IS2410 Exam 2
Spring 2020 – COVID EDITION
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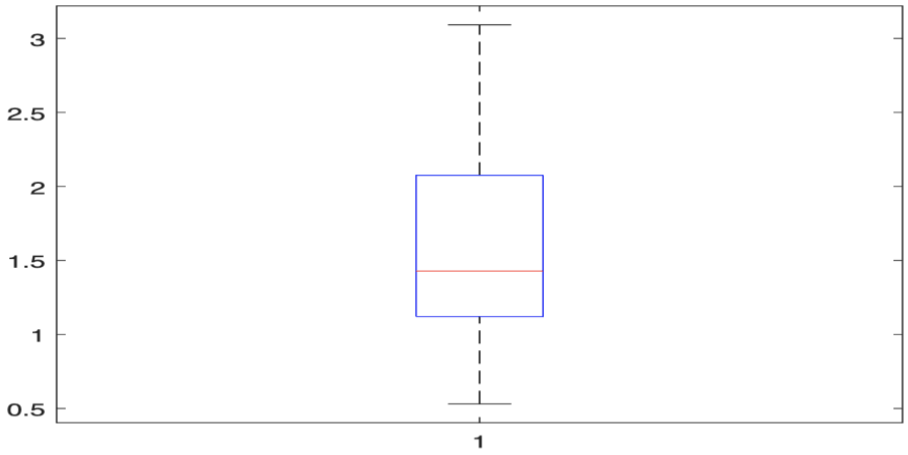
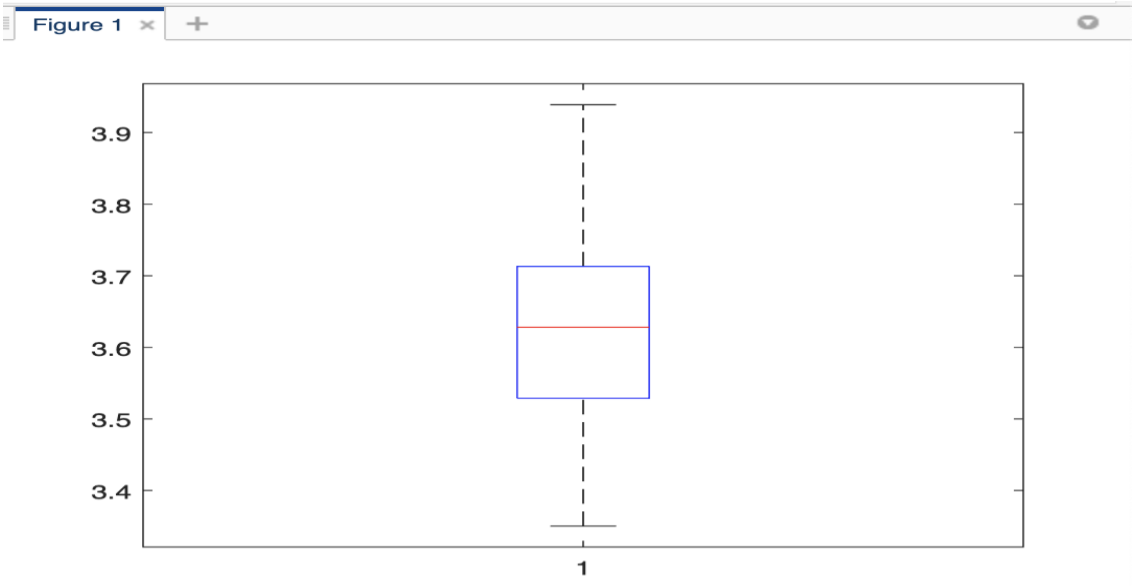
Problem 1. Ensembles. (submit boxplots).



PART 2. ENSEMBLE.



