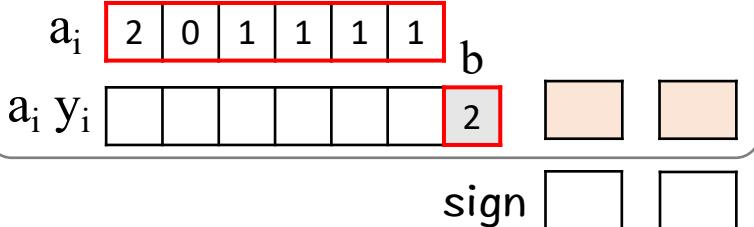


Linear

y_i	x_i	x'_j	x'_1	x'_2
1	x_1	2	2	1
-1	x_2	4	4	1
1	x_3	3	1	1
-1	x_4			
1	x_5			
-1	x_6			

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

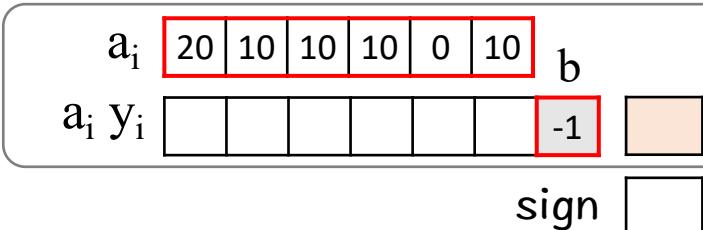
$$b + \sum a_i y_i K$$

RBF

X_i	$(x - x')^2$	$\sum \sqrt{-\gamma x - x' ^2}$	x'_j	x'_1	x'_2
1 2 1			2	2	1
0 4 3			4	4	1
0 3 0			3	1	1
0 3 1					
5 0 3					
1 4 3					

$-\gamma x - x' ^2$	$e^{-\gamma x - x' ^2}$
-0.1	0.9
-0.2	0.8
-0.3	0.7
-0.4	0.67
-0.5	0.6
$-\gamma$	$e^{-\gamma}$

1
1
1



SVM

Linear

y_i	X_i	3	1
1	1 2 1	13	
-1	0 4 3	25	
1	0 3 0	12	
-1	0 3 1	15	
1	5 0 3	19	
-1	1 4 3	27	

SVM

Kernel Matrix

$$K(x_i, x_j')$$

The diagram illustrates a sequence of numbers. The top row shows a_i followed by a sequence of six boxes containing the values 2, 0, 1, 1, 1, 1, which is then labeled b . Below this, the sequence y_i is shown as a sequence of five empty boxes, followed by a box containing the value 2, and then two additional empty boxes. At the bottom, the word "sign" is followed by two empty boxes.

Decision Boundary

$$b + \sum a_i y_i K$$

RBF

L2 distance $\| \|^2$

$$X_i \quad (x - x')^2 \quad \sum \sqrt{\frac{-y}{(-0.1)}} e^{\square}$$

$$x_{ij}^t$$

$-\gamma$	$ ^2$	e^\square
-0.5		0.6
-0.4		0.67
-0.3		0.7
-0.2		0.8
-0.1		0.9

1
1
1

1	2	1
0	4	3
0	3	0
0	3	1
5	0	3
1	4	3

A 4x3 grid of empty boxes, intended for students to draw their own figures or patterns.

The diagram consists of two vertical columns of six rectangular boxes each. The left column contains six empty white boxes. The right column contains six boxes, with the bottom three being filled with a light pink color.

