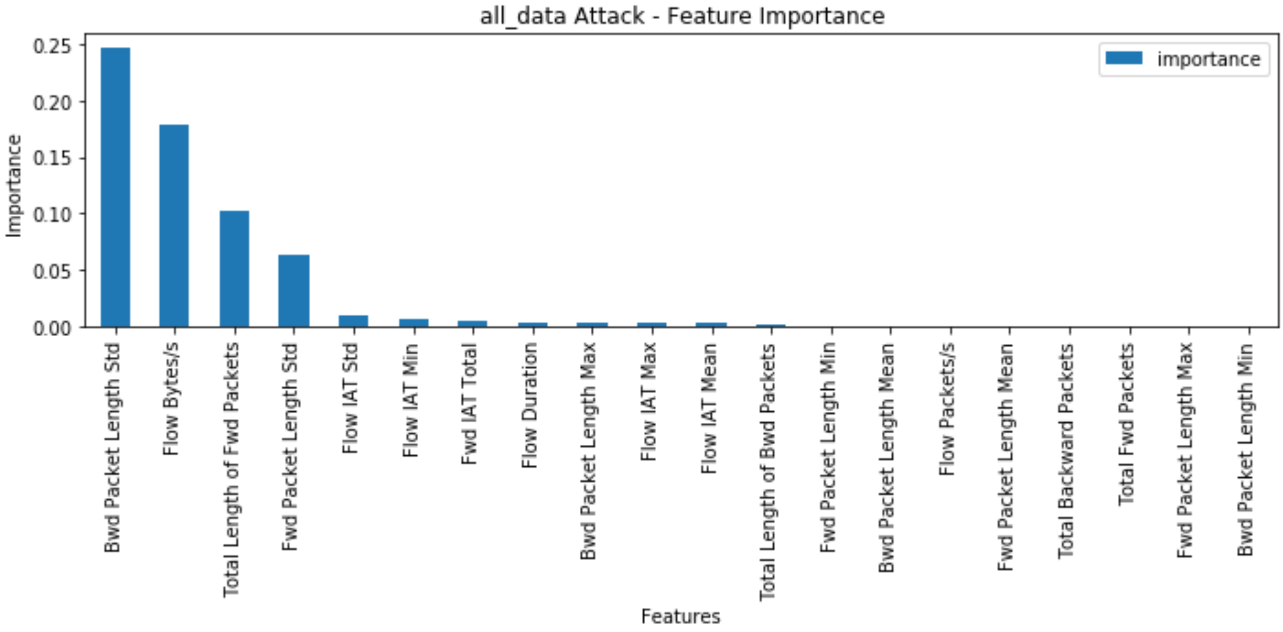
Paper Summary

Methodology

- **Dataset**: CIC-IDS2017 created by the Canadian Institute for Cybersecurity at the University of New Brunswick. This dataset consists of a 5-day (3rd July- 7th July 2017) data stream on a network created by computers using up-to-date operating systems such as Windows Vista / 7 / 8.1 / 10, Mac, Ubuntu 12/16 and Kali.
- **Models**:
  - Naive Bayes
  - Quadratic Discriminant Analysis (QDA)
  - Random Forest
  - Iterative Dichotomiser 3 (ID3)
- **Libraries**: Pandas, Scikit Learn, NumPy

Dataset Information

- **Total Features**: 85
- **Selected Features for All Data**: The Random Forest Regressor from Scikit-Learn was used to determine the feature weights.



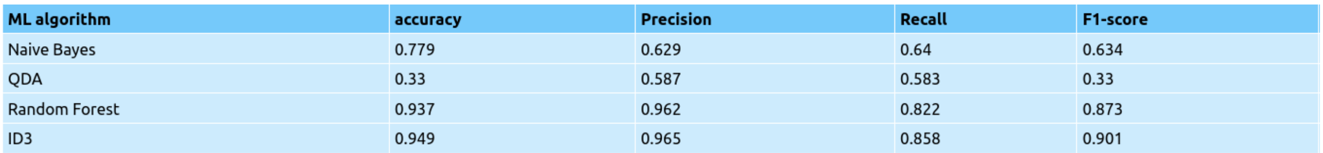
Types of Attacks Targeted

Attack	Feature
Bot	Bwd Packet Length Mean, Flow IAT Max, Flow Duration ,Flow IAT Min, Label
DDoS	Bwd Packet Length Std, Total Backward Packets, Fwd IAT Total,Flow Duration, Label

Attack	Feature
DoS GoldenEye	Flow IAT Max, Bwd Packet Length Std, Flow IAT Min, Total Backward Packets, Label
DoS Hulk	Flow IAT Mean, Fwd Packet Length Min, Bwd Packet Length Mean, Total Length of Bwd Packets, Label
DoS slowloris	Flow IAT Mean,Total Length of Bwd Packets ,Bwd Packet Length Mean, Total Fwd Packets, Label
FTP-Patator	Fwd Packet Length Max, Fwd Packet Length Std, Fwd Packet Length Mean, Bwd Packet Length Std, Label
Heartbleed	Total Backward Packets, Fwd Packet Length Max, Flow IAT Min, Bwd Packet Length Max, Label
Infiltration	Fwd Packet Length Max, Fwd Packet Length Mean, Flow Duration, Total Length of Fwd Packets, Label
PortScan	Flow Bytes/s,Total Length of Fwd Packets, Fwd IAT Total, Flow Duration, Label
SSH-Patator	Fwd Packet Length Max, Flow Duration, Flow IAT Max,Total Length of Fwd Packets, Label
Web Attack	Bwd Packet Length Std, Total Length of Fwd Packets, Flow Bytes/s, Flow IAT Max, Label

Perfromance Metrics

- **Accuracy**: The ratio of successfully categorized data to total data.
- **Recall (Sensitivity)**: The ratio of data classified as an attack to all attack data.
- **Precision**: The ratio of successful classified data as the attack to all data classified as the attack.
- **F-measure (F-score/F1-score)**: The harmonic-mean of sensitivity and precision. This metric is used to express the overall success.



ML algorithm	accuracy	Precision	Recall	F1-score
Naive Bayes	0.779	0.629	0.64	0.634
QDA	0.33	0.587	0.583	0.33
Random Forest	0.937	0.962	0.822	0.873
ID3	0.949	0.965	0.858	0.901