# Group 1: LB, ALTV, Min, Mean

## Question 1

Q1 1.

```
FileName    Date    SegFile b   e   LBE LB  AC  FM  UC  ... C   D   E   AD  DE  LD
FS  SUSP    CLASS   NSP
2   Fmcs_1.txt  1996-05-03  CTG0002.txt 5.0 632.0   132.0   132.0   4.0 0.0 4.0
... 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0 6.0 1.0
3   Fmcs_1.txt  1996-05-03  CTG0003.txt 177.0   779.0   133.0   133.0   2.0 0.0
5.0 ... 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0 6.0 1.0
4   Fmcs_1.txt  1996-05-03  CTG0004.txt 411.0   1192.0  134.0   134.0   2.0 0.0
6.0 ... 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0 6.0 1.0
5   Fmcs_1.txt  1996-05-03  CTG0005.txt 533.0   1147.0  132.0   132.0   4.0 0.0
5.0 ... 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 2.0 1.0
6   Fmcs_2.txt  1996-05-03  CTG0006.txt 0.0 953.0   134.0   134.0   1.0 0.0 10.0
... 0.0 0.0 0.0 0.0 0.0 1.0 0.0 0.0 8.0 3.0
... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...
... ...
2122    S8001045.dsp    1998-06-06  CTG2124.txt 2059.0  2867.0  140.0   140.0
0.0 0.0 6.0 ... 0.0 0.0 1.0 0.0 0.0 0.0 0.0 0.0 5.0 2.0
2123    S8001045.dsp    1998-06-06  CTG2125.txt 1576.0  2867.0  140.0   140.0
1.0 0.0 9.0 ... 0.0 0.0 1.0 0.0 0.0 0.0 0.0 0.0 5.0 2.0
2124    S8001045.dsp    1998-06-06  CTG2126.txt 1576.0  2596.0  140.0   140.0
1.0 0.0 7.0 ... 0.0 0.0 1.0 0.0 0.0 0.0 0.0 0.0 5.0 2.0
2125    S8001045.dsp    1998-06-06  CTG2127.txt 1576.0  3049.0  140.0   140.0
1.0 0.0 9.0 ... 0.0 0.0 1.0 0.0 0.0 0.0 0.0 0.0 5.0 2.0
2126    S8001045.dsp    1998-06-06  CTG2128.txt 2796.0  3415.0  142.0   142.0
1.0 1.0 5.0 ... 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 1.0
2125 rows × 40 columns
```

Q1 2.

```
    FileName    Date    SegFile b   e   LBE LB  AC  FM  UC  ... C   D   E   AD  DE
LD  FS  SUSP    CLASS   NSP
2   Fmcs_1.txt  1996-05-03  CTG0002.txt 5.0 632.0   132.0   132.0   4.0 0.0 4.0
... 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0 6.0 1
3   Fmcs_1.txt  1996-05-03  CTG0003.txt 177.0   779.0   133.0   133.0   2.0 0.0
5.0 ... 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0 6.0 1
4   Fmcs_1.txt  1996-05-03  CTG0004.txt 411.0   1192.0  134.0   134.0   2.0 0.0
6.0 ... 0.0 0.0 0.0 1.0 0.0 0.0 0.0 0.0 6.0 1
5   Fmcs_1.txt  1996-05-03  CTG0005.txt 533.0   1147.0  132.0   132.0   4.0 0.0
5.0 ... 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 2.0 1
6   Fmcs_2.txt  1996-05-03  CTG0006.txt 0.0 953.0   134.0   134.0   1.0 0.0 10.0
... 0.0 0.0 0.0 0.0 0.0 1.0 0.0 0.0 8.0 0
... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...
... ...
```

```
2122    S8001045.dsp    1998-06-06  CTG2124.txt 2059.0  2867.0  140.0   140.0
0.0 0.0 6.0 ... 0.0 0.0 1.0 0.0 0.0 0.0 0.0 0.0 5.0 0
2123    S8001045.dsp    1998-06-06  CTG2125.txt 1576.0  2867.0  140.0   140.0
1.0 0.0 9.0 ... 0.0 0.0 1.0 0.0 0.0 0.0 0.0 0.0 5.0 0
2124    S8001045.dsp    1998-06-06  CTG2126.txt 1576.0  2596.0  140.0   140.0
1.0 0.0 7.0 ... 0.0 0.0 1.0 0.0 0.0 0.0 0.0 0.0 5.0 0
2125    S8001045.dsp    1998-06-06  CTG2127.txt 1576.0  3049.0  140.0   140.0
1.0 0.0 9.0 ... 0.0 0.0 1.0 0.0 0.0 0.0 0.0 0.0 5.0 0
2126    S8001045.dsp    1998-06-06  CTG2128.txt 2796.0  3415.0  142.0   142.0
1.0 1.0 5.0 ... 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 1
2125 rows × 40 columns
```

