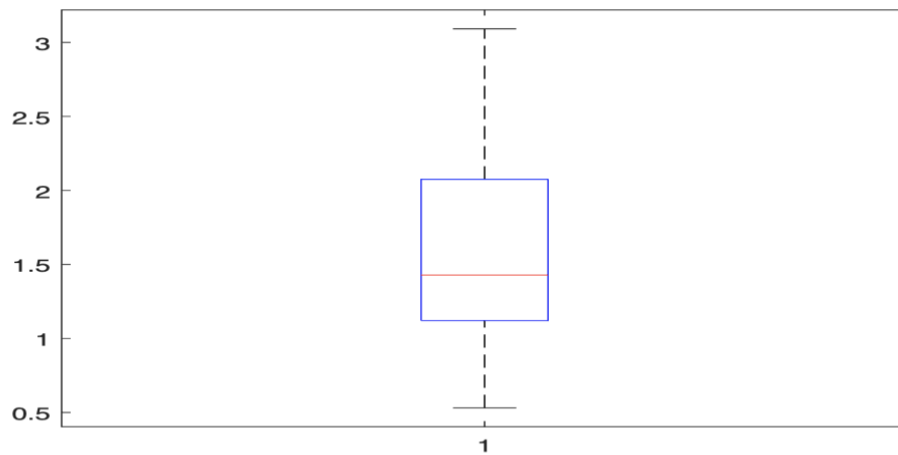
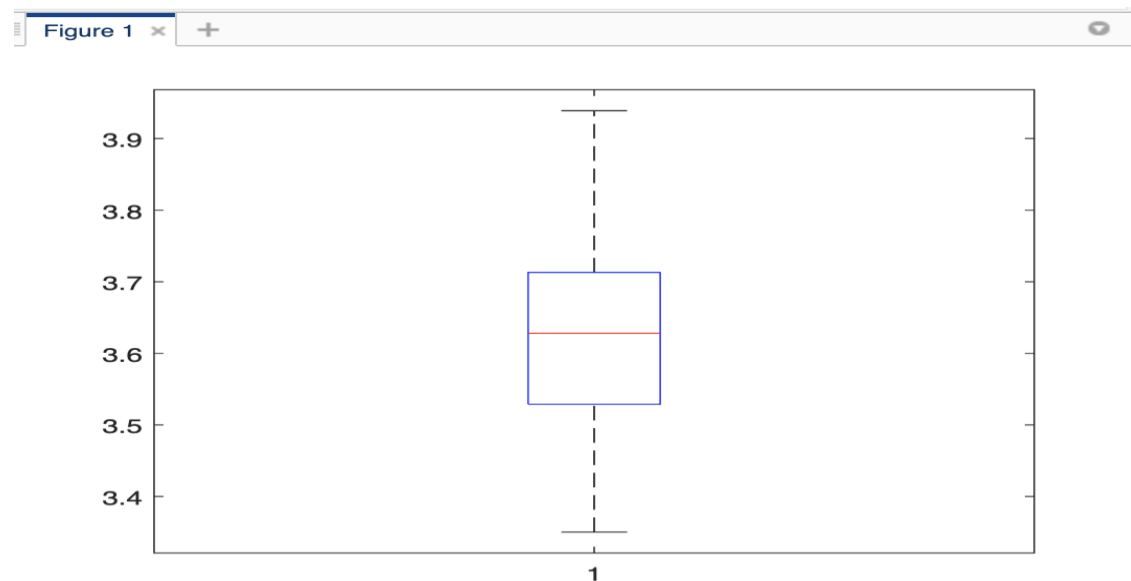


