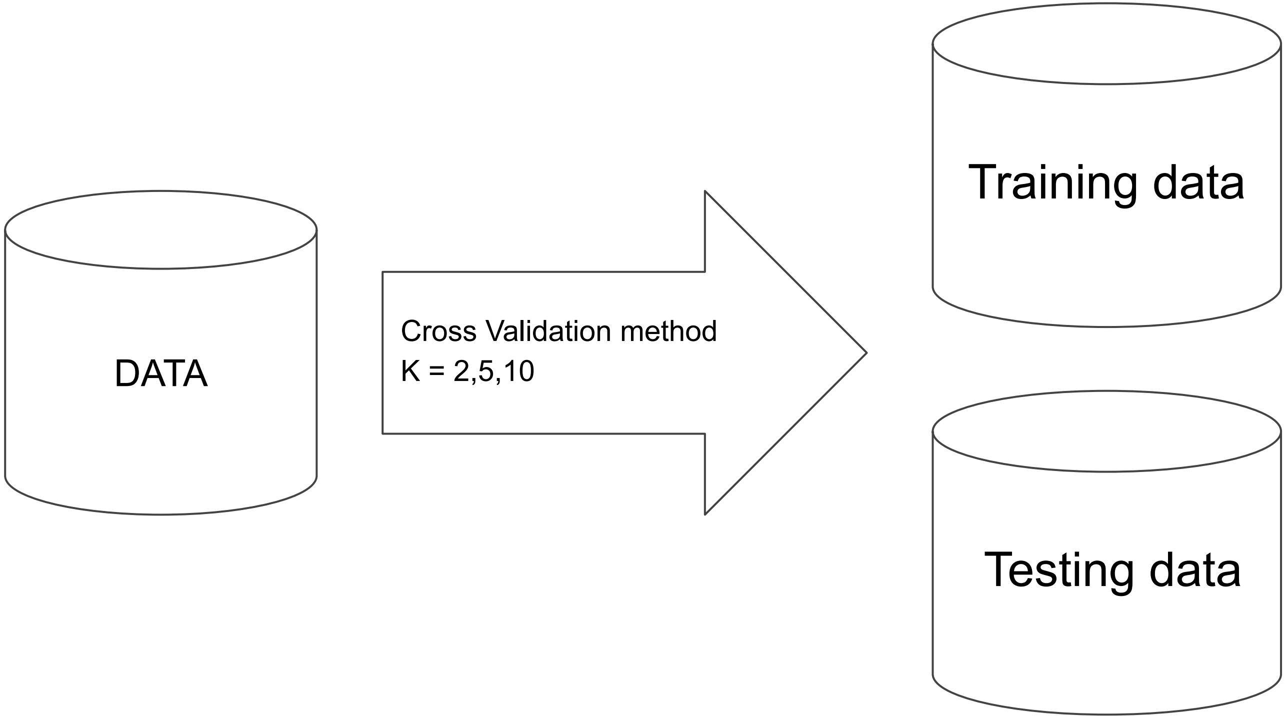


Multi-Layer Perceptron (MLP)

