Online Value Added Course on Machine Learning, Deep Learning and Neural Networks

Day 8

Conducted by

Mr. Anupam Borthakur

Prime Minister's Research Fellows (PMRF)

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

Assam down town University, Guwahati, Assam

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

Agenda

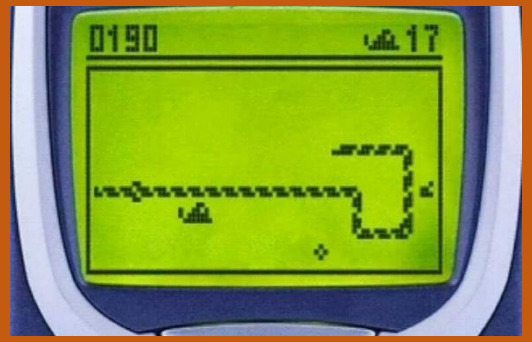
1. Recap of Supervised Learning
2. Introduction to Support Vector Machine (SVM)
3. Code implementation of that

Types of Machine Learning

Supervised Learning

Un-supervised Learning

Reinforcement Learning



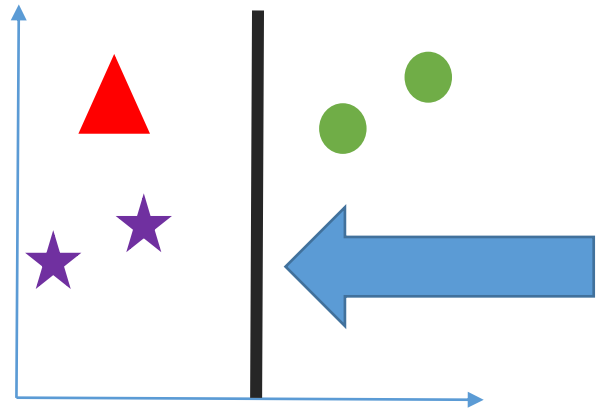
https://in.pinterest.com/pin/257690409914685423/

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

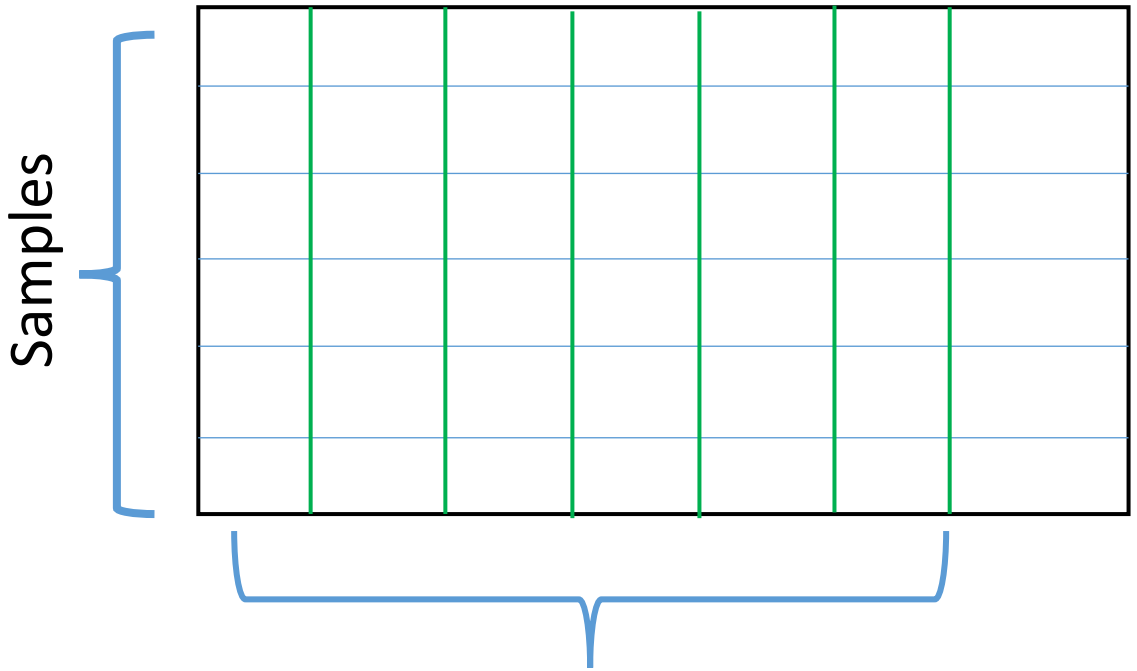
- Groups
- Clusters

?