# Question 2

## Q2 1.

Naive Bayesian

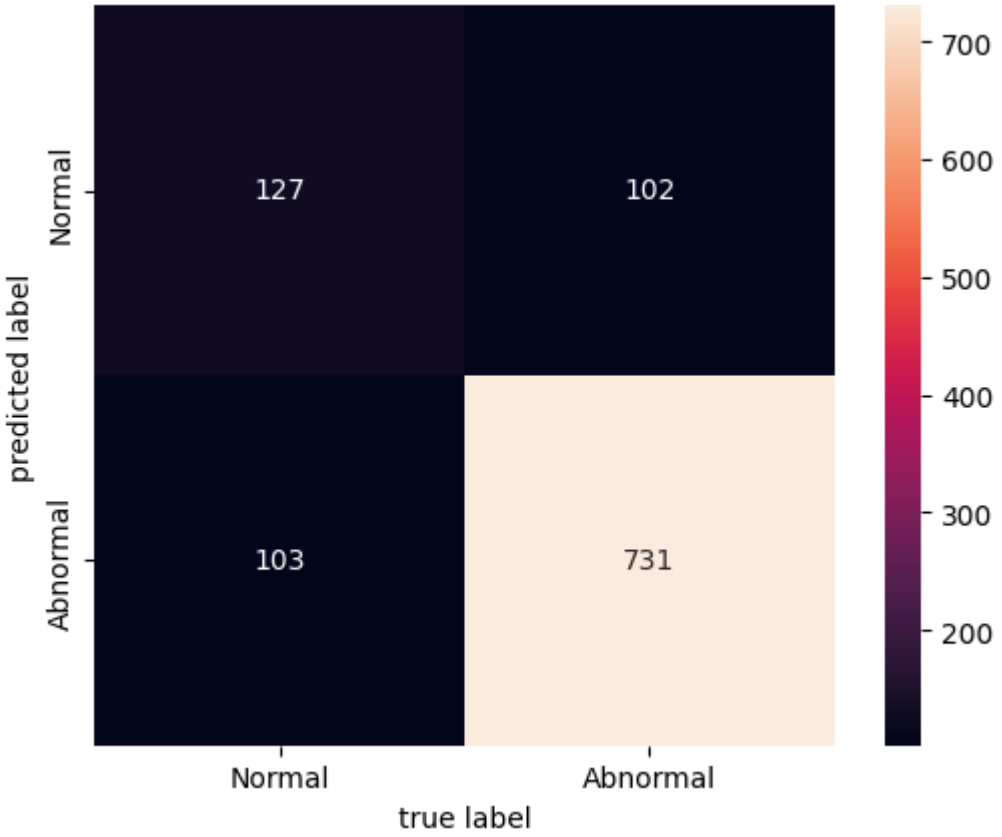
```
     LB  ALTV    Min Mean    NSP predict
1004    129.0   0.0 108.0   142.0   1   1
925 122.0   0.0 93.0    130.0   1   1
2001    125.0   0.0 71.0    117.0   1   1
476 150.0   37.0    140.0   150.0   0   0
1201    143.0   0.0 130.0   148.0   1   1
... ... ... ... ... ... ...
999 129.0   0.0 114.0   138.0   1   1
1976    135.0   0.0 124.0   144.0   1   1
1769    120.0   0.0 69.0    98.0    0   1
2104    133.0   6.0 91.0    132.0   1   1
106 125.0   0.0 56.0    123.0   1   1
1063 rows × 6 columns
```

