SVM KERNELS And ROC AUC Curve

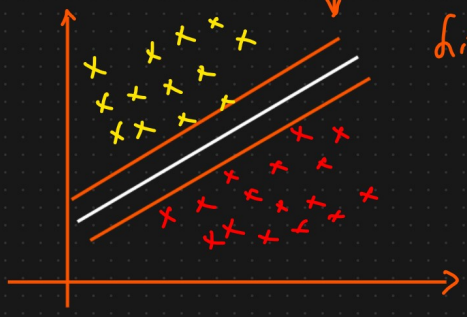
Agenda

1. SVM Kernels
2. ROC AUC Curve

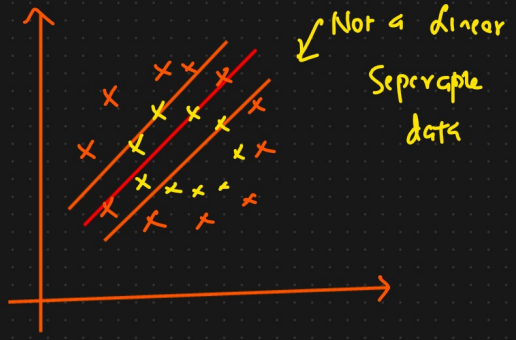
SVM Kernels

Kernel

Linear SVC

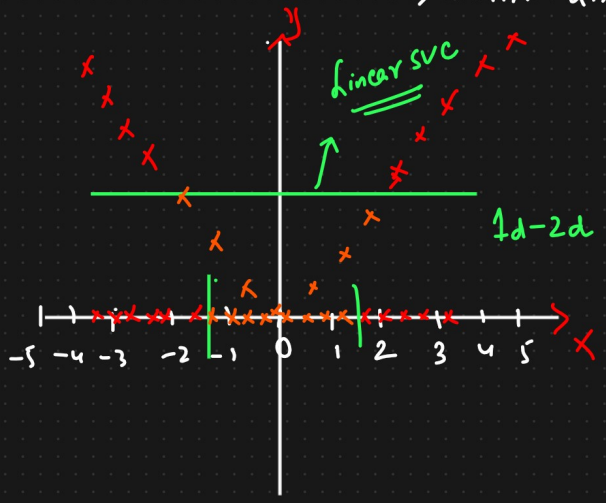


SVM Kernels



SVM Kernel ⟶ Transformation ⟶ Increasing the Dimension of the data.

↳ Mathematical Formula



Transformation

1d - 2d.

$$\Rightarrow \boxed{y = x^2}$$

Assignment

Just Try

⟹

SVM Kernel

1. Polynomial Kernel ✓
2. RBF Kernel ✓
3. Sigmoid Kernel

↳ Assignment

1. Polynomial Kernel

⇓ formula

$$f(x_1, x_2) = (x_1^T \cdot x_2 + 1)^d$$

d [x_1 , x_2]

[x_1 , x_2]

{ DOT operator } ⇐ $\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \cdot \begin{bmatrix} x_1 & x_2 \end{bmatrix}$

$$= \begin{bmatrix} x_1^2 & x_1 \cdot x_2 \\ x_1 \cdot x_2 & x_2^2 \end{bmatrix}$$

x_1	x_2	x_1^2	$x_1 \cdot x_2$	x_2^2

O/P

(x_1, x_2)

(x_1, x_2)

x_1	x_2	y
–	–	
–	–	
–	–	

SVM Kernels

Not a linear Seperable data

2d

x_2, x_1

⇓

2d – 3d

x_2^2, x_1^2, $x_1 \cdot x_2$

Polynomial ⇑ ⇒ Linear SVC

50%

x_1	x_2	y
→	–	–
→	–	–

⇓

x_2, x_1

Polynomial Kernel ⟹

x_2^2, $x_1 \cdot x_2$, x_1^2

$P_1 \leftarrow (x_1, x_2)$

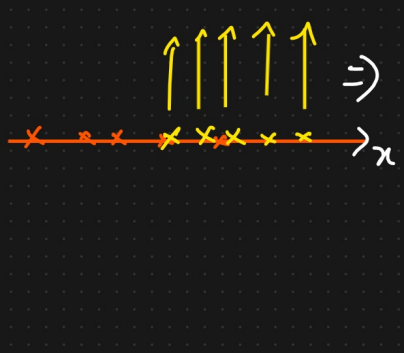
$$f(x_1, x_2) = (X_1^T \cdot X_2 + 1)^d$$

x_1	x_2	y
–	–	
–	–	
–	–	

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \cdot \begin{bmatrix} x_1 & x_2 \end{bmatrix}$$

x_1 x_2 | x_1^2 $x_1 \cdot x_2$ x_2^2 | y

$$\begin{bmatrix} x_1^2 & x_1 \cdot x_2 \\ x_2 \cdot x_1 & x_2^2 \end{bmatrix}$$



60%

Vaccination → Pass 1
→ Fail 0

→ 0.75 >

① ROC And AUC

Threshold ⇒ Super important

0.5 0.6 0.4 0.2 [0, 0.2, 0.4, 0.6, 0.8]

(0.8) (0.6)

Actual O/P y	probability ŷ	ŷ(0)	ŷ(0.2)	ŷ(0.4)
1	0.8	1	1	1
0	0.96	1	1	1
1	0.4	1	1	0
1	0.3	1	1	0
0	0.2	1	0	0
1	0.7	1	1	1

(0.6) Confusion matrix

Predicted \ Actual	1	0
1	4	2
0	0	0

4	1
0	1

TPR = TP / (TP + FN) = 4 / (4 + 0) = 1

FPR = FP / (FP + TN) = 2 / (2 + 0) = 1

TPR = 1 FPR = 0.5

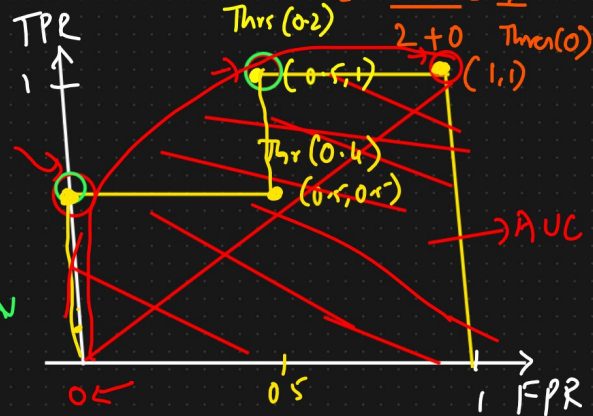
2	1
2	1

TPR = 0.5

FPR = 0.5

{ Domain Expert }

Model → FPR ↓↓



Zoom