# Introductie Support Vector Machines

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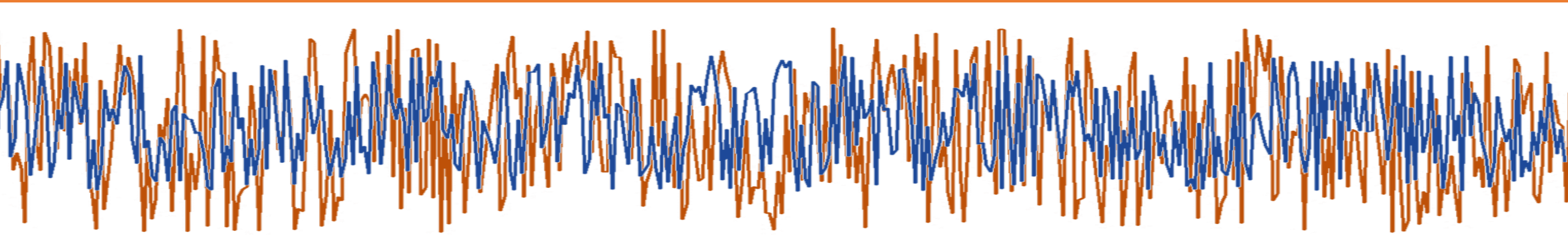
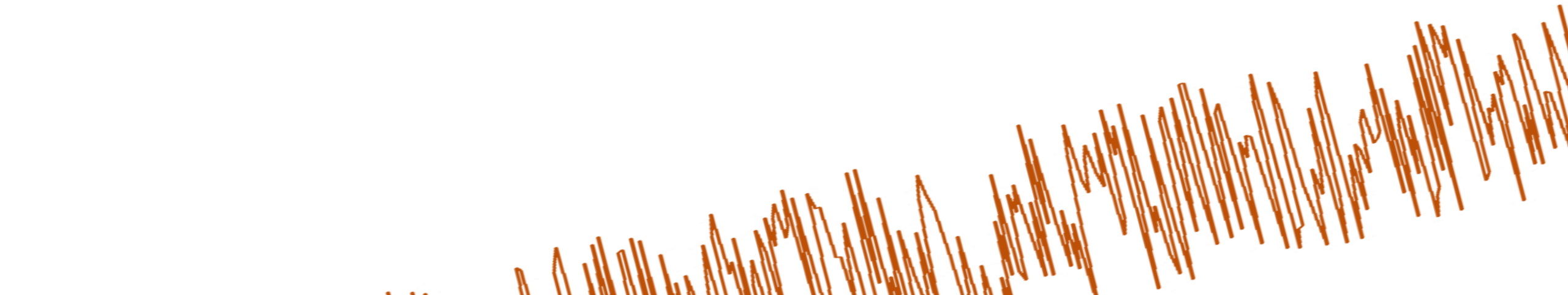
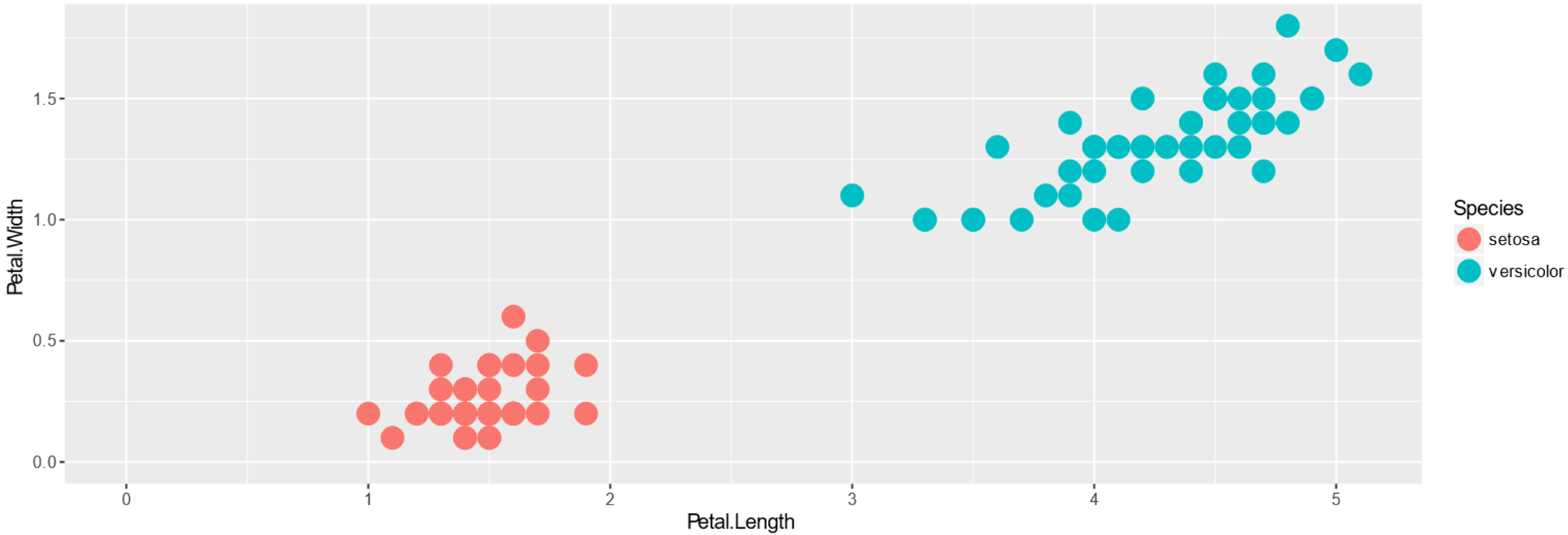
1 december 2017

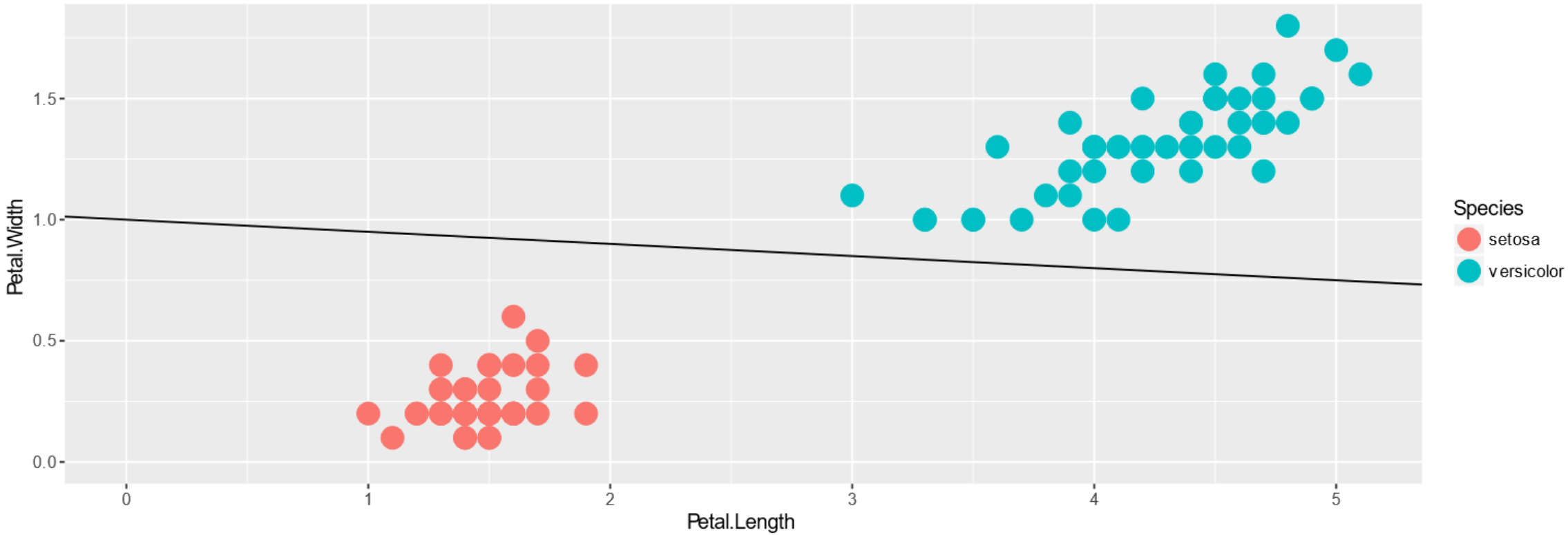


# Lineaire SVM

Vind de lantarenpalen tussen de bloemblaadjes.




Petal.Width
1.5
1.0
0.5
0.0
0
1
2
3
4
5
Petal.Length
Species
setosa
versicolor


Petal.Width
1.5
1.0
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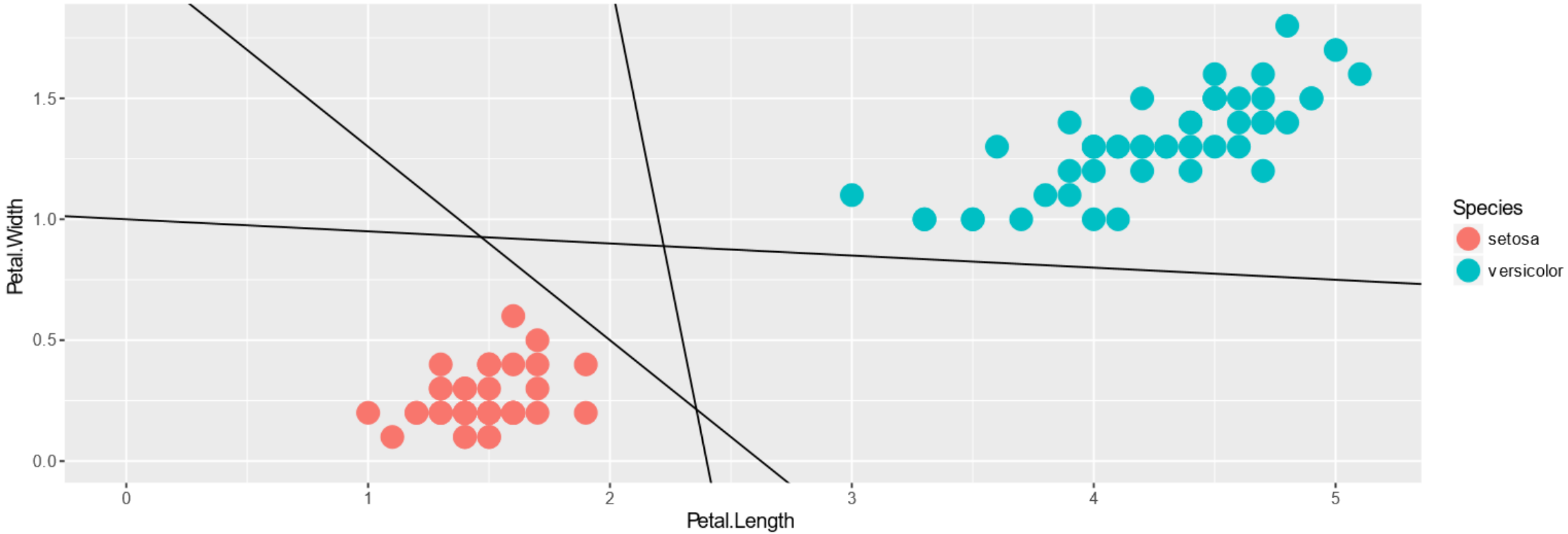
0.0
0
1
2
3
4
5
Petal.Length
Species
setosa
versicolor


