Online Course on Machine Learning, Deep Learning and Neural Networks

Day 3

Conducted by

Mr. Anupam Borthakur

Prime Minister's Research Fellows (PMRF)

Centre of Excellence in Artificial Intelligence
Indian Institute Of Technology, Kharagpur

Bapatla Engineering College, India

#iitKLIV

Kharagpur Learning, Imaging and
Visualization Research Group
www.iitkliv.github.io

Agenda

1. Recap of Supervised Learning

2. Introduction to Support Vector Machine (SVM)

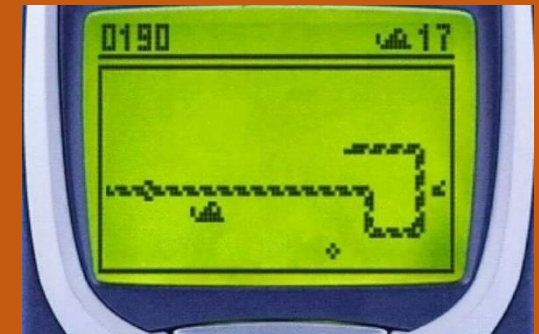3. Code implementation of that

Types of Machine Learning

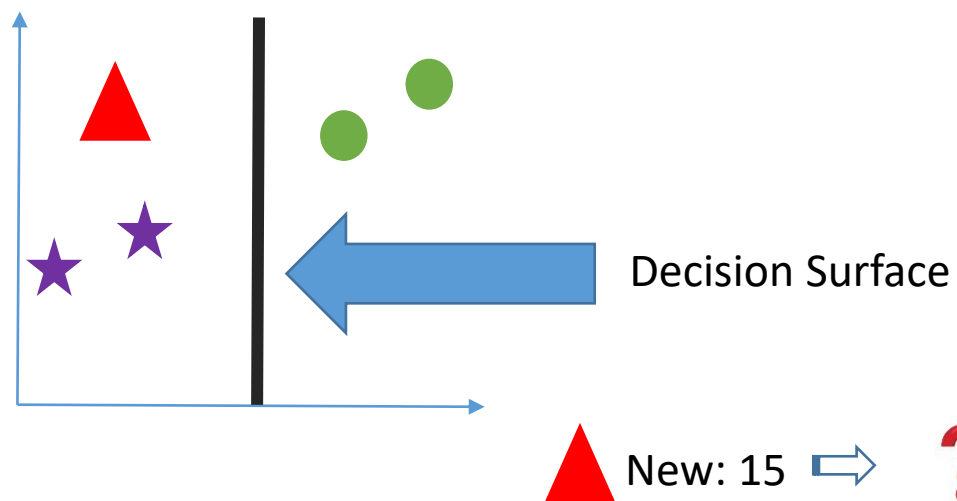

Supervised Learning

Un-supervised Learning

Reinforcement Learning

https://in.pinterest.com/pin/257690409914685423/

https://stock.adobe.com/in/images/teacher-pulling-her-student-ear/164847519

Supervised

Age	Class
14	T
24	A
17	T
30	A

Teenager (T)
Adult (A)

Decision Surface

New: 15 ❓

Unsupervised

Age
14
24
17
30

Find patterns
- Groups
- Clusters

Simple Structure of a Database
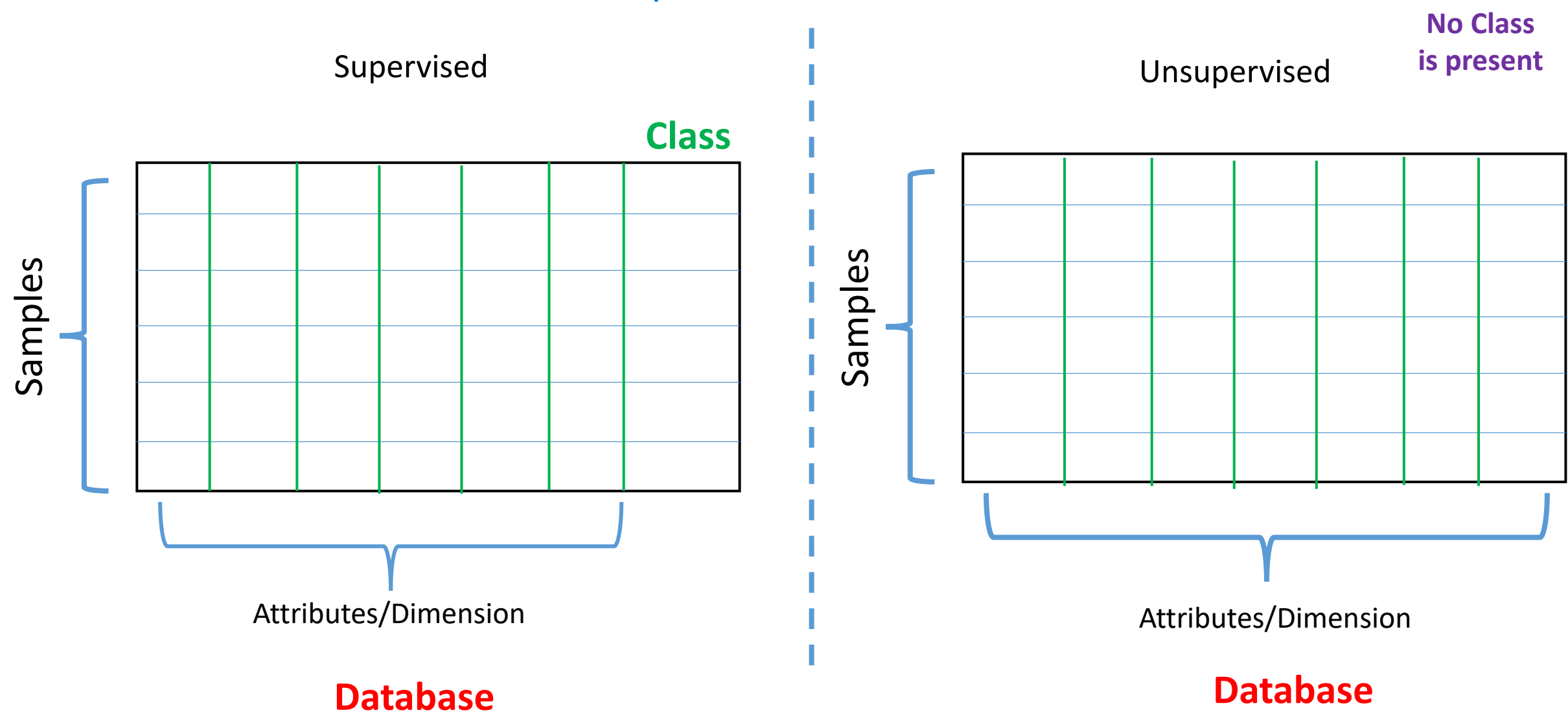
Supervised
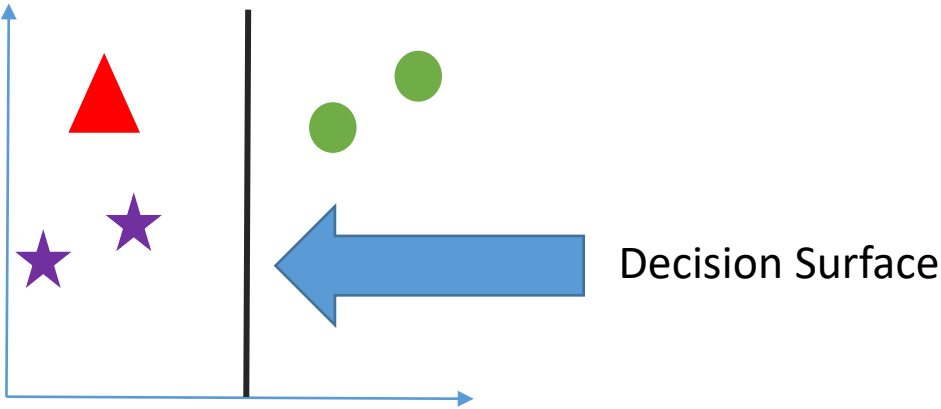
Unsupervised

