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CS 412 Homework 1

Problem 1 b).

pkg load statistics

% setup data

D = csvread('iris.csv');

X_train = D(:, 1:2);

y_train = D(:, end);

% setup meshgrid

[x1, x2] = meshgrid(2:0.01:5, 0:0.01:3);

grid_size = size(x1);

X12 = [x1(:) x2(:)];

kcount = [1,2,3,5,10,15]

kndx =1;

neighbors =[];

% compute kNN decision

n_X12 = size(X12, 1);

decision = zeros(n_X12, 1);

for entry = kcount

for i=1:n_X12

point = X12(i, :);

% compute euclidan distance from the point to all training data

dist = pdist2(X_train, point);

% sort the distance, get the index

[~, idx_sorted] = sort(dist);

% find the class of the nearest neighbour

```

neighbors = idx_sorted;
closest = y_train(neighbors(1:entry));
dec_labels = unique(closest);
count=[1:length(dec_labels)];

for j=1 : length(dec_labels)
    for k= 1: length(closest)
        temp_label = dec_labels(j);
        if (closest(k) == temp_label)
            count(j)= count(j)+1;
        endif
    endfor
endfor

temp = count(1);
max_indx =1;
for j= 2: length(count)
    if(count(j) > temp)
        temp = count(j);
        max_indx = j;
    endif
endfor

decision(i) = dec_labels(max_indx);
end

% plot decisions in the grid

decisionmap = reshape(decision, grid_size);
figure, imagesc(2:0.01:5, 0:0.01:3, decisionmap); % plot heading to give
%(entry + "NN decisionmap");

```

```
set(gca,'ydir','normal');
```

```
% colormap for the classes
```

```
% class 1 = light red, 2 = light green, 3 = light blue
```

```
cmap = [1 0.8 0.8; 0.8 1 0.8; 0.8 0.8 1];
```

```
colormap(cmap);
```

```
% scatter plot data
```

```
hold on;
```

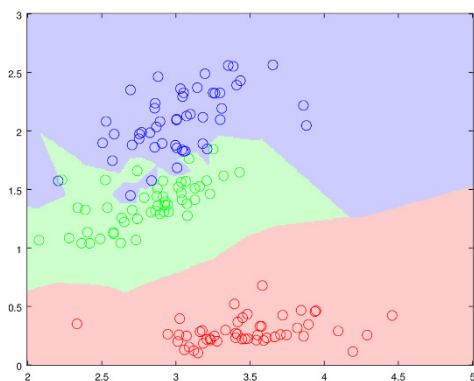
```
scatter(X_train(y_train == 1, 1), X_train(y_train == 1, 2), 10, 'r');
```

```
scatter(X_train(y_train == 2, 1), X_train(y_train == 2, 2), 10, 'g');
```

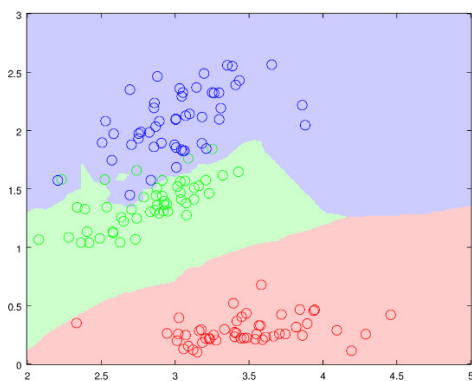
```
scatter(X_train(y_train == 3, 1), X_train(y_train == 3, 2), 10, 'b');
```

```
hold off;
```

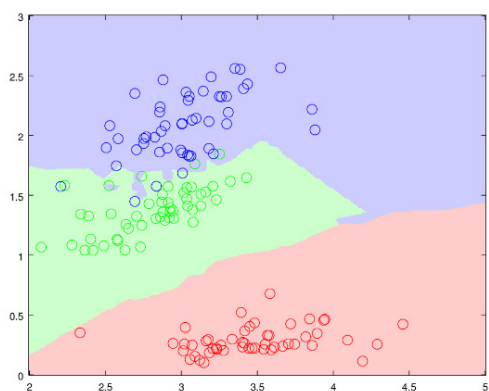
```
end
```



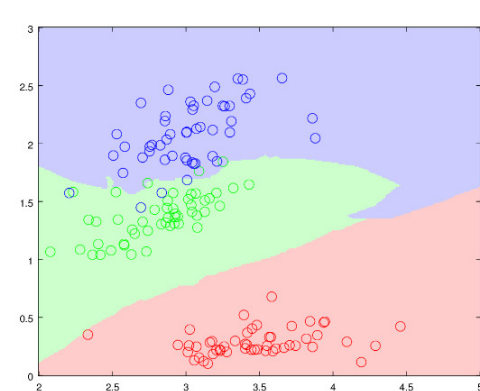
1NN decision Plot



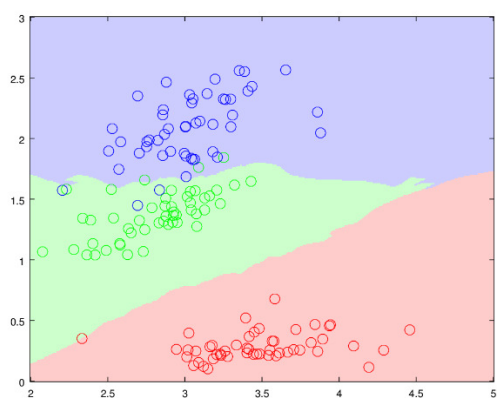
2NN Decision Plot



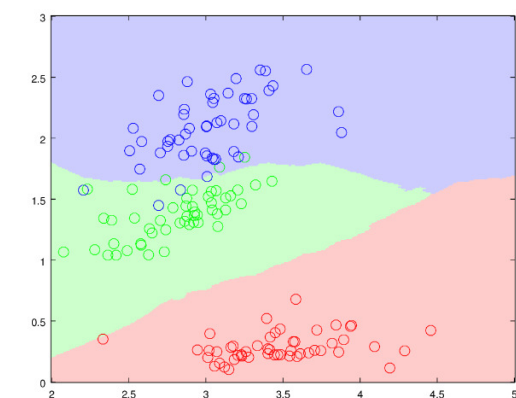
3NN Decision Plot



5NN Decision Plot



10NN decision Plot



15NN Decision Plot