IS2410 Exam 2
Spring 2020 – COVID EDITION
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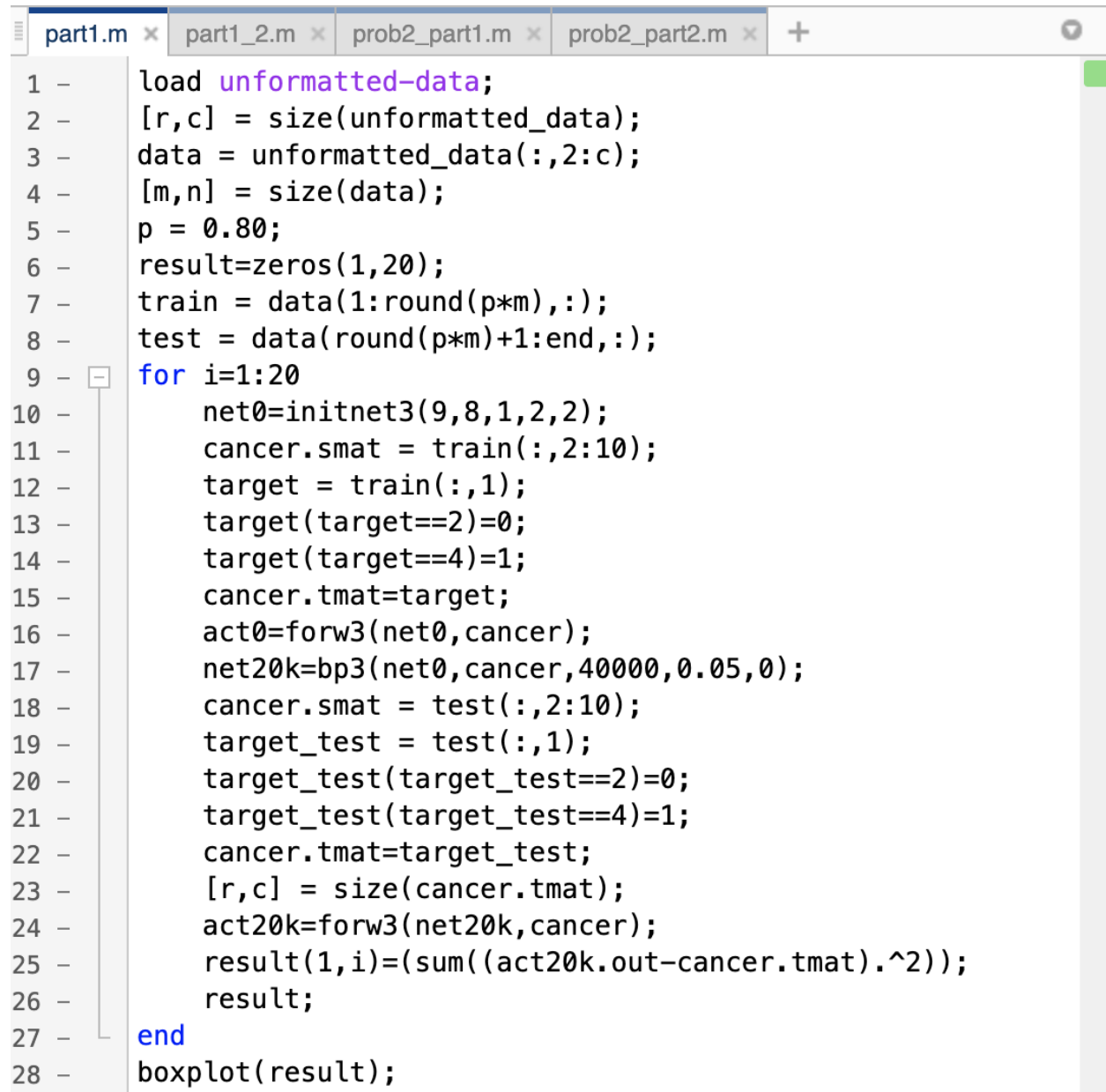
Problem 1. Ensembles. (submit boxplots).



PART 2. ENSEMBLE.



