import java.io.BufferedReader;

import java.io.FileReader;

import java.lang.Exception;

import weka.core.Instances;

import weka.classifiers.bayes.NaiveBayes;

import weka.classifiers.Evaluation;

public class NbClassifier {

public static void main(String [] args)

{

try

{

BufferedReader br1 =null;

br1=new BufferedReader(new FileReader("C:/Users/Admin/Desktop/BE\_IT\_2018\_19/IDSTr.arff"));

BufferedReader br2 =null;

br2=new BufferedReader(new FileReader("C:/Users/Admin/Desktop/BE\_IT\_2018\_19/IDSTest.arff"));

Instances train =new Instances (br1);

Instances test=new Instances(br2);

train.setClassIndex(train.numAttributes()-1);

test.setClassIndex(test.numAttributes()-1);

System.out.println("\n Training Data Set is: \n"+train);

System.out.println("\n Test Data Set is: \n"+test);

NaiveBayes nB = new NaiveBayes();

nB.buildClassifier(train);

System.out.println("Naive Bayes Model :\n\n\n"+nB);

Evaluation eval =new Evaluation(test);

eval.evaluateModel(nB, test,new Object[] { });

System.out.println("\n Errror Rate is :"+eval.errorRate());

System.out.println("\n Accuracy is :"+ (1 - eval.errorRate()));

System.out.println("Precision"+" " + "Recall"+" "+"fMeasure");

for(int i=0; i< test.numClasses();i++)

{

System.out.println("Class "+i +eval.precision(i) +" " + eval.recall(i)+ " " +eval.fMeasure(i));

}

String strSummary = eval.toSummaryString();

System.out.println(strSummary);

String cMatrix = eval.toMatrixString();

System.out.println(cMatrix);

String resPerClass = eval.toClassDetailsString();

System.out.println(resPerClass);

}

catch(Exception e)

{

System.err.println(e.getMessage());

}

}

}

// Output:

0,tcp,http,RSTR,54540,8314,0,0,0,2,0,1,1,0,0,0,0,0,0,0,0,0,2,2,0,0,0.5,0.5,1,0,0,48,48,1,0,0.02,0,0,0,0.02,0.02,anomaly

0,tcp,http,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,65,20,1,1,0,0,0.31,0.06,0,255,65,0.25,0.02,0.01,0,1,1,0,0,anomaly

0,tcp,http,SF,242,255,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,27,52,0,0,0,0,1,0,0.1,255,255,1,0,0,0,0,0,0,0,normal

0,tcp,uucp,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,145,19,1,1,0,0,0.13,0.06,0,255,1,0,0.07,0,0,1,1,0,0,anomaly

0,tcp,ftp\_data,SF,175337,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,1,0,0,99,133,0.75,0.04,0.75,0.02,0.01,0,0,0,normal

13998,tcp,other,RSTR,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,2,0,0,1,1,1,0,0,255,2,0.01,0.68,1,0,0,0,1,1,anomaly

0,udp,domain\_u,SF,45,131,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,72,152,0,0,0,0,1,0,0.01,255,254,1,0.01,0,0,0,0,0,0,normal

0,tcp,http,SF,190,1954,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,8,8,0,0,0,0,1,0,0,255,255,1,0,0,0,0,0,0,0,normal

0,tcp,http,SF,225,955,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,5,6,0,0,0,0,1,0,0.33,255,255,1,0,0,0,0,0,0,0,normal

@attribute flag {OTH,REJ,RSTO,RSTOS0,RSTR,S0,S1,S2,S3,SF,SH}

@attribute src\_bytes numeric

@attribute dst\_bytes numeric

@attribute land {0,1}

@attribute wrong\_fragment numeric

@attribute urgent numeric

@attribute hot numeric

@attribute num\_failed\_logins numeric

@attribute logged\_in {0,1}

@attribute num\_compromised numeric

@attribute root\_shell numeric

@attribute su\_attempted numeric

@attribute num\_root numeric

@attribute num\_file\_creations numeric

@attribute num\_shells numeric

@attribute num\_access\_files numeric

@attribute num\_outbound\_cmds numeric

@attribute is\_host\_login {0,1}

@attribute is\_guest\_login {0,1}

@attribute count numeric

@attribute srv\_count numeric

@attribute serror\_rate numeric

@attribute srv\_serror\_rate numeric

@attribute rerror\_rate numeric

@attribute srv\_rerror\_rate numeric

@attribute same\_srv\_rate numeric

@attribute diff\_srv\_rate numeric

@attribute srv\_diff\_host\_rate numeric

@attribute dst\_host\_count numeric

@attribute dst\_host\_srv\_count numeric

@attribute dst\_host\_same\_srv\_rate numeric

@attribute dst\_host\_diff\_srv\_rate numeric

@attribute dst\_host\_same\_src\_port\_rate numeric

@attribute dst\_host\_srv\_diff\_host\_rate numeric

@attribute dst\_host\_serror\_rate numeric

@attribute dst\_host\_srv\_serror\_rate numeric

@attribute dst\_host\_rerror\_rate numeric

@attribute dst\_host\_srv\_rerror\_rate numeric

@attribute class {normal,anomaly}

@data

0,tcp,ftp\_data,SF,491,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,2,0,0,0,0,1,0,0,150,25,0.17,0.03,0.17,0,0,0,0.05,0,normal

