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**Project 1: Data creation and display**

**Results:** (1) 2-d plot of the Fisher’s Iris data with petal width versus sepal length

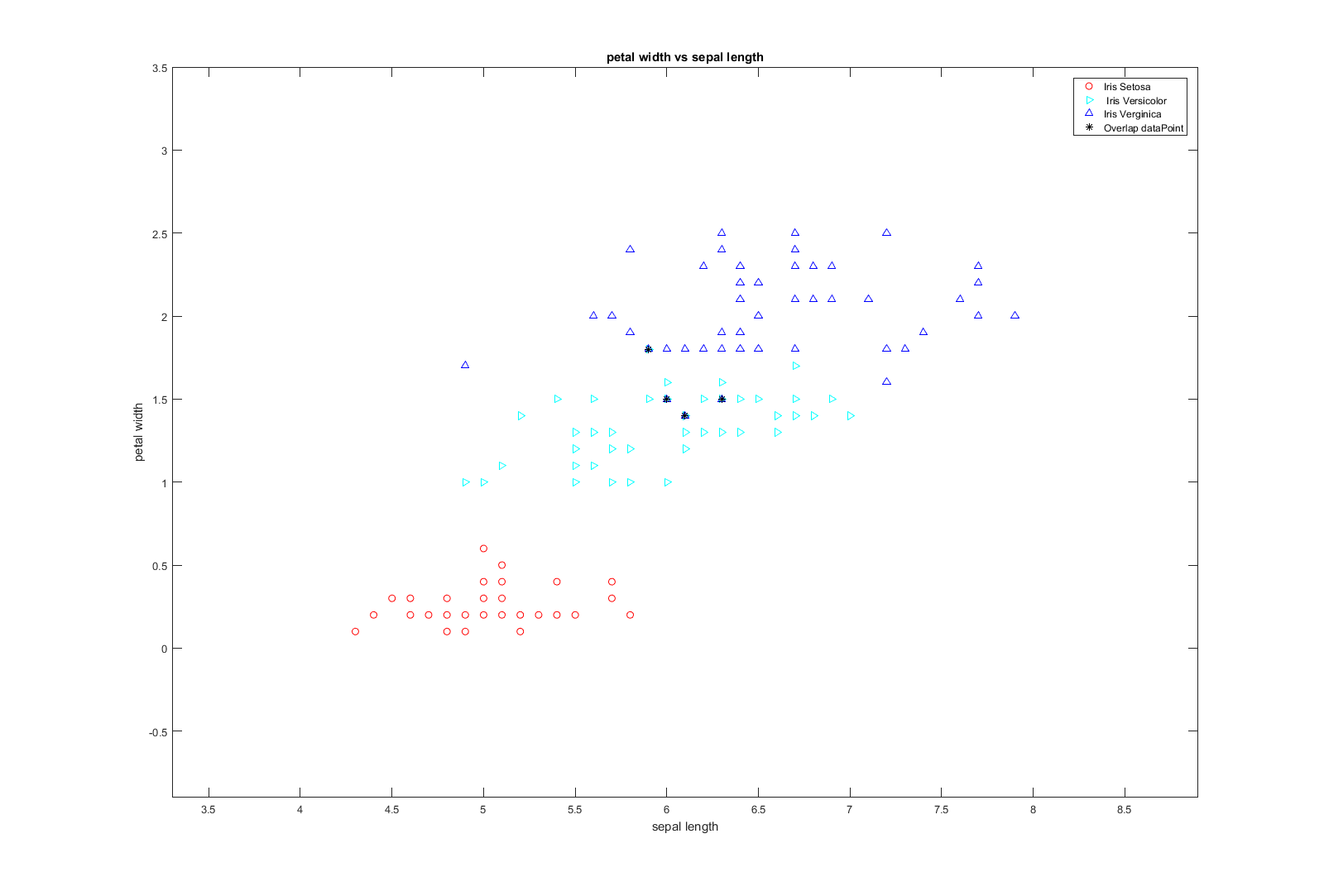


Figure 1: 2-d plot of the Fisher’s Iris data with petal width versus sepal length