Petal.Width
1.5
1.0
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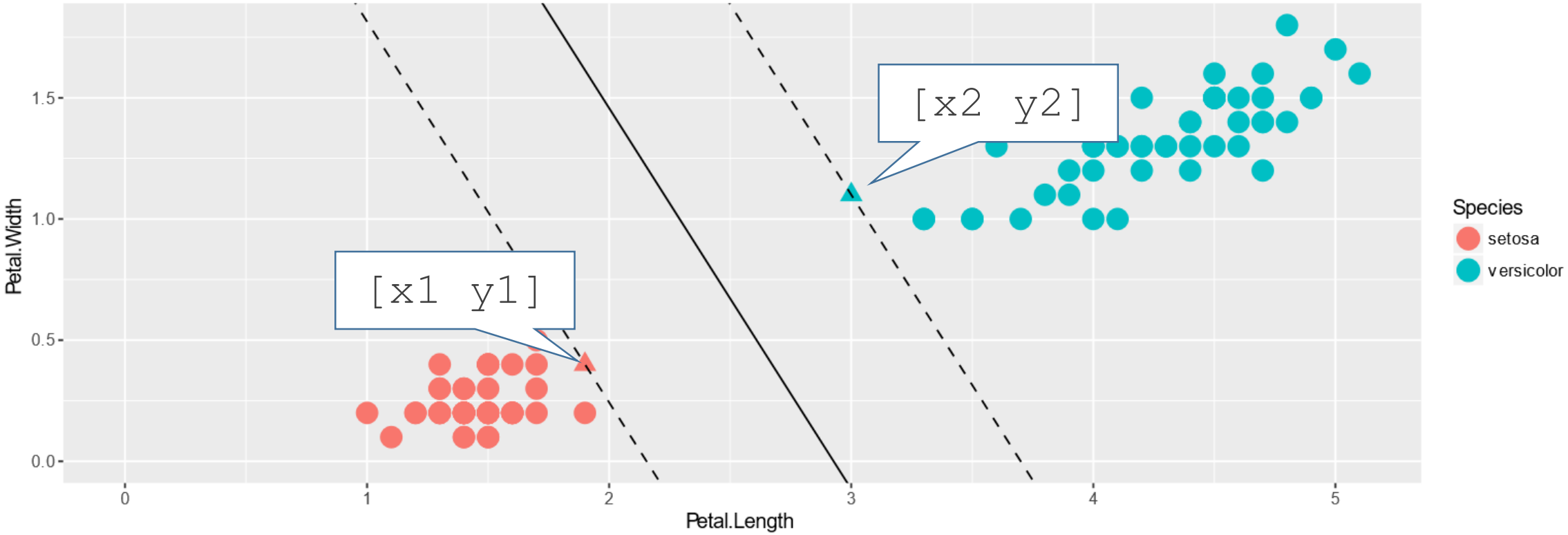
0.0
0
1
2
3
4
5
Petal.Length
Species
setosa
versicolor


[x1 y1]
[x2 y2]
Petal.Width
Petal.Length
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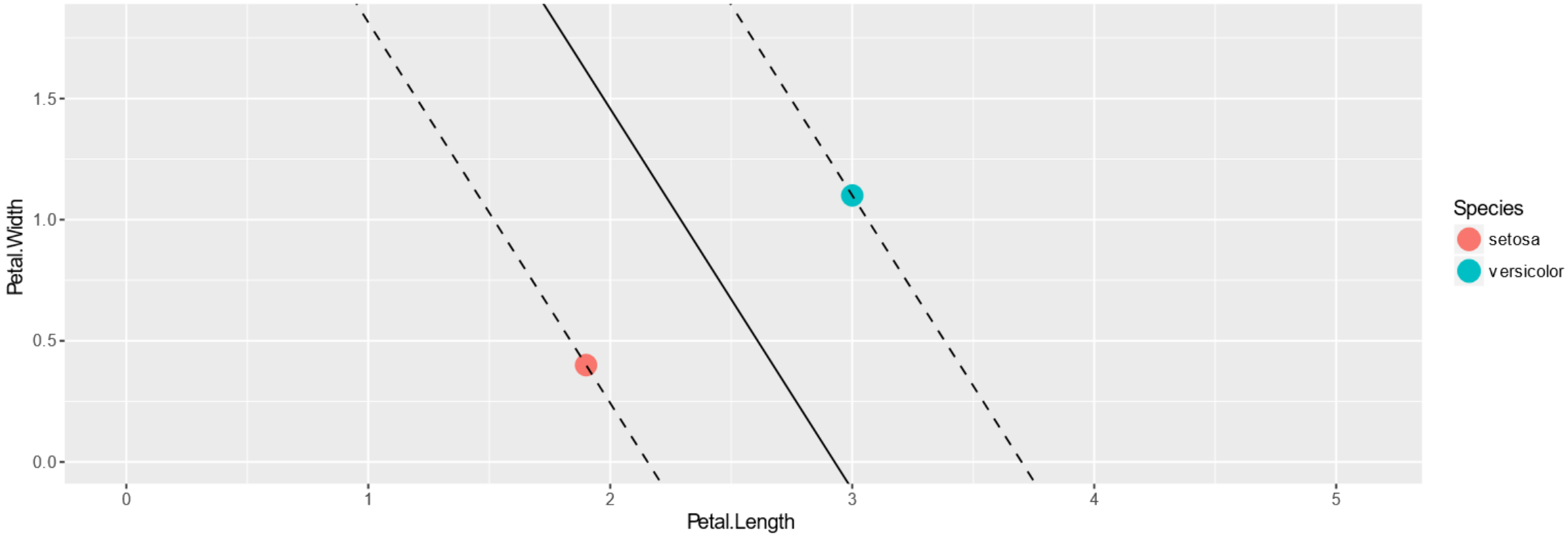
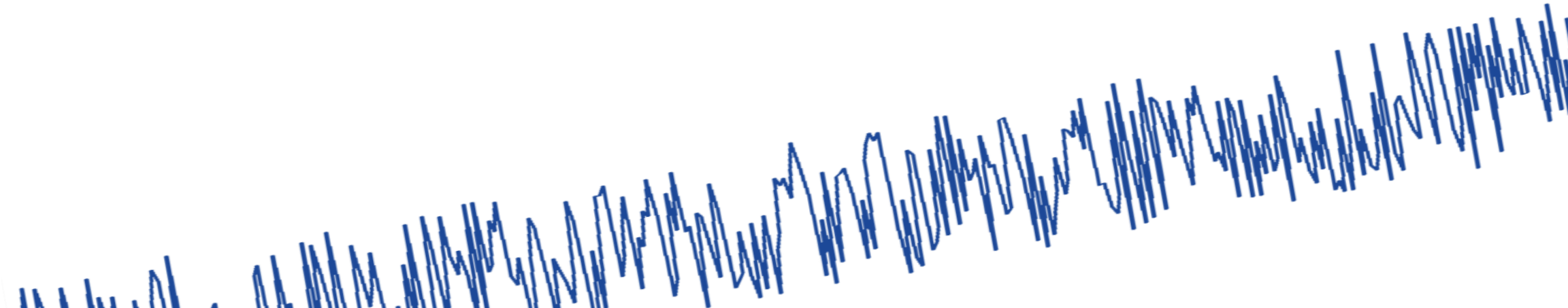
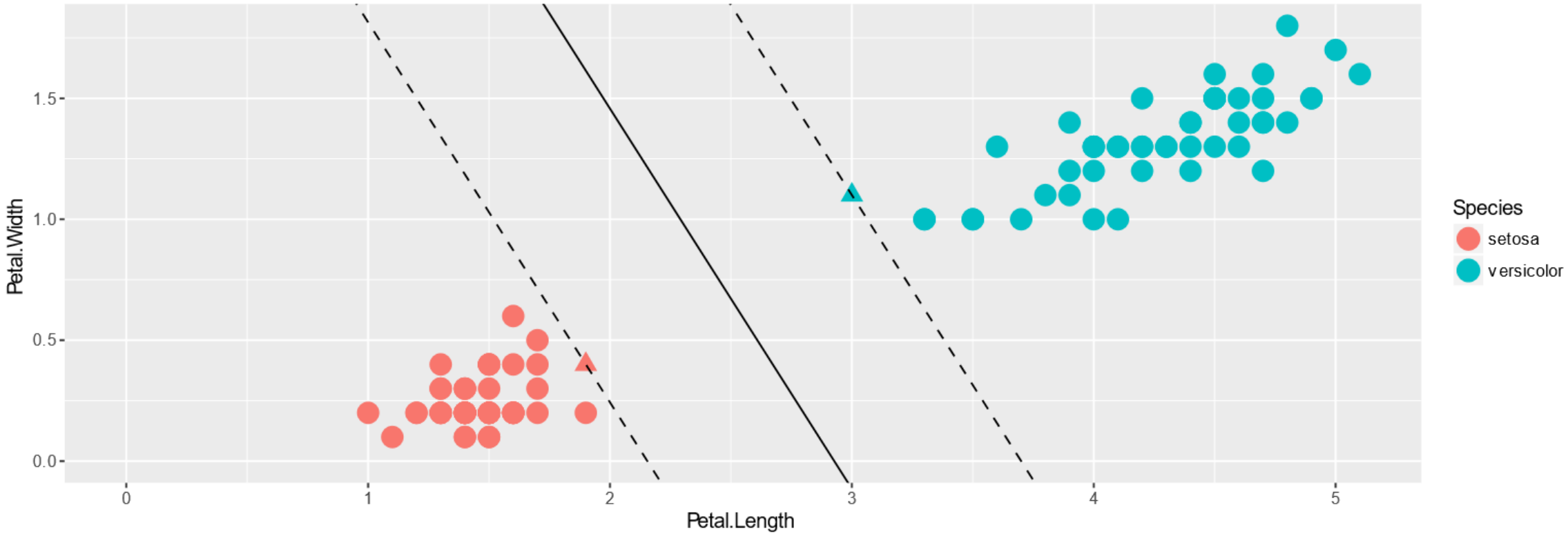
0.5
1.0
1.5
0
1
2
3
4
5
Species
setosa
versicolor


Petal.Width
1.5
1.0
0.5
0.0
0
1
2
3
4
5
Petal.Length
Species
setosa
versicolor

# LET OP!

Tips en aanwijzingen voor een schone straat.




