

### Practical Exercise 3

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Der Code ist zusätzlich als Datei einsehbar.

#### Task 1:

Code:

```
%Task 1

load ("iris_data.mat")
load ("iris_species.mat")
% We separate the array in blocks of size 50x4 to get the
% specific data of the different species.
c_1 = meas(1:50,:);
c_2 = meas(51:100,:);
c_3 = meas(101:150,:);
iris = cat(3,c_1,c_2,c_3);
```

Beispiel Aufrufe von iris:

Erste 5 Beobachtungen von „sepal length“ in „Iris Virginica“ Daten	Erste 3 Beobachtungen von „petal length“ in „Iris Setosa“ Daten
<pre>&gt;&gt; iris(1:5, 1, 3) ans =      6.3000     5.8000     7.1000     6.3000     6.5000</pre>	<pre>&gt;&gt; iris(1:3, 3, 1) ans =      1.4000     1.4000     1.3000</pre>

## Task 2:

Code:

```
%Task 2

iris1 = cell(51, 5, 3);

L_col = cell(1,5);           % cell array containing the labels for the columns
L_row = cell(50,1);          % cell array containing the labels for the rows

L_col(1,2) = "SepalLength";
L_col(1,3) = "SepalWidth";
L_col(1,4) = "PetalLength";
L_col(1,5) = "PetalWidth";
for i = 1:50
    L_row(i,1) = strcat("Obs", int2str(i));
end

L_col(1,1) = "Setosa";
c_1_L = num2cell(c_1);
c_1_L = cat (2,L_row, c_1_L);
c_1_L = cat (1,L_col, c_1_L);

L_col(1,1) = "Versicolor";
c_2_L = num2cell(c_2);
c_2_L = cat (2,L_row, c_2_L);
c_2_L = cat (1,L_col, c_2_L);

L_col(1,1) = "Virginica";
c_3_L = num2cell(c_3);
c_3_L = cat (2,L_row, c_3_L);
c_3_L = cat (1,L_col, c_3_L);

iris1 = cat(3, c_1_L, c_2_L, c_3_L); %assambeling iris1
```

Task 3:

Code:

Ausgabe:

#### Task 4:

Code:

```
%Task 4
setosa    = reshape([iris1{2:51, 2:5, 1}], 50, 4);
versicolor = reshape([iris1{2:51, 2:5, 2}], 50, 4);
virginica  = reshape([iris1{2:51, 2:5, 3}], 50, 4);
```

Beispielaufrufe:

```
>> setosa(1:3,:)
ans =
```

5.1000	3.5000	1.4000	0.2000
4.9000	3.0000	1.4000	0.2000
4.7000	3.2000	1.3000	0.2000

```
>> virginica(2:3,:)
ans =
```

5.8000	2.7000	5.1000	1.9000
7.1000	3.0000	5.9000	2.1000

## Task 5:

Code:

```
%Task 5
Sum=zeros(1,4);
s_v= size(versicolor,1);
% Here we calculate the mean.
for i=1:s_v
    for j=1:4
        Sum(j) = Sum(j) + versicolor(i,j);
    end
end
Avg=Sum/s_v;
% Calculating the Variance
variance_sepallenght = var(versicolor(:,1));
variance_sepalwidth  = var(versicolor(:,2));
variance_petallenght = var(versicolor(:,3));
variance_petalwidth  = var(versicolor(:,4));

Var=[variance_sepallenght,variance_sepalwidth,variance_petallenght,variance_petalwidth];

%building the cell array "myarray" with labels:
L_col_new=L_col;
L_col_new(1,1)="Versicolor";
L_row_new=cell(2,1);
L_row_new(1,1)= "mean";
L_row_new(2,1)= "variance";

Avg_L=num2cell(Avg);
Var_L=num2cell(Var);

myarray= cat(1,Avg_L, Var_L);
myarray= cat(2,L_row_new, myarray);
myarray= cat (1,L_col_new, myarray);

printcell(myarray);
```

Ausgabe:

```
>> printcell(myarray);
Versicolor SepalLength SepalWidth PetalLength PetalWidth
mean 5.936 2.77 4.26 1.326
variance 0.26643 0.098469 0.22082 0.039106
>> |
```

