Ford Tang

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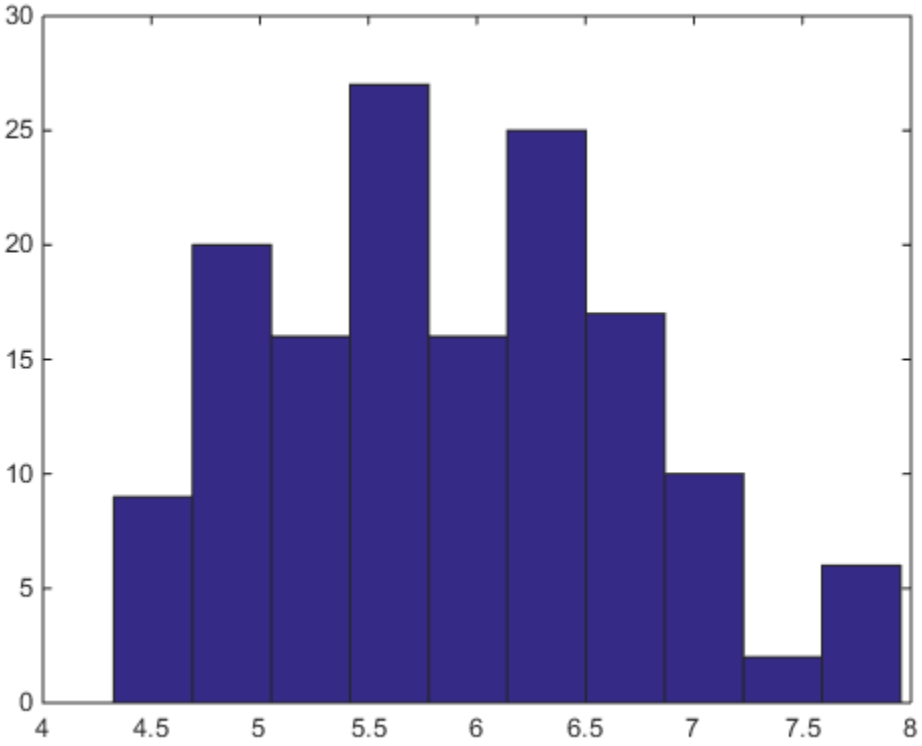
CS 178