0,udp,other,SF,146,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,13,1,0,0,0,0,0.08,0.15,0,255,1,0,0.6,0.88,0,0,0,0,0,normal

0,tcp,private,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,123,6,1,1,0,0,0.05,0.07,0,255,26,0.1,0.05,0,0,1,1,0,0,anomaly

0,tcp,http,SF,232,8153,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,5,5,0.2,0.2,0,0,1,0,0,30,255,1,0,0.03,0.04,0.03,0.01,0,0.01,normal

0,tcp,http,SF,199,420,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,30,32,0,0,0,0,1,0,0.09,255,255,1,0,0,0,0,0,0,0,normal

0,tcp,private,REJ,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,121,19,0,0,1,1,0.16,0.06,0,255,19,0.07,0.07,0,0,0,0,1,1,anomaly

0,tcp,private,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,166,9,1,1,0,0,0.05,0.06,0,255,9,0.04,0.05,0,0,1,1,0,0,anomaly

0,tcp,private,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,117,16,1,1,0,0,0.14,0.06,0,255,15,0.06,0.07,0,0,1,1,0,0,anomaly

0,tcp,remote\_job,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,270,23,1,1,0,0,0.09,0.05,0,255,23,0.09,0.05,0,0,1,1,0,0,anomaly

0,tcp,private,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,133,8,1,1,0,0,0.06,0.06,0,255,13,0.05,0.06,0,0,1,1,0,0,anomaly

0,tcp,private,REJ,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,205,12,0,0,1,1,0.06,0.06,0,255,12,0.05,0.07,0,0,0,0,1,1,anomaly

0,tcp,private,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,199,3,1,1,0,0,0.02,0.06,0,255,13,0.05,0.07,0,0,1,1,0,0,anomaly

0,tcp,http,SF,287,2251,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,3,7,0,0,0,0,1,0,0.43,8,219,1,0,0.12,0.03,0,0,0,0,normal

0,tcp,ftp\_data,SF,334,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,2,2,0,0,0,0,1,0,0,2,20,1,0,1,0.2,0,0,0,0,anomaly

0,tcp,name,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,233,1,1,1,0,0,0,0.06,0,255,1,0,0.07,0,0,1,1,0,0,anomaly

0,tcp,netbios\_ns,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,96,16,1,1,0,0,0.17,0.05,0,255,2,0.01,0.06,0,0,1,1,0,0,anomaly

0,tcp,http,SF,300,13788,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,8,9,0,0.11,0,0,1,0,0.22,91,255,1,0,0.01,0.02,0,0,0,0,normal

0,icmp,eco\_i,SF,18,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,1,0,0,1,16,1,0,1,1,0,0,0,0,anomaly

0,tcp,http,SF,233,616,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,3,3,0,0,0,0,1,0,0,66,255,1,0,0.02,0.03,0,0,0.02,0,normal

0,tcp,http,SF,343,1178,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,9,10,0,0,0,0,1,0,0.2,157,255,1,0,0.01,0.04,0,0,0,0,normal

0,tcp,mtp,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,223,23,1,1,0,0,0.1,0.05,0,255,23,0.09,0.05,0,0,1,1,0,0,anomaly

0,tcp,private,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,280,17,1,1,0,0,0.06,0.05,0,238,17,0.07,0.06,0,0,0.99,1,0,0,anomaly

0,tcp,http,SF,253,11905,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,8,10,0,0,0,0,1,0,0.2,87,255,1,0,0.01,0.02,0,0,0,0,normal

5607,udp,other,SF,147,105,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,1,0,0,255,1,0,0.85,1,0,0,0,0,0,normal

0,tcp,mtp,S0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,248,2,1,1,0,0,0.01,0.06,0,255,2,0.01,0.06,0,0,1,1,0,0,anomaly

507,tcp,telnet,SF,437,14421,0,0,0,0,0,1,3,0,0,0,0,0,1,0,0,0,1,1,0,0,0,0,1,0,0,255,25,0.1,0.05,0,0,0.53,0,0.02,0.16,normal

Naive Bayes Model :

Naive Bayes Classifier

Class

Attribute normal anomaly

(0.53) (0.47)