## Task 6:

Code mit Kommentaren zu den Plots:

```
%Task 6
% The first 4 figures are obviously easily to be separated by a linear decision boundary.
% So the classes are easy to tell apart.
% The Sepal Length and Width of Setosa and Versicolor
figure(1)
plot(c_1(:,1),c_1(:,2),"bo", c_2(:,1),c_2(:,2),"r*")
title('Sepal Length and vs Sepal Width');
xlabel ('Sepal Length');
ylabel('Sepal Width');
legend("Setosa", "Versicolor");

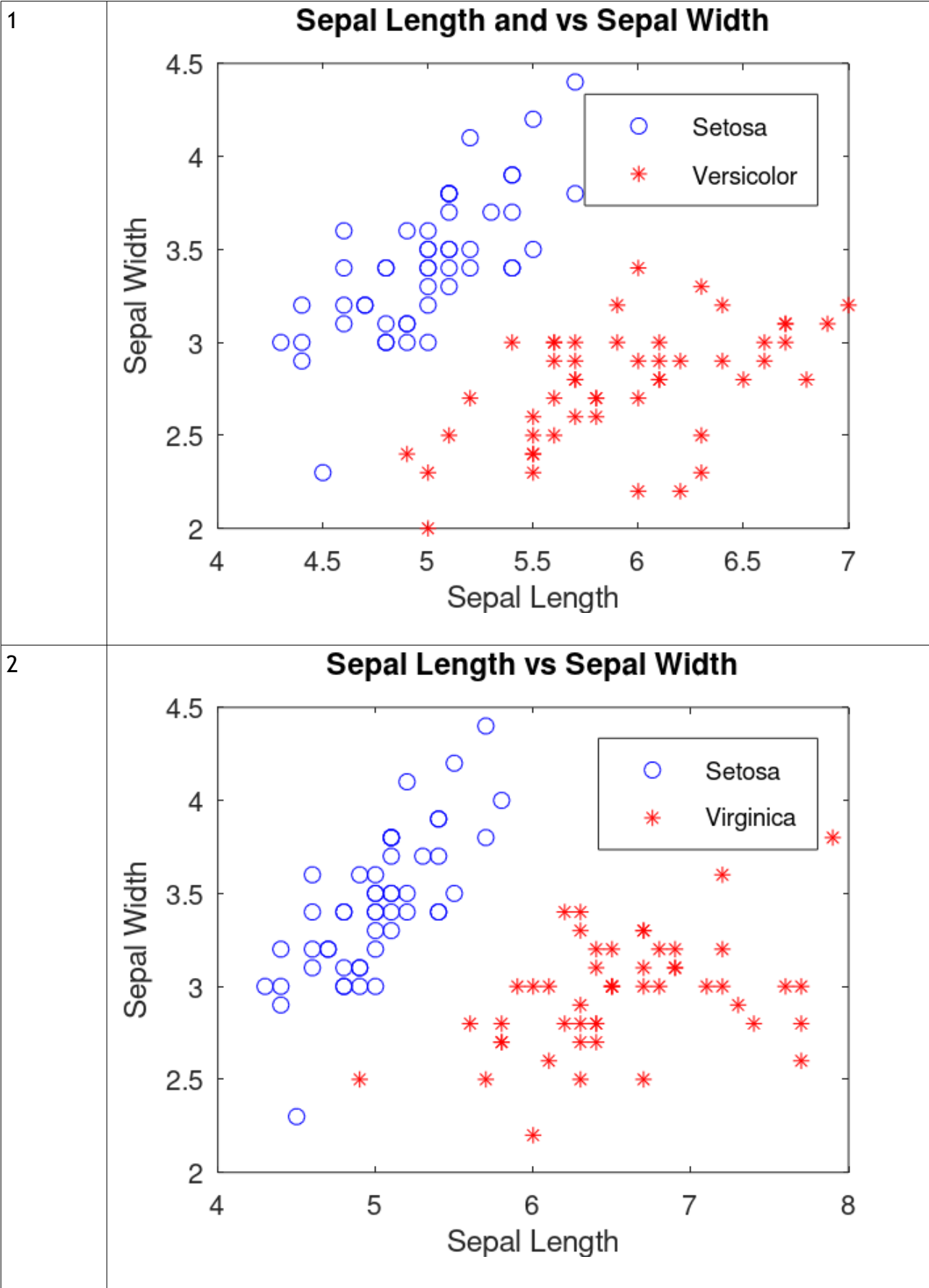
%The Sepal Length and Width of Setosa and Virginica
figure(2)
plot(c_1(:,1),c_1(:,2),"bo", c_3(:,1),c_3(:,2),"r*")
title('Sepal Length vs Sepal Width');
xlabel ('Sepal Length');
ylabel('Sepal Width');
legend("Setosa", "Virginica");

%The Sepal and Petal Length of Setosa and Versicolor
figure(3)
plot(c_1(:,1),c_1(:,3),"bo", c_2(:,1),c_2(:,3),"r*")
title('Sepal Length vs Petal Length');
xlabel ('Sepal Length');
ylabel('Petal Length');
legend("Setosa", "Versicolor");

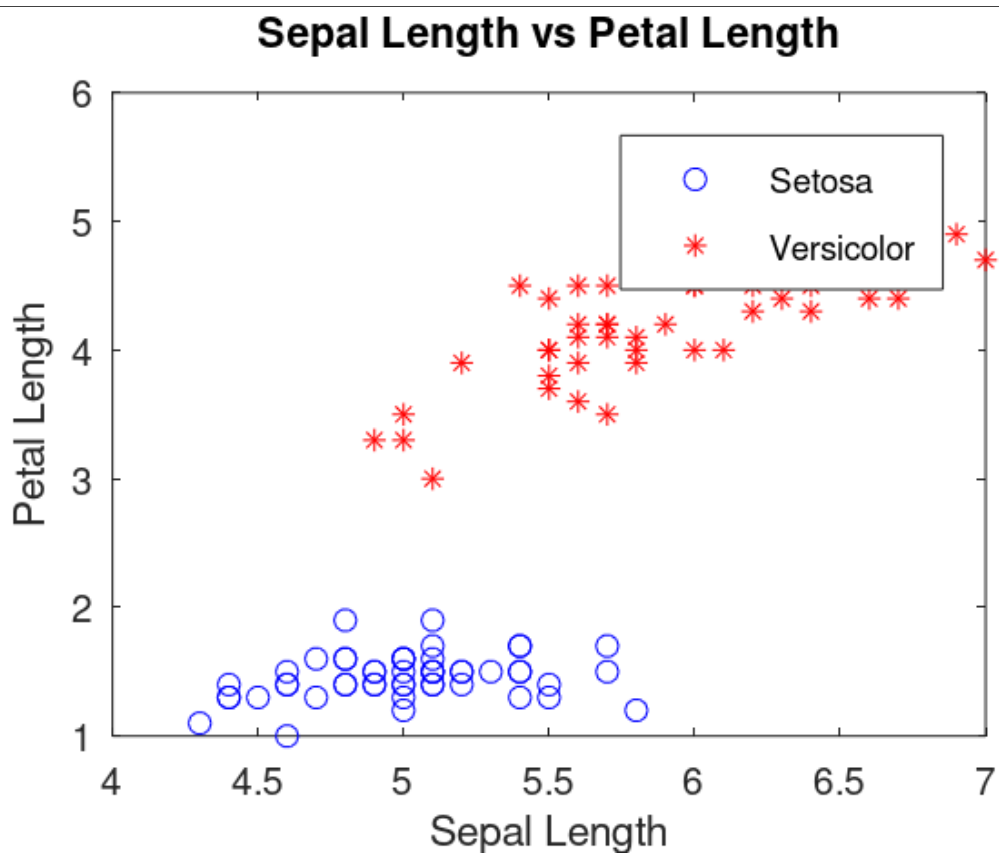
%The Petal Length and Width of Setosa and Versicolor
figure(4)
plot(c_1(:,3),c_1(:,4),"bo", c_2(:,3),c_2(:,4),"r*")
title('Petal Length vs Petal Width');
xlabel ('Petal Length');
ylabel('Petal Width');
legend("Setosa", "Versicolor");

% In that figure we take a look at the relation between the Petal Length to the Petal Width
% in comparison to the relation between Sepal Length and Sepal Width.
% We take Setosa and Versicolour as Data.
% Its not easily possible to separate those two classes by a linear decision boundary.
figure(5)
setosa_petal_length_width = c_1(:,1)./c_1(:,2);
versicolor_petal_length_width = c_2(:,1)./c_2(:,2);
setosa_setosa_length_width = c_1(:,3)./c_1(:,4);
versicolor_setosa_length_width = c_2(:,3)./c_2(:,4);
plot(setosa_petal_length_width, setosa_setosa_length_width,"bo",
     versicolor_petal_length_width,versicolor_setosa_length_width,"r*")
title('Relation Petal Length/Width vs Relation Sepal Length/Width');
xlabel ('Petal Length/Length');
ylabel('Sepal Length/Width');
legend("Setosa", "Versicolor");
```