Classification

Accuracy Rate

Cross Validation Method

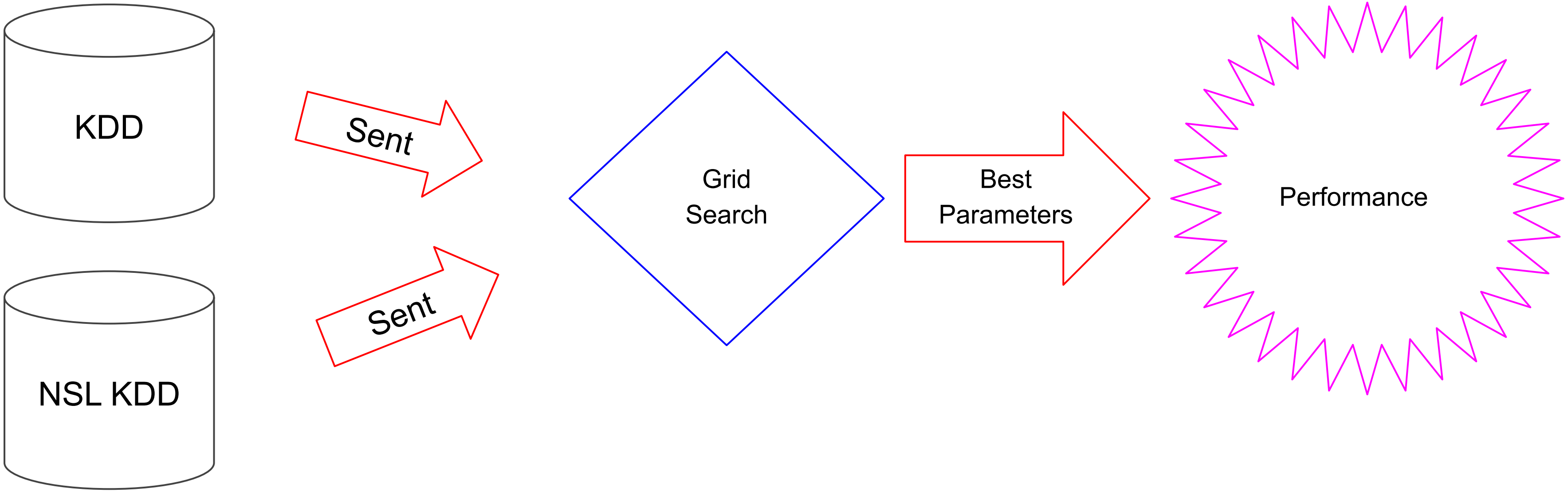

DATA

Cross Validation method
K = 2,5,10

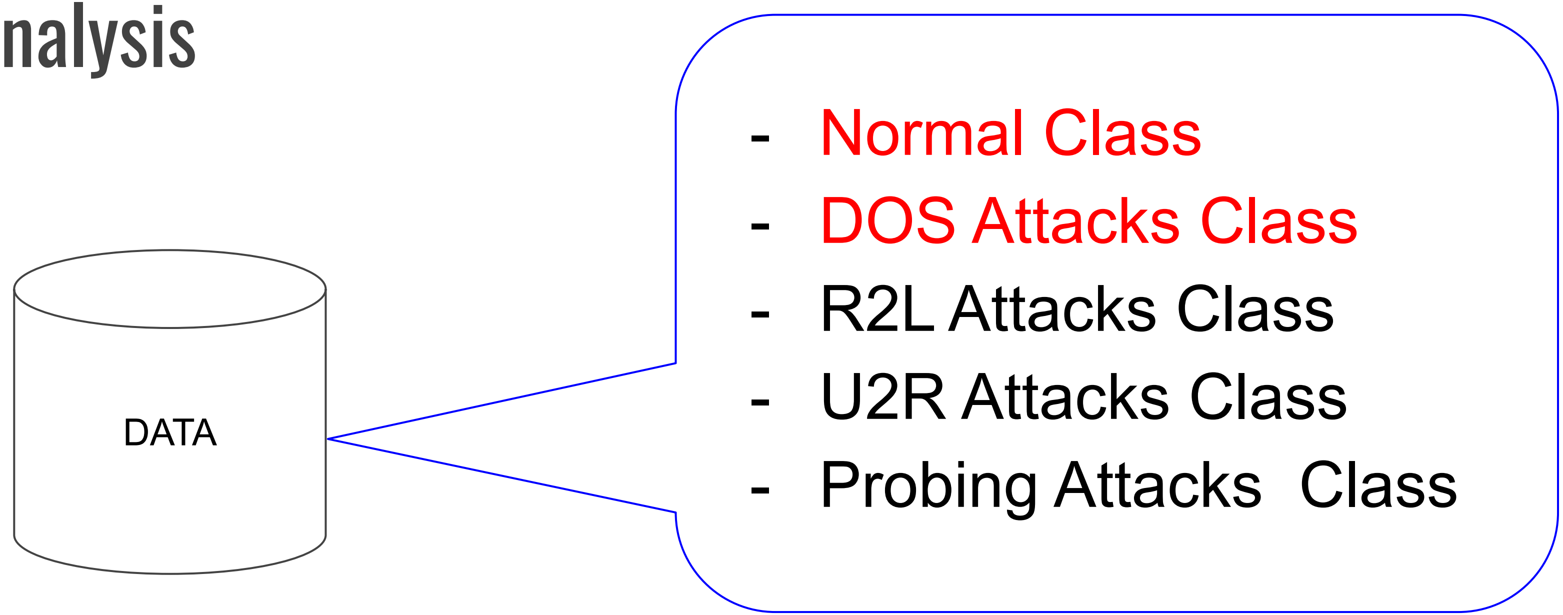
Training data

Testing data

Grid Search Method



Data Analysis