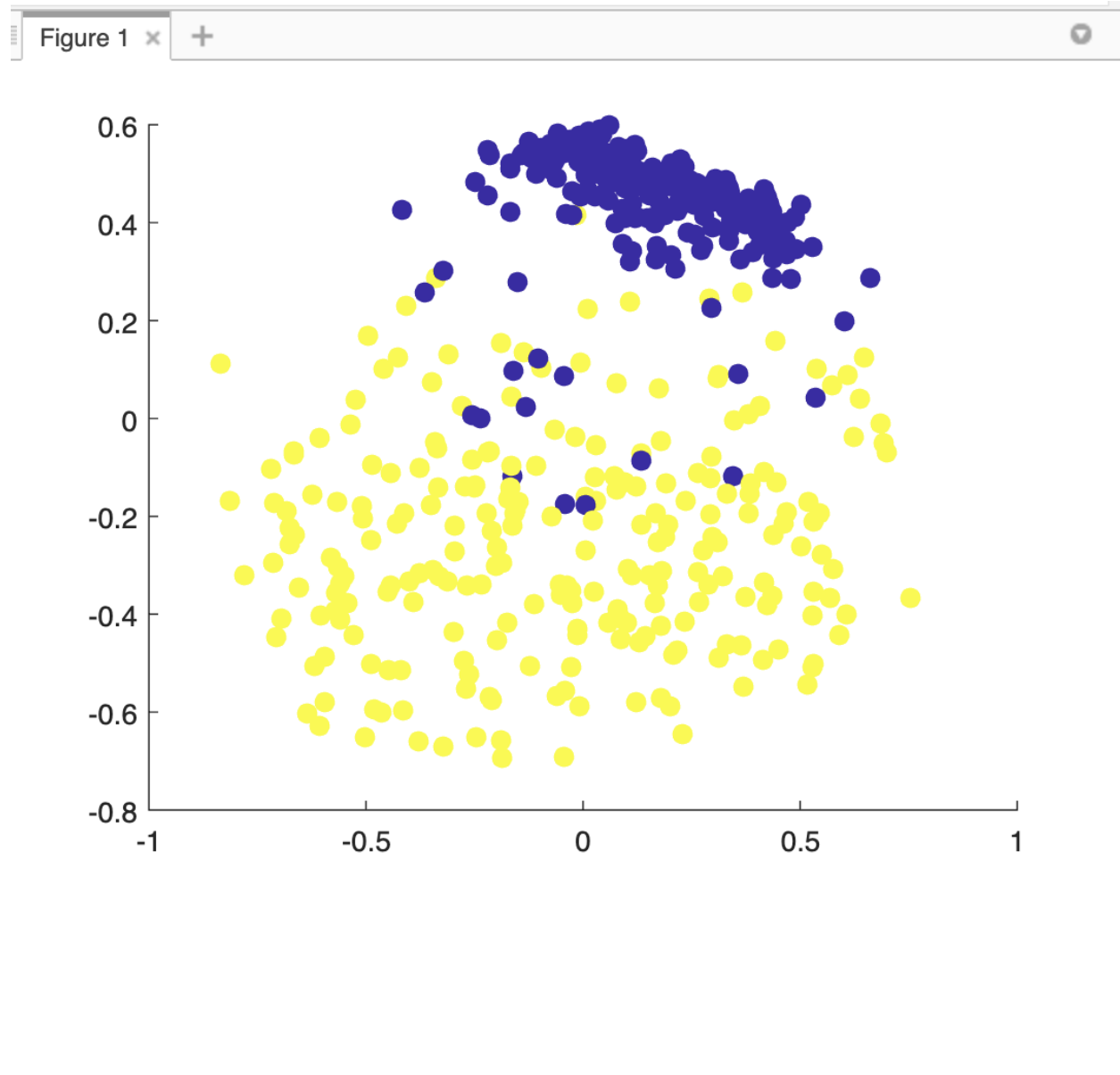
MATLAB script showing how I averaged the individual networks to get the ensemble performance.