======================================================

duration

mean 166.8125 469.6805

std. dev. 1264.409 3770.6841

weight sum 9173 8077

precision 77.7013 77.7013

protocol\_type

tcp 7315.0 6791.0

udp 1692.0 332.0

icmp 169.0 957.0

[total] 9176.0 8080.0

service

aol 1.0 1.0

auth 32.0 100.0

bgp 1.0 107.0

courier 1.0 120.0

csnet\_ns 1.0 72.0

ctf 1.0 79.0

daytime 1.0 72.0

discard 1.0 77.0

domain 8.0 62.0

domain\_u 1218.0 2.0

echo 1.0 50.0

eco\_i 56.0 548.0

ecr\_i 25.0 407.0

efs 1.0 69.0

exec 1.0 64.0

finger 82.0 169.0

ftp 133.0 124.0

ftp\_data 687.0 273.0

gopher 1.0 76.0

harvest 1.0 1.0

hostnames 1.0 68.0

http 5151.0 295.0

http\_2784 1.0 1.0

http\_443 1.0 81.0

http\_8001 1.0 2.0

imap4 1.0 94.0

IRC 28.0 1.0

iso\_tsap 1.0 88.0

klogin 1.0 61.0

kshell 1.0 51.0

ldap 1.0 60.0

link 1.0 68.0

login 1.0 51.0

mtp 1.0 63.0

name 1.0 61.0

netbios\_dgm 1.0 59.0

netbios\_ns 1.0 49.0

netbios\_ssn 1.0 48.0

netstat 1.0 57.0

nnsp 1.0 87.0

nntp 1.0 42.0

ntp\_u 24.0 1.0

other 354.0 224.0

pm\_dump 1.0 3.0

pop\_2 1.0 13.0

pop\_3 26.0 13.0

printer 1.0 7.0

private 137.0 2877.0

red\_i 3.0 1.0

remote\_job 1.0 15.0

rje 1.0 15.0

shell 2.0 9.0

smtp 967.0 37.0

sql\_net 1.0 29.0

ssh 1.0 41.0

sunrpc 1.0 45.0

supdup 1.0 79.0

systat 1.0 58.0

telnet 145.0 202.0

tftp\_u 1.0 1.0

tim\_i 1.0 3.0

time 14.0 92.0

urh\_i 3.0 1.0

urp\_i 86.0 2.0

uucp 1.0 111.0

uucp\_path 1.0 89.0

vmnet 1.0 81.0

whois 1.0 108.0

X11 14.0 4.0

Z39\_50 1.0 126.0

[total] 9243.0 8147.0

flag

OTH 2.0 3.0

REJ 358.0 1185.0

RSTO 30.0 175.0

RSTOS0 1.0 14.0

RSTR 21.0 323.0

S0 49.0 4793.0

S1 59.0 2.0

S2 14.0 5.0

S3 13.0 1.0

SF 8636.0 1557.0

SH 1.0 30.0

[total] 9184.0 8088.0

src\_bytes

mean 11976.5041 52879.8578

std. dev. 180553.24354250254.3744

weight sum 9173 8077

precision 280256.3069 280256.3069

dst\_bytes

mean 4212.9065 2058.5389

std. dev. 64339.4472 99241.9848

weight sum 9173 8077

precision 1670.7013 1670.7013

land

0 9173.0 8077.0

1 2.0 2.0

[total] 9175.0 8079.0

wrong\_fragment

mean 0 0.0501

std. dev. 0.25 0.3751

weight sum 9173 8077

precision 1.5 1.5

urgent

mean 0 0.0001

std. dev. 0.1667 0.1667

weight sum 9173 8077

precision 1 1

hot

mean 0.2539 0.193

std. dev. 2.5402 1.9323

weight sum 9173 8077

precision 3.85 3.85

num\_failed\_logins

mean 0.0012 0.0007

std. dev. 0.1667 0.1667

weight sum 9173 8077

precision 1 1

logged\_in

0 2646.0 7810.0

1 6529.0 269.0

[total] 9175.0 8079.0

num\_compromised

mean 0.2159 0.0035

std. dev. 8.9902 4.65

weight sum 9173 8077

precision 27.9 27.9

root\_shell

mean 0.0021 0.001

std. dev. 0.1667 0.1667

weight sum 9173 8077

precision 1 1

su\_attempted

mean 0.0019 0

std. dev. 0.1667 0.1667

weight sum 9173 8077

precision 1 1

num\_root

mean 0.2324 0.0087

std. dev. 10.0093 5.8241

weight sum 9173 8077

precision 34.9444 34.9444

num\_file\_creations

mean 0.0169 0.0031

std. dev. 0.5264 0.3452

weight sum 9173 8077

precision 2.0714 2.0714

num\_shells

mean 0.0009 0.0001

std. dev. 0.1667 0.1667

weight sum 9173 8077

precision 1 1

num\_access\_files

mean 0.0079 0.0008

std. dev. 0.2083 0.2083

weight sum 9173 8077

precision 1.25 1.25