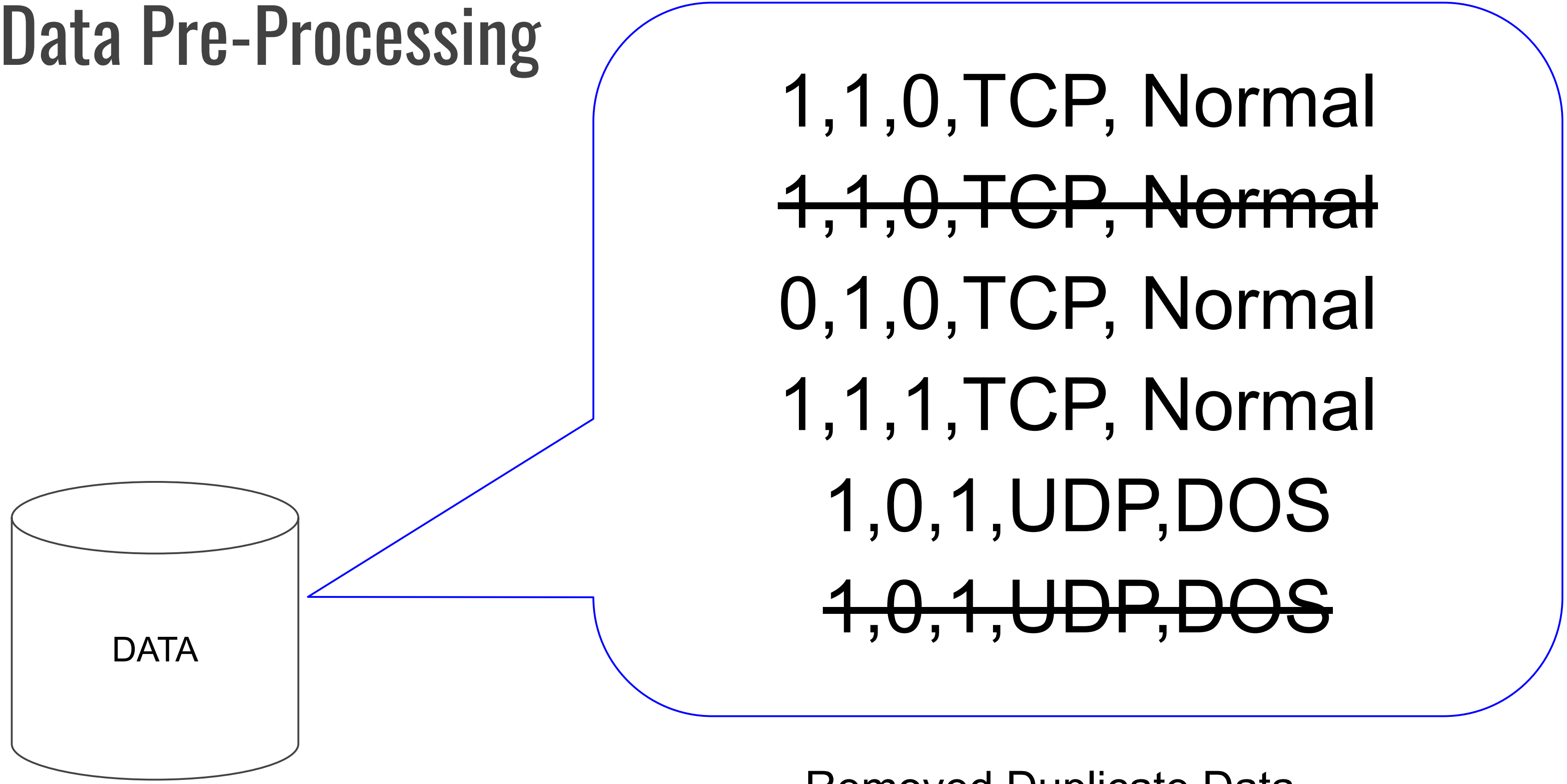


- Normal Class
- DOS Attacks Class
- R2L Attacks Class
- U2R Attacks Class
- Probing Attacks Class

The datasets were divided into Normal Class and 4 features of attack class.

In the dataset of this research, there are 41 