No Class
is present

Class

Samples

Samples

Attributes/Dimension

Attributes/Dimension

Database

Database

Supervised

	Age	Class
★	14	T
●	24	A
★	17	T
●	30	A

Decision Surface

Types of Supervised Learning

Supervised Learning

Classification

Regression

Types of Supervised Learning

Supervised Learning

Classification

Regression

Output having labels(discrete value)

output having continuous value.

Age	Class
14	T
24	A
17	T
30	A

Classification

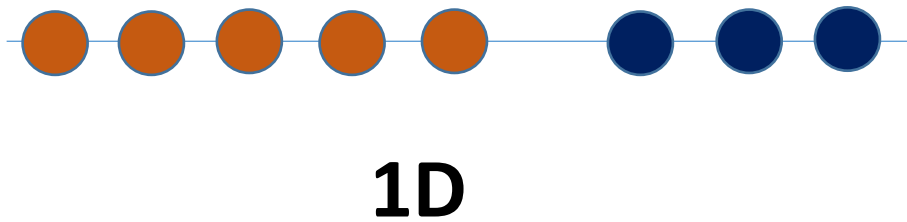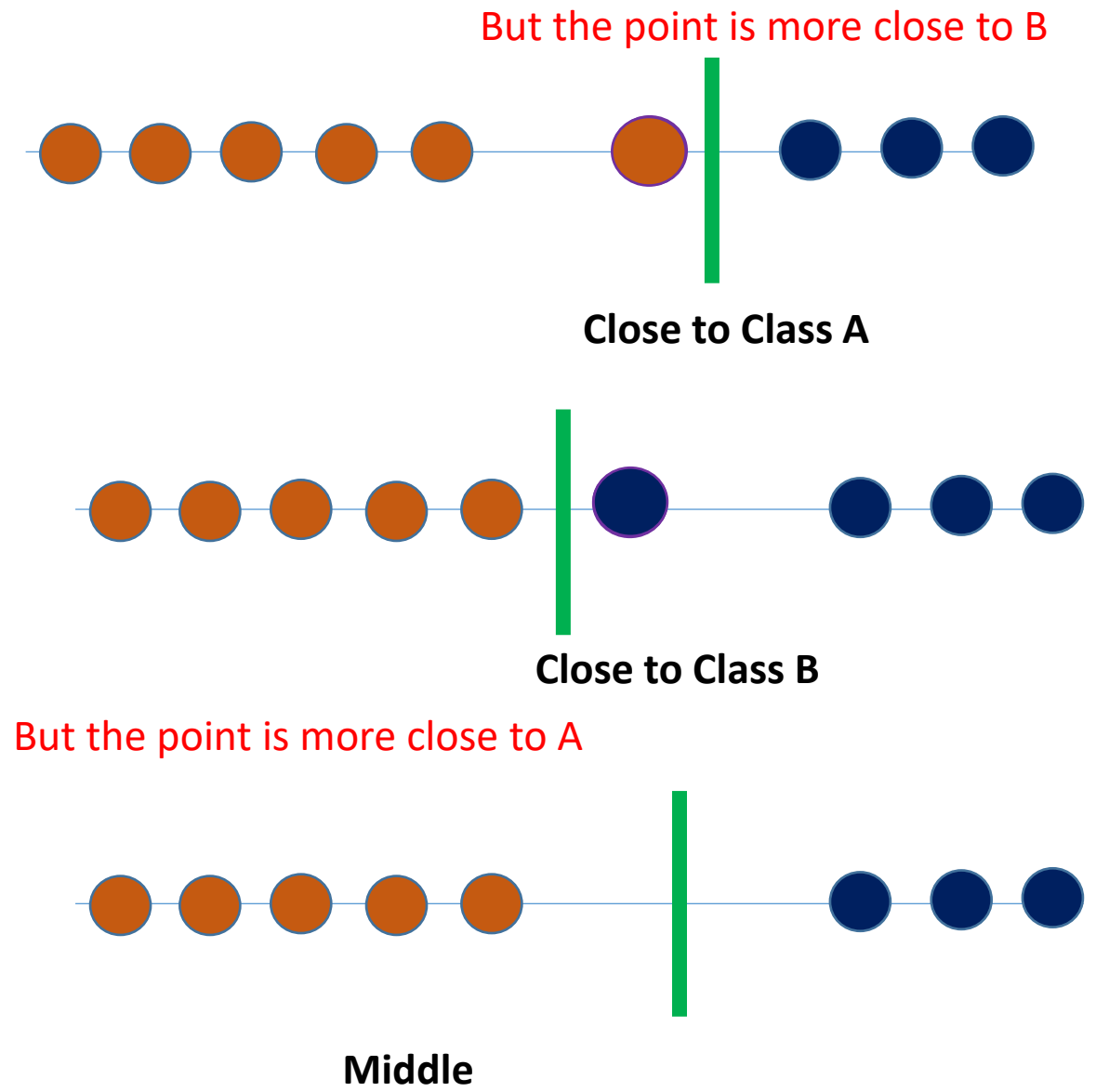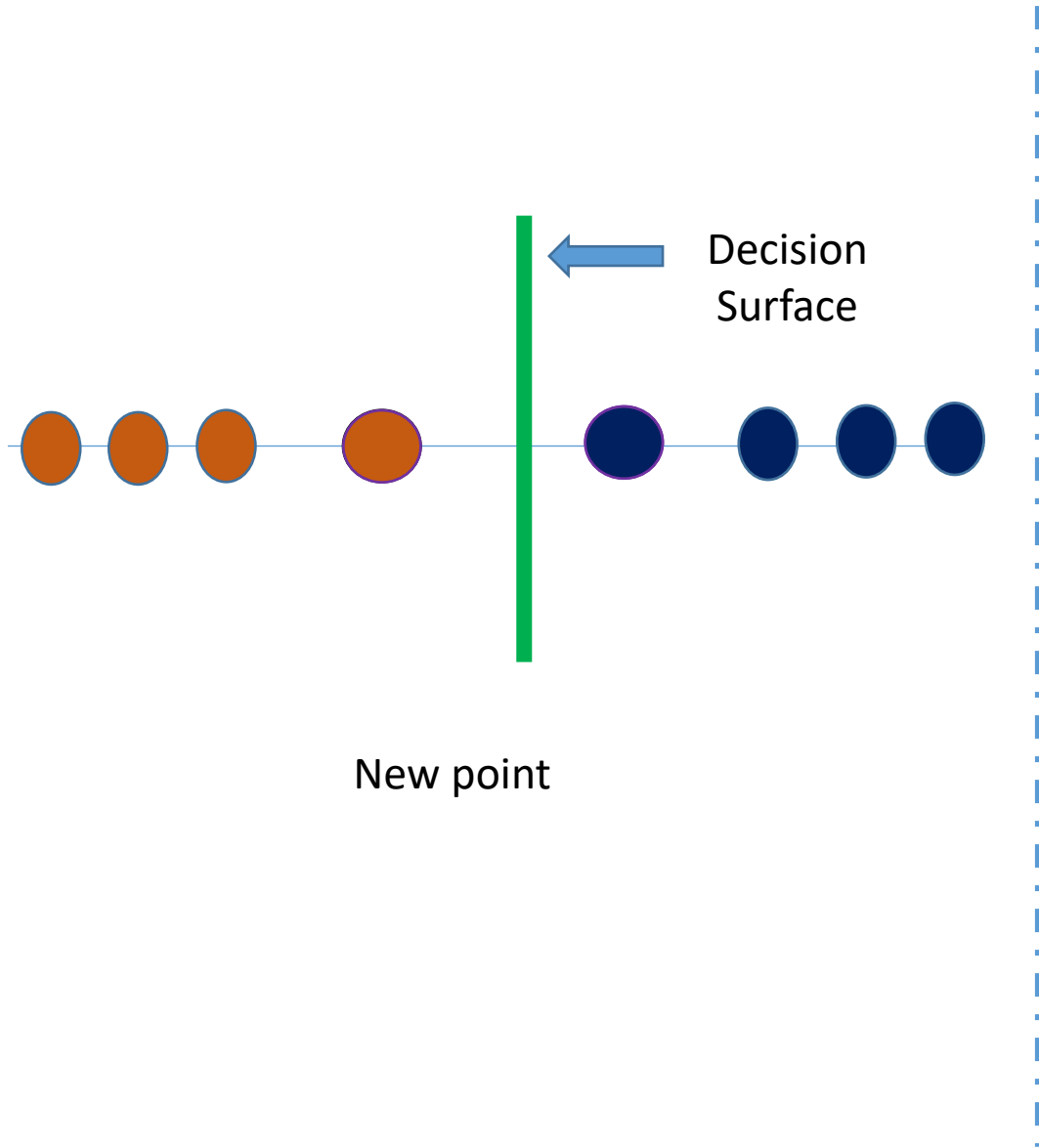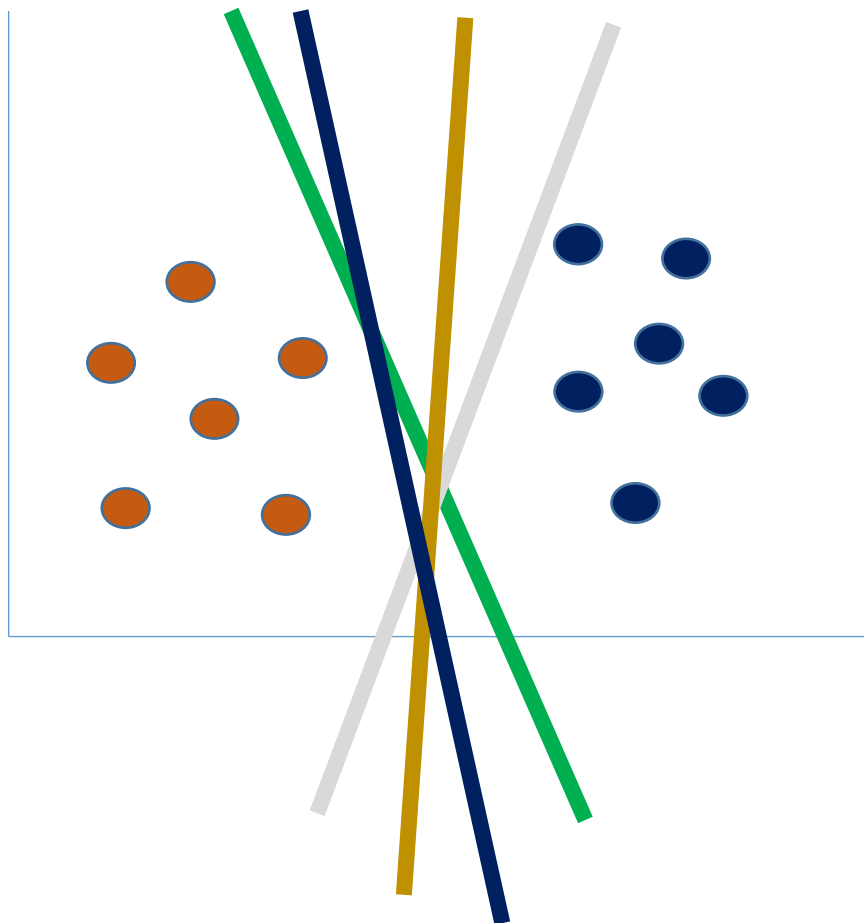## Simple Training Pipeline of Machine Learning
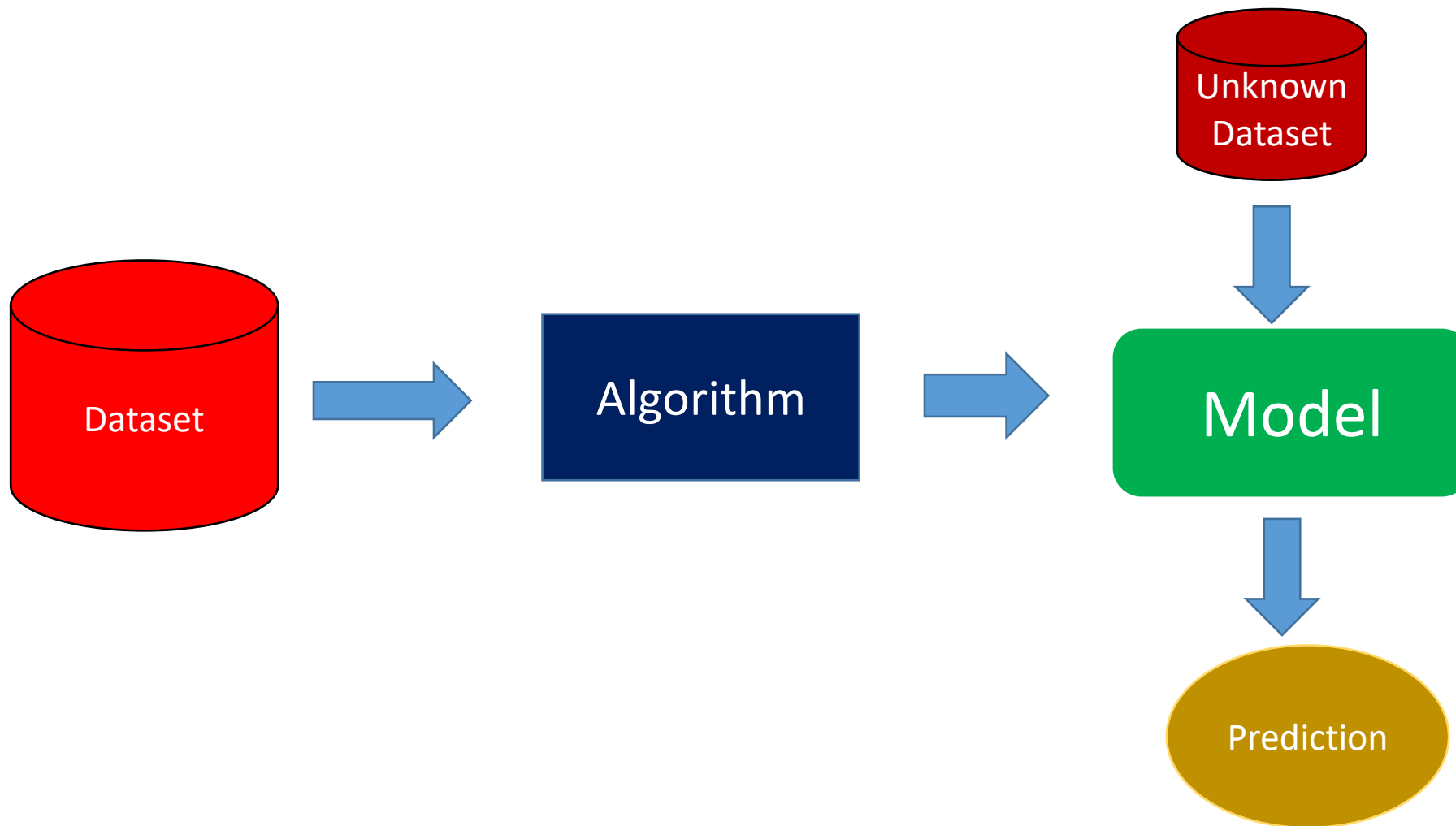
Introduction to Support Vector Machine (SVM)