Petal.Width
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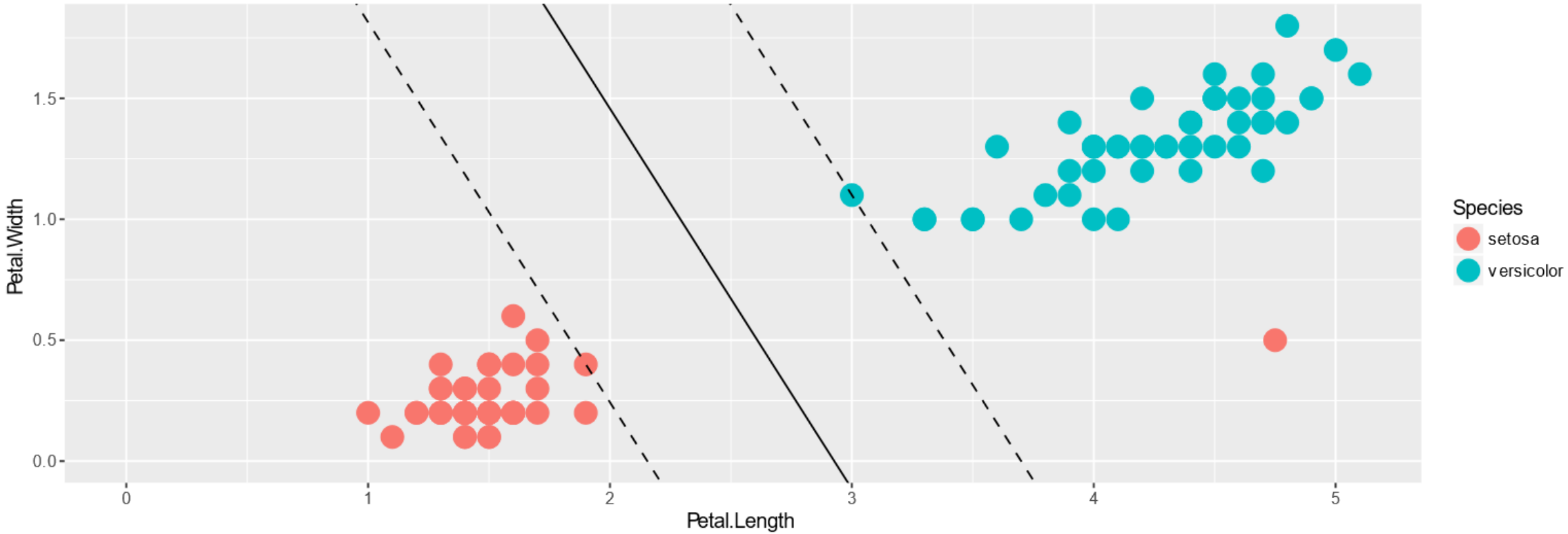
1.0
0.5
0.0
0
1
2
3
4
5
Petal.Length
Species
setosa
versicolor


Petal.Width
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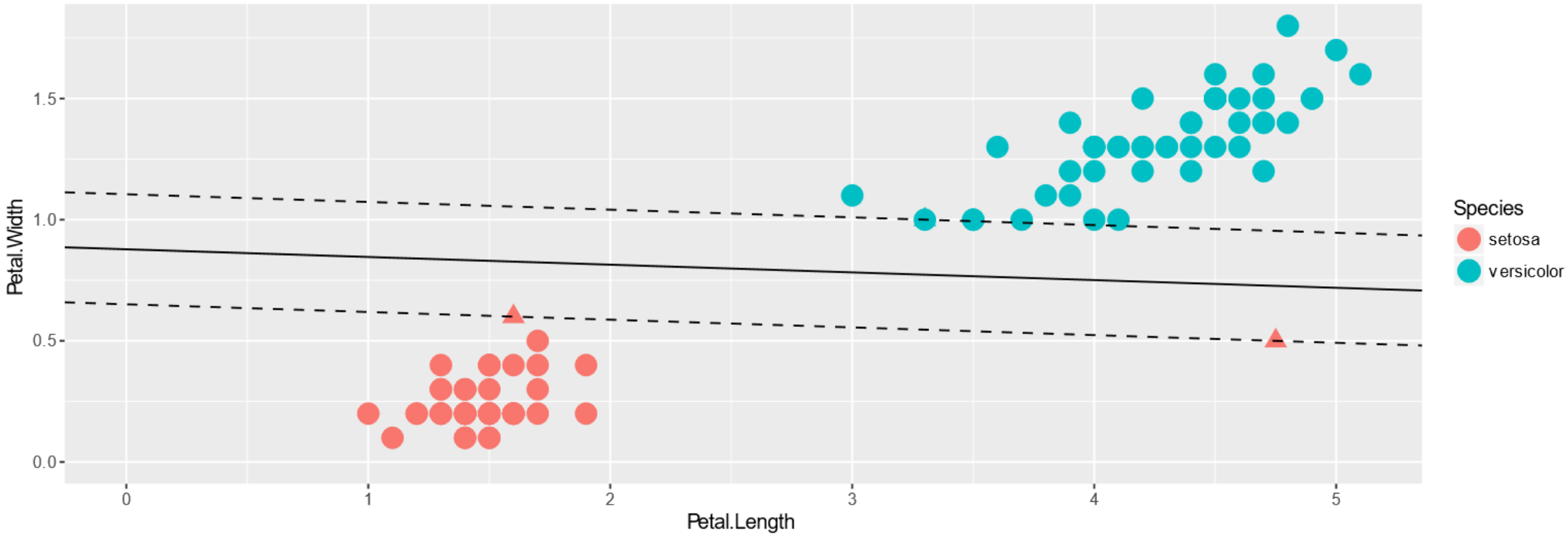
1.0
0.5
0.0
0
1
2
3
4
5
Petal.Length
Species
setosa
versicolor


Petal.Width
1.5
1.0
0.5
0.0
0
1
2
3
4
5
Petal.Length
Species
setosa
versicolor

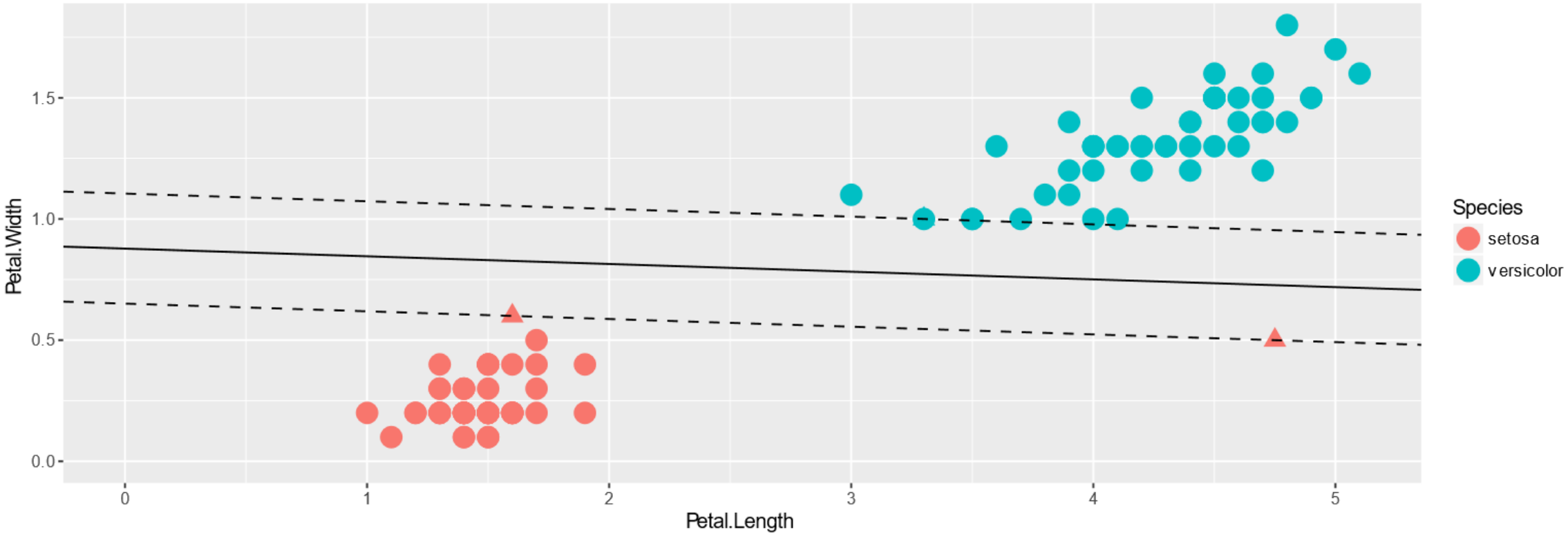
# Hyper-Parameters:

# C

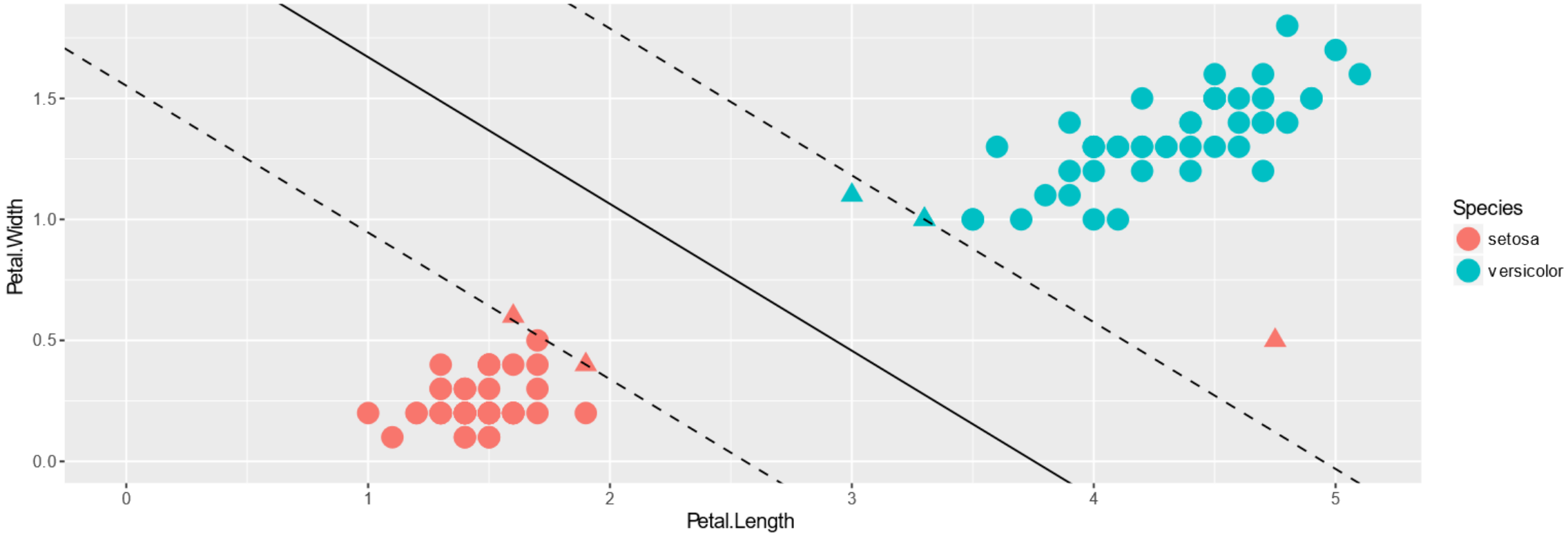
1. Ik wil een zo breed mogelijke marge;
2. Ik wil zo min mogelijk punten in die marge hebben.