features which are selected only normal and DDoS attacks

Data Pre-Processing



1,1,0,TCP, Normal

~~1,1,0,TCP, Normal~~

0,1,0,TCP, Normal

1,1,1,TCP, Normal

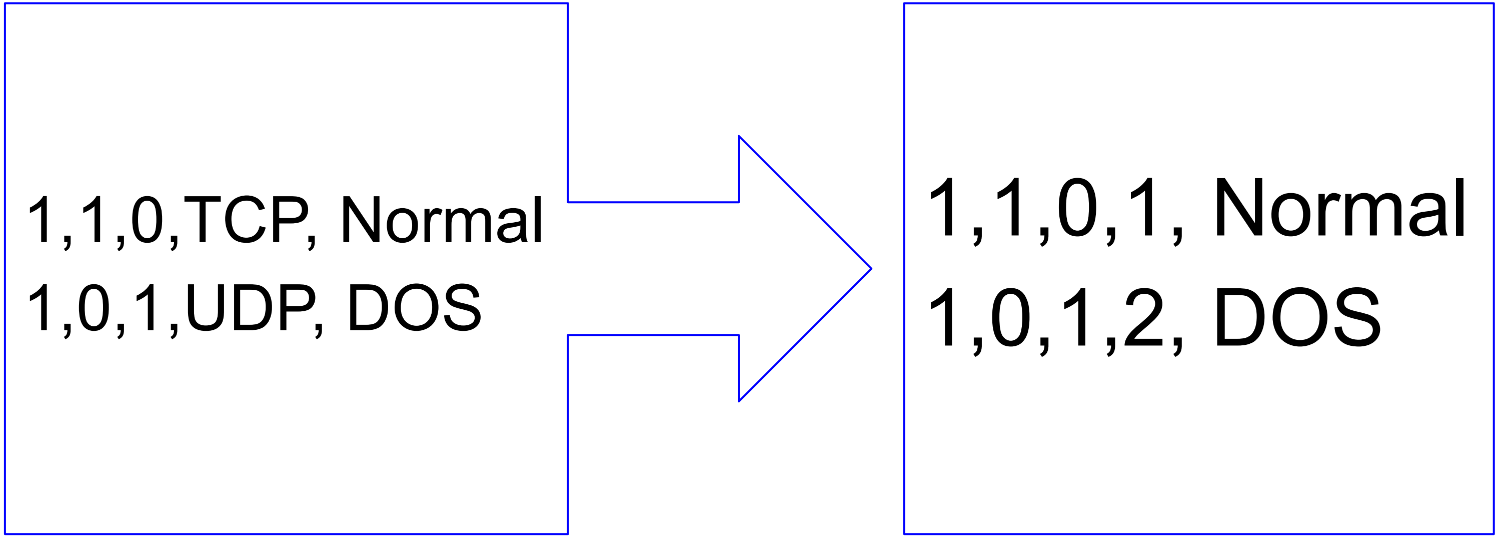
1,0,1,UDP,DOS

~~1,0,1,UDP,DOS~~

Removed Duplicate Data.