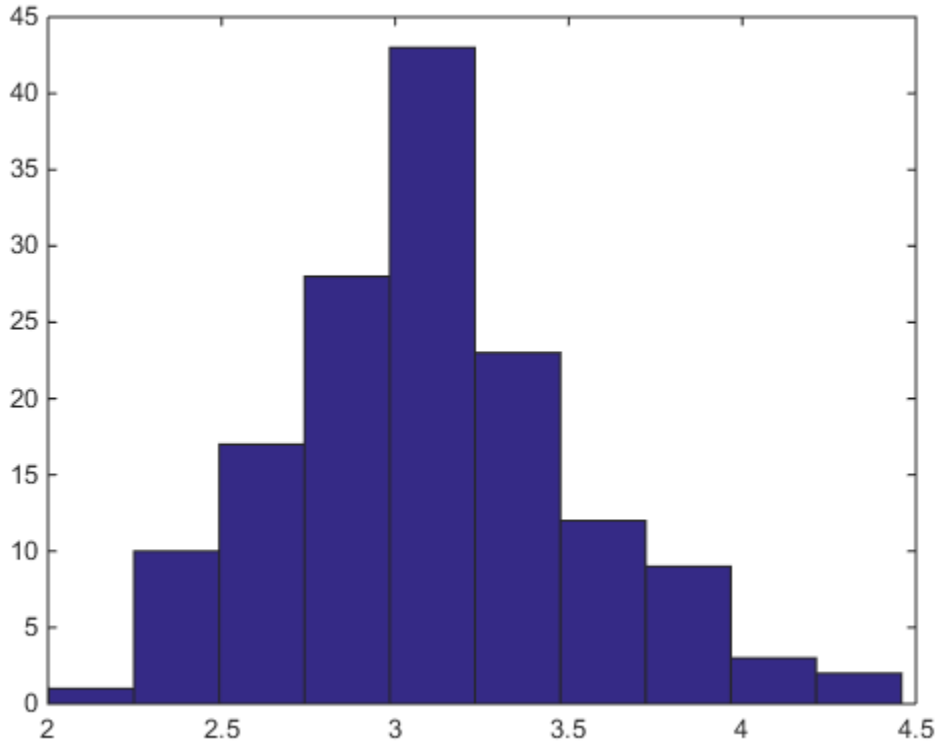
Homework #1

Problem 1

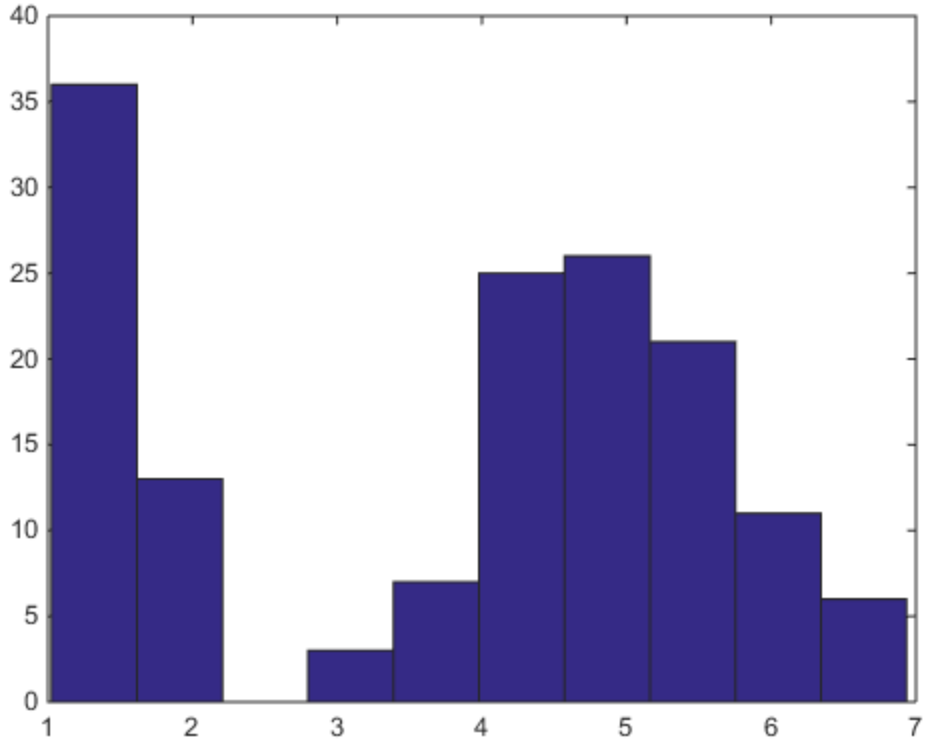
a. size(X,2) = 4
   size(X,1) = 148
b. hist(X(:,1)) =