- C is het belang van (2) ten opzichte van (1)
- Hoge C: meer bias
- Lage C: meer variance

C = 100

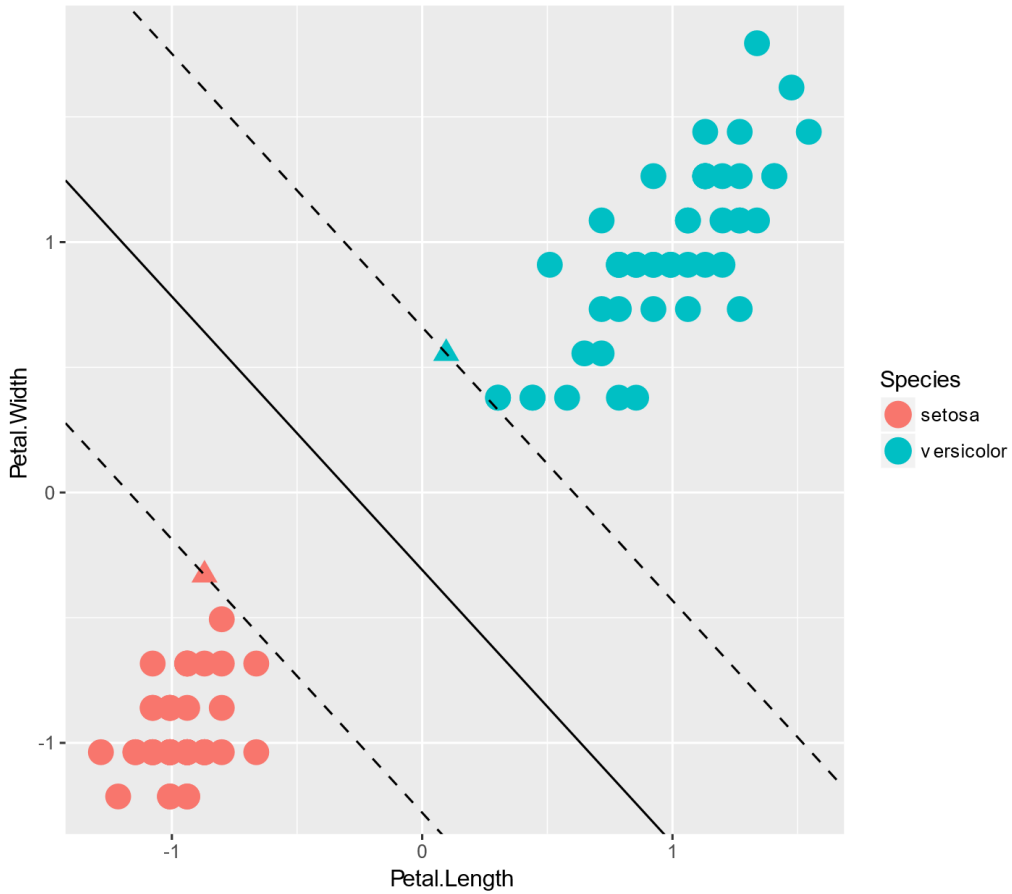

Petal.Width
1.5
1.0
0.5
0.0
0
1
2
3
4
5
Petal.Length
Species
setosa
versicolor

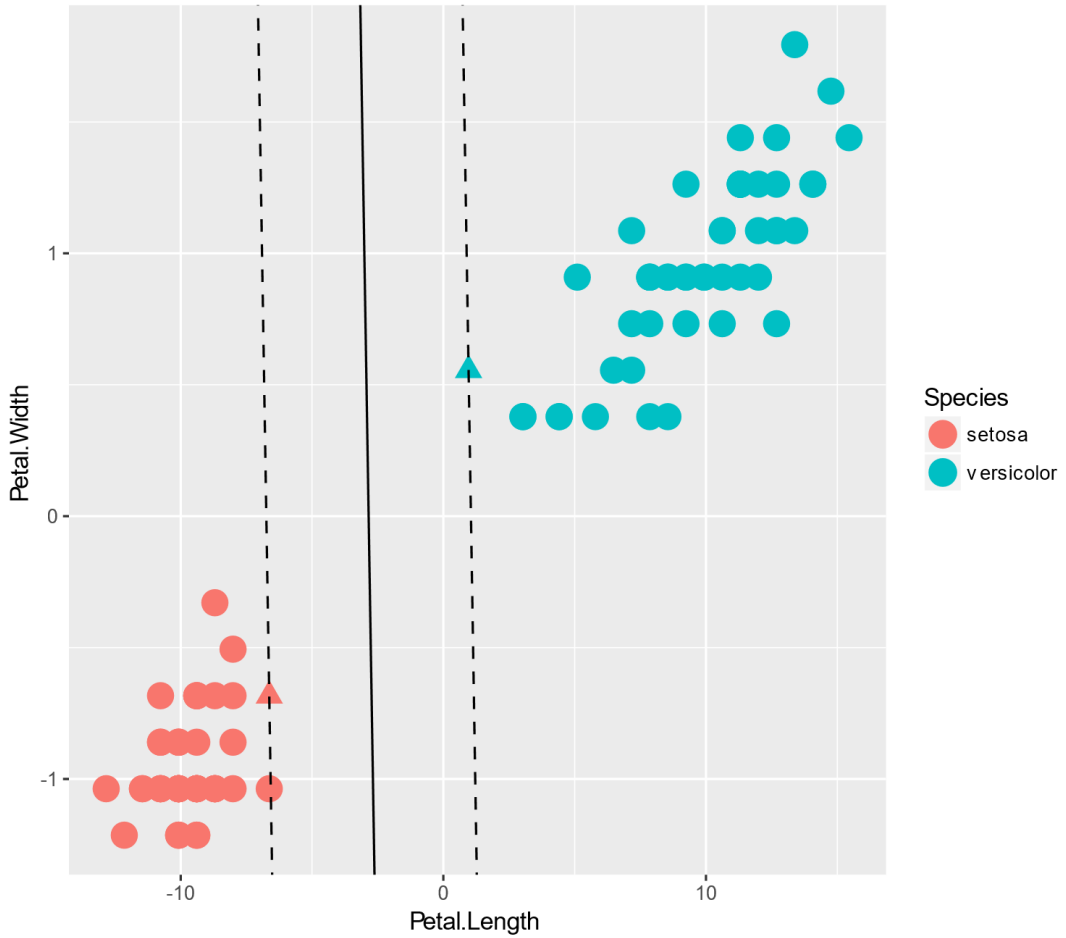
C = 1


Petal.Width
1.5
1.0
0.5
0.0
0
1
2
3
4
5
Petal.Length
Species
setosa
versicolor

# En dan nog dit:

# Scaling


Petal.Width
Petal.Length
1
0
-1
-1
0
1
Species
setosa
versicolor


Petal.Width
Petal.Length
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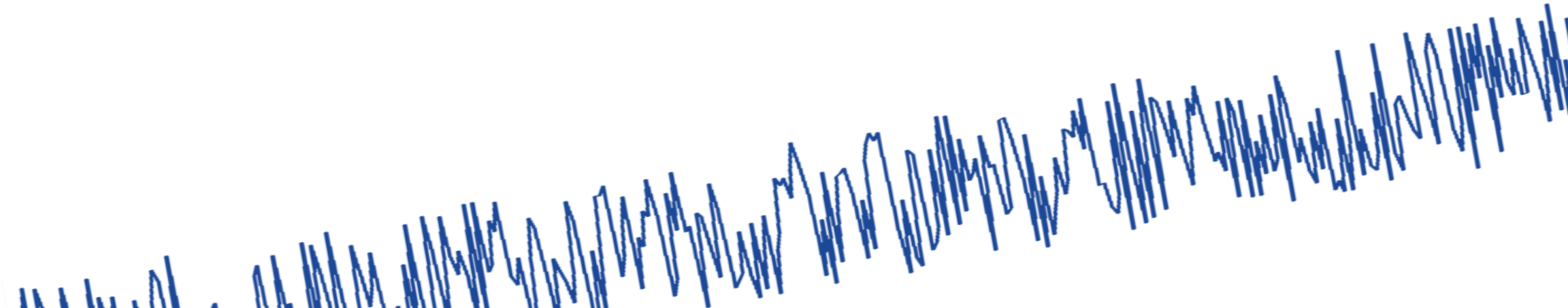
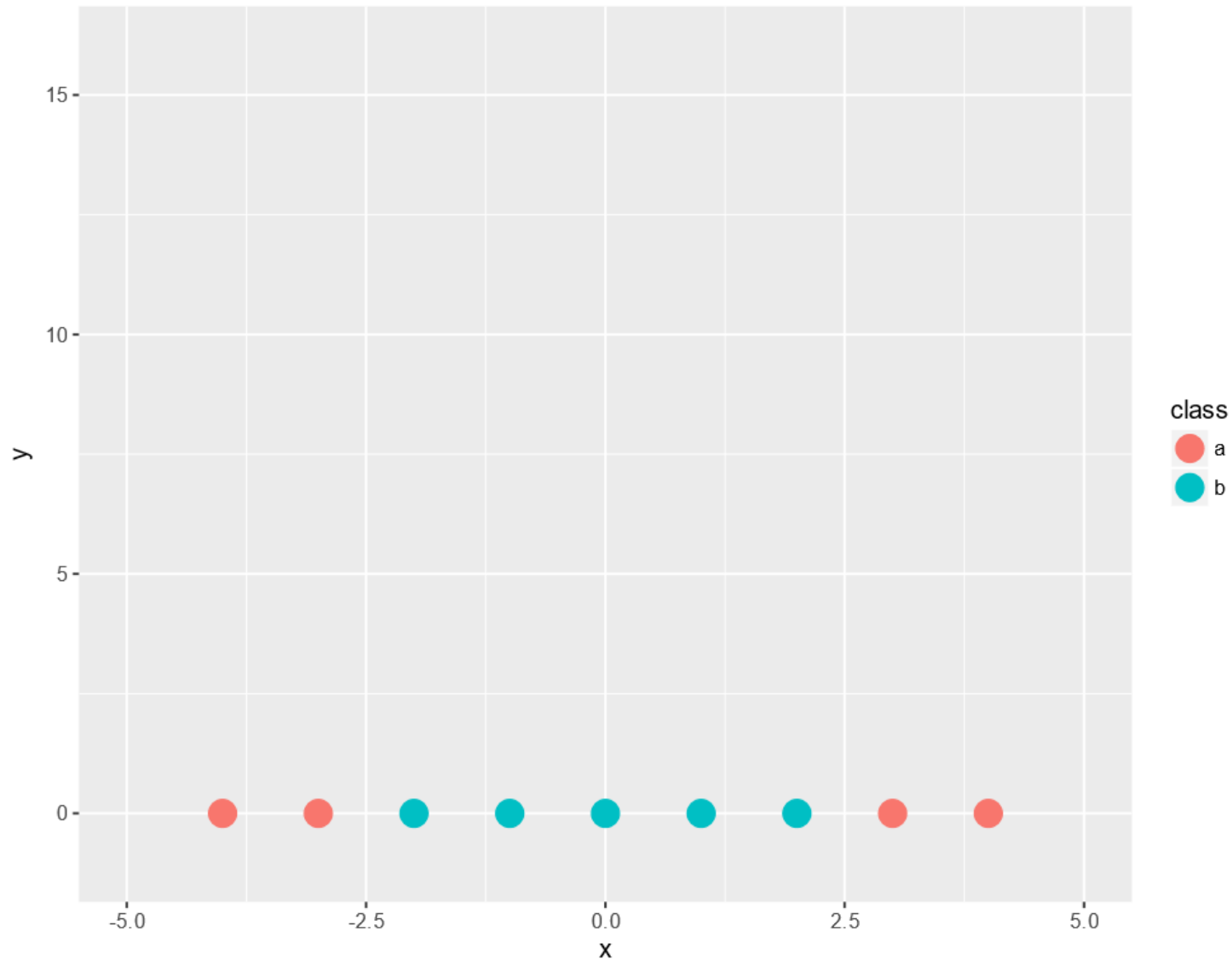
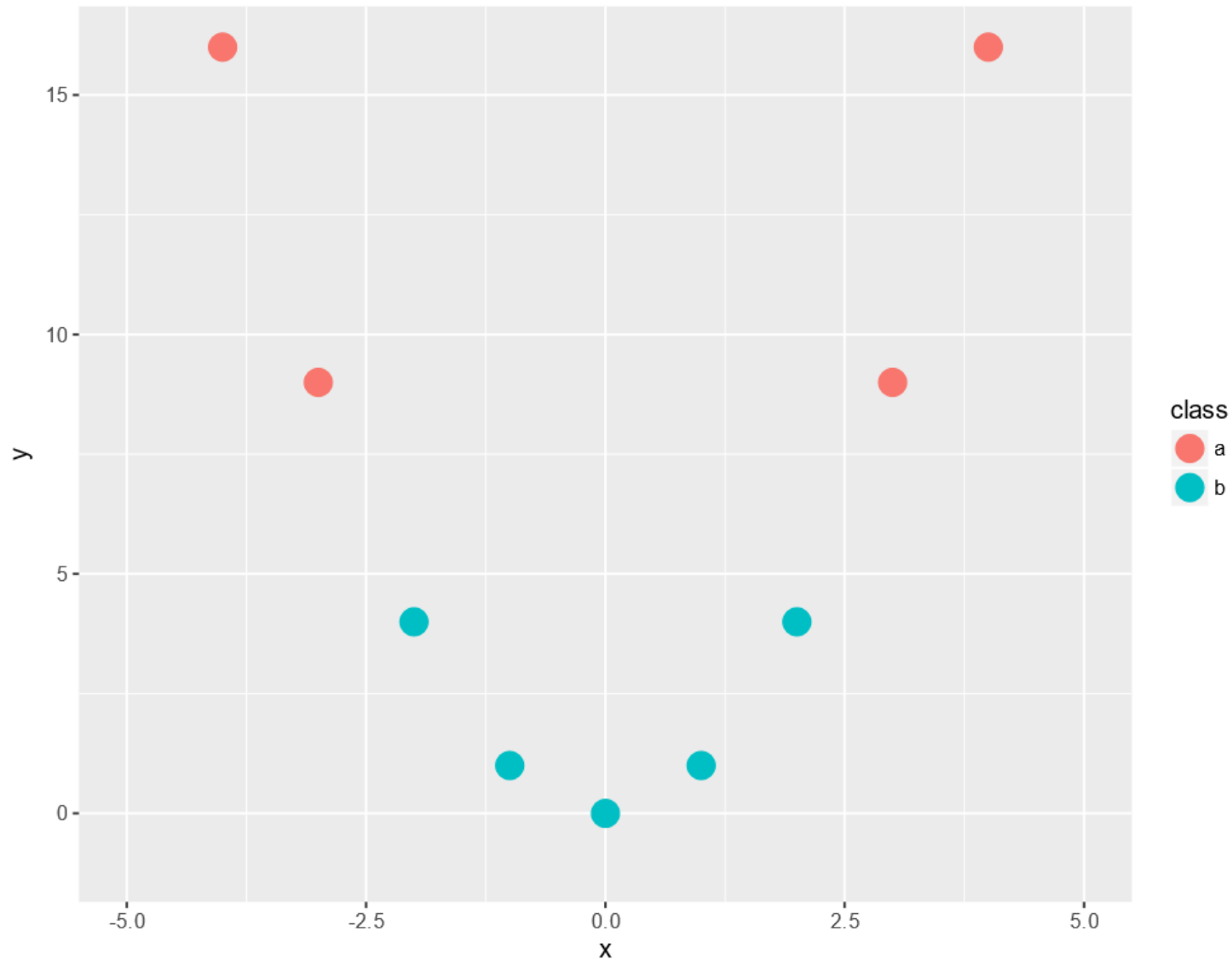
0
-1
-10
0
10
Species
setosa
versicolor