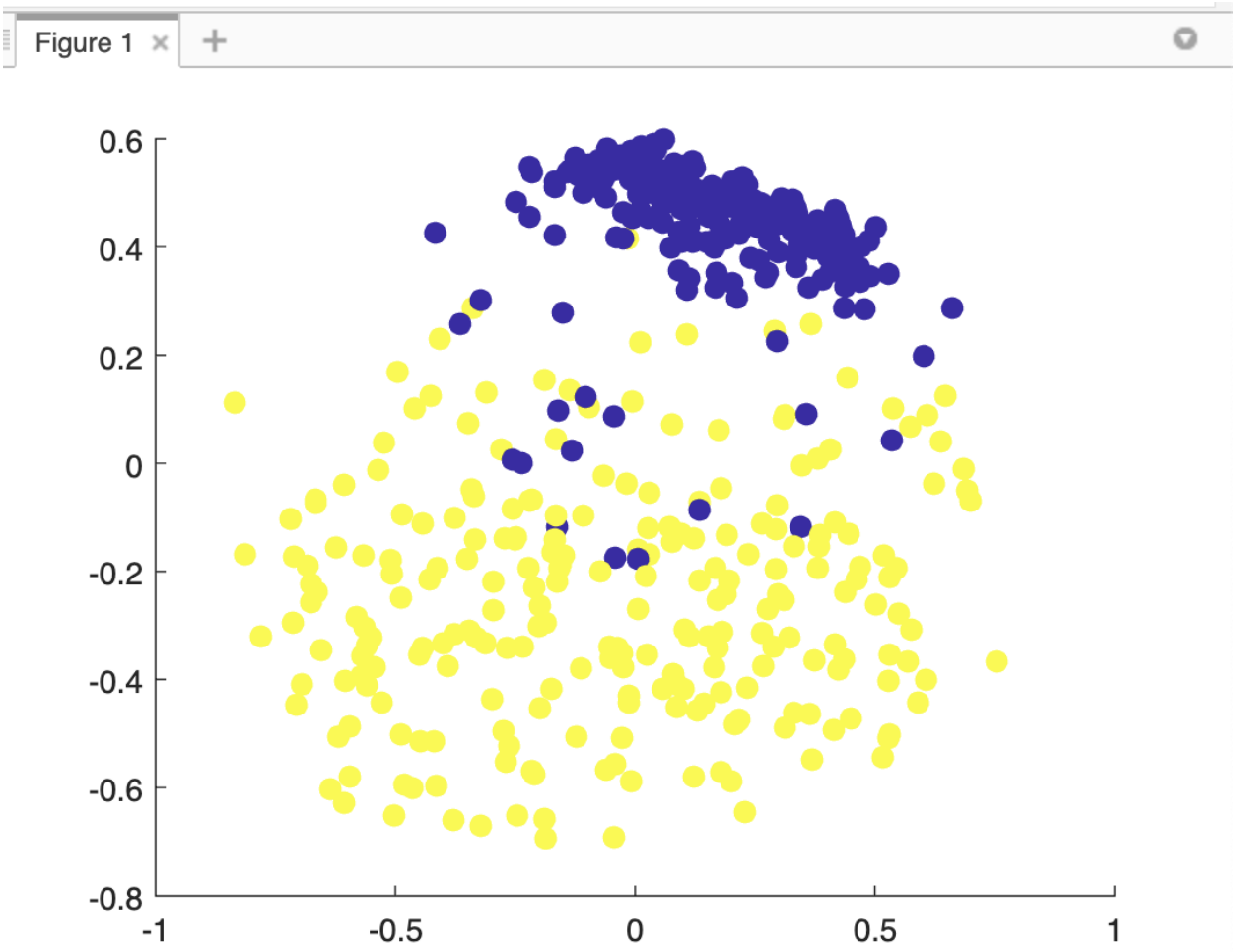
MATLAB script showing how I averaged the individual networks to get the ensemble performance.