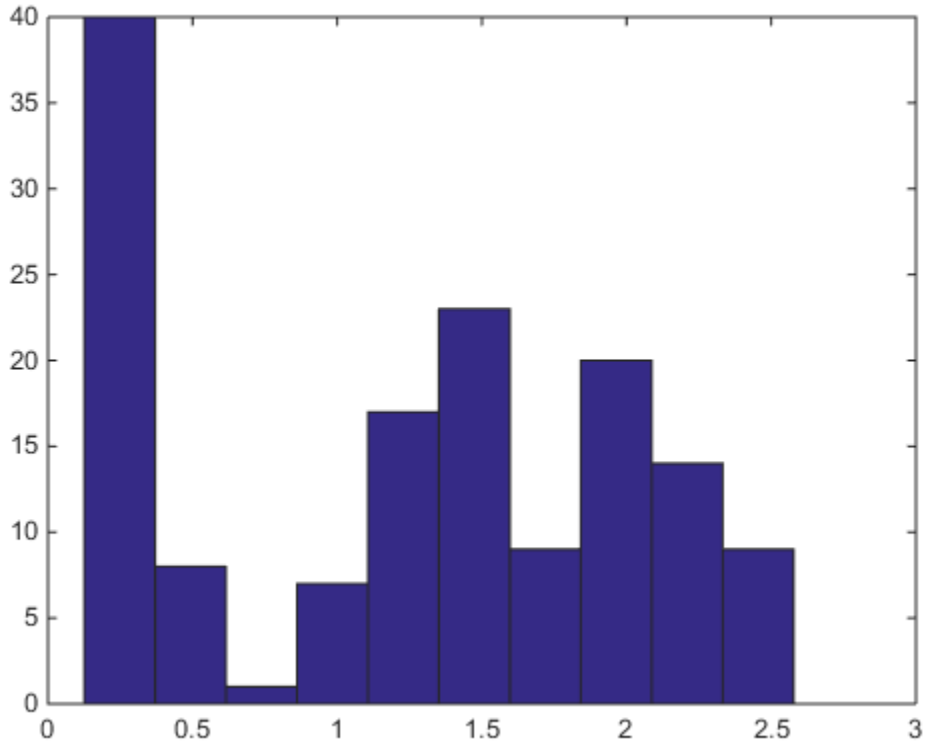
hist(X(:,2)) =



hist(X(:,3)) =

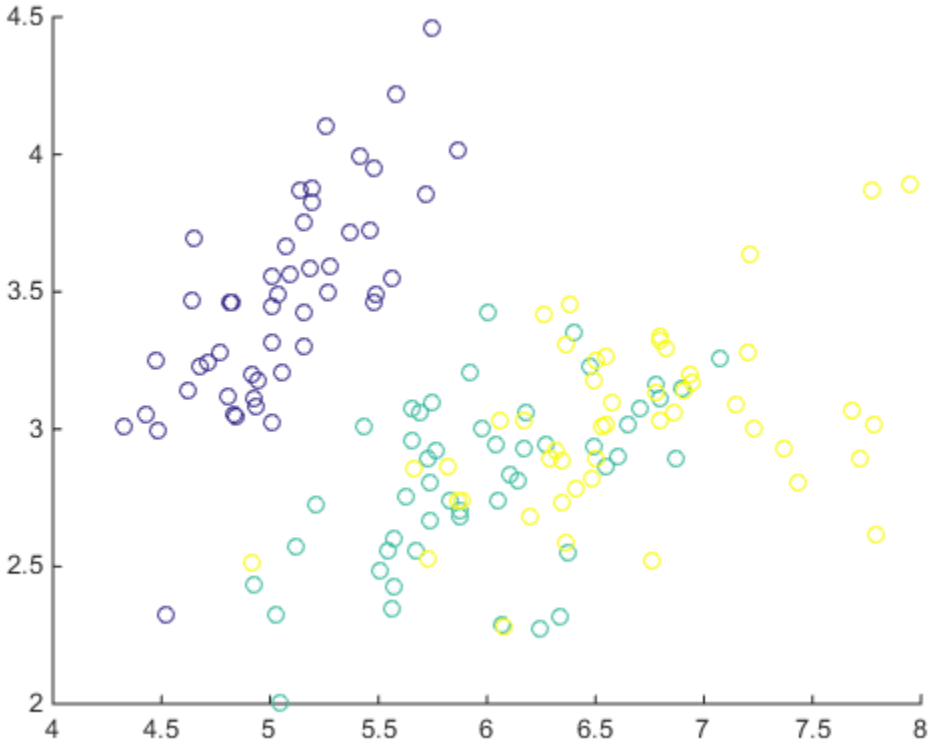


hist(X(:,4)) =

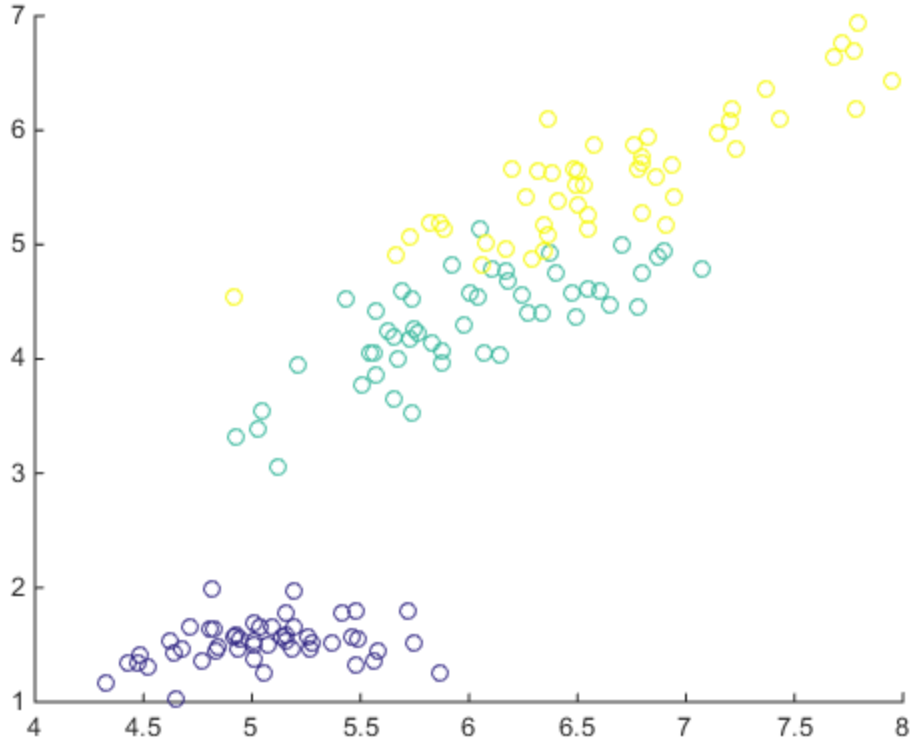


c. mean(X) = 5.9001 3.0989 3.8196 1.2526
d. var(X) = 0.6993 0.1916 3.0976 0.5797
   std(X) = 0.8362 0.4378 1.7600 0.7613
e. normX = X;
   normX = bsxfun(@minus, X, mean(X));
   normX = bsxfun(@rdivide, normX, std(normX));