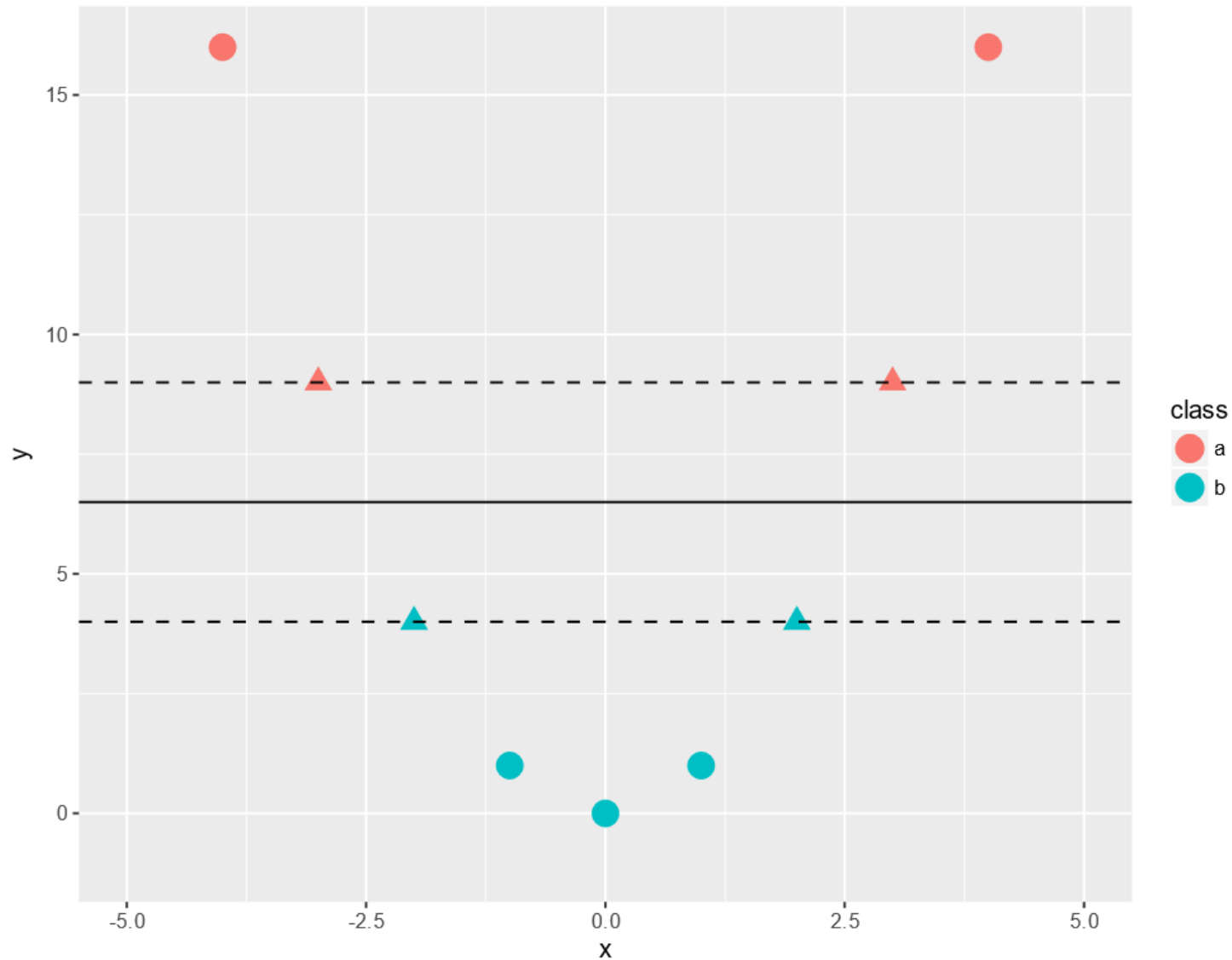
# Kernels

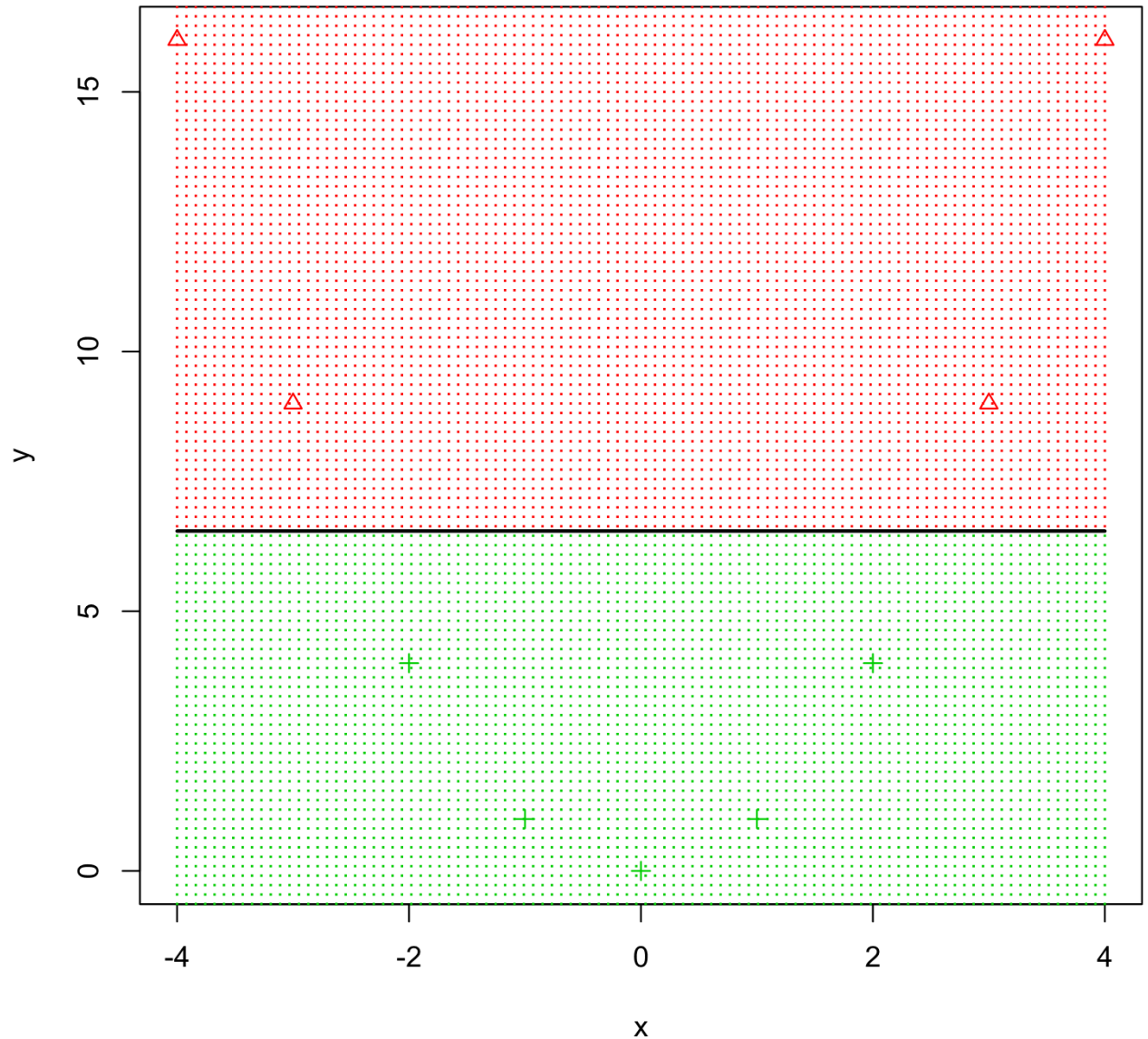
Lantarenpalen in oneindig veel dimensies.