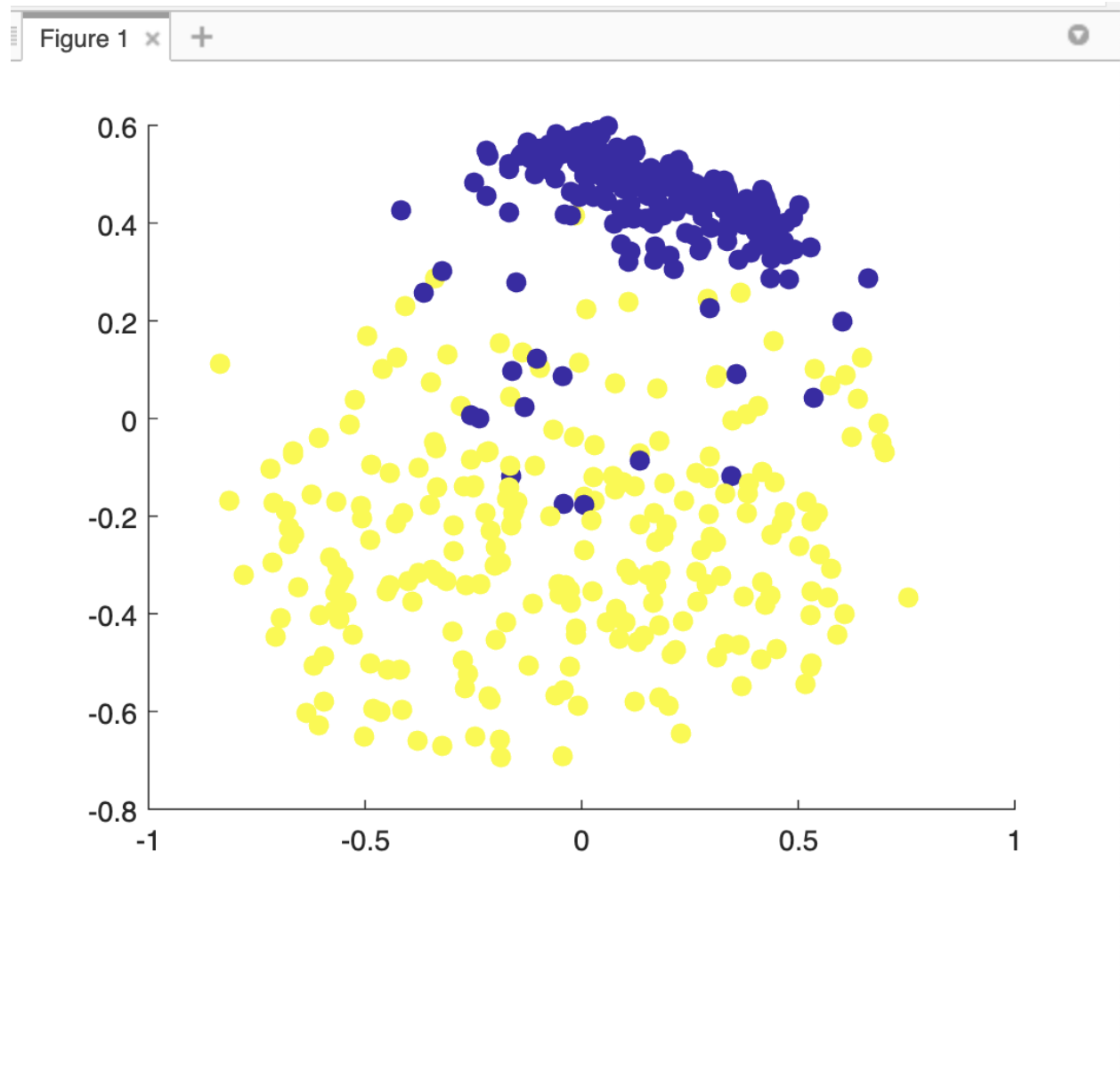
```
part1.m x part1_2.m x prob2_part1.m x prob2_part2.m x +
1 - load unformatted-data;
2 - [r,c] = size(unformatted_data);
3 - data = unformatted_data(:,2:c);
4 - [m,n] = size(data);
5 - p = 0.80;
6 - result=zeros(1,20);
7 - train = data(1:round(p*m),:);
8 - test = data(round(p*m)+1:end,:);
9 - for i=1:20
10 -     net0=initnet3(9,8,1,2,2);
11 -     cancer.smat = train(:,2:10);
12 -     target = train(:,1);
13 -     target(target==2)=0;
14 -     target(target==4)=1;
15 -     cancer.tmat=target;
16 -     act0=forw3(net0,cancer);
17 -     net20k=bp3(net0,cancer,40000,0.05,0);
18 -     cancer.smat = test(:,2:10);
19 -     target_test = test(:,1);
20 -     target_test(target_test==2)=0;
21 -     target_test(target_test==4)=1;
22 -     cancer.tmat=target_test;
23 -     [r,c] = size(cancer.tmat);
24 -     act20k=forw3(net20k,cancer);
25 -     result(1,i)=(sum((act20k.out-cancer.tmat).^2));
26 -     result;
27 - end
28 - boxplot(result);
```