Simple Structure of a Database

Supervised

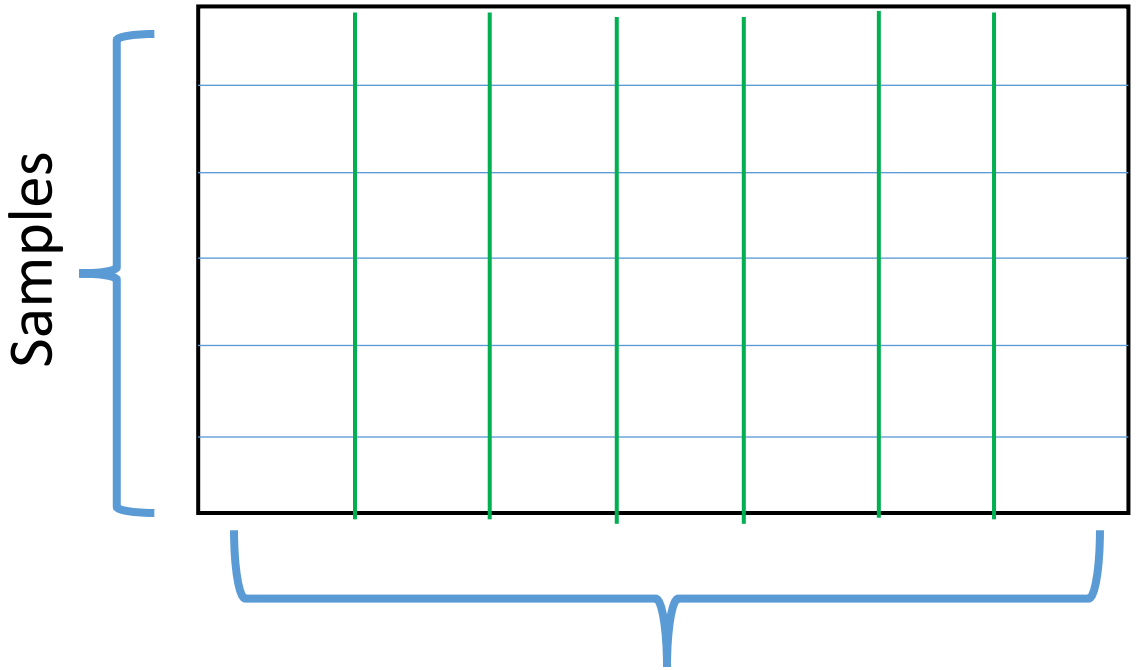
Class



Database

Unsupervised

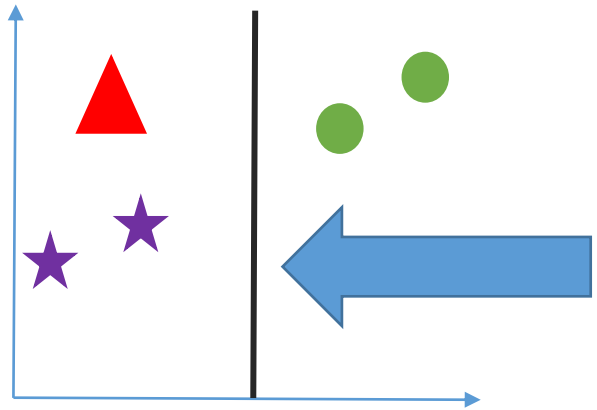
No Class is present



Database

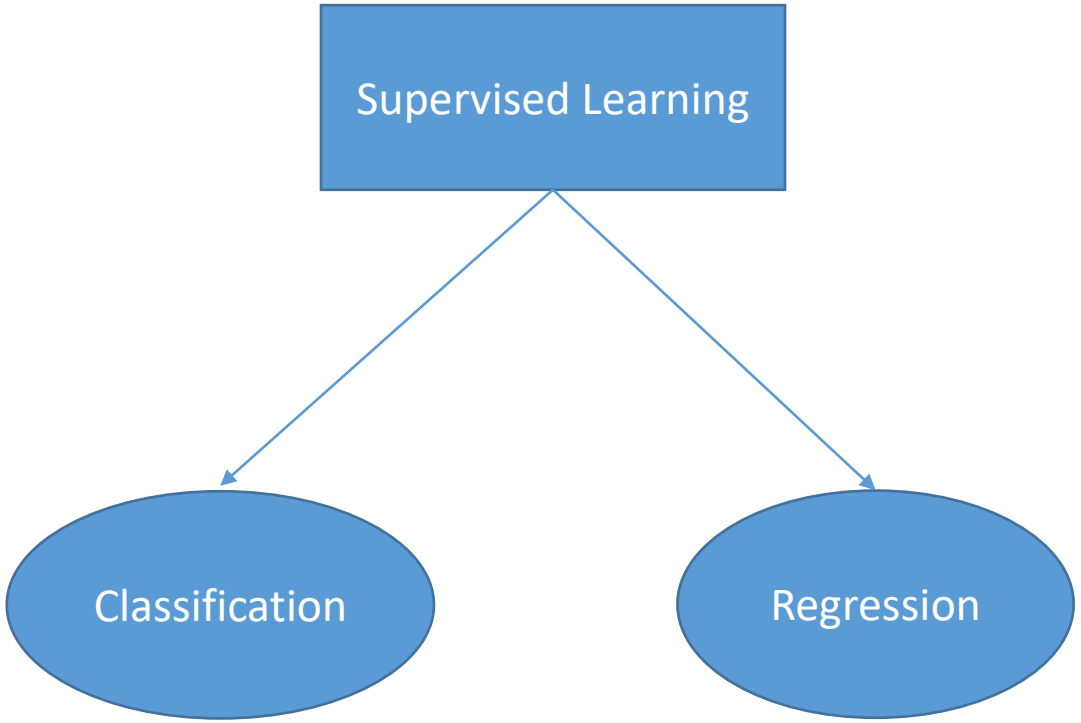
Supervised

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

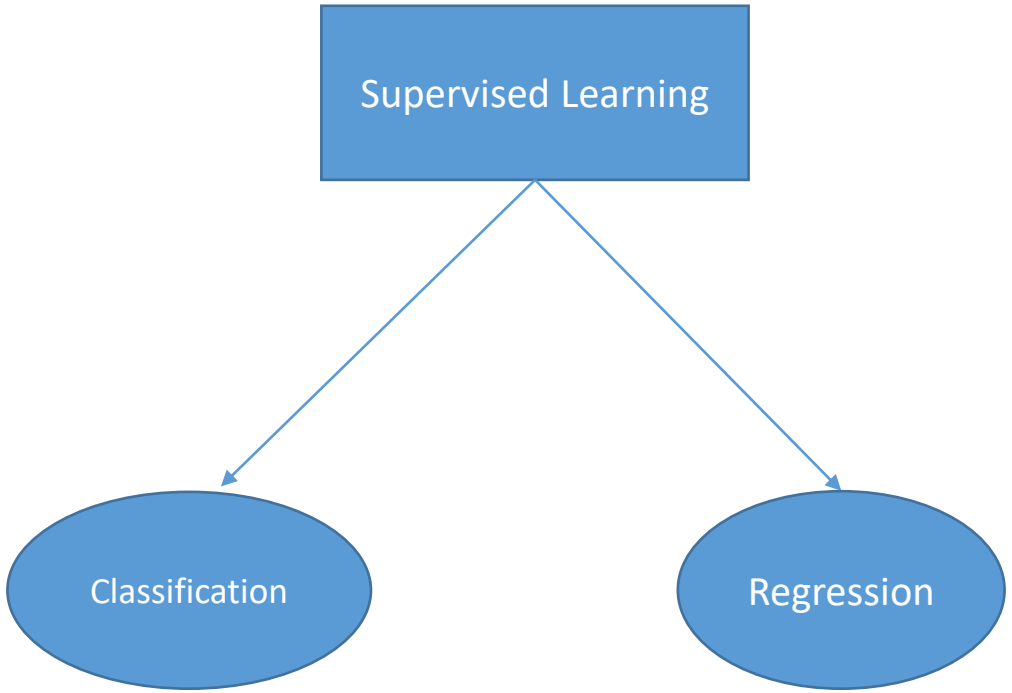


Decision Surface

Types of Supervised Learning



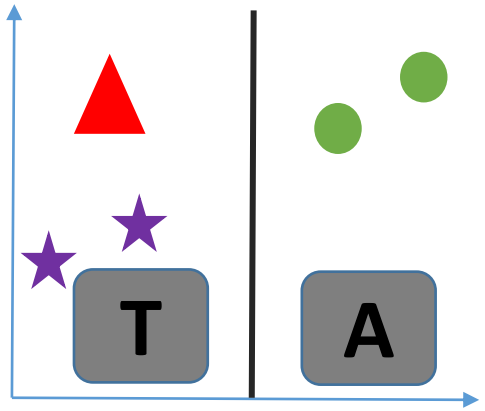
Types of Supervised Learning



Output having labels(discrete value)