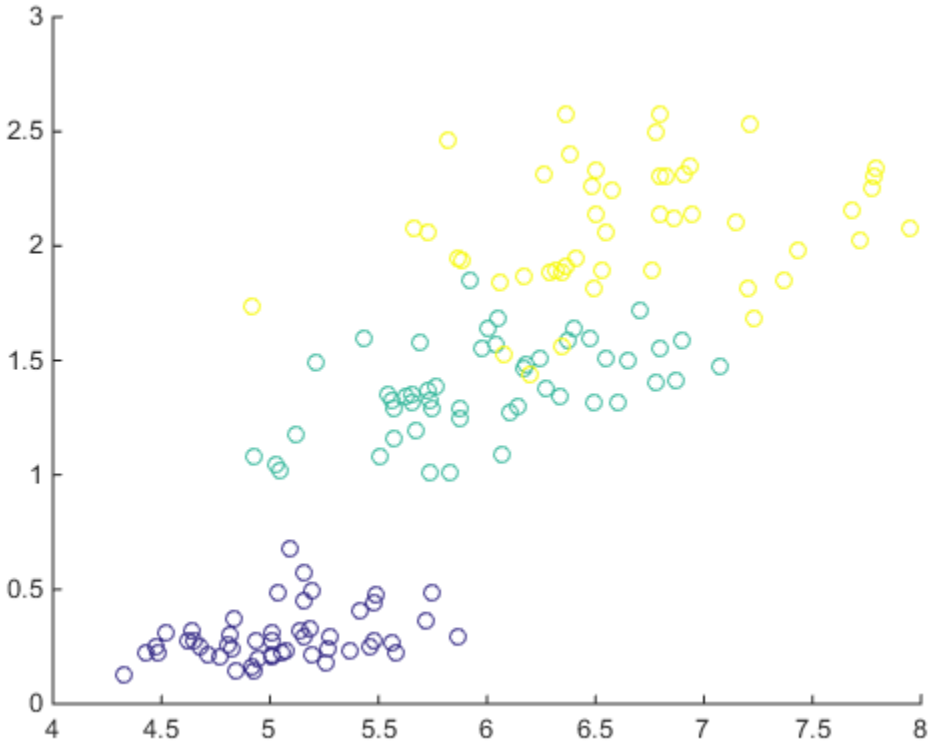
f. scatter(X(:,1),X(:,2),[],y) =



scatter(X(:,1),X(:,3),[],y) =



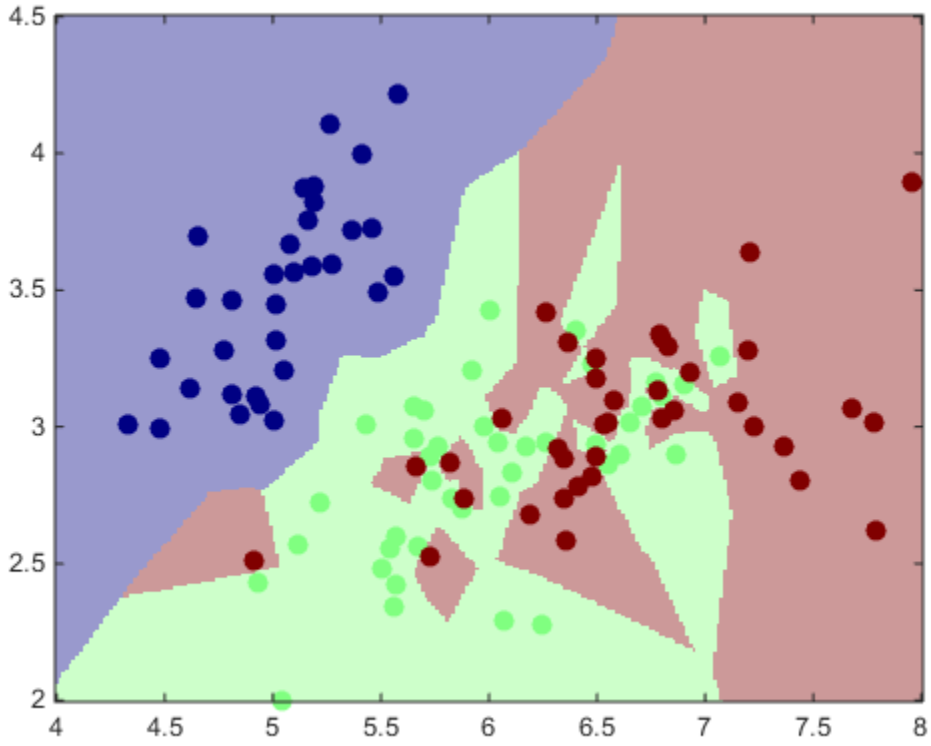
scatter(X(:,1),X(:,4),[],y) =



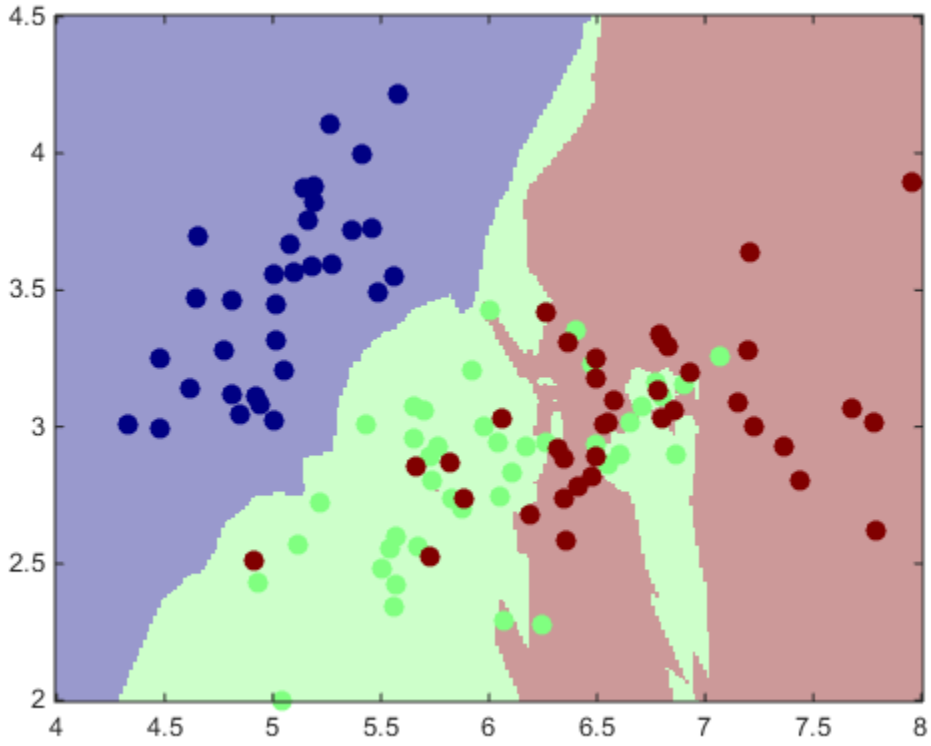
Problem 2

a. iris = load('data/iris.txt'); y = iris(:,end); X = iris(:,1:2);
[X y] = shuffleData(X,y);
[Xtr Xte Ytr Yte] = splitData(X,y, .75);
knn = knnClassify(Xtr, Ytr, 1);
plotClassify2D(knn, Xtr, Ytr);