Data Pre-Processing

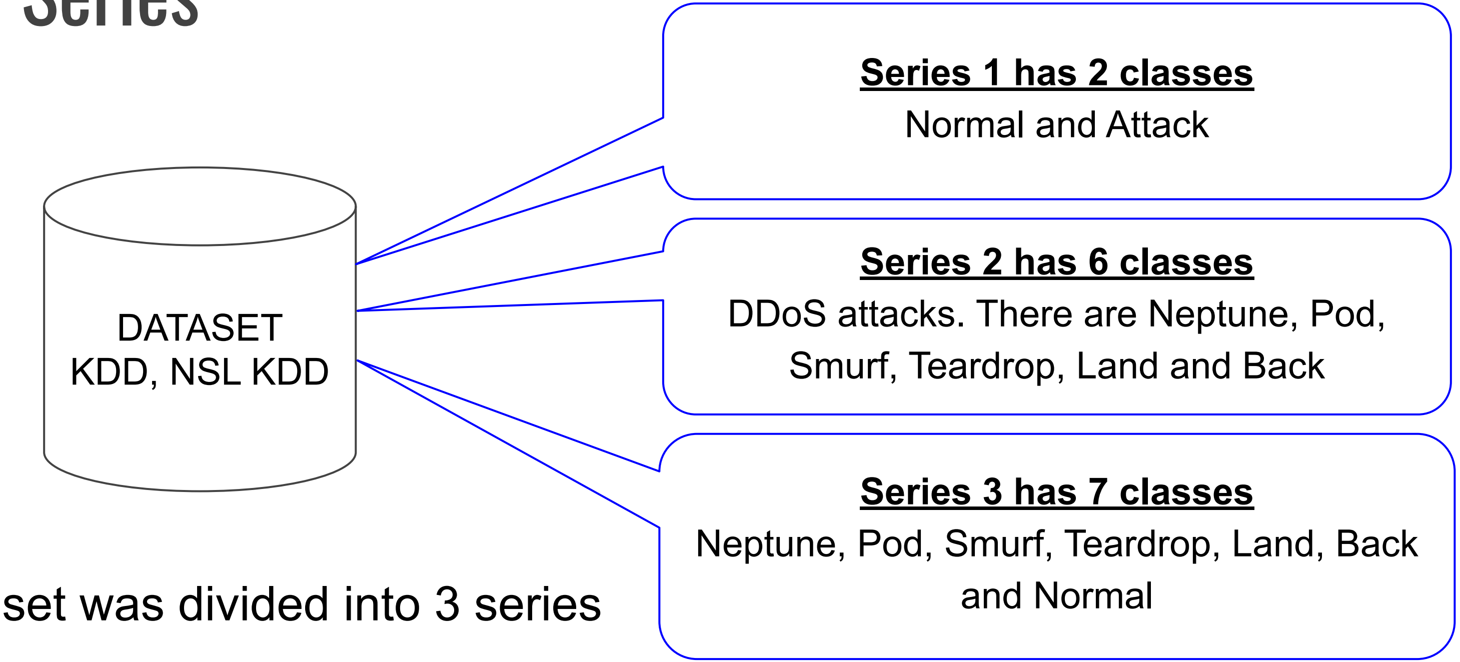
Convert Alphabet to Numeric



1,1,0,TCP, Normal
1,0,1,UDP, DOS

1,1,0,1, Normal
1,0,1,2, DOS

Data Series



DATASET