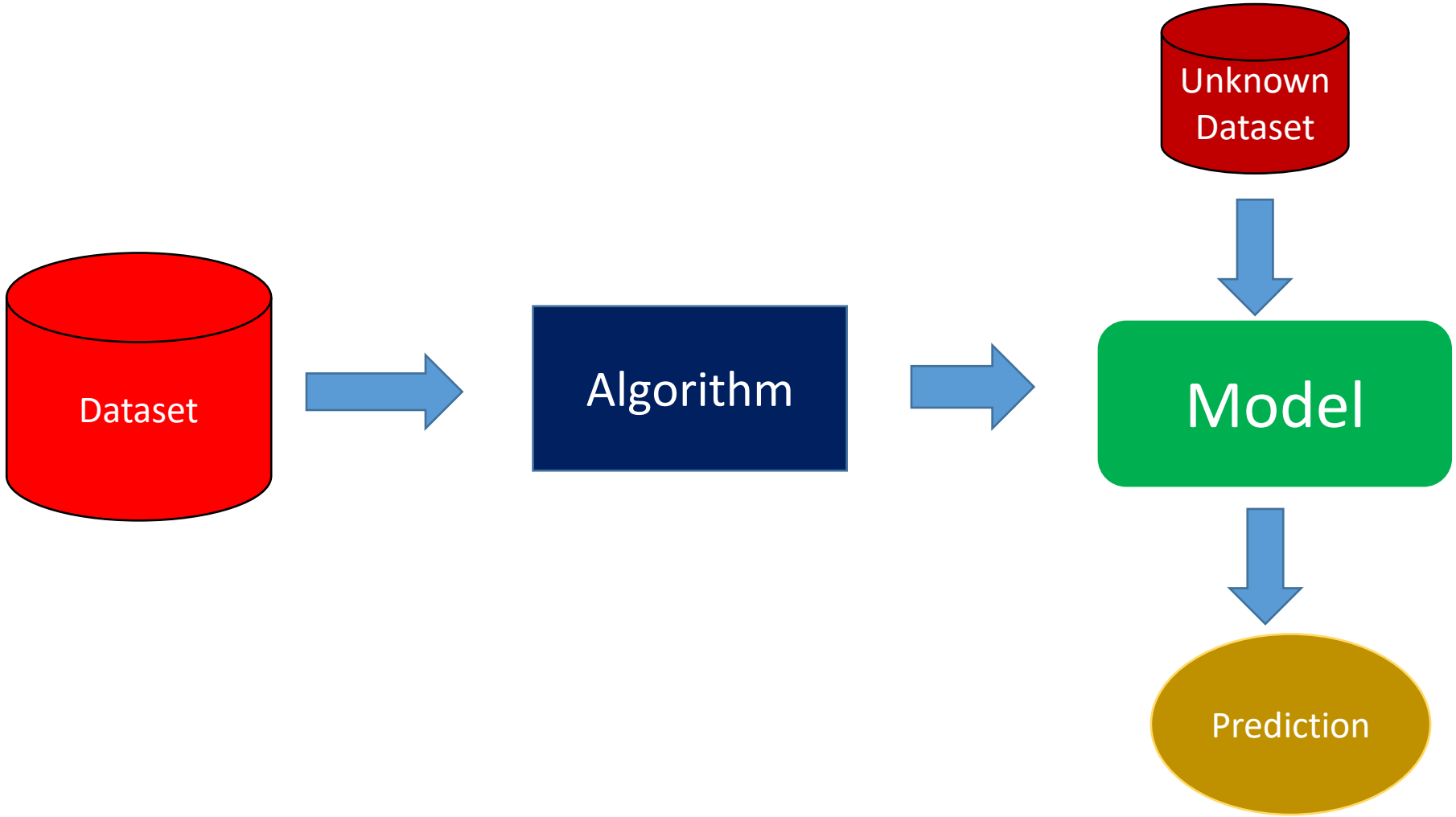
output having continuous value.

Age	Class
14	T
24	A
17	T
30	A



Classification

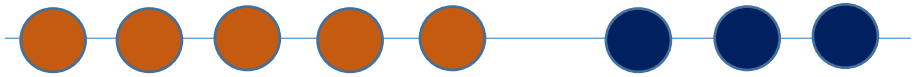
Simple Training Pipeline of Machine Learning



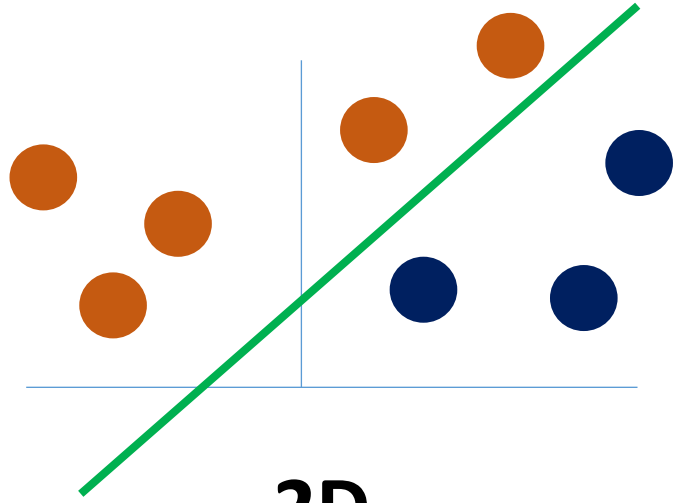
Introduction to Support Vector Machine (SVM)

