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

`>> iris(1:5, 1, 3)`
`ans =`
 	
`6.3000`
`5.8000`
`7.1000`
`6.3000`
`6.5000`
	`>> iris(1:3, 3, 1)`
	`ans =`
	
	`1.4000`
	`1.4000`
	`1.3000`

Task 2:

Code:

```
%Task 2

irisl = 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);

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

Task 3:

Code:

```
%Task 3
function printcell(arr)
  dim_x = size(arr,1);
  dim_y = size(arr,2);
  dim_z = size(arr,3);
  for k = 1:dim_z
    for j = 1:dim_x
      line = arr(j,:,k);
        for i = 1:dim_y
          printf(num2str(line{i})), printf("   ")
        end
      printf("\n")
    end
  end
endfunction
```

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);
```

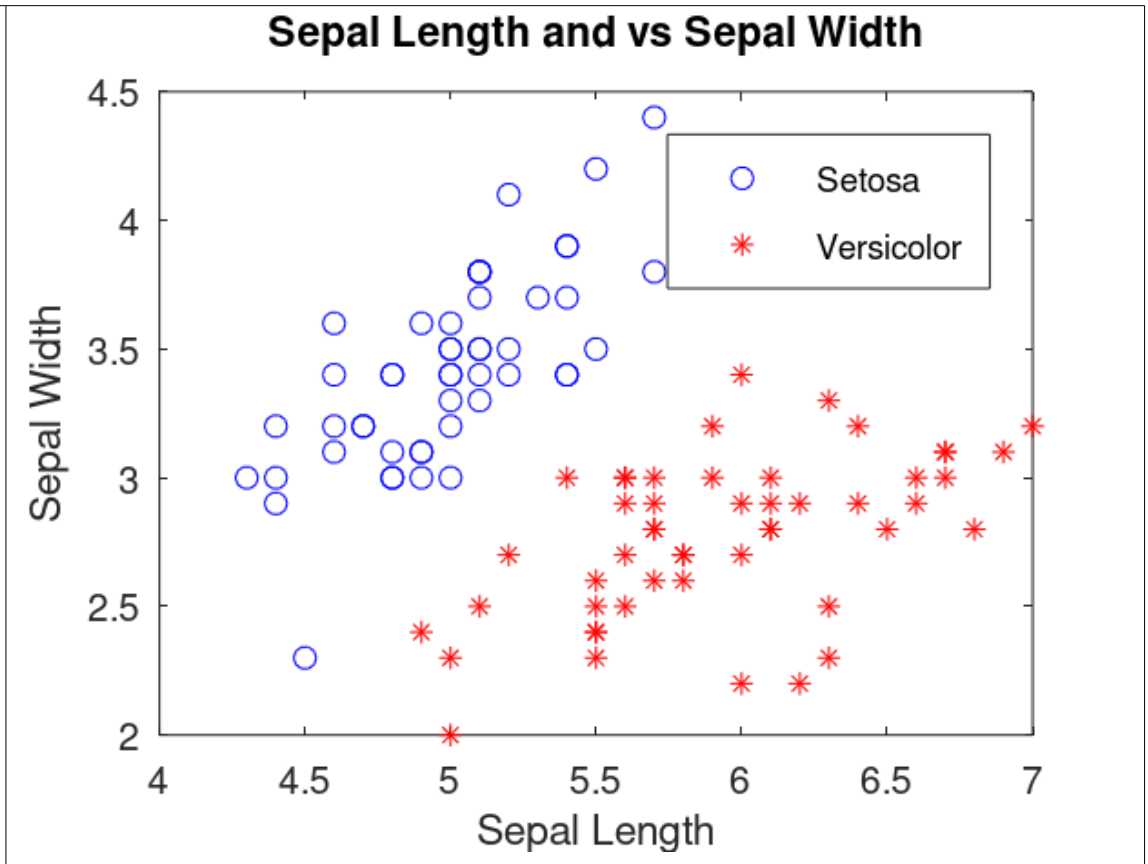
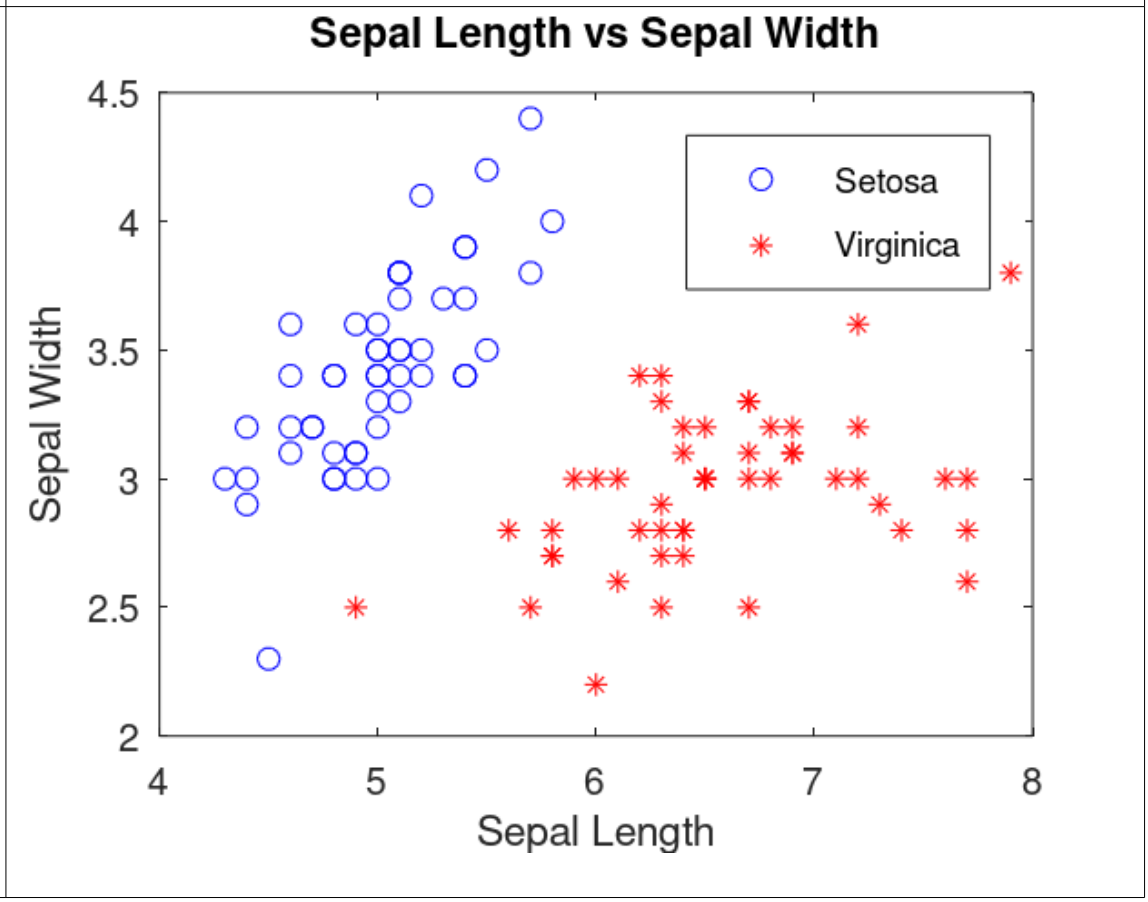
Task 6:

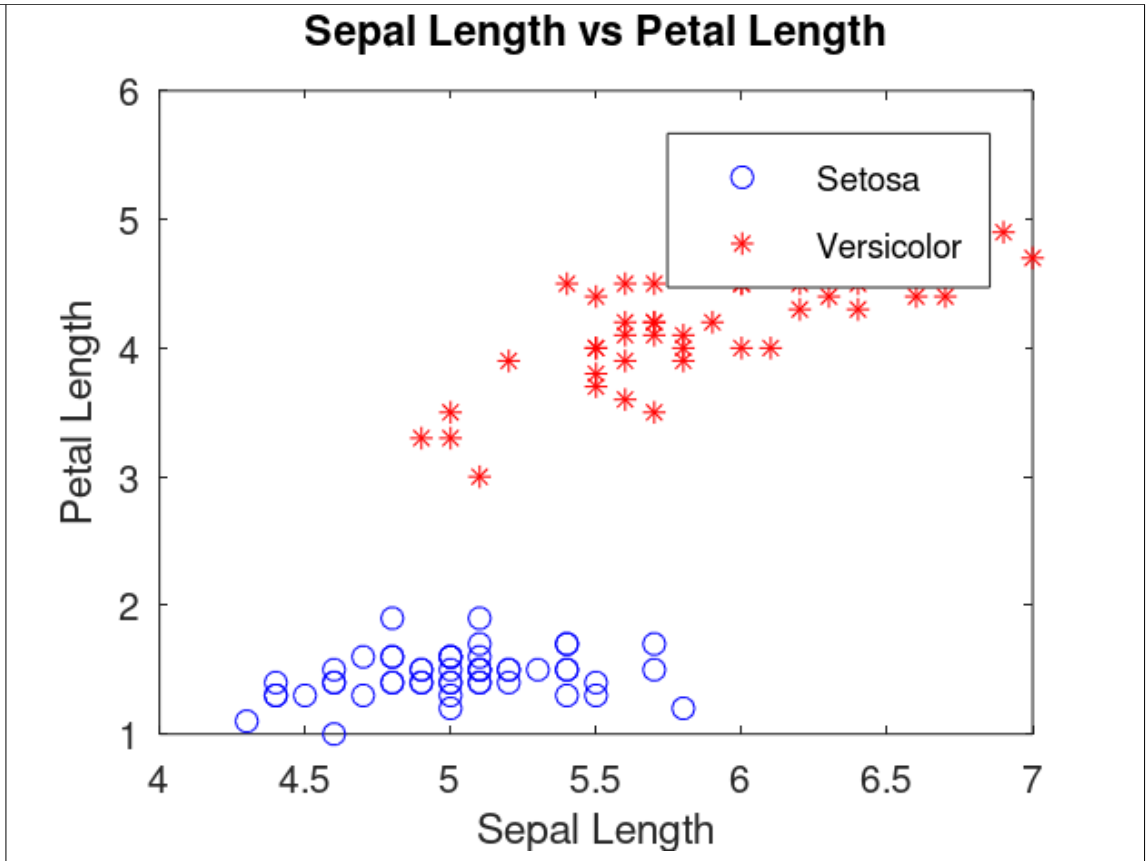
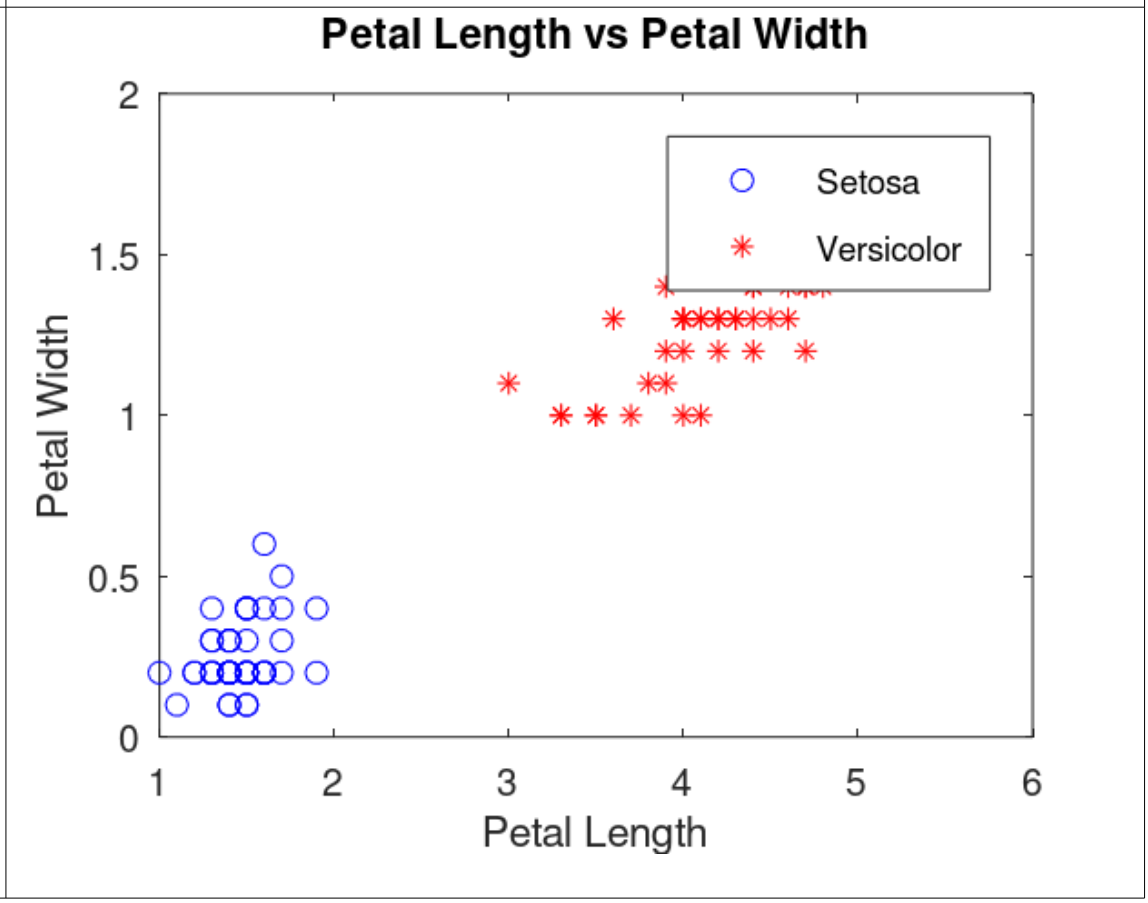
Code mit Kommentaren zu den Plots:

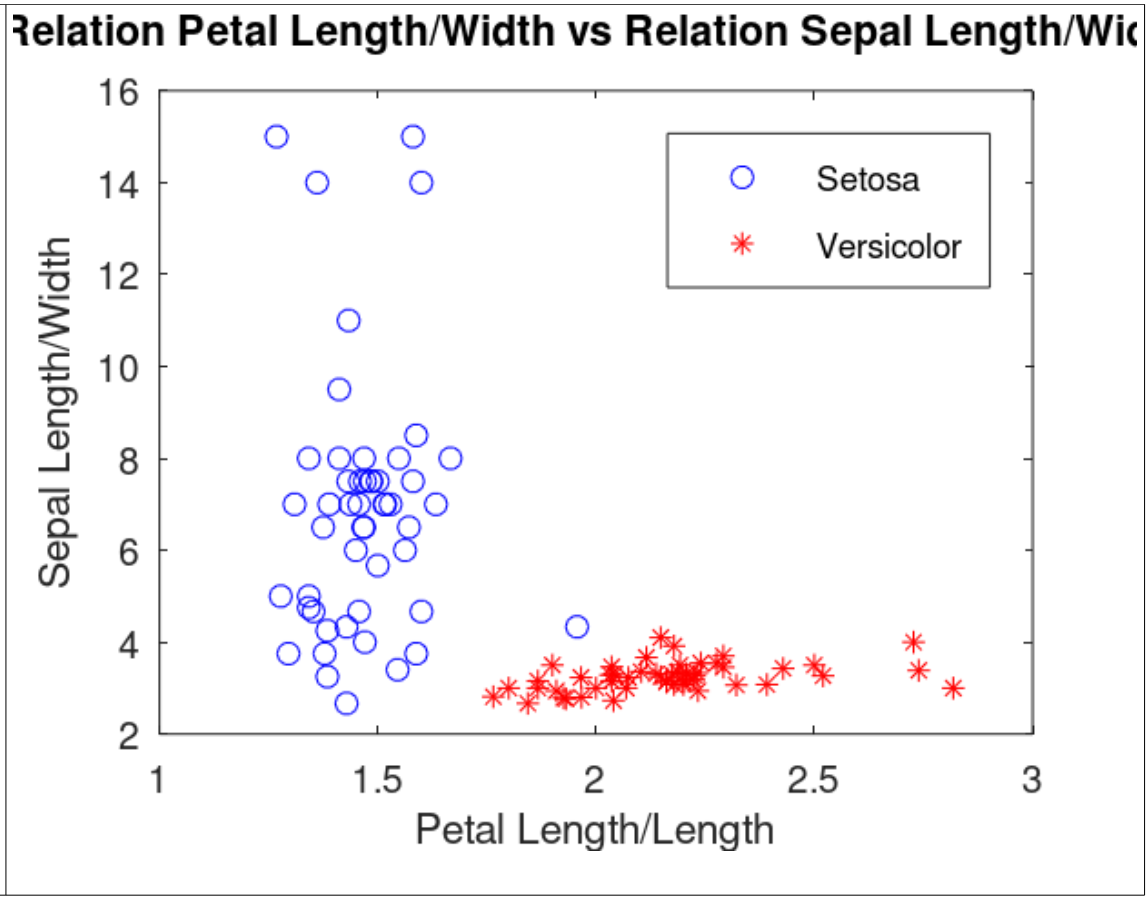
```
%Task 6
% The first 4 figures are obviously easily to be separated by a linear decision boundary.
% So the classes are easy to tell apart.
% The Sepal Length and Width of Setosa and Versicolor
figure(1)
  plot(c_1(:,1),c_1(:,2),"bo", c_2(:,1),c_2(:,2),"r*")
  title('Sepal Length and vs Sepal Width');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

%The Sepal Lenght and Width of Setosa and Viginica
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:

1	 Sepal Length and vs Sepal Width Setosa Versicolor Sepal Width Sepal Length 4.5 4 3.5 3 2.5 2 4 4.5 5 5.5 6 6.5 7
2	 Sepal Length vs Sepal Width Setosa Virginica Sepal Width Sepal Length 4.5 4 3.5 3 2.5 2 4 5 6 7 8

3	 Sepal Length vs Petal Length Setosa Versicolor Petal Length Sepal Length 1 2 3 4 5 6 4 4.5 5 5.5 6 6.5 7
4	 Petal Length vs Petal Width Setosa Versicolor Petal Width Petal Length 0 0.5 1 1.5 2 1 2 3 4 5 6

5	 Relation Petal Length/Width vs Relation Sepal Length/Wic Sepal Length/Width Petal Length/Length Setosa Versicolor 16 14 12 10 8 6 4 2 1 1.5 2 2.5 3