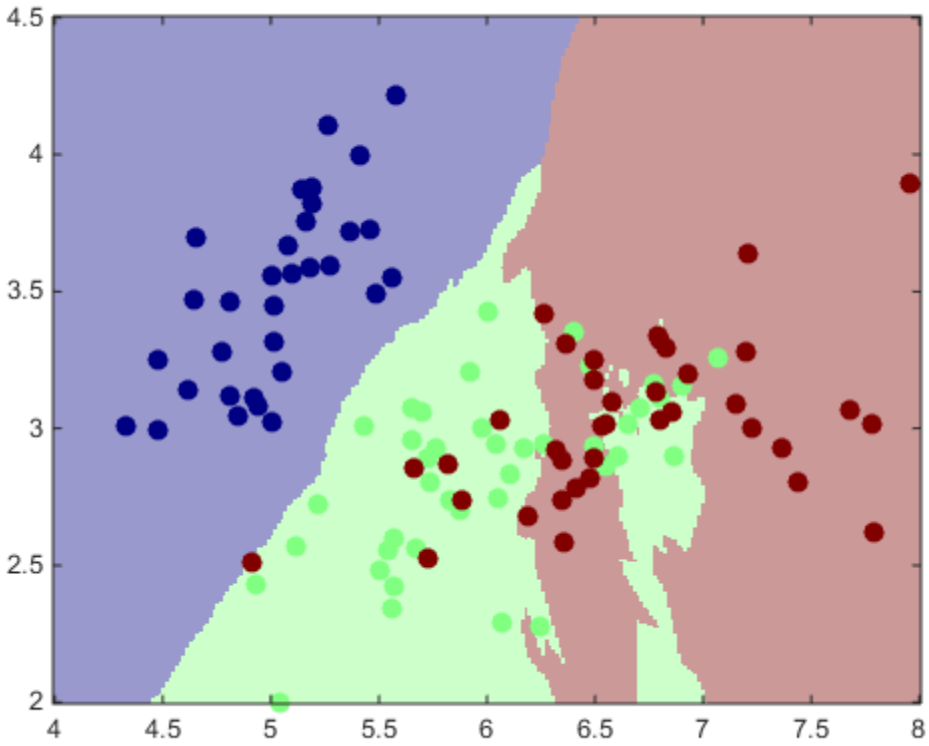
K = 1



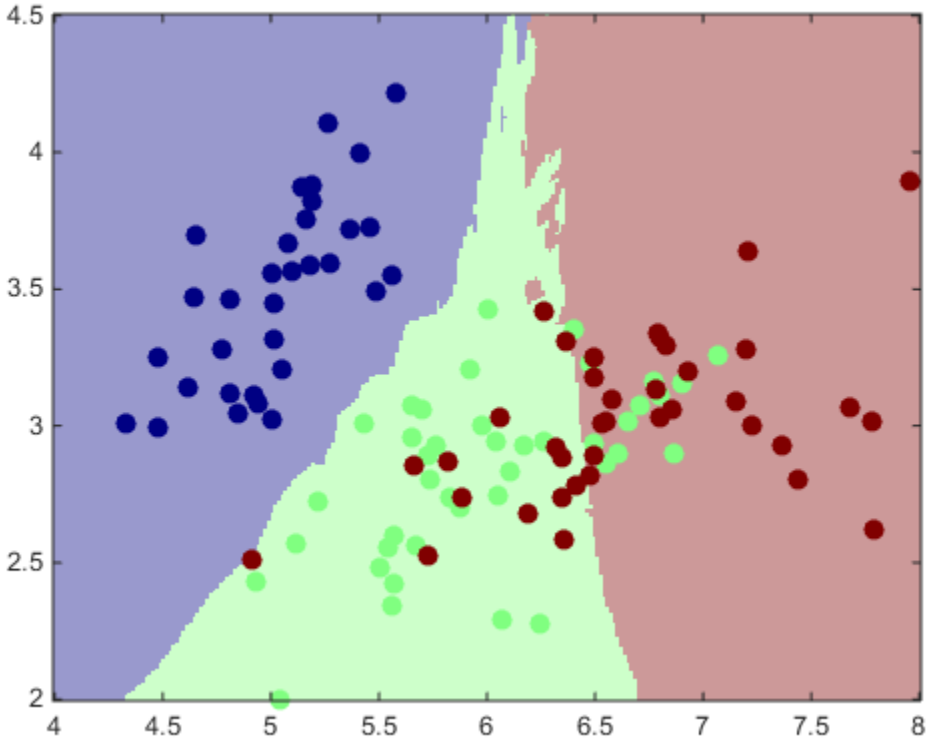
knn = knnClassify(Xtr, Ytr, 5);
plotClassify2D(knn, Xtr, Ytr);
K = 5