1. 1D to 2D
2. Decision Surface/ Hyperplane
3. Linearly Separable
4. Margin
5. Support Vectors
6. Functional Margin
7. Non-linearly Separable

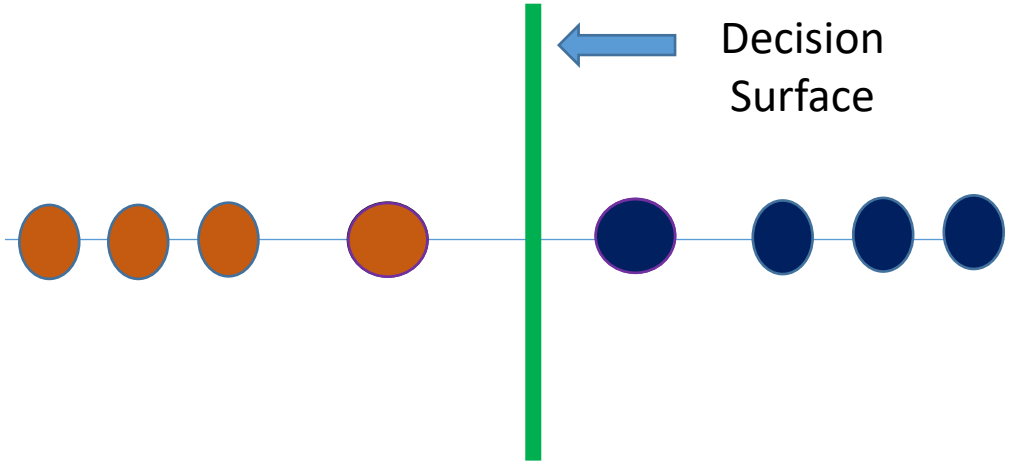
1D to 2D



1D

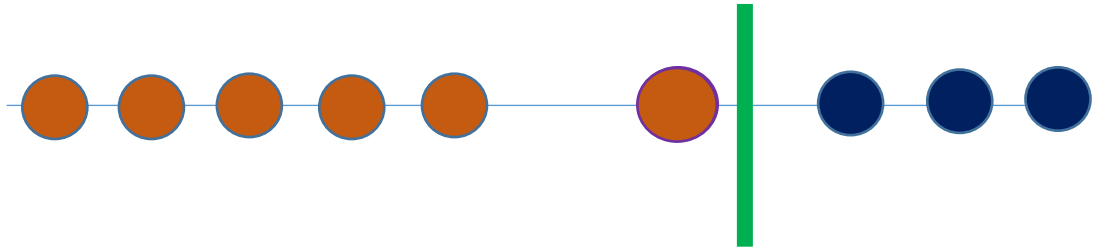


2D

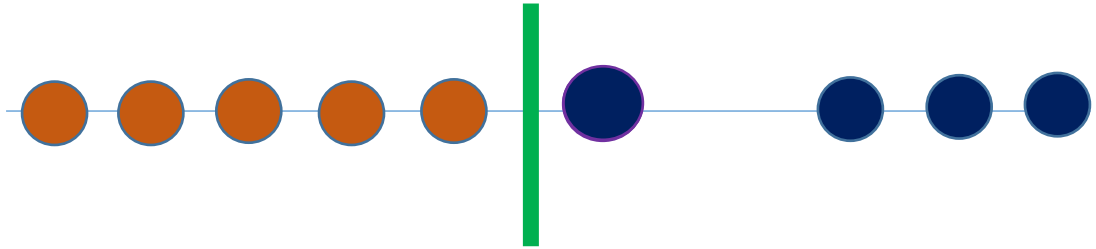


New point

But the point is more close to B

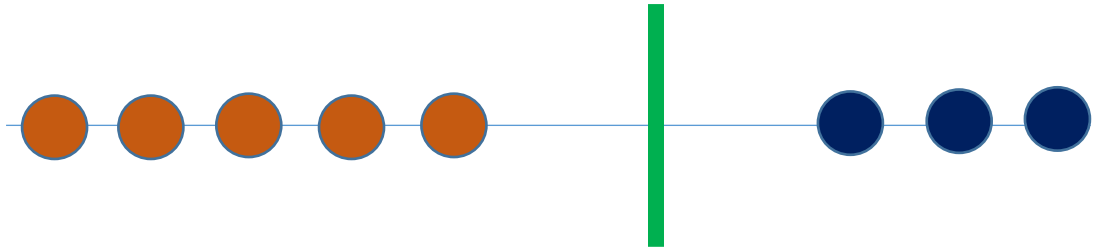