The diagram consists of two vertical columns of six rectangular boxes each. The left column is entirely white, while the right column is entirely light green. A single, thick grey vertical line is placed between the two columns, creating a clear separation.

a_i	20	10	10	10	0	10	b
$a_i \ y_i$						-1	

Linear

$$\begin{matrix} & x'_1 & x'_2 \\ \mathbf{x}'_j & \begin{array}{|c|} \hline 2 \\ \hline 4 \\ \hline 3 \\ \hline \end{array} & \begin{array}{|c|} \hline 1 \\ \hline 1 \\ \hline 1 \\ \hline \end{array} \end{matrix}$$

SVM

y_i	X_i	3	1
1	1	13	2
-1	2	25	7
1	1	12	3
-1	0	15	4
1	3	19	8
-1	0	27	8
1	3		
-1	1		
1	4		
-1	3		

Kernel Matrix

$$K(x_i, x'_j)$$

The diagram illustrates a vector a_i represented as a red-bordered box containing the elements 2, 0, 1, 1, 1, 1. Below it, a vector y_i is shown as a black-bordered box with six empty slots, the last one containing the value 2. To the right of y_i , two orange-bordered boxes represent the 'sign' of each component.

Decision Boundary

$$b + \sum a_i y_i K$$

RBF

L2 distance $\| \|^2$

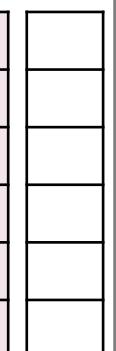
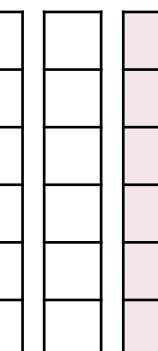
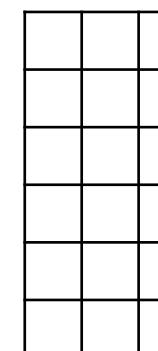
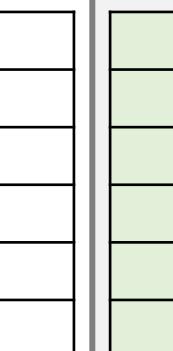
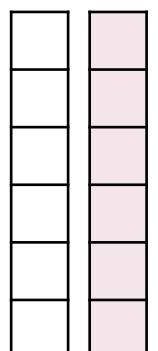
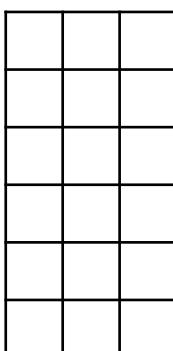
$$X_i = (x - x')^2 \sum \sqrt{\frac{-\gamma}{(-0.1)}} e^{\frac{x}{\gamma}}$$

$$x'_j$$

$-\gamma$	$ \cdot ^2$	e^\square
-0.5		0.6
-0.4		0.67
-0.3		0.7
-0.2		0.8
-0.1		0.9

1
1
1

1	2	1
0	4	3
0	3	0
0	3	1
5	0	3
1	4	3



a_i	20	10	10	10	0	10	b
a_i	y_i					-1	

Linear

y_i	x_i	x'_j	x'_1	x'_2
1	x_1	1 2 1	2	1
-1	x_2	0 4 3	4	1
1	x_3	0 3 0	3	1
-1	x_4	0 3 1	13	2
1	x_5	5 0 3	25	7
-1	x_6	1 4 3	12	3

Kernel Matrix

$$K(x_i, x'_j)$$

a_i	2 0 1 1 1 1	b
$a_i y_i$	2 0 1 -1 1 -1	2
		sign

Decision Boundary

$$b + \sum a_i y_i K$$

RBF

x_i	$(x - x')^2$	$\sum \sqrt{-\gamma x - x' ^2}$	x'_j	x'_1	x'_2
1 2 1			2		
0 4 3			4		
0 3 0			3		
0 3 1					
5 0 3					
1 4 3					

$-\gamma x - x' ^2$	$e^{-\gamma x - x' ^2}$
-0.1	0.9
-0.2	0.8
-0.3	0.7
-0.4	0.67
-0.5	0.6