## Q2 2.

Accuracy NB - 0.8071495766698025

## Q2 3.

Naive Bayesian




# Question 3

## Q3 1.

Decision Tree Classifier

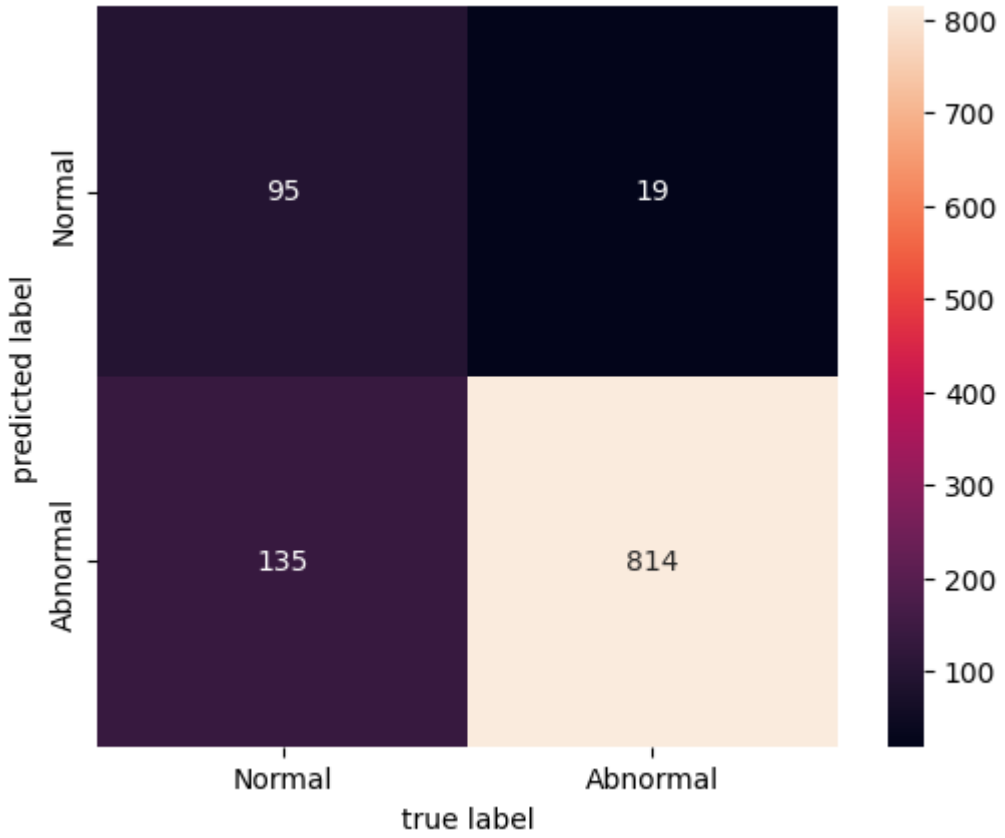
```
     LB  ALTV    Min Mean    NSP predict
1004    129.0   0.0 108.0   142.0   1   1
925 122.0   0.0 93.0    130.0   1   1
2001    125.0   0.0 71.0    117.0   1   1
476 150.0   37.0    140.0   150.0   0   1
1201    143.0   0.0 130.0   148.0   1   1
... ... ... ... ... ... ...
999 129.0   0.0 114.0   138.0   1   1
1976    135.0   0.0 124.0   144.0   1   1
1769    120.0   0.0 69.0    98.0    0   0
2104    133.0   6.0 91.0    132.0   1   1
106 125.0   0.0 56.0    123.0   1   1
1063 rows × 6 columns
```