1. 1D to 2D

2. Decision Surface/ Hyperplane

3. Linearly Separable

4. Margin

5. Support Vectors

6. Functional Margin

7. Non-linearly Separable

1D to 2D

1D

2D

But the point is more close to B

Close to Class A

← Decision Surface

New point

Close to Class B

But the point is more close to A

Middle

maximum

Support Vectors
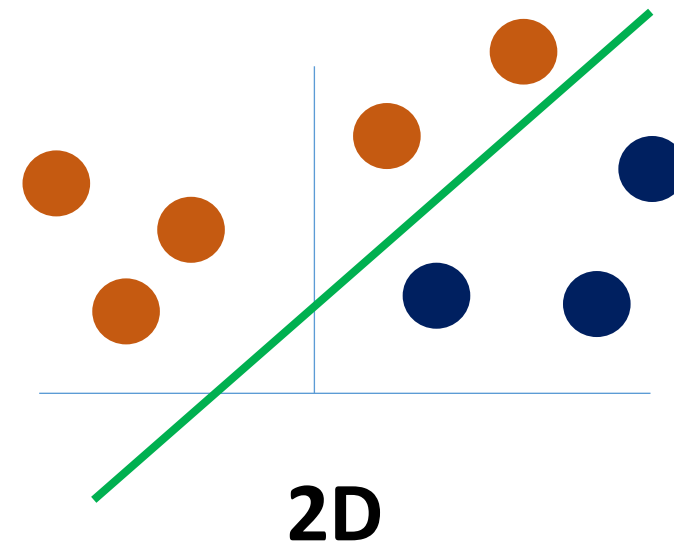
Margin

- How many decision surface there could be? → Infinite?
- Which decision surface to choose?