1
1
1

a_i	20 10 10 10 0 10	b
$a_i y_i$		-1
		sign

Linear

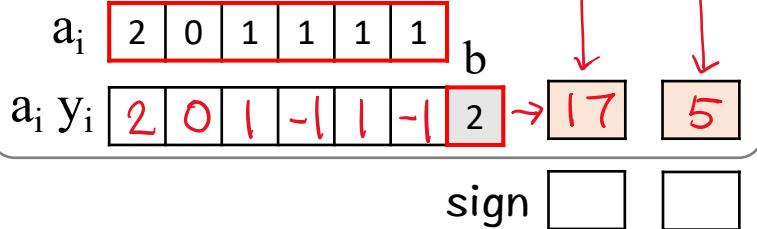
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	x_i	x'_j
1	x_1	13
-1	x_2	25
1	x_3	12
-1	x_4	15
1	x_5	19
-1	x_6	27
		2
		7
		3
		4
		8
		8

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

RBF

x'_j	2
4	4
3	3

$-\gamma ^2$	e^\square
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

$$X_i \quad (x - x')^2 \quad \sum \sqrt{-\gamma ||^2_{(-0.1)}} e^\square$$

1	2	1
0	4	3
0	3	0
0	3	1
5	0	3
1	4	3

$$\sum \sqrt{-\gamma ||^2_{(-0.1)}} e^\square$$

$$a_i [20 10 10 10 0 10] b$$

$$a_i y_i [] [] [-1] []$$

$$\text{sign} []$$

Linear

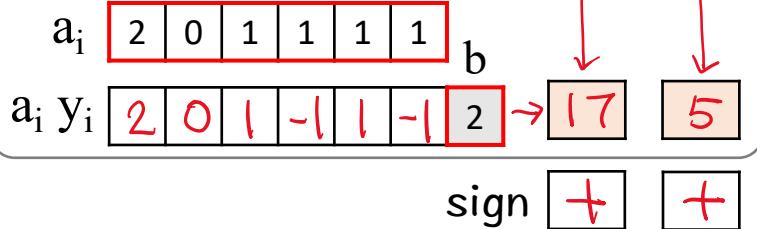
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	X_i	x'_j
1	$x_1 \begin{matrix} 1 & 2 & 1 \end{matrix}$	13
-1	$x_2 \begin{matrix} 0 & 4 & 3 \end{matrix}$	25
1	$x_3 \begin{matrix} 0 & 3 & 0 \end{matrix}$	12
-1	$x_4 \begin{matrix} 0 & 3 & 1 \end{matrix}$	15
1	$x_5 \begin{matrix} 5 & 0 & 3 \end{matrix}$	19
-1	$x_6 \begin{matrix} 1 & 4 & 3 \end{matrix}$	27

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

RBF

1	2	1
0	4	3
0	3	0
0	3	1
5	0	3
1	4	3

L2 distance $\| \cdot \|^2$

$$X_i \quad (x - x')^2 \quad \sum \sqrt{\| \cdot \|^2_{(-0.1)}} e^{\frac{-\gamma}{\| \cdot \|^2}}$$

x'_j
2
4
3

$-\gamma \ \cdot\ ^2$	$e^{\frac{-\gamma}{\ \cdot\ ^2}}$
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

$$a_i \begin{bmatrix} 20 & 10 & 10 & 10 & 0 & 10 \end{bmatrix} b$$

$$a_i y_i \begin{bmatrix} & & & & & -1 \end{bmatrix} \rightarrow$$

$$\text{sign } \boxed{}$$

1
1
1

Linear

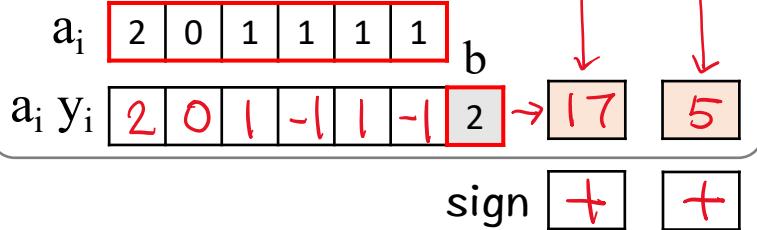
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	X_i	x'_j
1	$x_1 \begin{matrix} 1 & 2 & 1 \end{matrix}$	13
-1	$x_2 \begin{matrix} 0 & 4 & 3 \end{matrix}$	25
1	$x_3 \begin{matrix} 0 & 3 & 0 \end{matrix}$	12
-1	$x_4 \begin{matrix} 0 & 3 & 1 \end{matrix}$	15
1	$x_5 \begin{matrix} 5 & 0 & 3 \end{matrix}$	19
-1	$x_6 \begin{matrix} 1 & 4 & 3 \end{matrix}$	27