KDD, NSL KDD

Series 1 has 2 classes

Normal and Attack

Series 2 has 6 classes

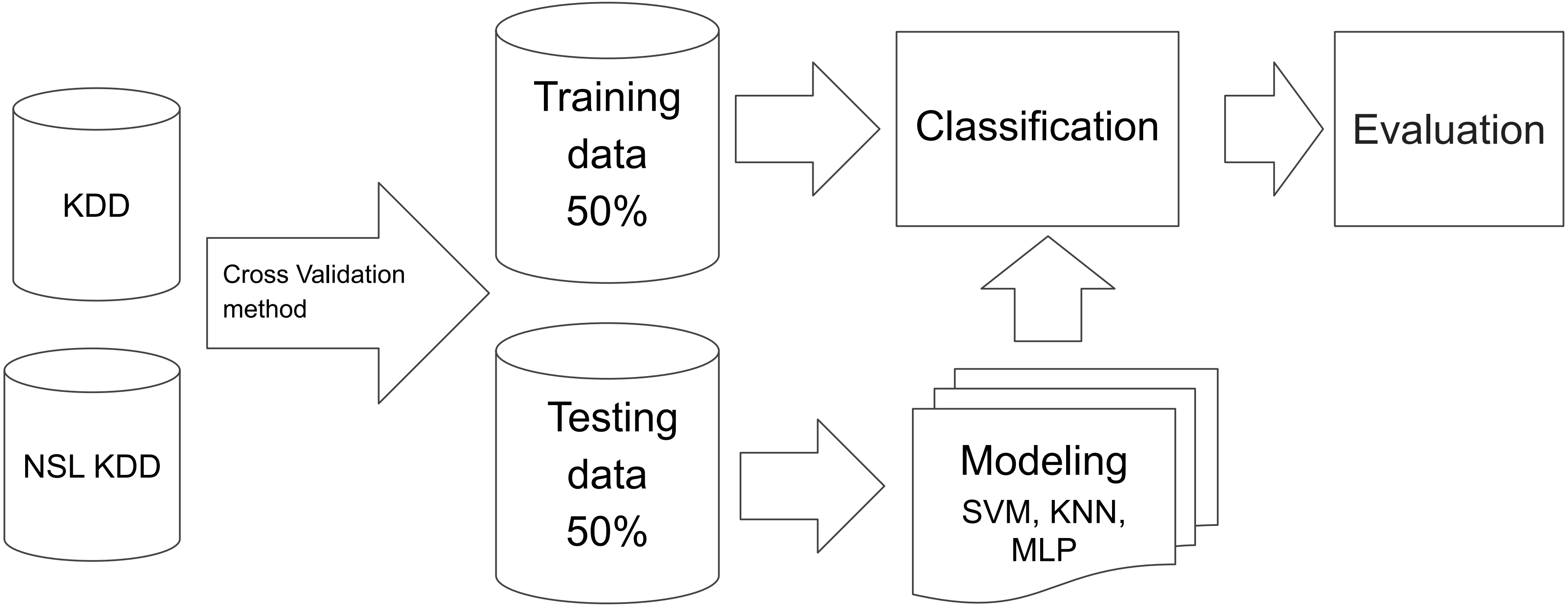
DDoS attacks. There are Neptune, Pod, Smurf, Teardrop, Land and Back