Minimum Distance of a training instance from the **Decision surface**

maximum

Support Vectors
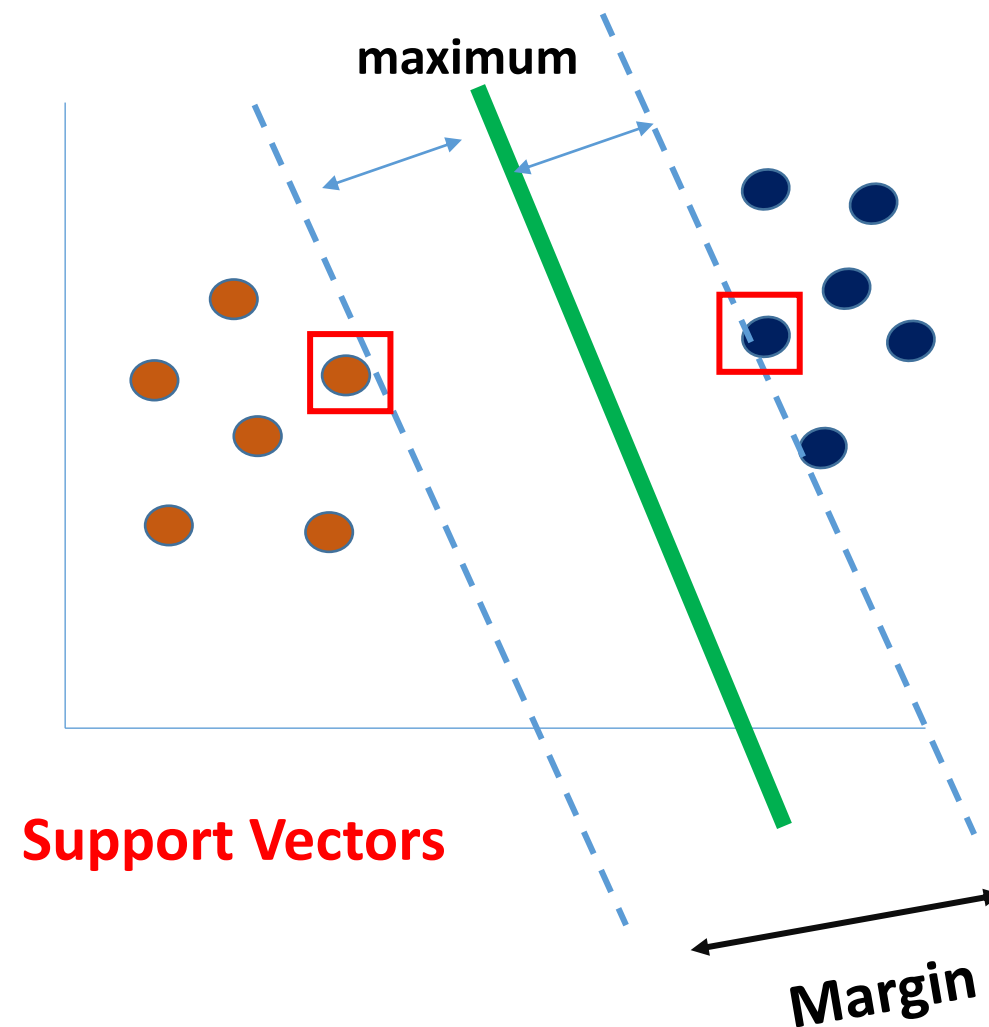
Margin

**Minimum Distance** of a training instance from the **Decision surface**
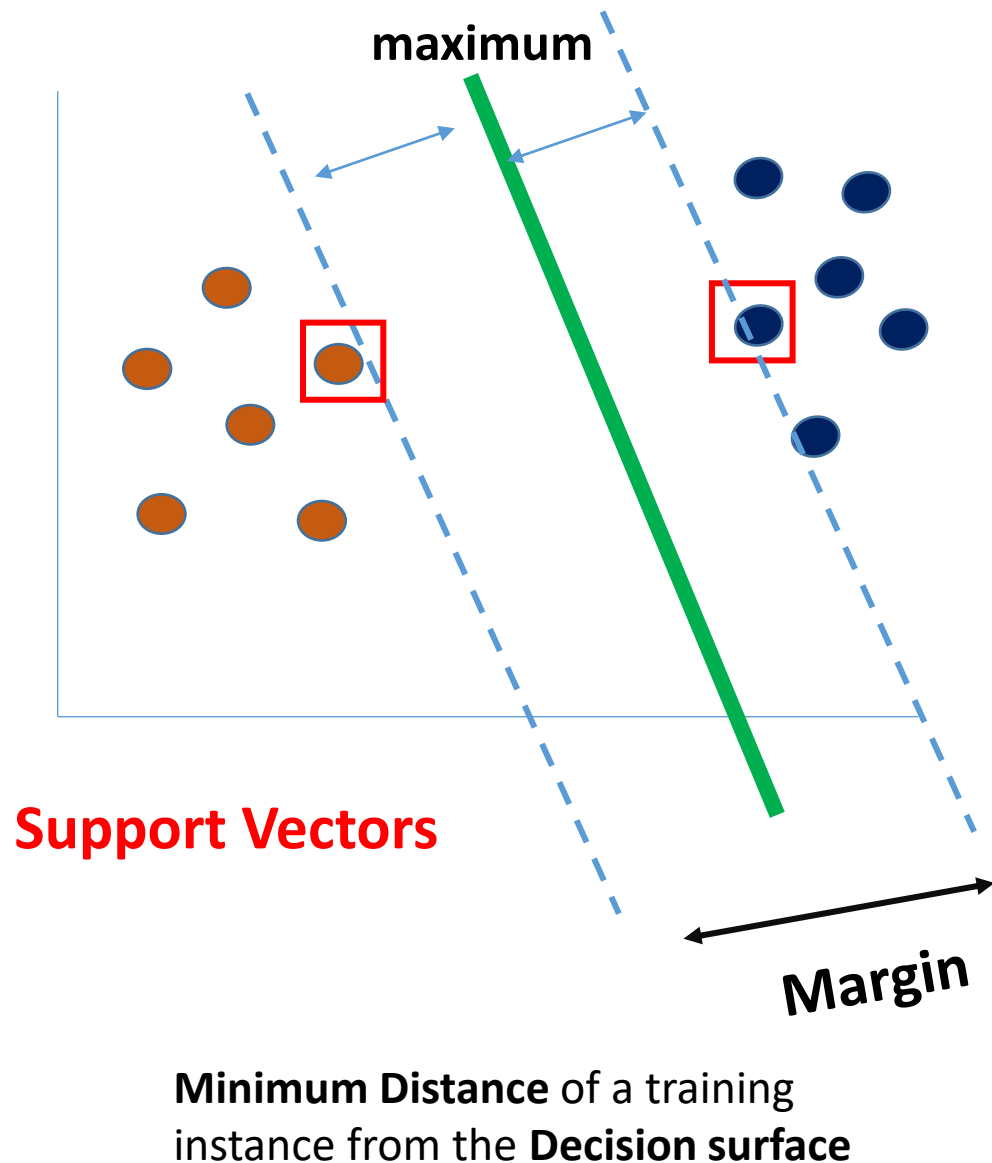
- ✓ **Margin: Minimum Distance** of a training instance from the **Decision surface**