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

RBF

X_i	x'_j
$\begin{matrix} 1 & 2 & 1 \end{matrix}$	$\begin{matrix} 2 \\ 4 \\ 3 \end{matrix}$
$\begin{matrix} 0 & 4 & 3 \end{matrix}$	$\begin{matrix} 4 \\ 0 \\ 0 \end{matrix}$
$\begin{matrix} 0 & 3 & 0 \end{matrix}$	$\begin{matrix} 0 \\ 1 \\ 0 \end{matrix}$
$\begin{matrix} 0 & 3 & 1 \end{matrix}$	$\begin{matrix} 4 \\ 1 \\ 4 \end{matrix}$
$\begin{matrix} 5 & 0 & 3 \end{matrix}$	$\begin{matrix} 9 \\ 16 \\ 0 \end{matrix}$
$\begin{matrix} 1 & 4 & 3 \end{matrix}$	$\begin{matrix} 1 \\ 0 \\ 0 \end{matrix}$

$-\gamma x ^2$	e^\square
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

$$a_i \begin{bmatrix} 20 & 10 & 10 & 10 & 0 & 10 \end{bmatrix} \quad b$$

$$a_i y_i \begin{bmatrix} & & & & & -1 \end{bmatrix} \quad \text{sign } \begin{bmatrix} & \end{bmatrix}$$

$$\text{sign } \begin{bmatrix} & \end{bmatrix}$$

Linear

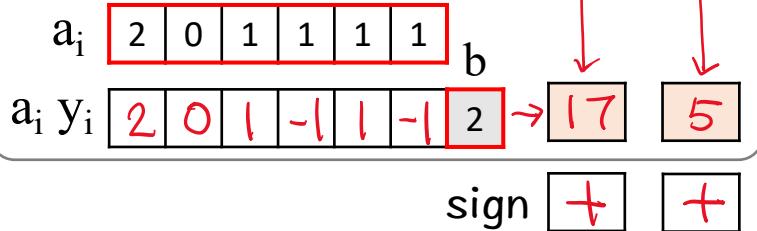
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	X_i	x'_j
1	$x_1 \begin{matrix} 1 & 2 & 1 \end{matrix}$	13
-1	$x_2 \begin{matrix} 0 & 4 & 3 \end{matrix}$	25
1	$x_3 \begin{matrix} 0 & 3 & 0 \end{matrix}$	12
-1	$x_4 \begin{matrix} 0 & 3 & 1 \end{matrix}$	15
1	$x_5 \begin{matrix} 5 & 0 & 3 \end{matrix}$	19
-1	$x_6 \begin{matrix} 1 & 4 & 3 \end{matrix}$	27

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

RBF

X_i	x'_j
$\begin{matrix} 1 & 2 & 1 \end{matrix}$	$\begin{matrix} 2 \\ 4 \\ 3 \end{matrix}$
$\begin{matrix} 0 & 4 & 3 \end{matrix}$	$\begin{matrix} 4 \\ 0 \\ 0 \end{matrix}$
$\begin{matrix} 0 & 3 & 0 \end{matrix}$	$\begin{matrix} 0 \\ 1 \\ 0 \end{matrix}$
$\begin{matrix} 0 & 3 & 1 \end{matrix}$	$\begin{matrix} 4 \\ 1 \\ 4 \end{matrix}$
$\begin{matrix} 5 & 0 & 3 \end{matrix}$	$\begin{matrix} 9 \\ 16 \\ 0 \end{matrix}$
$\begin{matrix} 1 & 4 & 3 \end{matrix}$	$\begin{matrix} 1 \\ 0 \\ 0 \end{matrix}$