Problem 2. Autoencoders

PART 1. 3-layer autoencoder



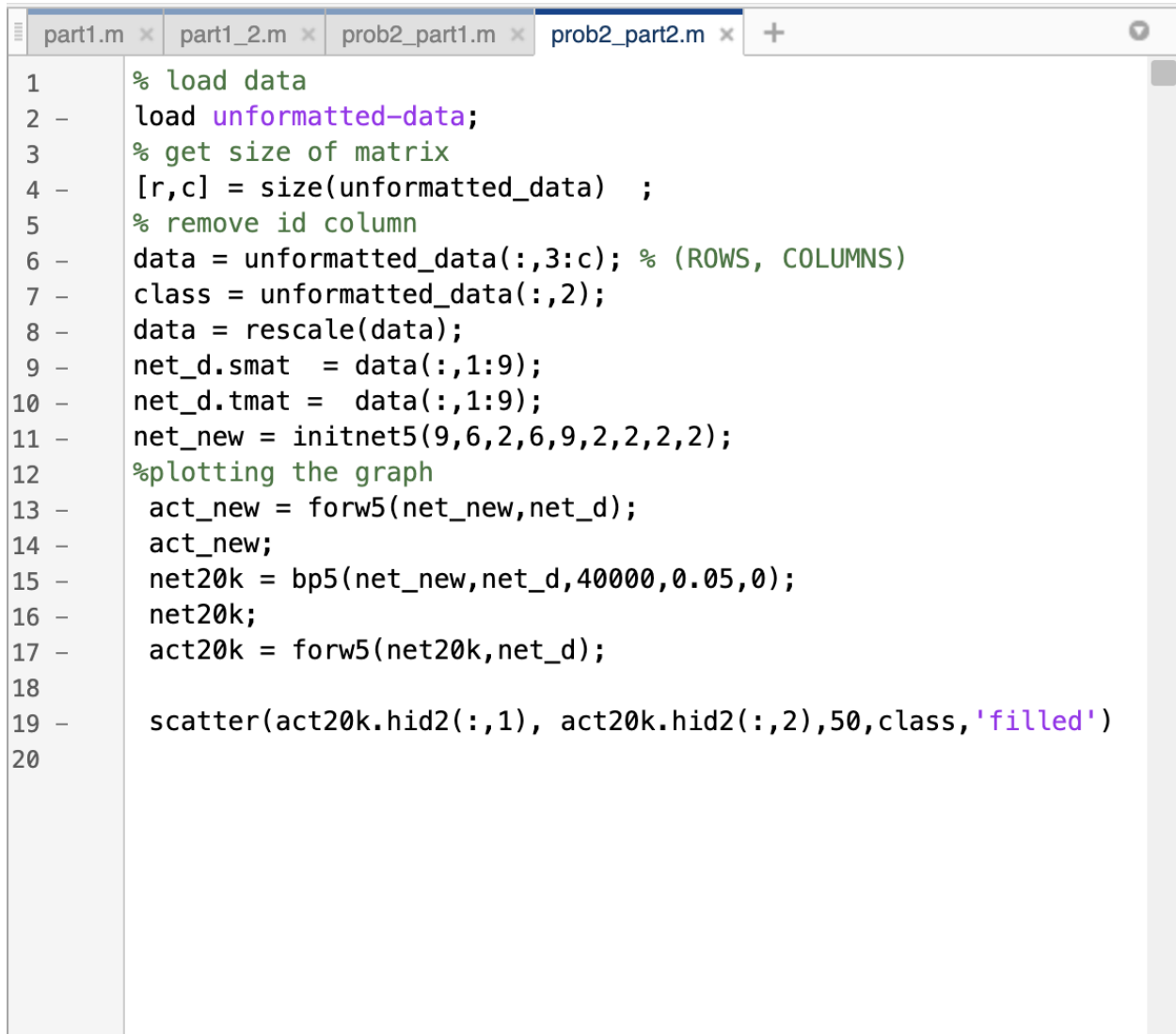
PART 2. 5-layer autoencoder



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



The image shows a MATLAB script editor window with four tabs: 'part1.m', 'part1_2.m', 'prob2_part1.m', and 'prob2_part2.m'. The 'prob2_part2.m' tab is active. The script contains 20 lines of MATLAB code for a 5-layer autoencoder. The code includes loading data, removing an ID column, rescaling, initializing a neural network, training it, and plotting the results.

```
1 % load data
2 load unformatted_data;
3 % get size of matrix
4 [r,c] = size(unformatted_data) ;
5 % remove id column
6 data = unformatted_data(:,3:c); % (ROWS, COLUMNS)
7 class = unformatted_data(:,2);
8 data = rescale(data);
9 net_d.smat = data(:,1:9);
10 net_d.tmat = data(:,1:9);
11 net_new = initnet5(9,6,2,6,9,2,2,2,2);
12 %plotting the graph
13 act_new = forw5(net_new,net_d);
14 act_new;
15 net20k = bp5(net_new,net_d,40000,0.05,0);
16 net20k;
17 act20k = forw5(net20k,net_d);
18
19 scatter(act20k.hid2(:,1), act20k.hid2(:,2),50,class,'filled')
20
```