- ✓ *Choose that Decision Surface for which the Margin width is maximum*

- ✓ Number of support vectors should be extremely small

- ✓ Minimum two support vectors should be there

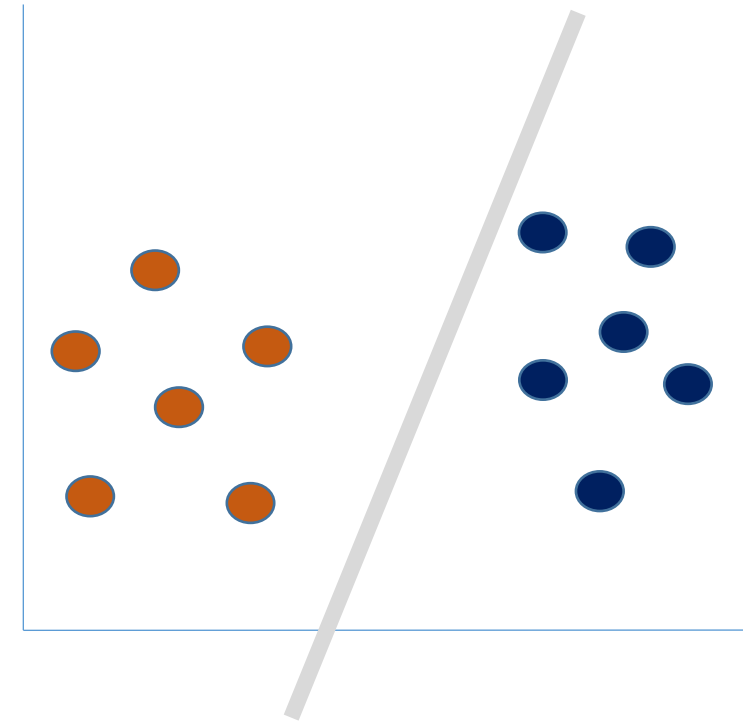*Larger functional Margin more confidence in predicting*