$-\gamma x ^2$	e^\square
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

$$a_i \begin{bmatrix} 20 & 10 & 10 & 10 & 0 & 10 \end{bmatrix} b$$

$$a_i y_i \begin{bmatrix} & & & & & -1 \end{bmatrix} \rightarrow$$

$$\text{sign } \boxed{}$$

1
1
1

Linear

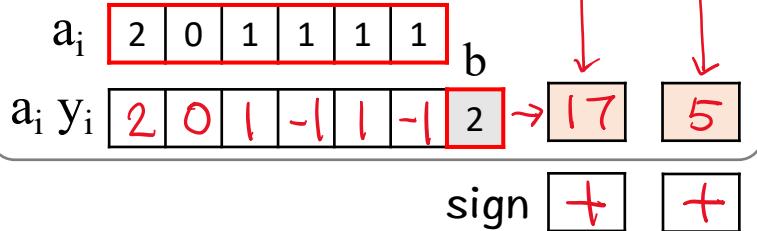
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	X_i	x'_j
1	$x_1 \begin{matrix} 1 & 2 & 1 \end{matrix}$	13
-1	$x_2 \begin{matrix} 0 & 4 & 3 \end{matrix}$	25
1	$x_3 \begin{matrix} 0 & 3 & 0 \end{matrix}$	12
-1	$x_4 \begin{matrix} 0 & 3 & 1 \end{matrix}$	15
1	$x_5 \begin{matrix} 5 & 0 & 3 \end{matrix}$	19
-1	$x_6 \begin{matrix} 1 & 4 & 3 \end{matrix}$	27

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

RBF

X_i	x'_j
$(x - x')^2$	$\sum \sqrt{-\gamma x - x' ^2}$
1 2 1	2
0 4 3	4
0 3 0	3
0 3 1	
5 0 3	
1 4 3	

$-\gamma x - x' ^2$	e^\square
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

$$a_i \begin{bmatrix} 20 & 10 & 10 & 10 & 0 & 10 \end{bmatrix} b$$

$$a_i y_i \begin{bmatrix} & & & & & -1 \end{bmatrix} \rightarrow$$

$$\text{sign } \boxed{}$$

1
1
1

Linear

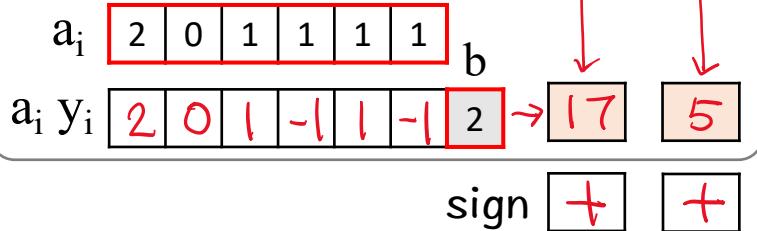
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	X_i	x'_j
1	$x_1 \begin{matrix} 1 & 2 & 1 \end{matrix}$	13
-1	$x_2 \begin{matrix} 0 & 4 & 3 \end{matrix}$	25
1	$x_3 \begin{matrix} 0 & 3 & 0 \end{matrix}$	12
-1	$x_4 \begin{matrix} 0 & 3 & 1 \end{matrix}$	15
1	$x_5 \begin{matrix} 5 & 0 & 3 \end{matrix}$	19
-1	$x_6 \begin{matrix} 1 & 4 & 3 \end{matrix}$	27

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

RBF

X_i	x'_j
$(x - x')^2$	$\sum \sqrt{-\gamma x - x' ^2}$
$L2 \text{ distance } x ^2$	$e^{-\gamma x - x' ^2}$
1 2 1	2
0 4 3	4
0 3 0	3
0 3 1	-0.3
5 0 3	-0.2
1 4 3	-0.1