# Total overlapping data points for petal width vs sepal length is : 4

(2) 2-d plot of the Fisher’s Iris data with petal length versus sepal width

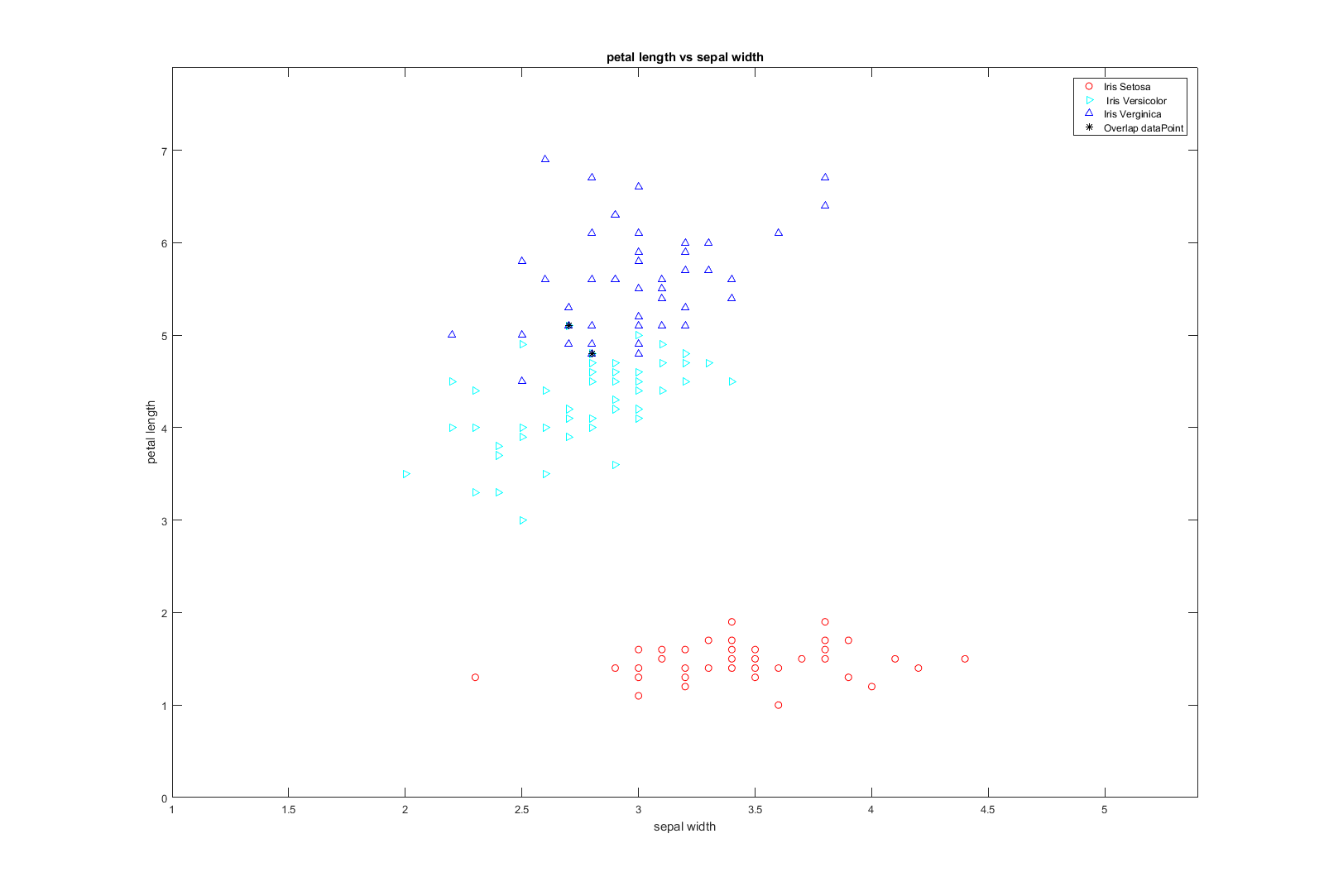


Figure 2: 2-d plot of the Fisher’s Iris data with petal length versus sepal width