Close to Class B

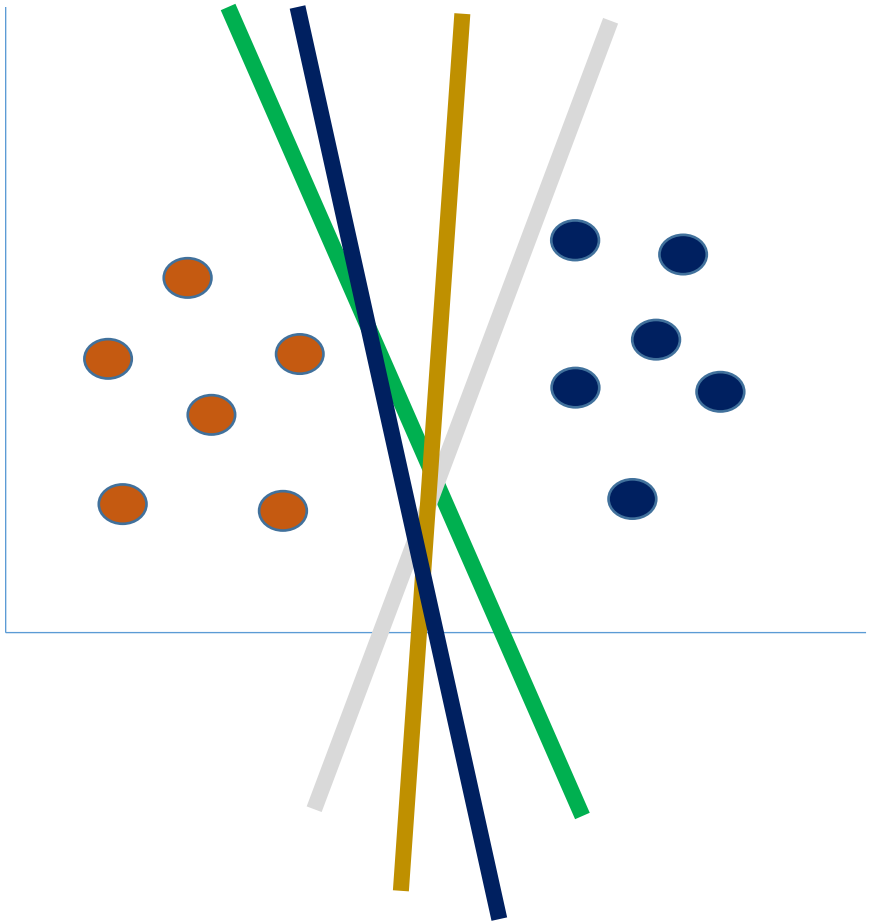


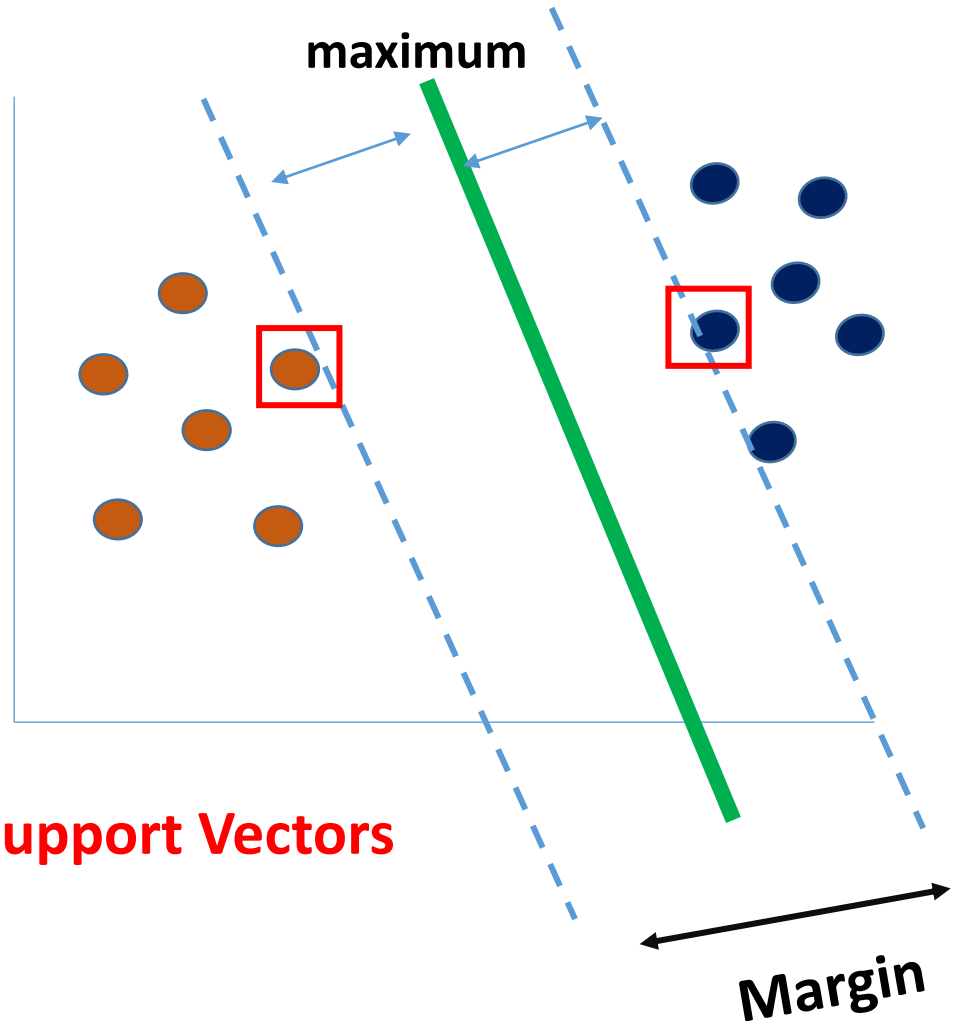
But the point is more close to A

Close to Class A



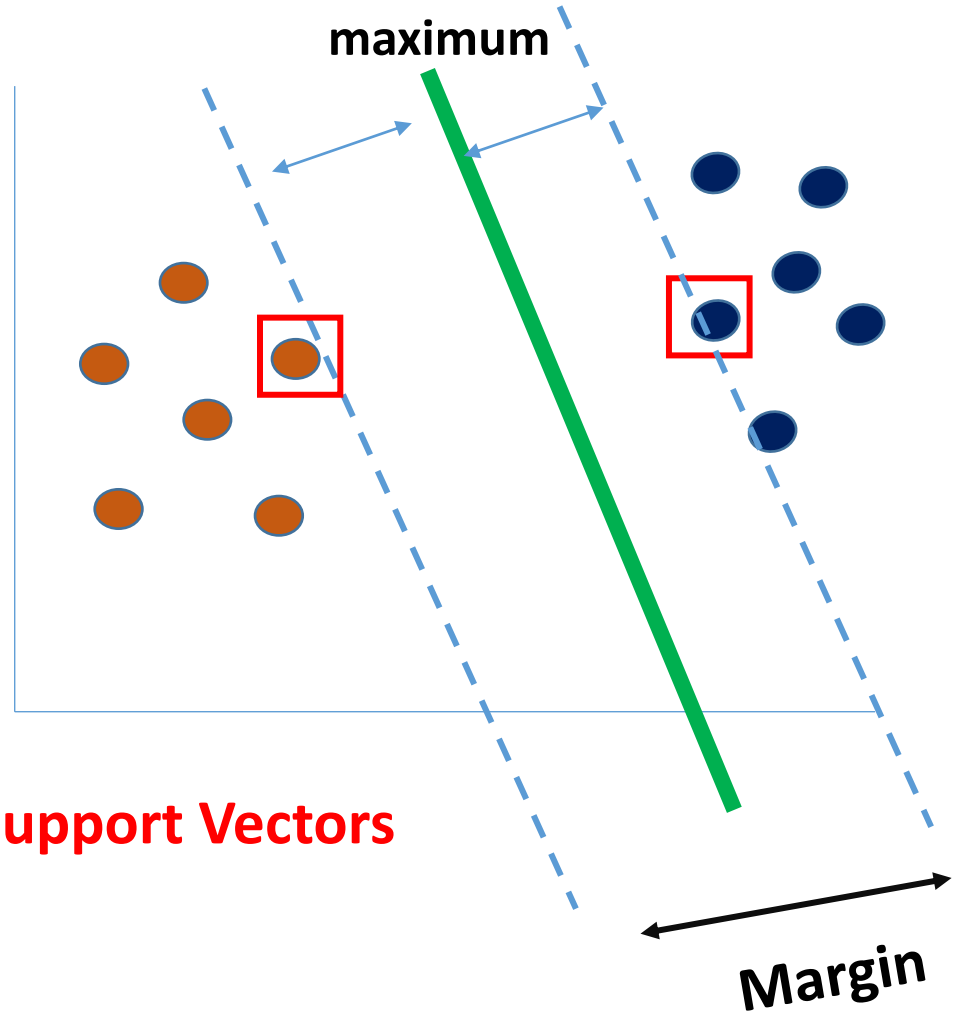
Middle





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

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

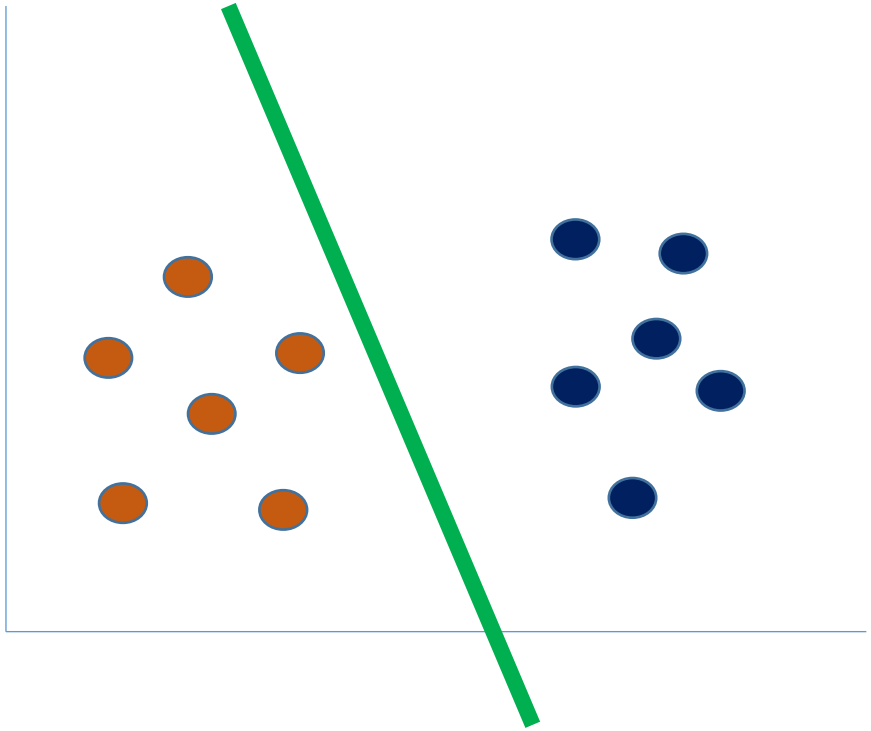