Series 3 has 7 classes

Neptune, Pod, Smurf, Teardrop, Land, Back and Normal

The dataset was divided into 3 series

Modeling of Data for DDoS Attacks Classification



KDD

NSL KDD

Cross Validation method

Training data 50%

Testing data 50%

Classification

Evaluation

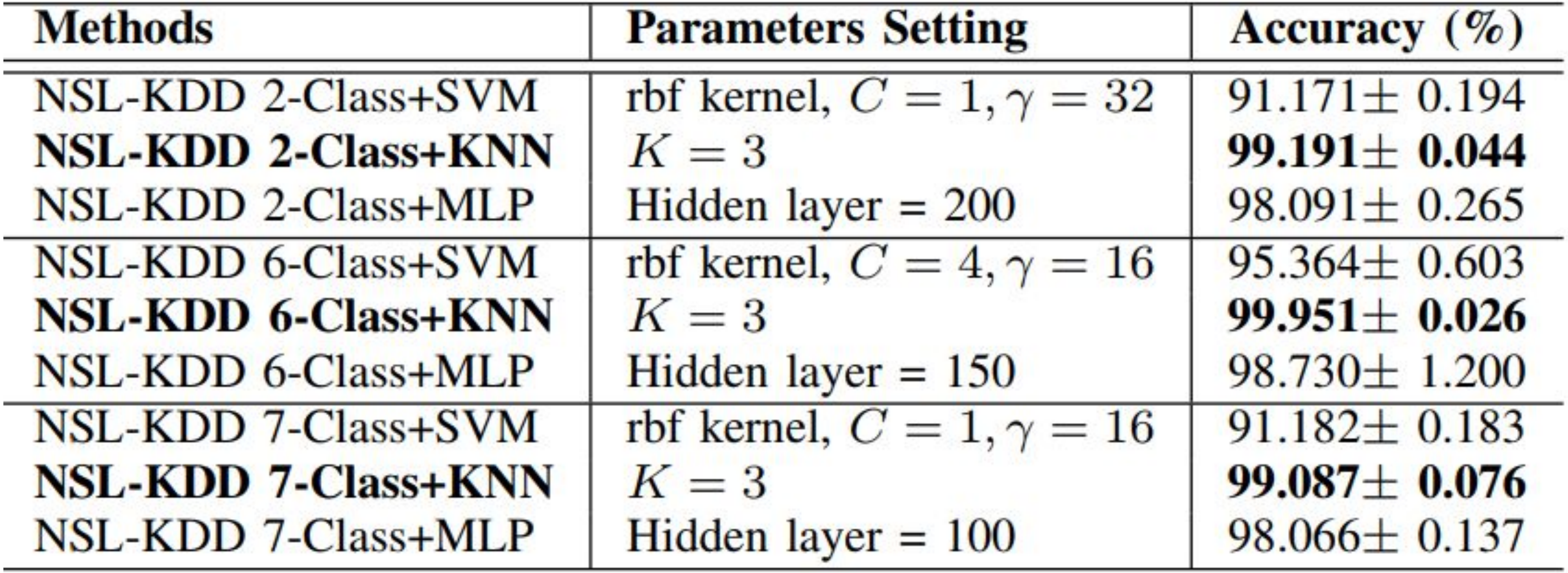
Modeling

SVM, KNN, MLP

TABLE I: Accuracy Results of the KDD Dataset

Methods	**Parameters Setting**	**Accuracy (%)**
KDD 2-Class+SVM	rbf kernel, $C = 8, \gamma = 16$	98.946± 0.022
KDD 2-Class+KNN	$K = 3$	**99.983**± **0.003**
KDD 2-Class+MLP	Hidden layer = 150	98.833± 0.131
KDD 6-Class+SVM	rbf kernel, $C = 8, \gamma = 32$	98.781± 0.020
KDD 6-Class+KNN	$K = 3$	**99.998**± **0.002**
KDD 6-Class+MLP	Hidden layer = 20	99.981± 0.131
KDD 7-Class+SVM	rbf kernel, $C = 4, \gamma = 32$	99.096± 0.027
KDD 7-Class+KNN	$K = 3$	**99.984**± **0.002**
KDD 7-Class+MLP	Hidden layer = 500	99.944± 0.019

TABLE II: Accuracy Results of the NSL-KDD Dataset



Methods	**Parameters Setting**	**Accuracy (%)**
NSL-KDD 2-Class+SVM	rbf kernel, $C = 1, \gamma = 32$	91.171± 0.194
NSL-KDD 2-Class+KNN	$K = 3$	**99.191± 0.044**
NSL-KDD 2-Class+MLP	Hidden layer = 200	98.091± 0.265
NSL-KDD 6-Class+SVM	rbf kernel, $C = 4, \gamma = 16$	95.364± 0.603
NSL-KDD 6-Class+KNN	$K = 3$	**99.951± 0.026**
NSL-KDD 6-Class+MLP	Hidden layer = 150	98.730± 1.200
NSL-KDD 7-Class+SVM	rbf kernel, $C = 1, \gamma = 16$	91.182± 0.183
NSL-KDD 7-Class+KNN	$K = 3$	**99.087± 0.076**
NSL-KDD 7-Class+MLP	Hidden layer = 100	98.066± 0.137

CONCLUSION

- Find a special feature
- Reduce the number of features
- Not reduce the accuracy rate

THANK YOU!