# Total overlapping data points for petal length vs sepal width is : 2

**MATLAB Code:**

%% file name dataCreationAndDisplay.m

% author: Mrinmoy Sarkar

% email: msarkar@aggies.ncat.edu

% date: 9/2/2017

clear;

close all;

% load data to a veriable

data = importdata('iris.txt');

% no. of class is 3 named Iris-setosa, Iris-versicolor and Iris-verginica

% there are 4 attributes named sepal-length, sepal-width, petal-length,

% petal-width

% there are 50 plants for each species

irisSetosa = zeros(50,4);

irisVersicolor = zeros(50,4);

irisVerginica = zeros(50,4);

n = size(data,1);

indxSeto = 1;

indxVers = 1;

indxVerg = 1;

for i=2:n

x = strsplit(cell2mat(data(i)));

if strcmp(x(5), 'Iris-setosa')

for j=1:4

irisSetosa(indxSeto,j) = str2double(cell2mat(x(j)));

end

indxSeto = indxSeto + 1;

elseif strcmp(x(5), 'Iris-versicolor')

for j=1:4

irisVersicolor(indxVers,j) = str2double(cell2mat(x(j)));

end

indxVers = indxVers + 1;

elseif strcmp(x(5), 'Iris-virginica')

for j=1:4

irisVerginica(indxVerg,j) = str2double(cell2mat(x(j)));

end

indxVerg = indxVerg + 1;

end

end

%% plot Fisher's Iris data with petal width versus sepal length

figure;

plot(irisSetosa(:,1), irisSetosa(:,4), 'or'); hold on;

plot(irisVersicolor(:,1), irisVersicolor(:,4), '>c'); hold on;

plot(irisVerginica(:,1), irisVerginica(:,4), '^b'); hold on;

axis([min([min(irisSetosa(:,1)),min(irisVersicolor(:,1)),min(irisVerginica(:,1))])-1 ...

max([max(irisSetosa(:,1)),max(irisVersicolor(:,1)),max(irisVerginica(:,1))])+1 ...

min([min(irisSetosa(:,4)),min(irisVersicolor(:,4)),min(irisVerginica(:,4))])-1 ...

max([max(irisSetosa(:,4)), max(irisVersicolor(:,4)),max(irisVerginica(:,4))])+1]);

title('petal width vs sepal length');

xlabel('sepal length');

ylabel('petal width');

legend('Iris Setosa', ' Iris Versicolor', 'Iris Verginica','AutoUpdate','off');

%% plot overlap symbol (\*)

overlapingPointX = [];

overlapingPointY = [];

for i=1:length(irisSetosa(:,1))

x11 = irisSetosa(i,1);

y11 = irisSetosa(i,4);

x21 = irisVersicolor(i,1);

y21 = irisVersicolor(i,4);

for j=1:length(irisSetosa(:,1))

x22 = irisVersicolor(j,1);

y22 = irisVersicolor(j,4);

x32 = irisVerginica(j,1);

y32 = irisVerginica(j,4);

d1 = (x11-x22)^2 + (y11-y22)^2;

d2 = (x11-x32)^2 + (y11-y32)^2;

d3 = (x21-x32)^2 + (y21-y32)^2;

if d1 == 0 || d2 == 0

if isempty(find(overlapingPointX == irisSetosa(i,1)))

overlapingPointX = [overlapingPointX irisSetosa(i,1)];

overlapingPointY = [overlapingPointY irisSetosa(i,4)];

else

if isempty(find(overlapingPointY(find(overlapingPointX == irisSetosa(i,1))) == irisSetosa(i,4)))

overlapingPointX = [overlapingPointX irisSetosa(i,1)];

overlapingPointY = [overlapingPointY irisSetosa(i,4)];

end

end

end

if d3 == 0

if isempty(find(overlapingPointX == irisVersicolor(i,1)))

overlapingPointX = [overlapingPointX irisVersicolor(i,1)];

overlapingPointY = [overlapingPointY irisVersicolor(i,4)];

else

if isempty(find(overlapingPointY(find(overlapingPointX == irisVersicolor(i,1))) == irisVersicolor(i,4)))

overlapingPointX = [overlapingPointX irisVersicolor(i,1)];

overlapingPointY = [overlapingPointY irisVersicolor(i,4)];

end

end

end

end

end

disp(['Total overlapping data points for petal width vs sepal length is : ' num2str(length(overlapingPointX))])

plot(overlapingPointX, overlapingPointY, '\*k');

legend('Iris Setosa', ' Iris Versicolor', 'Iris Verginica', 'Overlap dataPoint')