part1.m | part1_2.m | prob2_part1.m | prob2_part2.m

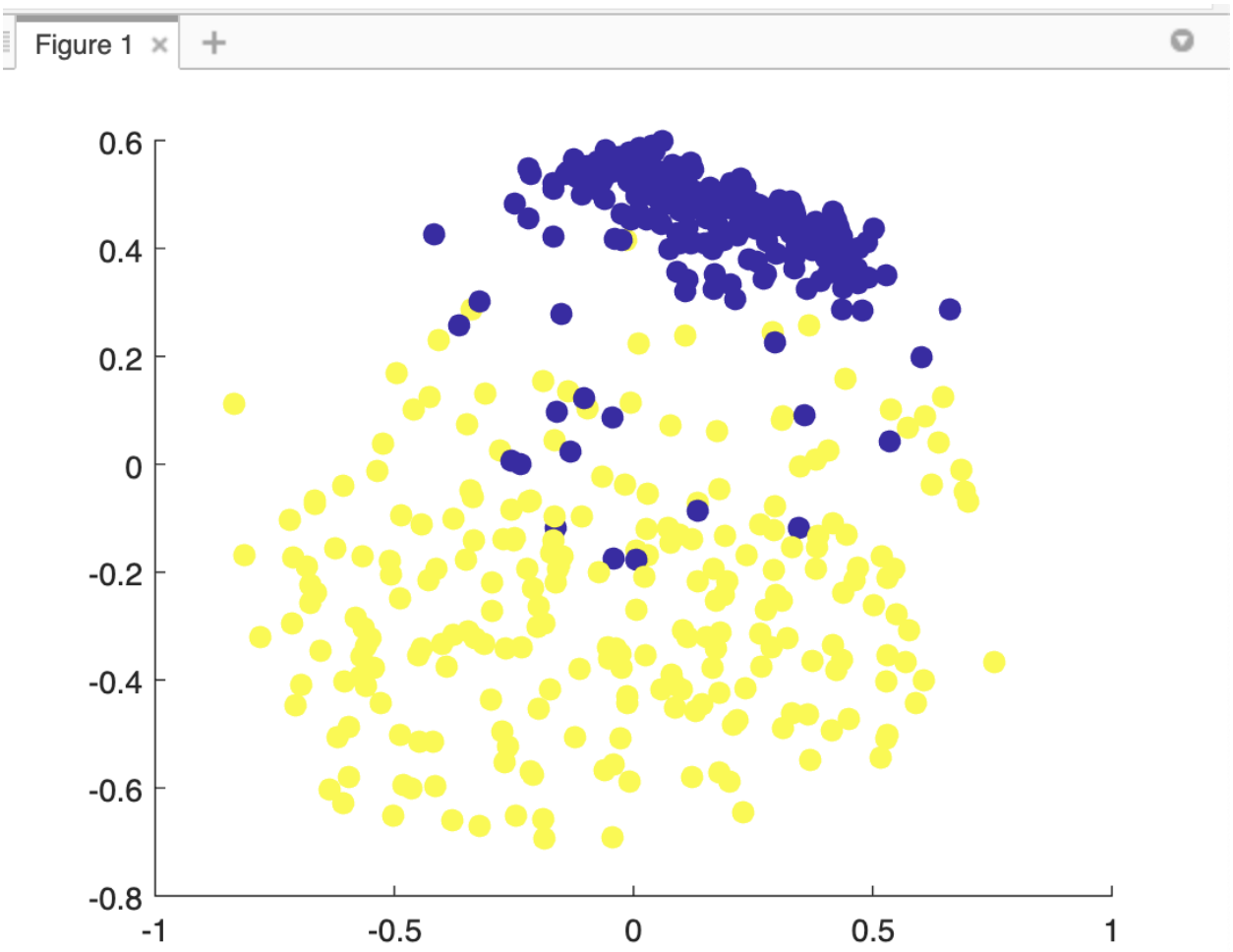
```
load unformatted-data;
[r,c] = size(unformatted_data);
data = unformatted_data(:,2:c);
[m,n] = size(data);
p = 0.80;
result=zeros(1,20);
train = data(1:round(p*m),:);
test = data(round(p*m)+1:end,:);
for i=1:20
    net0=initnet3(9,8,1,2,2);
    cancer.smat = train(:,2:10);
    target = train(:,1);
    target(target==2)=0;
    target(target==4)=1;
    cancer.tmat=target;
    act0=forw3(net0,cancer);
    net20k=bp3(net0,cancer,40000,0.05,0);
    cancer.smat = test(:,2:10);
    target_test = test(:,1);
    target_test(target_test==2)=0;
    target_test(target_test==4)=1;
    cancer.tmat=target_test;
    [r,c] = size(cancer.tmat);
    act20k=forw3(net20k,cancer);
    result(1,i)=(sum((act20k.out-cancer.tmat).^2));
    result;
end
boxplot(result);
```

Problem 2. Autoencoders

PART 1. 3-layer autoencoder



PART 2. 5-layer autoencoder



With the same data set as problem 1. Didn't split the data into train/test sets. Used bp3.m to train a 9-2-9 autoencoder on the same 9 input attributes (omit the class label and patient ID). Used the same learning rate and number of iterations as in Problem 1.

Generated a scatter plot of the hidden unit representations, coding the class by color.

MATLAB code for 5-layer autoencoder

part1.m | part1_2.m | prob2_part1.m | prob2_part2.m

```
% load data
load unformatted-data;
% get size of matrix
[r,c] = size(unformatted_data)  ;
% remove id column
data = unformatted_data(:,3:c); % (ROWS, COLUMNS)
class = unformatted_data(:,2);
data = rescale(data);
net_d.smat  = data(:,1:9);
net_d.tmat =  data(:,1:9);
net_new = initnet5(9,6,2,6,9,2,2,2,2);
%plotting the graph
 act_new = forw5(net_new,net_d);
 act_new;
 net20k = bp5(net_new,net_d,40000,0.05,0);
 net20k;
 act20k = forw5(net20k,net_d);

 scatter(act20k.hid2(:,1), act20k.hid2(:,2),50,class,'filled')

```