## Q3 2.

Accuracy Decision Tree Classifier - 0.8551269990592663

## Q3 3.

Decision Tree Classifier



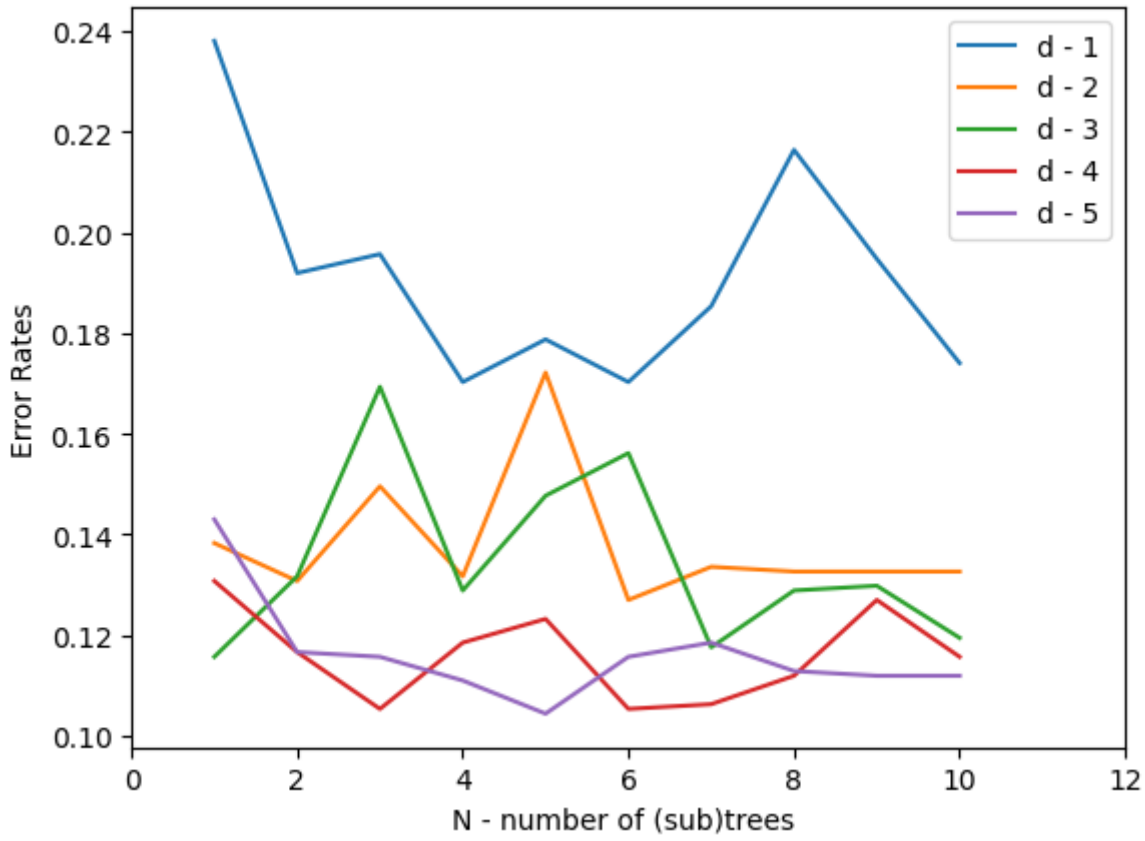

# Question 4

## Q4 1.

Random Forest Classifier - N - 1 Max depth d - 1 Error Rate - 0.23800564440263405
N - 2 Max depth d - 1 Error Rate - 0.19190968955785515
N - 3 Max depth d - 1 Error Rate - 0.1956726246472248
N - 4 Max depth d - 1 Error Rate - 0.17027281279397932
N - 5 Max depth d - 1 Error Rate - 0.1787394167450611
N - 6 Max depth d - 1 Error Rate - 0.17027281279397932
N - 7 Max depth d - 1 Error Rate - 0.18532455315145813
N - 8 Max depth d - 1 Error Rate - 0.21636876763875823
N - 9 Max depth d - 1 Error Rate - 0.1947318908748824
N - 10 Max depth d - 1 Error Rate - 0.17403574788334897
N - 1 Max depth d - 2 Error Rate - 0.13828786453433684
N - 2 Max depth d - 2 Error Rate - 0.13076199435559732
N - 3 Max depth d - 2 Error Rate - 0.14957666980244588
N - 4 Max depth d - 2 Error Rate - 0.13170272812793982
N - 5 Max depth d - 2 Error Rate - 0.1721542803386642
N - 6 Max depth d - 2 Error Rate - 0.12699905926622768
N - 7 Max depth d - 2 Error Rate - 0.1335841956726247
N - 8 Max depth d - 2 Error Rate - 0.1326434619002822
N - 9 Max depth d - 2 Error Rate - 0.1326434619002822
N - 10 Max depth d - 2 Error Rate - 0.1326434619002822
N - 1 Max depth d - 3 Error Rate - 0.11571025399811852

N - 2 Max depth d - 3 Error Rate - 0.13170272812793982
N - 3 Max depth d - 3 Error Rate - 0.16933207902163683
N - 4 Max depth d - 3 Error Rate - 0.12888052681091255
N - 5 Max depth d - 3 Error Rate - 0.147695202257761
N - 6 Max depth d - 3 Error Rate - 0.1561618062088429
N - 7 Max depth d - 3 Error Rate - 0.1175917215428034
N - 8 Max depth d - 3 Error Rate - 0.12888052681091255
N - 9 Max depth d - 3 Error Rate - 0.12982126058325494
N - 10 Max depth d - 3 Error Rate - 0.11947318908748827
N - 1 Max depth d - 4 Error Rate - 0.13076199435559732
N - 2 Max depth d - 4 Error Rate - 0.11665098777046101
N - 3 Max depth d - 4 Error Rate - 0.10536218250235185
N - 4 Max depth d - 4 Error Rate - 0.11853245531514578
N - 5 Max depth d - 4 Error Rate - 0.12323612417685792
N - 6 Max depth d - 4 Error Rate - 0.10536218250235185
N - 7 Max depth d - 4 Error Rate - 0.10630291627469424
N - 8 Max depth d - 4 Error Rate - 0.11194731890874887
N - 9 Max depth d - 4 Error Rate - 0.12699905926622768
N - 10 Max depth d - 4 Error Rate - 0.11571025399811852
N - 1 Max depth d - 5 Error Rate - 0.14299153339604886
N - 2 Max depth d - 5 Error Rate - 0.11665098777046101
N - 3 Max depth d - 5 Error Rate - 0.11571025399811852
N - 4 Max depth d - 5 Error Rate - 0.11100658513640638
N - 5 Max depth d - 5 Error Rate - 0.10442144873000936
N - 6 Max depth d - 5 Error Rate - 0.11571025399811852
N - 7 Max depth d - 5 Error Rate - 0.11853245531514578
N - 8 Max depth d - 5 Error Rate - 0.11288805268109126
N - 9 Max depth d - 5 Error Rate - 0.11194731890874887
N - 10 Max depth d - 5 Error Rate - 0.11194731890874887