%% plot Fisher's Iris data with petal length versus sepal width

figure;

plot(irisSetosa(:,2), irisSetosa(:,3), 'or'); hold on;

plot(irisVersicolor(:,2), irisVersicolor(:,3), '>c'); hold on;

plot(irisVerginica(:,2), irisVerginica(:,3), '^b'); hold on;

axis([min([min(irisSetosa(:,2)),min(irisVersicolor(:,2)),min(irisVerginica(:,2))])-1 ...

max([max(irisSetosa(:,2)),max(irisVersicolor(:,2)),max(irisVerginica(:,2))])+1 ...

min([min(irisSetosa(:,3)),min(irisVersicolor(:,3)),min(irisVerginica(:,3))])-1 ...

max([max(irisSetosa(:,3)), max(irisVersicolor(:,3)),max(irisVerginica(:,3))])+1]);

title('petal length vs sepal width');

xlabel('sepal width');

ylabel('petal length');

legend('Iris Setosa', ' Iris Versicolor', 'Iris Verginica','AutoUpdate','off');

%% plot overlap symbol (\*)

overlapingPointX = [];

overlapingPointY = [];

for i=1:length(irisSetosa(:,2))

x11 = irisSetosa(i,2);

y11 = irisSetosa(i,3);

x21 = irisVersicolor(i,2);

y21 = irisVersicolor(i,3);

for j=1:length(irisSetosa(:,2))

x22 = irisVersicolor(j,2);

y22 = irisVersicolor(j,3);

x32 = irisVerginica(j,2);

y32 = irisVerginica(j,3);

d1 = (x11-x22)^2 + (y11-y22)^2;

d2 = (x11-x32)^2 + (y11-y32)^2;

d3 = (x21-x32)^2 + (y21-y32)^2;

if d1 == 0 || d2 == 0

if isempty(find(overlapingPointX == irisSetosa(i,2)))

overlapingPointX = [overlapingPointX irisSetosa(i,2)];

overlapingPointY = [overlapingPointY irisSetosa(i,3)];

else

if isempty(find(overlapingPointY(find(overlapingPointX == irisSetosa(i,2))) == irisSetosa(i,3)))

overlapingPointX = [overlapingPointX irisSetosa(i,2)];

overlapingPointY = [overlapingPointY irisSetosa(i,3)];

end

end

end

if d3 == 0

if isempty(find(overlapingPointX == irisVersicolor(i,2)))

overlapingPointX = [overlapingPointX irisVersicolor(i,2)];

overlapingPointY = [overlapingPointY irisVersicolor(i,3)];

else

if isempty(find(overlapingPointY(find(overlapingPointX == irisVersicolor(i,2))) == irisVersicolor(i,3)))

overlapingPointX = [overlapingPointX irisVersicolor(i,2)];

overlapingPointY = [overlapingPointY irisVersicolor(i,3)];

end

end

end

end

end

disp(['Total overlapping data points for petal length vs sepal width is : ' num2str(length(overlapingPointX))])

plot(overlapingPointX, overlapingPointY, '\*k');

legend('Iris Setosa', ' Iris Versicolor', 'Iris Verginica', 'Overlap dataPoint')

**Summary of the results:**

**(1)**

* For petal width vs sepal length, Iris Setosa is linearly separable from Irsi Vesicolor and Iris Verginica
* There are 4 overlapping points between Irsi Vesicolor and Iris Verginica
* Because of the overlapping points, Irsi Vesicolor and Iris Verginica are not linearly separable

**(2)**

* For petal length vs sepal width, Iris Setosa is linearly separable from Irsi Vesicolor and Iris Verginica
* There are 2 overlapping points between Irsi Vesicolor and Iris Verginica
* Because of the overlapping points, Irsi Vesicolor and Iris Verginica are not linearly separable
* There are some points in Irsi Vesicolor and Iris Verginica that are enclosed in one another region