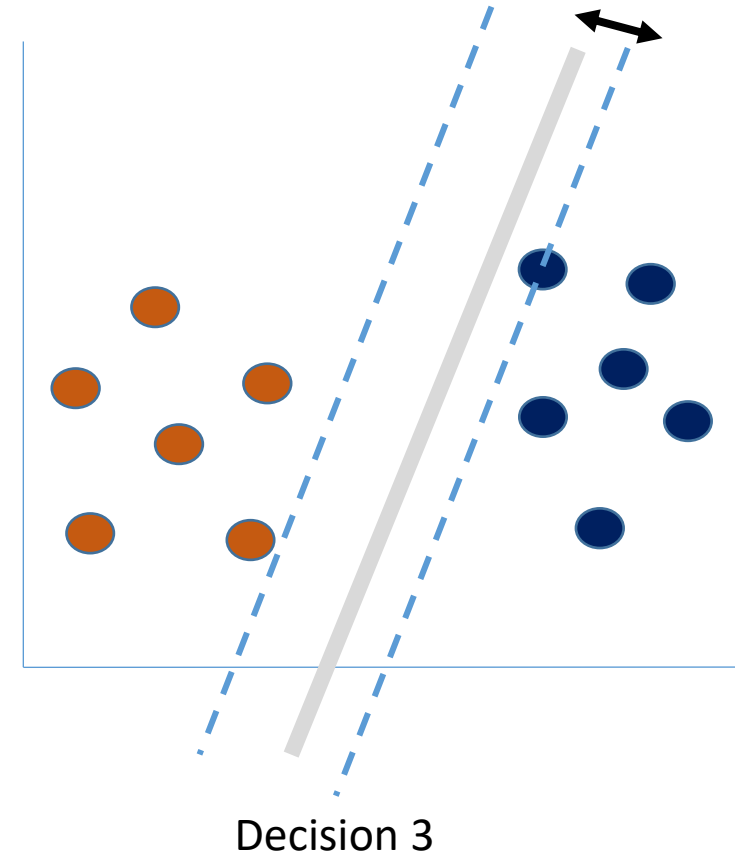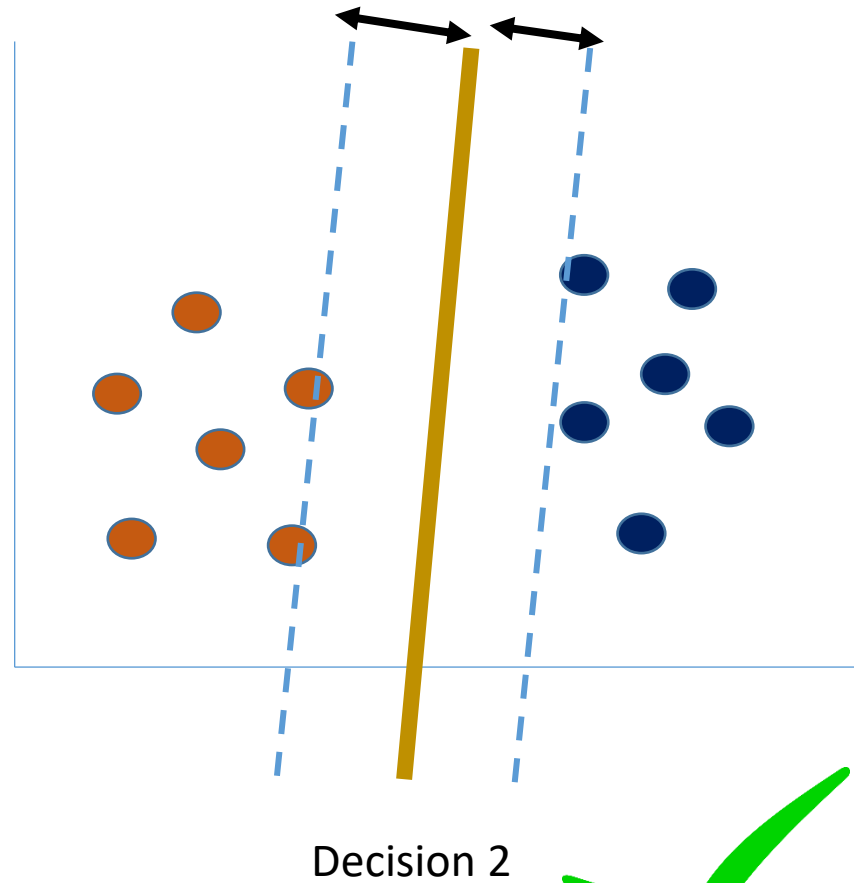
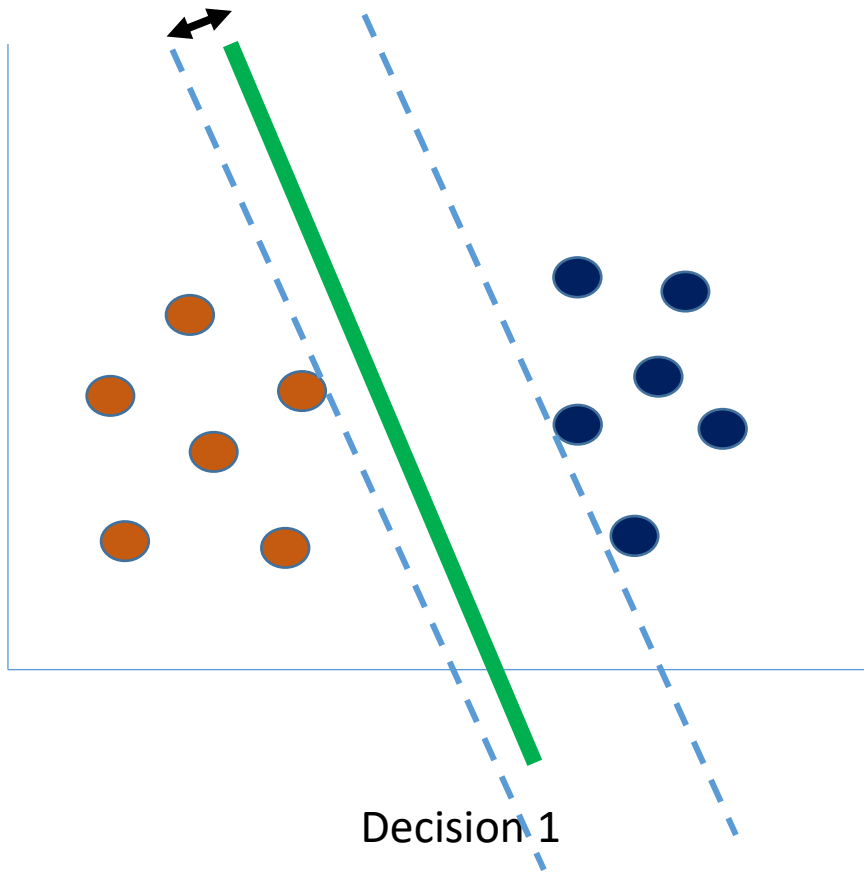# Which decision surface to choose?
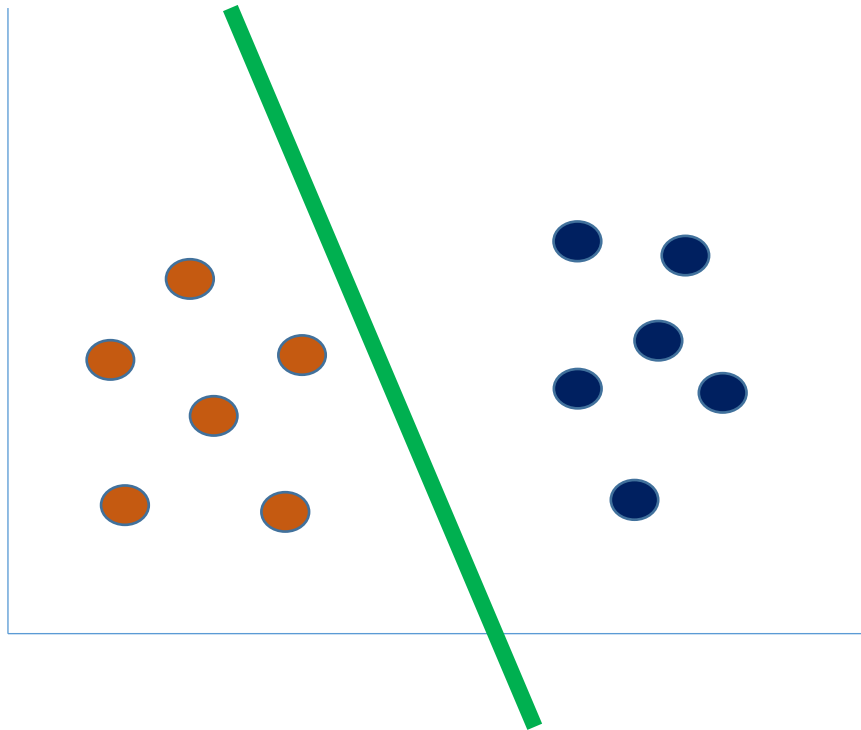
Decision 1
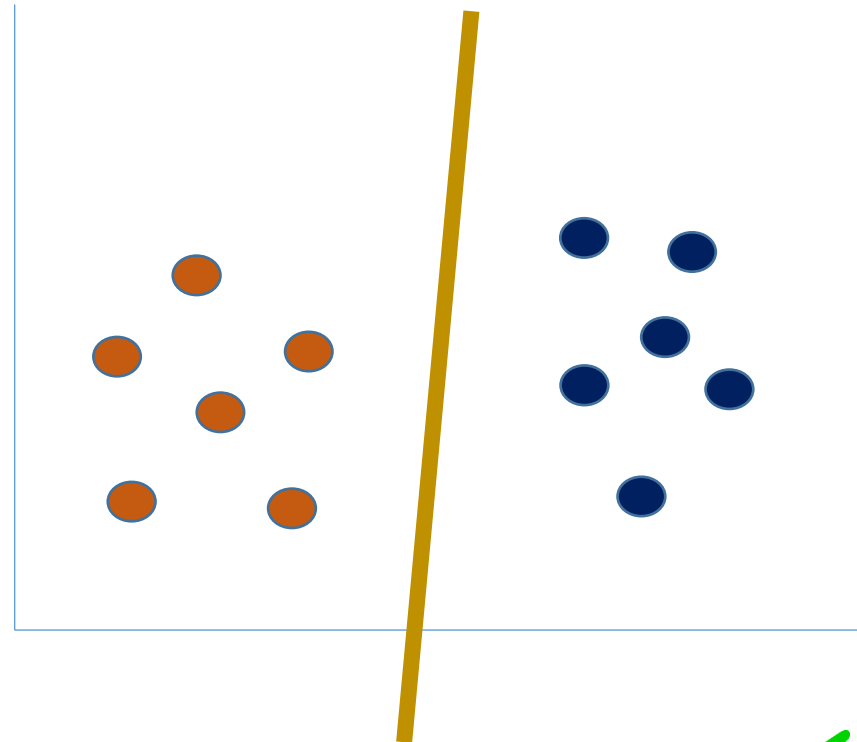
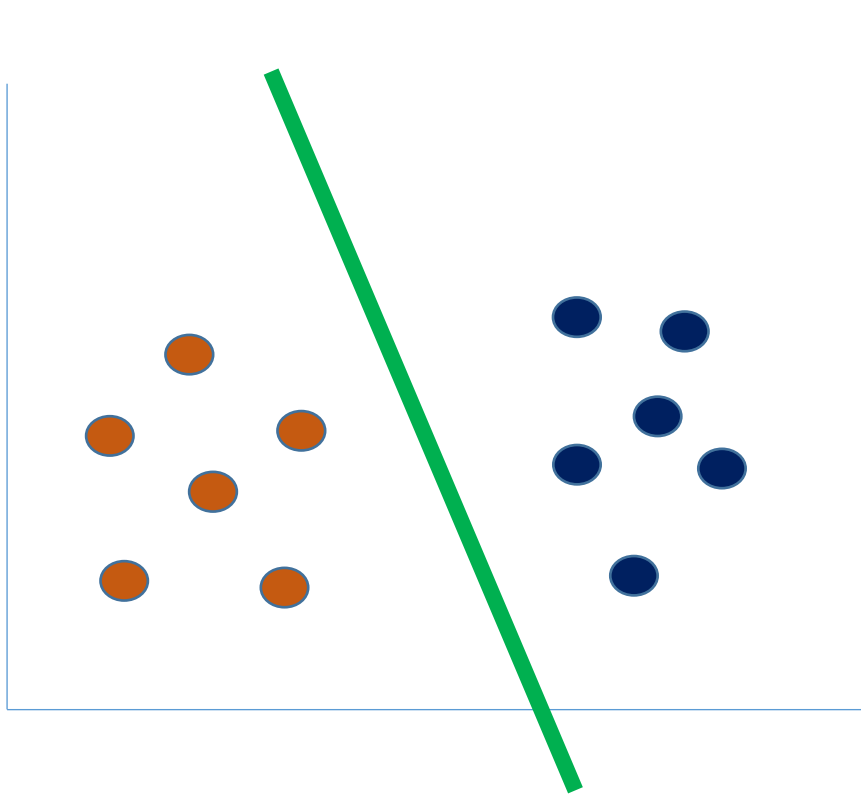Decision 2