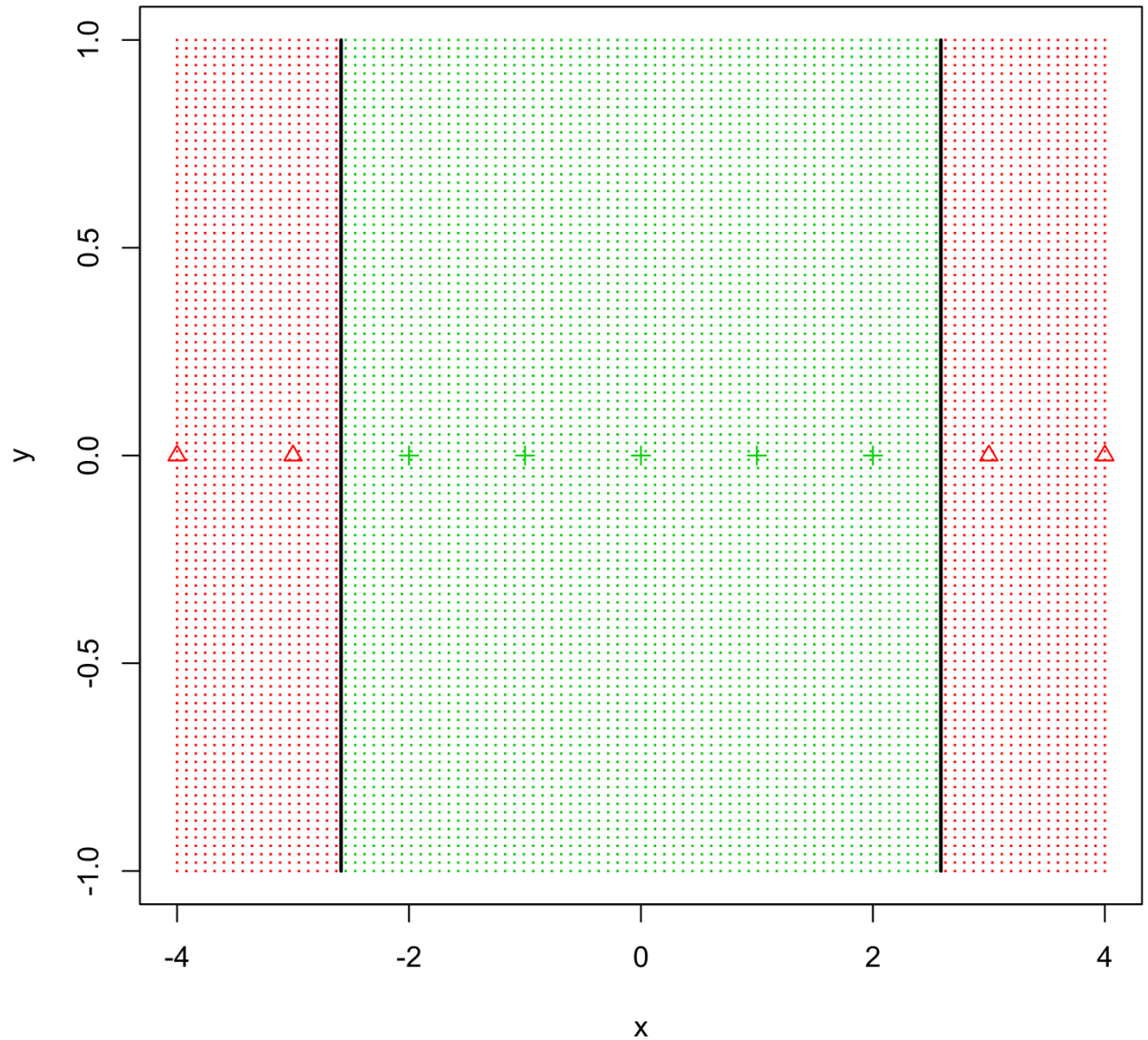



15
10
5
0
y
-5.0
-2.5
0.0
2.5
5.0
x
class
a
b


15
10
5
0
y
-5.0
-2.5
0.0
2.5
5.0
x
class
a
b


15
10
5
0
y
-5.0
-2.5
0.0
2.5
5.0
x
class
a
b


y
15
10
5
0
-4
-2
0
2
4
x


1.0
0.5
0.0
-0.5
-1.0
y
-4
-2
0
2
4
x

# Hyper-Parameters:

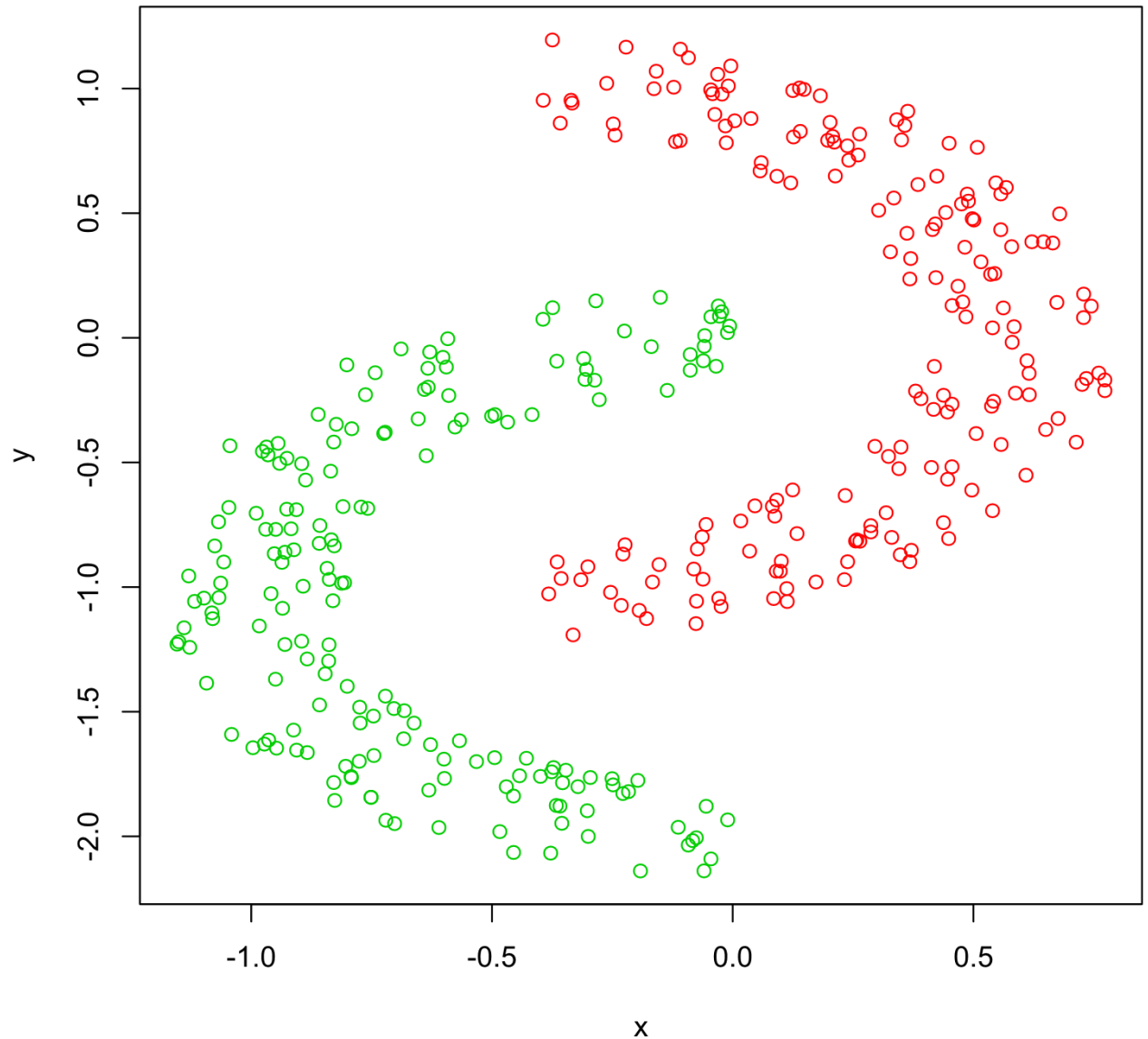
# degree

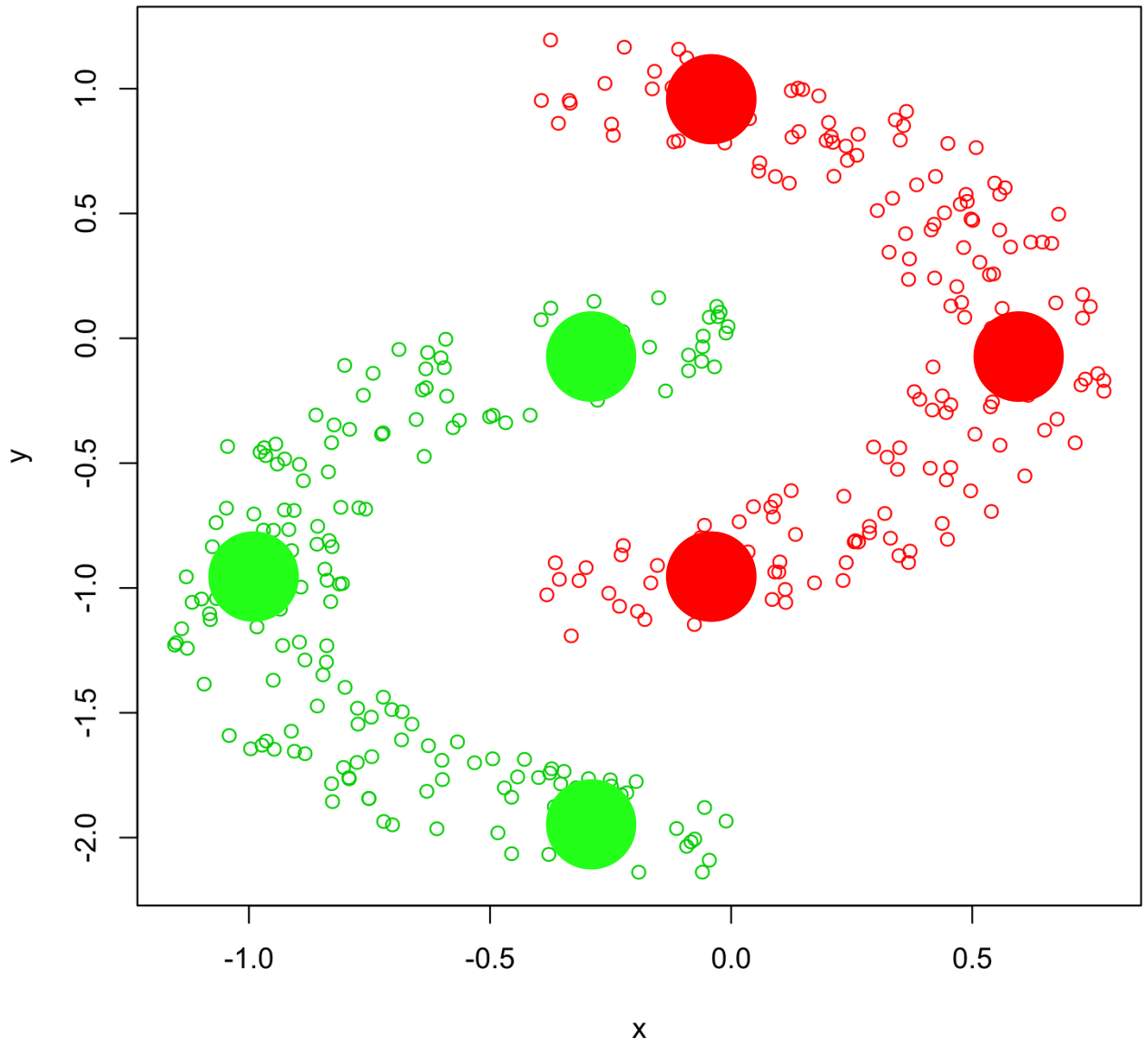
- De graad van de polynomische transformatie
- Daarom ook alleen van belang bij een polynomische kernel
- Transformaties van hogere graad zijn meer gevoelig voor overfit