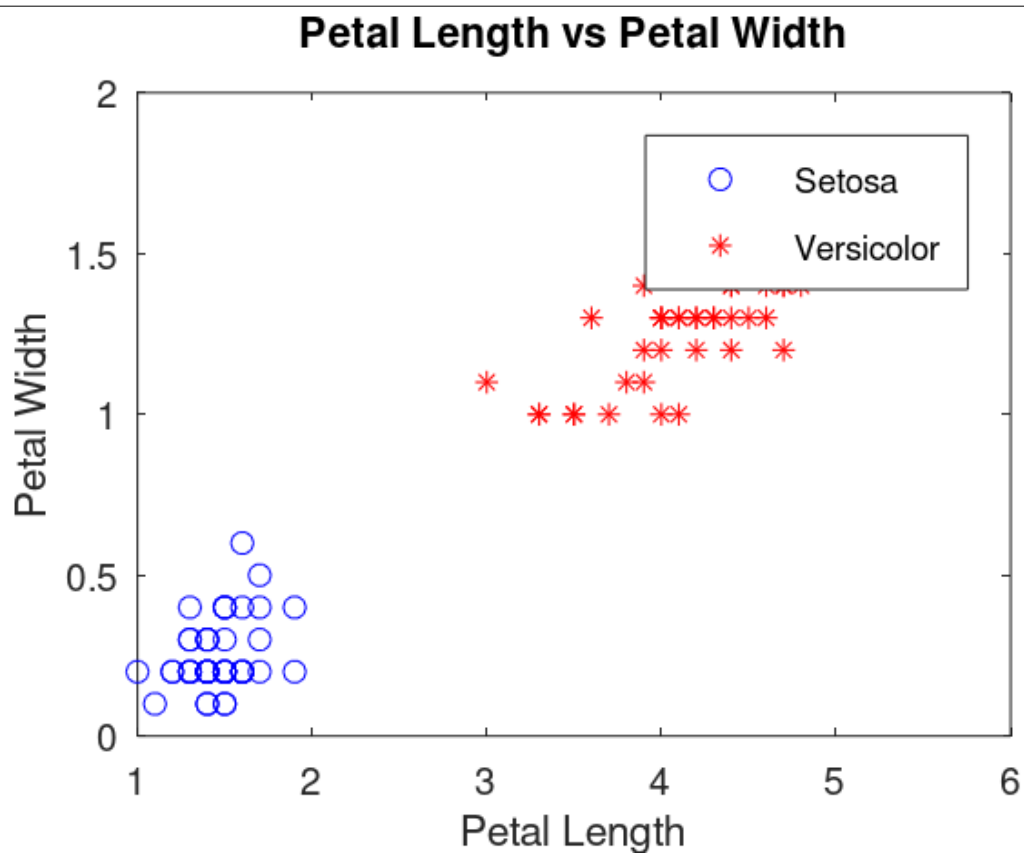
Plots:



3



4





5

**Relation Petal Length/Width vs Relation Sepal Length/Width**