Minimum Distance of a training instance from the **Decision surface**

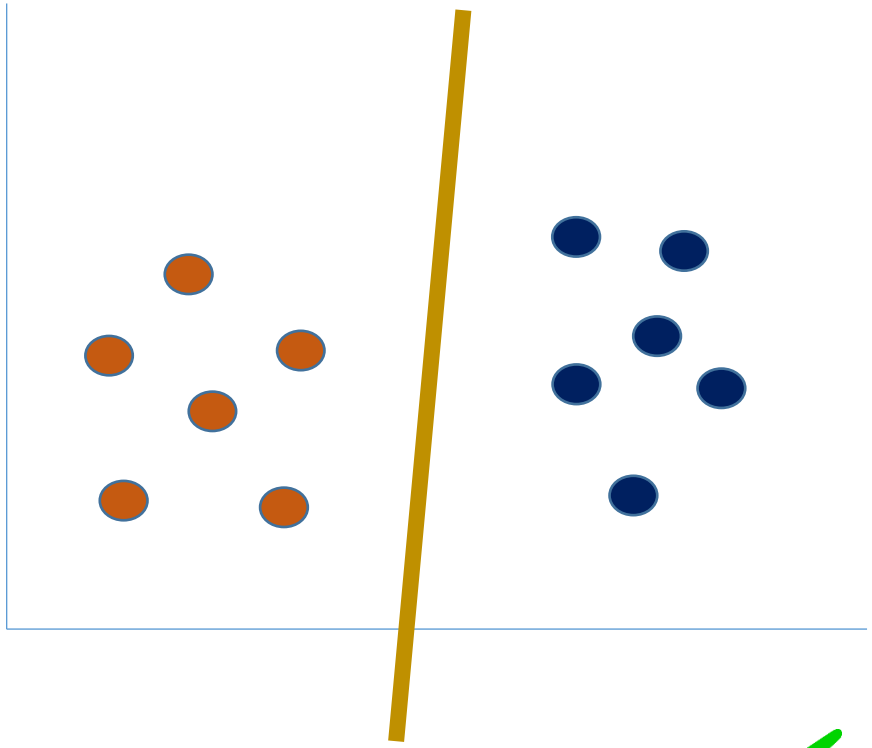
- ✓ **Margin: Minimum Distance** of a training instance from the **Decision surface**
- ✓ *Choose that Decision Surface for which the Margin width is maximum*
- ✓ Number of support vectors should be extremely small
- ✓ Minimum two support vectors should be there