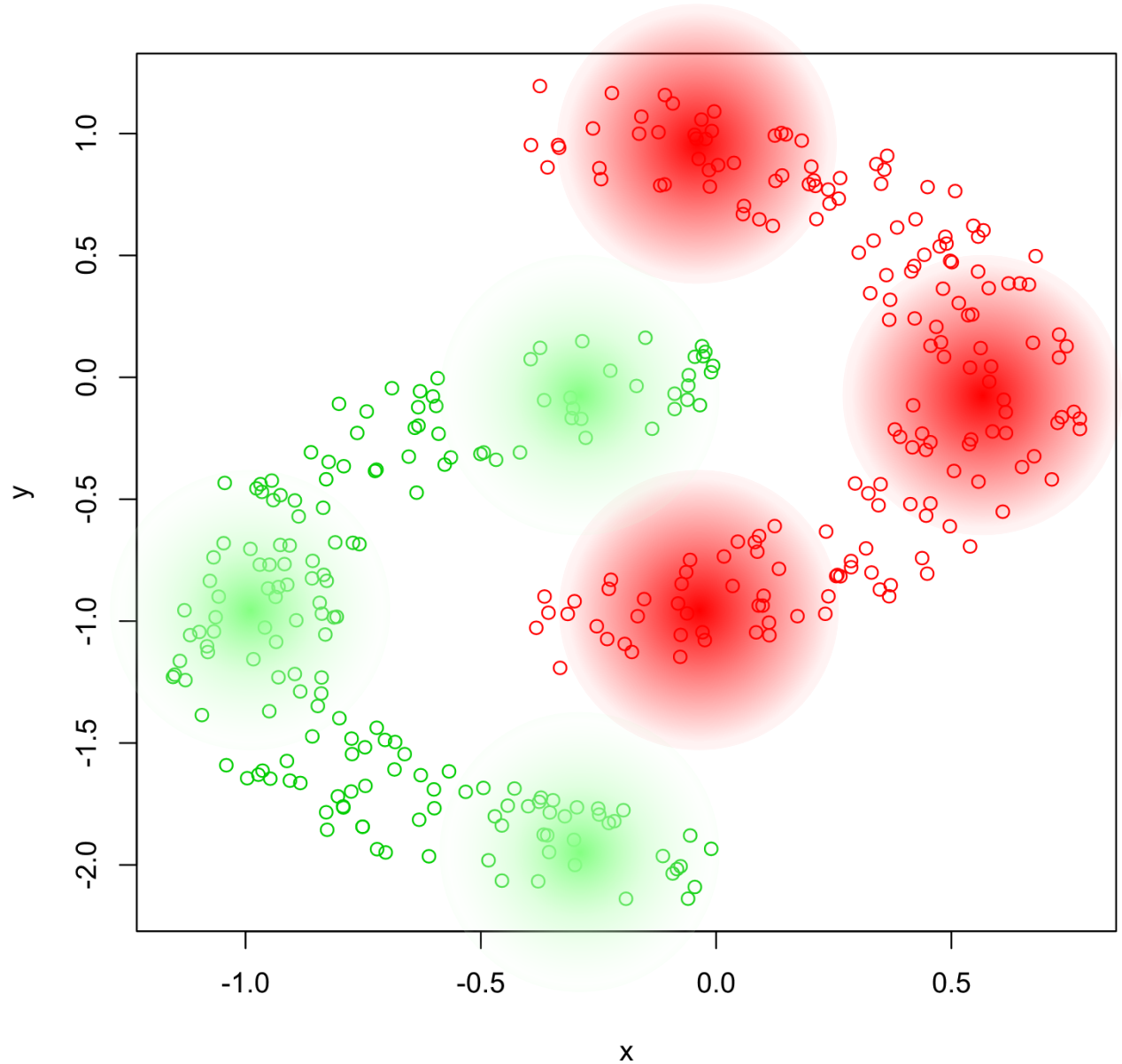
# Hyper-Parameters:

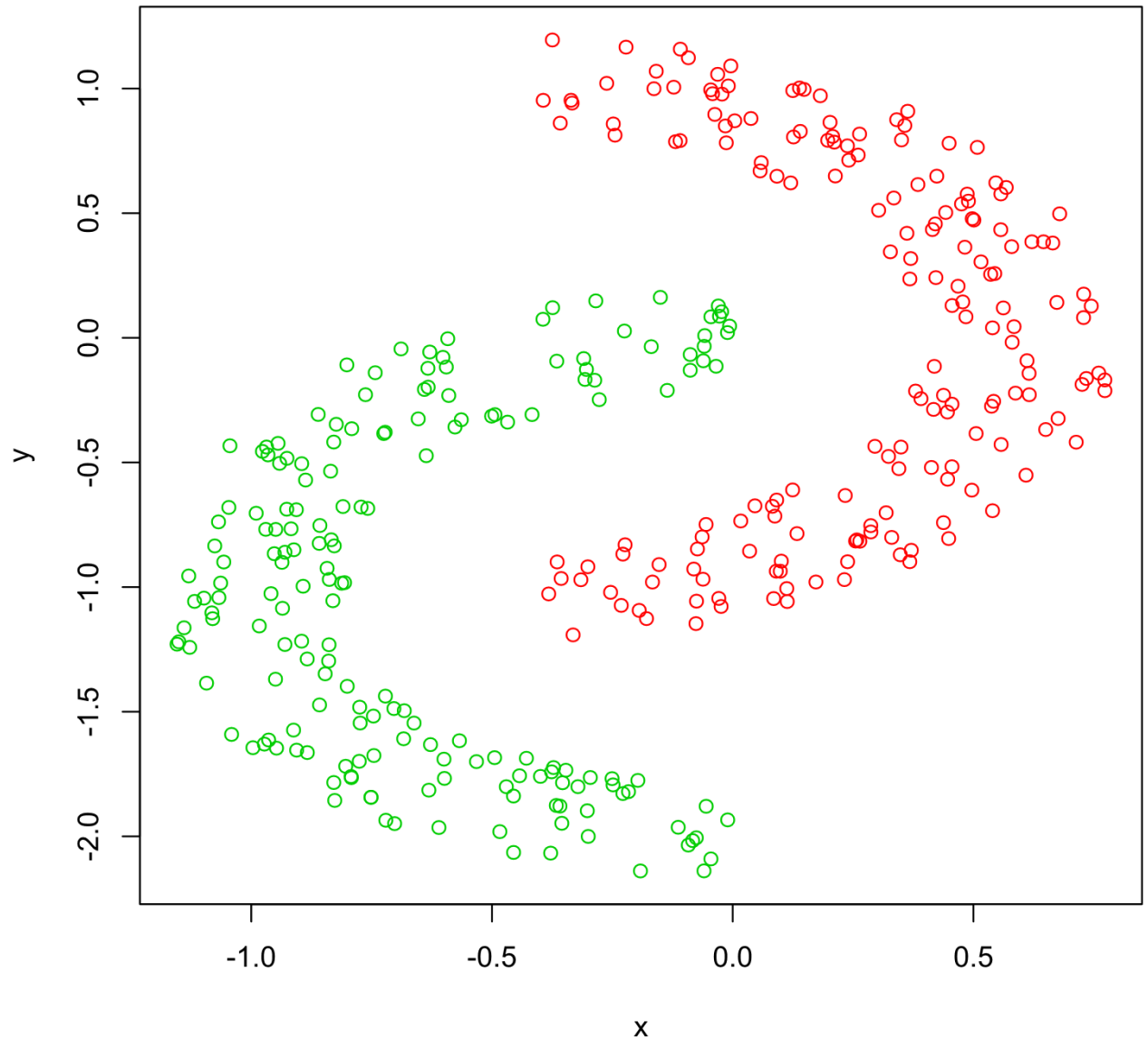
# coef0

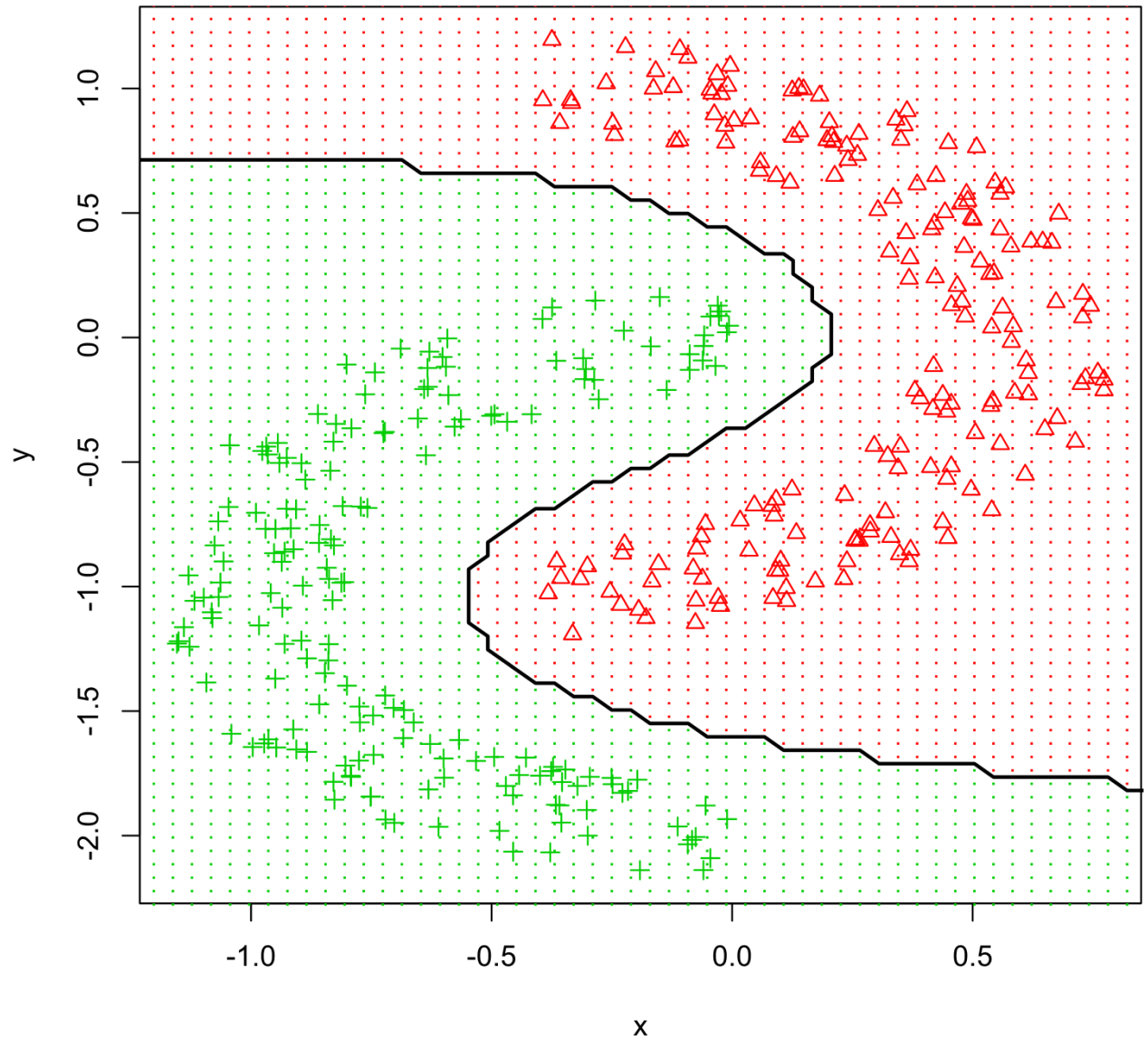
- Verhouding tussen hoge en lage-graad polynomen
- Hoge coef0 betekent gevoeliger voor overfit


