**i) MATLAB Code Data Analysis**

%%% Project

%%% Clear command window

clc

clear all

%%%

%%% Read excel data into matlab

train1 = readtable('Data set (stage 1)','Sheet','Train1');

train2 = readtable('Data set (stage 1)','Sheet','Train2');

train3 = readtable('Data set (stage 1)','Sheet','Train3');

train4 = readtable('Data set (stage 1)','Sheet','Train4');

train5 = readtable('Data set (stage 1)','Sheet','Train5');

train6 = readtable('Data set (stage 1)','Sheet','Train6');

train7 = readtable('Data set (stage 1)','Sheet','Train7');

train8 = readtable('Data set (stage 1)','Sheet','Train8');

train9 = readtable('Data set (stage 1)','Sheet','Train9');

train10 = readtable('Data set (stage 1)','Sheet','Train10');

eeg = readtable('Data set (stage 1)','Sheet','Total');

%%

%%%Convert data to arrays and create scatterplot matrix for each patient and total data set%%

t1 = table2array(train1)

t2 = table2array(train2)

t3 = table2array(train3)

t4 = table2array(train4)

t5 = table2array(train5)

t6 = table2array(train6)

t7 = table2array(train7)

t8 = table2array(train8)

t9 = table2array(train9)

t10 = table2array(train10)

g = table2array(eeg)

%%

%%% Scatter Plot for whole data set

gplotmatrix(g,[]);

%%% Correlation matrix for whole data set

coveeg = cov(g)

correeg = corrcov(coveeg)

%%Descriptive Statistics

Meang = mean(g);

SDg = std(g);

summary (eeg);

**ii) MATLAB Code for Feature Selection, Model Building and Model Performance Evaluation**

%%

%%% Create a linear model of the patient data set

%%%%

X = [eeg.x2, eeg.x3, eeg.x4, eeg.x5];

mdl = fitlm(X, eeg.BIS);

%%%

%%Parameter selection based on data analysis and weights in linear model

Y = [eeg.x2, eeg.x4, eeg.x5];

%%

%%%

%%Apply linear model to data set the use these parameters to build NN model

%Calculate inputs from linear model

lin = fitlm(Y, eeg.BIS);

linResult = predict(lin,Y);

TrainInput = transpose(linResult(1:24136, 1));

TestInput = transpose(linResult(24137:34377, 1));

%%%Target values from eeg data

TrainResult = transpose(g(1:24136, 1));

TestResult = transpose(g(24137:34377, 1));

%%

%%%Build neural Network

netconf = [10]

net = feedforwardnet(netconf, 'trainlm');

net = train(net,TrainInput,TrainResult);

net.trainParam.epochs=1000;

net.trainParam.goal=0.05;

net.trainParam.show=50;

net.trainParam.lr=0.05;

net.trainParam.mc=0.8;

net.divideFcn= 'dividerand';

%%Calculate model performance

predT = sim(net,TestInput);

[R,P,RL,RU] = corrcoef(predT,TestResult);

e = TestResult-predT;

perf = mae(e); %%MAE

err = mse(net,TestResult,predT) %%MSE

%%

% % Plot Results of test set

figure; hold on;

plot (predT);

plot(TestResult);

%%

% Apply model to a test patient 8

%Calculate inputs from linear model

Z = [train8.x2, train8.x4, train8.x5]

W = [train8.BIS];

linResult2 = predict(lin,Z);

Train8Input = transpose(linResult2);

pred8 = sim(net,Train8Input);

%%

%%Plot Results of Patient 8

figure; hold on;

plot (pred8);

plot(W);