Q4 2.

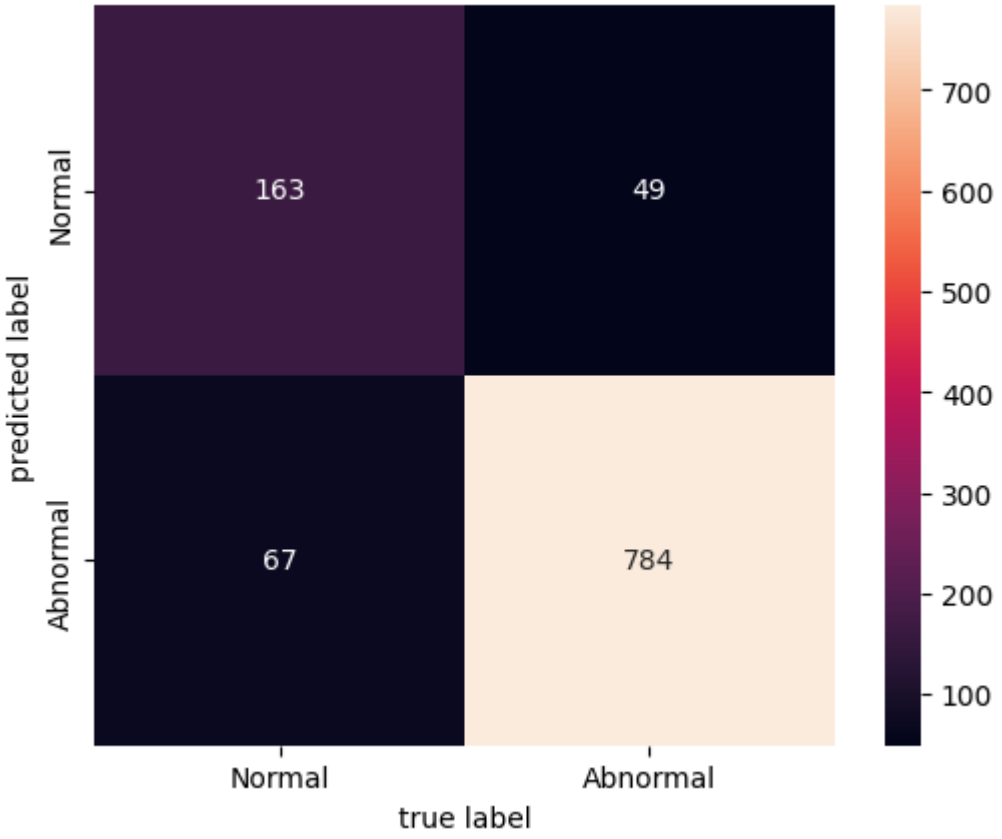



Random Forest Max accuracy - 0.8955785512699906 for N - 5 and d - 5

Q4 3.

Random Forest Max accuracy - 0.8955785512699906 for N - 5 and d - 5

Q4 4.




## Question 5

| Model | TP | FP | TN | FN | accuracy | TPR | TNR |
|---|---|---|---|---|---|---|---|
| naive bayesian | 731 | 103 | 127 | 102 | 0.807150 | 0.877551 | 0.552174 |
| decision tree | 814 | 135 | 95 | 19 | 0.855127 | 0.977191 | 0.413043 |
| random forest | 784 | 67 | 163 | 49 | 0.890875 | 0.941176 | 0.708696 |