Decision 3

Reason which decision surface is best

Decision 1

Decision 2

Decision 3

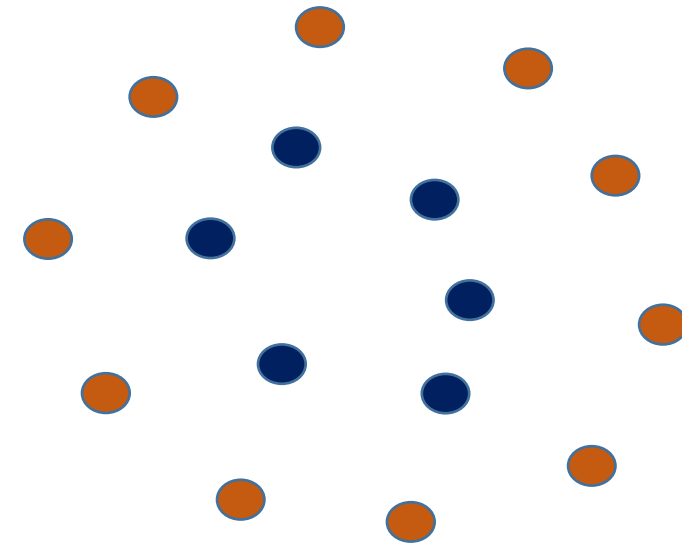✓ *Choose that Decision Surface for which the Margin width is maximum*

Coding Tutorial

Difference between Linearly Separable and Non- Separable

Linearly Separable

Non- Separable

Thank You

For your Attention!

Any Questions?