1. Figures:
\[ a) - \text{speaker 1, o-speaker 2, black = “a”, class e in red, class i in green and class u in blue. Least} \]
overlapping is (1,4), most overlapping is (1,10).

b) Hard to distinguish between speakers since the “+” and “o” tend to cling together (exception is (13,8) but that is probably a coincidence)

- 2. NN classification
- 2a) function classes = nnclassifier(trainingdata, testdata, traininglabels)
- distance(length(traininglabels),1)=0;
- classes(size(testdata,2))=0;
- for i=1:size(testdata,2)
  for j=1:size(trainingdata,2)
    distance(j) = sqrt(sum((trainingdata(:,j)-testdata(:,i)).^2));
  end
  [m, ind] = min(distance);
  classes(i)=traininglabels(ind);
end
- 2b) Try to select low MFCC's since they describe spectral envelope.
- 3a) 55.625 % with means vs. 70 % with all data sets.
The code:
  octave.exe:3> load mfccs.mat
  octave.exe:4> whos
  octave.exe:5> whos
  octave.exe:6> ma1=mean(a1mfcc,2);
  octave.exe:7> ma2=mean(a2mfcc,2);
  octave.exe:8> me2=mean(e2mfcc,2);
  octave.exe:9> mu2=mean(u2mfcc,2);
  octave.exe:10> mi2=mean(i2mfcc,2);
  octave.exe:11> mi1=mean(i1mfcc,2);
  octave.exe:12> mu1=mean(u1mfcc,2);
  octave.exe:13> me1=mean(e1mfcc,2);
  octave.exe:14> mtraining=[ma1 me1 mi1 mu1];
  octave.exe:15> mlabel = [1:4];
  octave.exe:20> labels=[ones(1,80) 2*ones(1,80) 3*ones(1,80) 4*ones(1,80)];
  octave.exe:30> classes=nnclassifier(mtraining,testing,mlabel);
  octave.exe:28> classes2=nnclassifier(training,testing,labels);
  octave.exe:31> sum(classes2==labels)/3.2
  ans =  70.313
  octave.exe:32> sum(classes==labels)/3.2
  ans =  55.625
3b) subplot(2,1,1); plot(classes2,”^r”);subplot(2,1,2); plot(classes,”^g”);
- As you can see, the most common misclassification is between classes 2 and 4 (vowels “e” and “u”);
- 3c) At part 1 you can see that selection of the MFCC’s pairwise with appropriate pairs (look at the graph (1,4) can reduce the dimensionality.