y
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-1.0
-0.5
0.0
0.5
x


1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
y
-1.0
-0.5
0.0
0.5
x


1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
y
-1.0
-0.5
0.0
0.5
x


y
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-1.0
-0.5
0.0
0.5
x

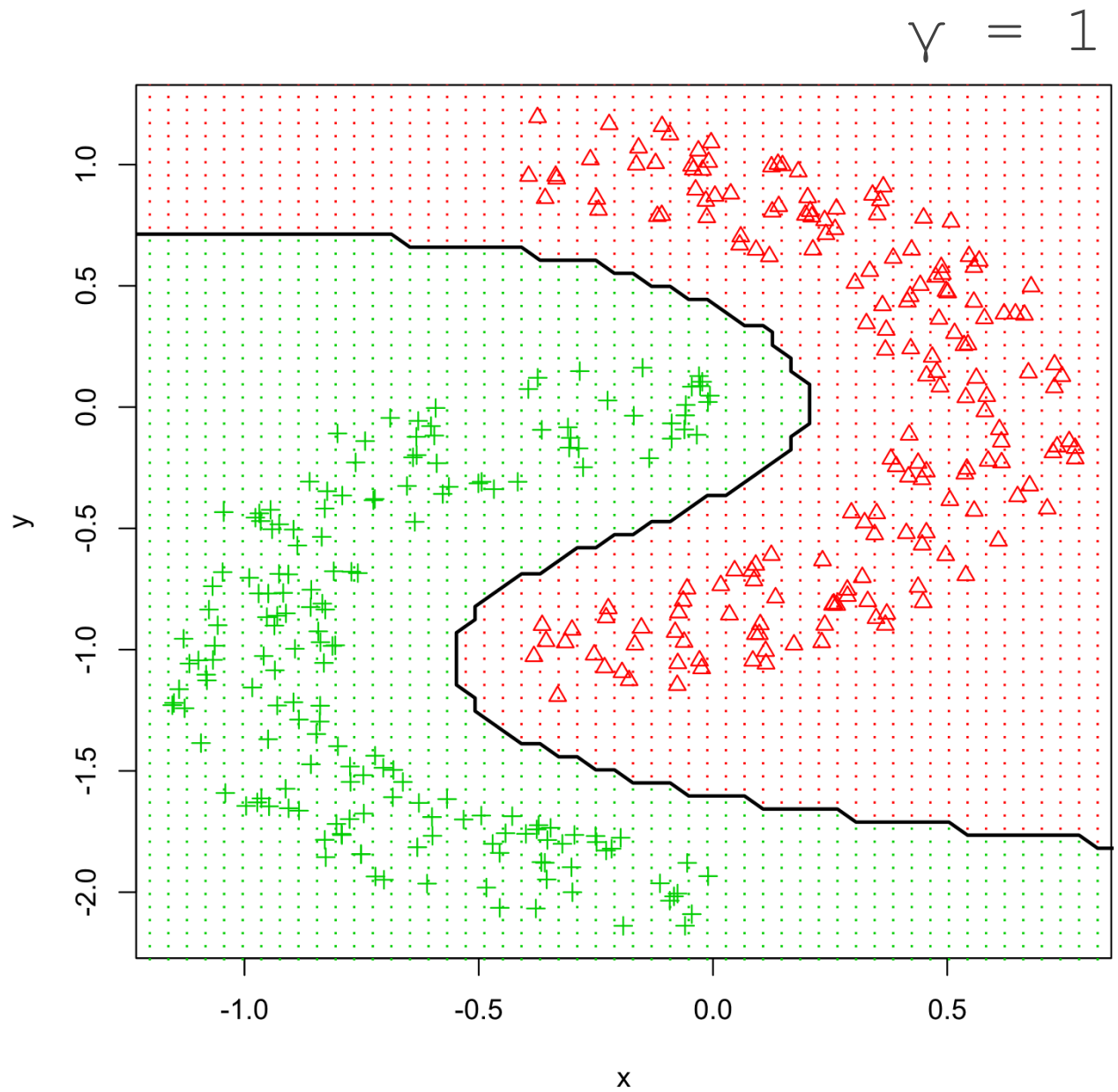

1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
y
-1.0
-0.5
0.0
0.5
x

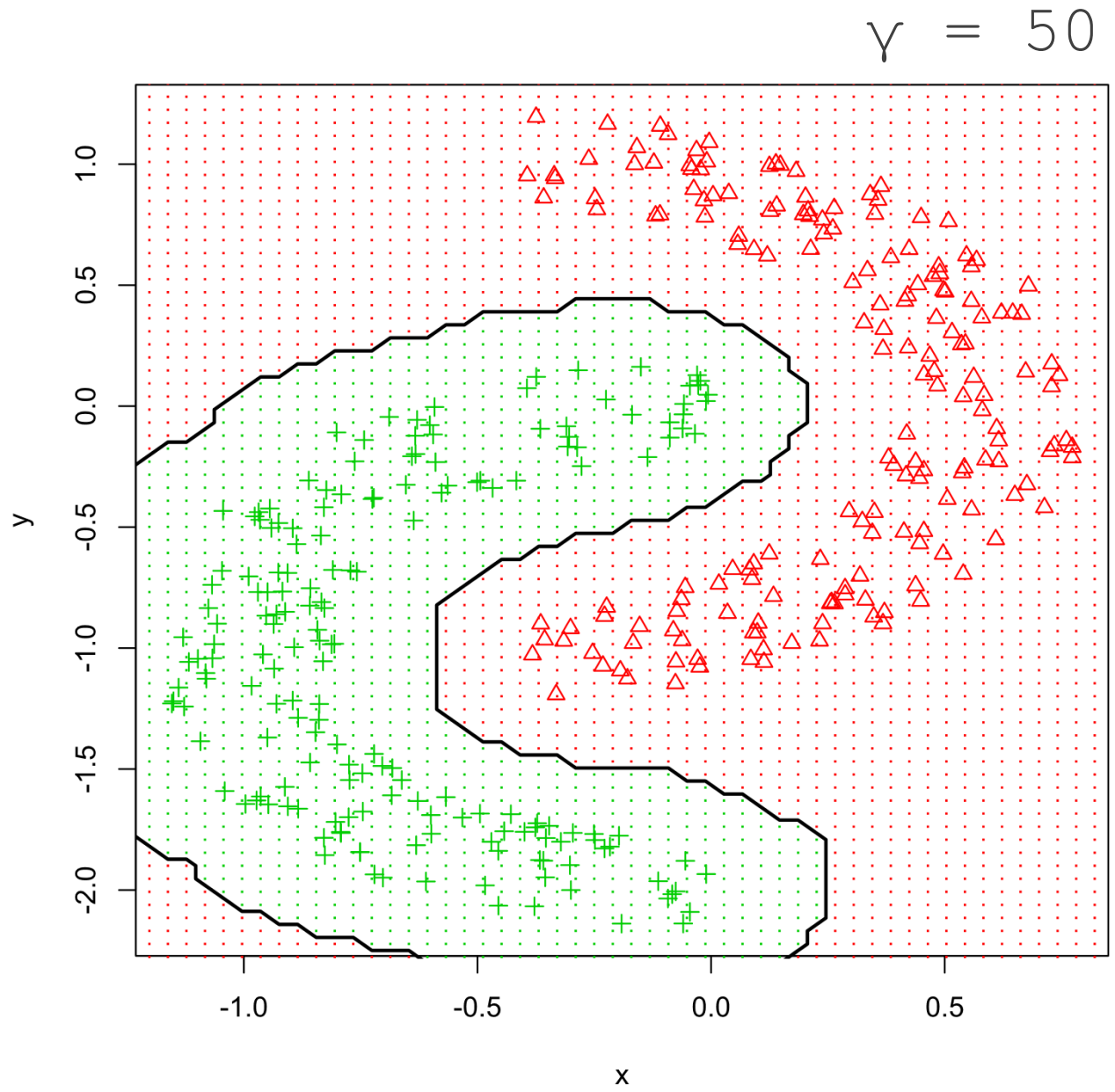
# Hyper-Parameters:

# γ

- Hoe ver telt een punt nog mee?
- (d.w.z. de breedte van de Gaussische verdeling)

- Hoge γ: kleine reikwijdte, overfitting
- Kleine γ: grote reikweidte, underfitting


γ = 1
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
y
-1.0
-0.5
0.0
0.5
x


γ = 50
y
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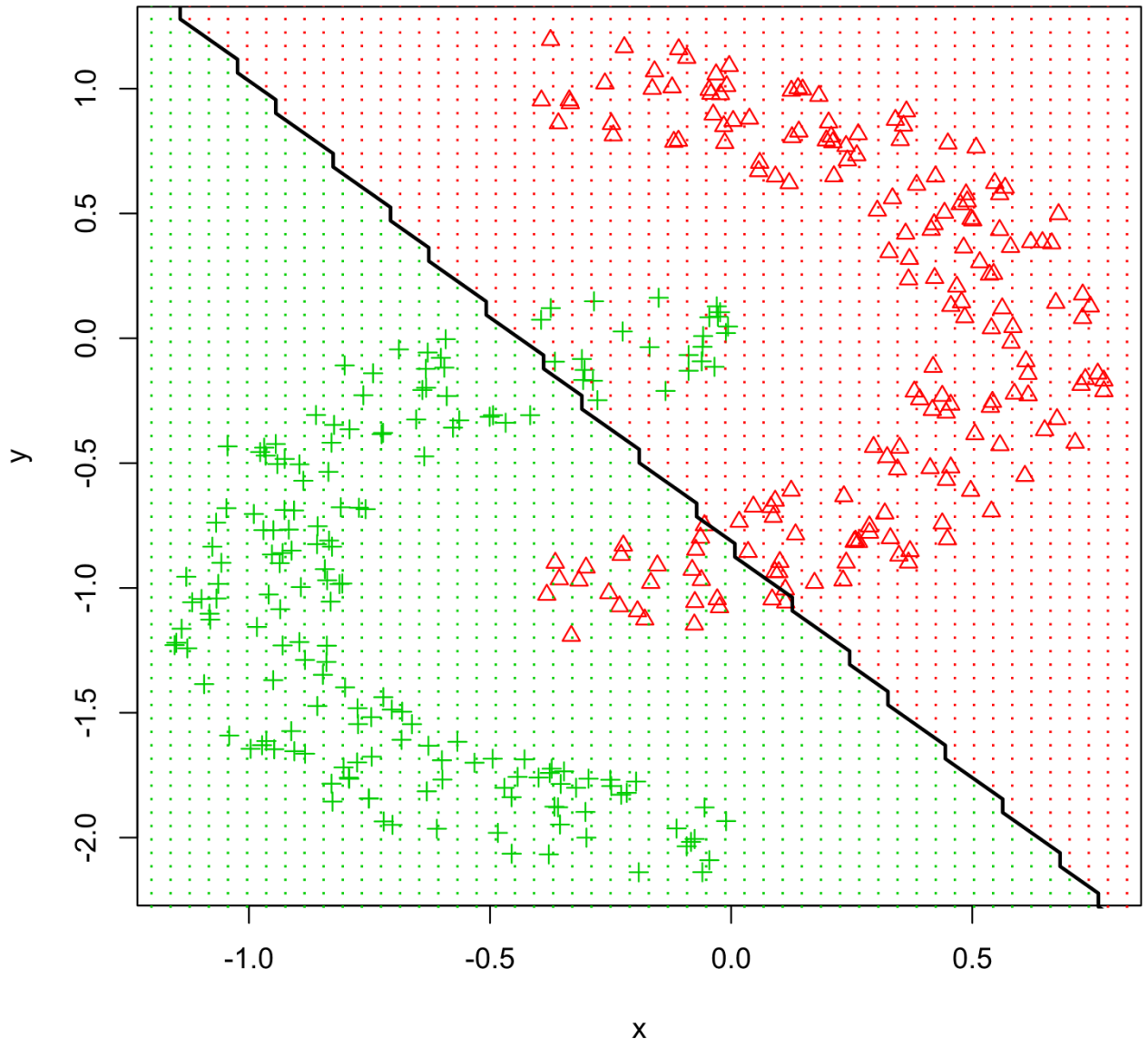
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-1.0
-0.5
0.0
0.5
x

$\gamma = 0,01$



# Introductie Support Vector Machines

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1 december 2017