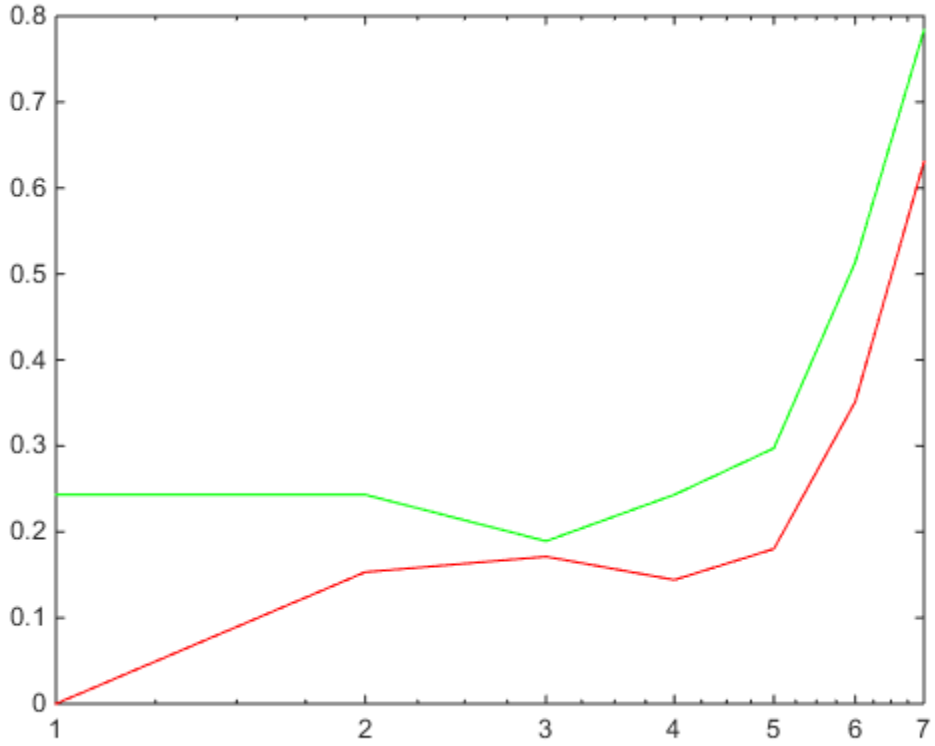
knn = knnClassify(Xtr, Ytr, 10);
plotClassify2D(knn, Xtr, Ytr);
K = 10



knn = knnClassify(Xtr, Ytr, 50);
plotClassify2D(knn, Xtr, Ytr);
K = 50



b. iris = load('data/iris.txt'); y = iris(:,end); X = iris(:,1:2);
[X y] = shuffleData(X,y);
[Xtr Xte Ytr Yte] = splitData(X,y, .75);
K=[1,2,5,10,50,100,200];
for i=1:length(K)
learner = knnClassify(Xtr, Ytr, K(i));
errTrain(i) = err(learner, Xtr, Ytr);
errTest(i) = err(learner, Xte, Yte);
end;
figure;
semilogx(errTrain, 'r');
hold on;
semilogx(errTest, 'g');
hold off;



K = 5 would work best.

Problem 3

a. P(X1 = 1 | y = -1) = 3/6
P(X2 = 1 | y = -1) = 5/6
P(X3 = 1 | y = -1) = 4/6
P(X4 = 1 | y = -1) = 5/6
P(X5 = 1 | y = -1) = 2/6

P(X1 = 1 | y = 1) = 3/4
P(X2 = 1 | y = 1) = 0/4
P(X3 = 1 | y = 1) = 3/4

P(X4 = 1 | y = 1) = 2/4
P(X5 = 1 | y = 1) = 1/4
P(y = 1) = 4/10
P(y = -1) = 6/10

b.

(X1 X2 X3 X4 X5)	P(y = -1 | X)	P(y = 1 | X)	Ŷ
(0 0 0 0 0)	3/6 * 1/6 * 2/6 * 1/6 * 4/6 * 6/10 = 0.00185	¼ * 1 * ¼ * 2/4 * ¾ * 4/10 = 0.009375	1
(1 1 0 1 0)	3/6 * 5/6 * 2/6 * 5/6 * 4/6 * 6/10 = 0.0463	¾ * 0/4 * ¼ * 2/4 * ¾ * 4/10 = 0	-1

c. P(y = 1 | (1 1 0 1 0)) = ¾ * 0/4 * ¼ * 2/4 * ¾ * 4/10 = 0
d. With many variables, calculating dependence with Bayes classifier will be much more difficult (or impossible) and time consuming. Naïve Bayes is easier and works well enough.