Larger functional Margin more confidence in predicting

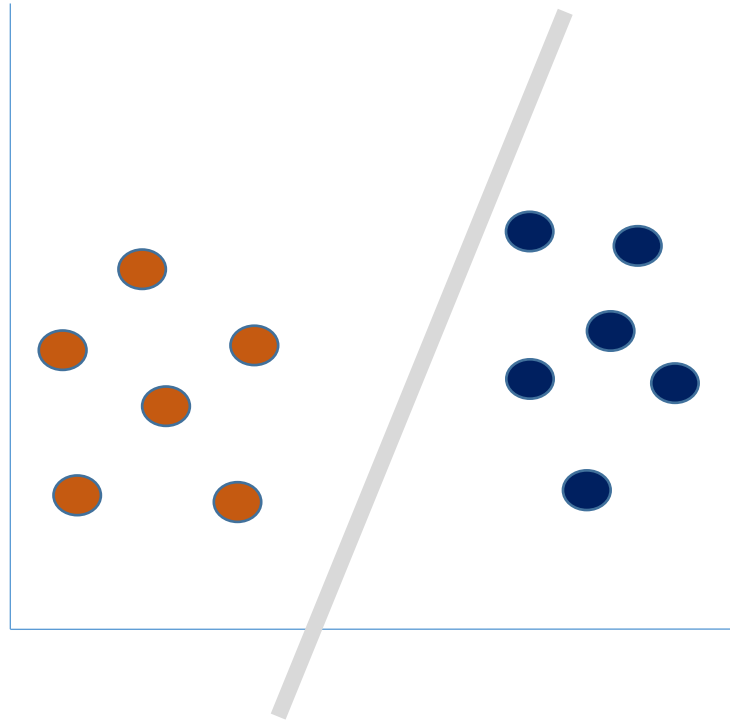
Which decision surface to choose?