num\_outbound\_cmds

mean 0 0

std. dev. 0.0017 0.0017

weight sum 9173 8077

precision 0.01 0.01

is\_host\_login

0 9174.0 8078.0

1 1.0 1.0

[total] 9175.0 8079.0

is\_guest\_login

0 9047.0 8033.0

1 128.0 46.0

[total] 9175.0 8079.0

count

mean 22.8135 156.3374

std. dev. 54.4438 123.1573

weight sum 9173 8077

precision 1.1591 1.1591

srv\_count

mean 27.9517 28.2804

std. dev. 60.1145 85.8654

weight sum 9173 8077

precision 1.3178 1.3178

serror\_rate

mean 0.0142 0.6004

std. dev. 0.0983 0.4859

weight sum 9173 8077

precision 0.0159 0.0159

srv\_serror\_rate

mean 0.0127 0.5972

std. dev. 0.0917 0.4893

weight sum 9173 8077

precision 0.0213 0.0213

rerror\_rate

mean 0.0428 0.2071

std. dev. 0.1996 0.3993

weight sum 9173 8077

precision 0.0152 0.0152

srv\_rerror\_rate

mean 0.0438 0.2095

std. dev. 0.2003 0.4048

weight sum 9173 8077

precision 0.0263 0.0263

same\_srv\_rate

mean 0.9698 0.3033

std. dev. 0.1424 0.3941

weight sum 9173 8077

precision 0.011 0.011

diff\_srv\_rate

mean 0.0286 0.098

std. dev. 0.1446 0.1996

weight sum 9173 8077

precision 0.0147 0.0147

srv\_diff\_host\_rate

mean 0.1234 0.0615

std. dev. 0.2641 0.237

weight sum 9173 8077

precision 0.0185 0.0185

dst\_host\_count

mean 148.0459 222.3973

std. dev. 101.8782 78.8731

weight sum 9173 8077

precision 1 1

dst\_host\_srv\_count

mean 188.7996 29.3961

std. dev. 93.4807 51.7398

weight sum 9173 8077

precision 1 1

dst\_host\_same\_srv\_rate

mean 0.8081 0.1839

std. dev. 0.3262 0.3194

weight sum 9173 8077

precision 0.01 0.01

dst\_host\_diff\_srv\_rate

mean 0.0416 0.1281

std. dev. 0.13 0.2222

weight sum 9173 8077

precision 0.01 0.01

dst\_host\_same\_src\_port\_rate

mean 0.1201 0.1765

std. dev. 0.2512 0.3579

weight sum 9173 8077

precision 0.01 0.01

dst\_host\_srv\_diff\_host\_rate

mean 0.0258 0.038

std. dev. 0.0669 0.1426

weight sum 9173 8077

precision 0.0169 0.0169

dst\_host\_serror\_rate

mean 0.0152 0.5993

std. dev. 0.0974 0.4839

weight sum 9173 8077

precision 0.0104 0.0104

dst\_host\_srv\_serror\_rate

mean 0.0079 0.5951

std. dev. 0.0666 0.4891

weight sum 9173 8077

precision 0.0127 0.0127

dst\_host\_rerror\_rate

mean 0.045 0.2021

std. dev. 0.1921 0.3824

weight sum 9173 8077

precision 0.01 0.01

dst\_host\_srv\_rerror\_rate

mean 0.0427 0.2074

std. dev. 0.1867 0.4039

weight sum 9173 8077

precision 0.0108 0.0108

Errror Rate is :0.11538461538461539

Accuracy is :0.8846153846153846

Precision Recall fMeasure

Class 00.9 0.8181818181818182 0.8571428571428572

Class 10.875 0.9333333333333333 0.9032258064516129

Correctly Classified Instances 23 88.4615 %

Incorrectly Classified Instances 3 11.5385 %

Kappa statistic 0.7607

Mean absolute error 0.1153

Root mean squared error 0.3394

Relative absolute error 23.5809 %

Root relative squared error 68.6978 %

Total Number of Instances 26

=== Confusion Matrix ===

a b <-- classified as

9 2 | a = normal

1 14 | b = anomaly

=== Detailed Accuracy By Class ===

TP Rate FP Rate Precision Recall F-Measure ROC Area Class

0.818 0.067 0.9 0.818 0.857 0.976 normal

0.933 0.182 0.875 0.933 0.903 0.976 anomaly

Weighted Avg. 0.885 0.133 0.886 0.885 0.884 0.976