Decision 1

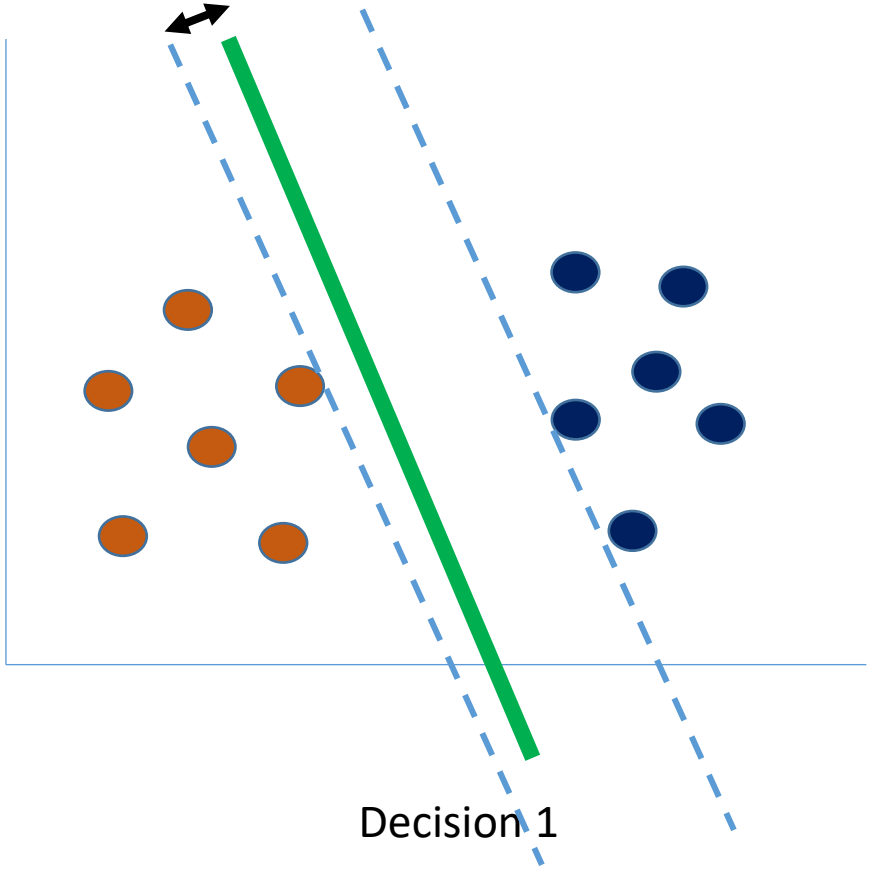


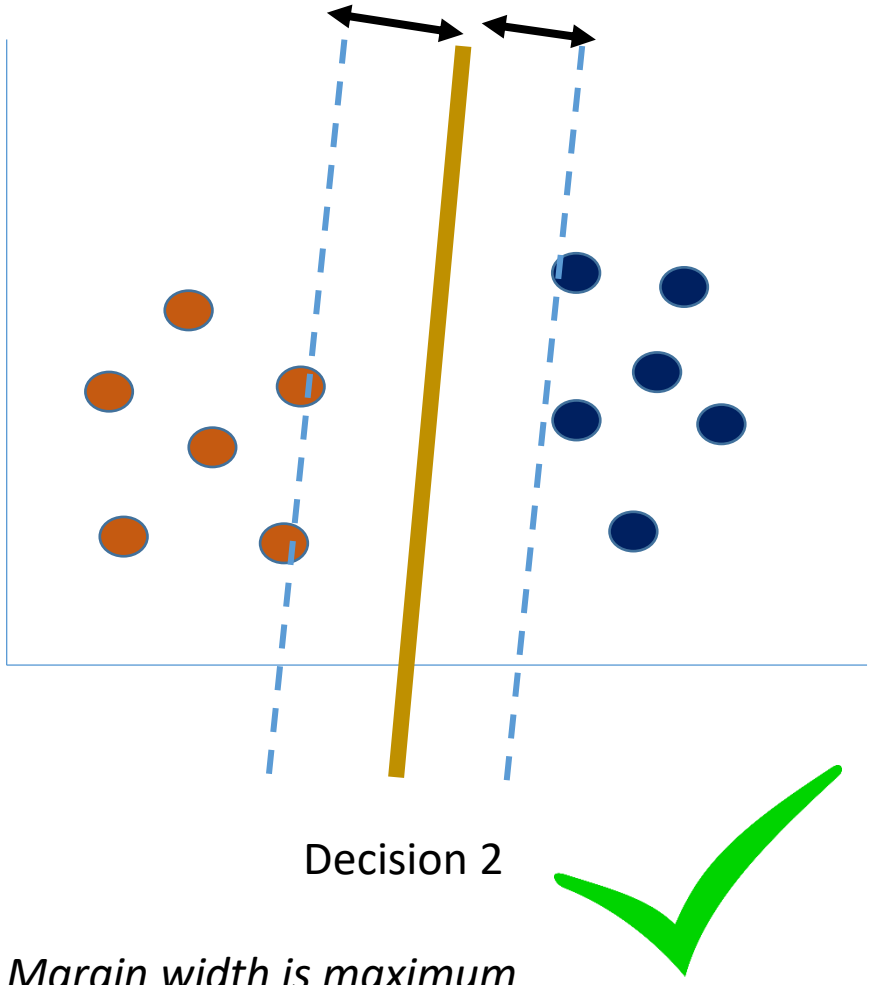
Decision 2

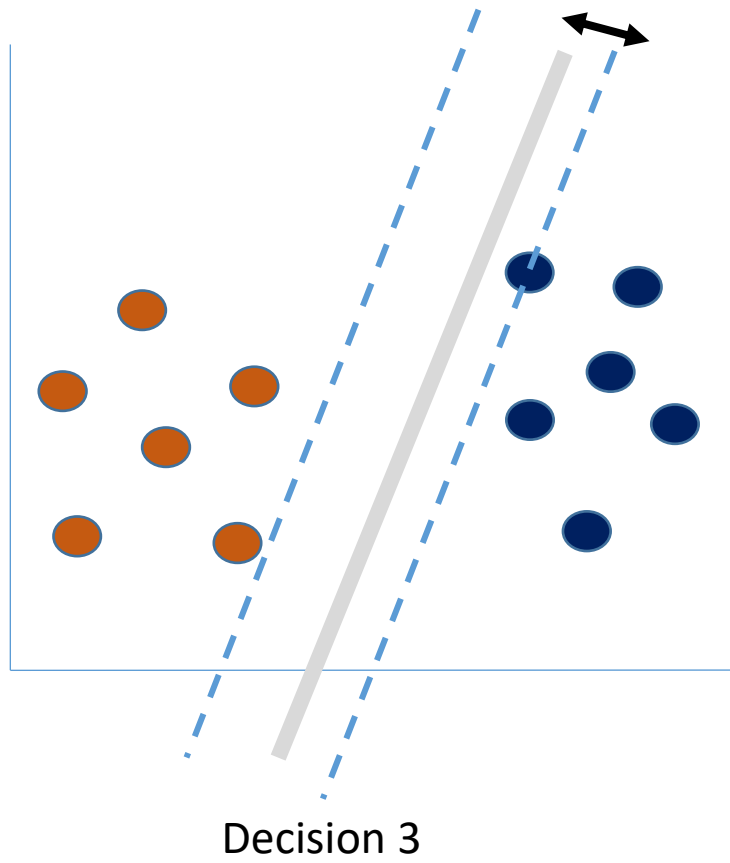


Decision 3

Reason which decision surface is best



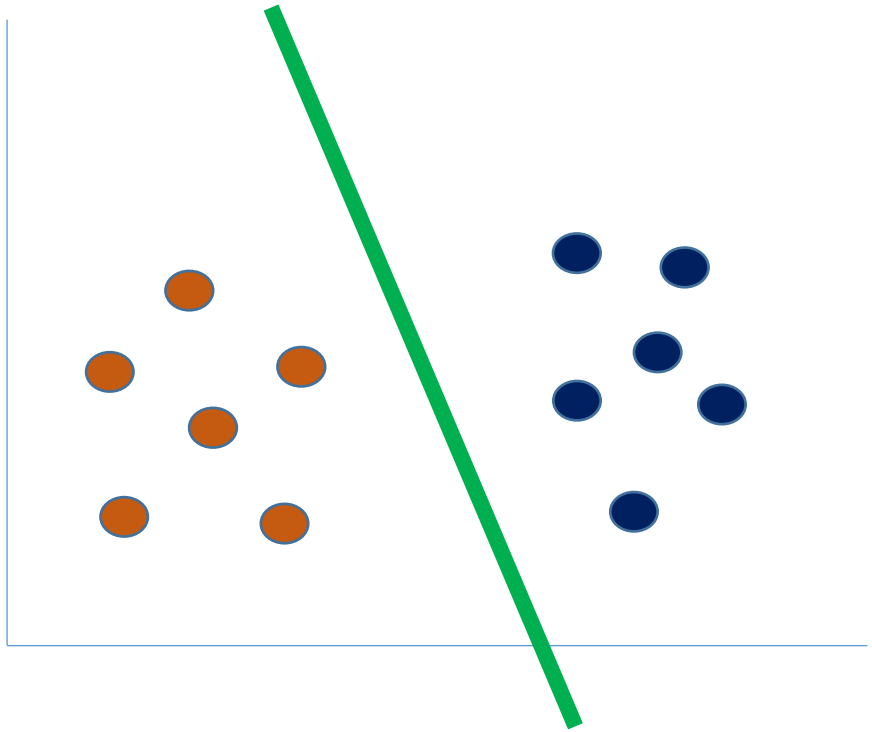




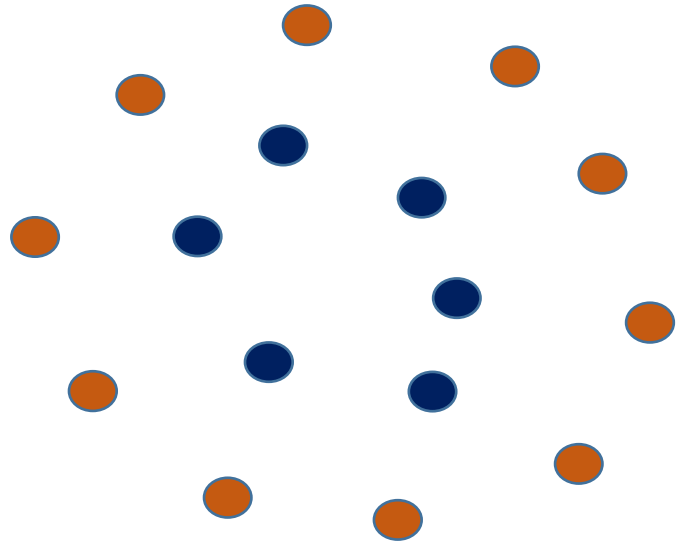
✓ *Choose that Decision Surface for which the Margin width is maximum*

Coding Tutorial

Difference between Linearly Separable and Non- Separable



Linearly Separable



Non- Separable

Thank You

For your Attention!

Any Questions?