$-\gamma x ^2$	$e^{-\gamma x ^2}$
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

$$a_i \begin{bmatrix} 20 & 10 & 10 & 10 & 0 & 10 \end{bmatrix} \quad b$$

$$a_i y_i \begin{bmatrix} & & & & & -1 \end{bmatrix} \quad \boxed{}$$

$$\text{sign} \quad \boxed{}$$

1
1
1

Linear

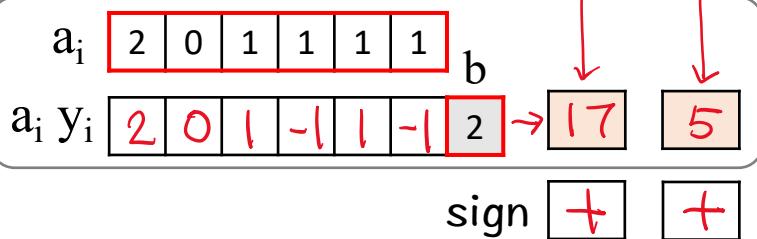
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	x_i	x'_j
1	$x_1 \begin{matrix} 1 & 2 & 1 \end{matrix}$	$x'_1 \begin{matrix} 13 \\ 25 \\ 12 \\ 15 \\ 19 \\ 27 \end{matrix}$
-1	$x_2 \begin{matrix} 0 & 4 & 3 \end{matrix}$	$x'_2 \begin{matrix} 2 \\ 7 \\ 3 \\ 4 \\ 8 \\ 8 \end{matrix}$
1	$x_3 \begin{matrix} 0 & 3 & 0 \end{matrix}$	
-1	$x_4 \begin{matrix} 0 & 3 & 1 \end{matrix}$	
1	$x_5 \begin{matrix} 5 & 0 & 3 \end{matrix}$	
-1	$x_6 \begin{matrix} 1 & 4 & 3 \end{matrix}$	

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

RBF

x_i	x'_j
$\begin{matrix} 1 & 2 & 1 \end{matrix}$	$\begin{matrix} 2 \\ 4 \\ 3 \end{matrix}$
$\begin{matrix} 0 & 4 & 3 \end{matrix}$	
$\begin{matrix} 0 & 3 & 0 \end{matrix}$	
$\begin{matrix} 0 & 3 & 1 \end{matrix}$	
$\begin{matrix} 5 & 0 & 3 \end{matrix}$	
$\begin{matrix} 1 & 4 & 3 \end{matrix}$	

L2 distance $\| \cdot \|^2$

$(x - x')^2 \sum \sqrt{-\gamma \| \cdot \|^2_{(-0.1)}} e^{\frac{-}{\gamma}}$

$-\gamma \ \cdot \ ^2$	$e^{\frac{-}{\gamma}}$
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

$$a_i \begin{bmatrix} 20 & 10 & 10 & 10 & 0 & 10 \end{bmatrix} b$$

$$a_i y_i \begin{bmatrix} & & & & & -1 \end{bmatrix}$$

$$\text{sign } \boxed{}$$

1
1
1

Linear

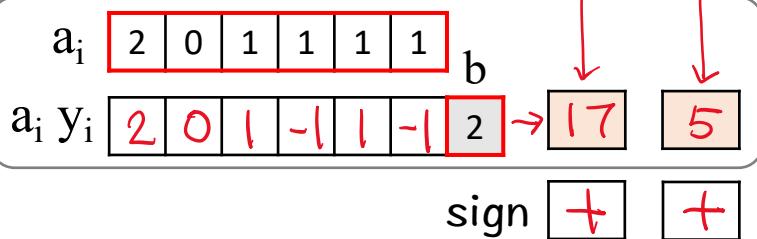
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	X_i	x'_j
1	$x_1 \begin{matrix} 1 & 2 & 1 \end{matrix}$	13
-1	$x_2 \begin{matrix} 0 & 4 & 3 \end{matrix}$	25
1	$x_3 \begin{matrix} 0 & 3 & 0 \end{matrix}$	12
-1	$x_4 \begin{matrix} 0 & 3 & 1 \end{matrix}$	15
1	$x_5 \begin{matrix} 5 & 0 & 3 \end{matrix}$	19
-1	$x_6 \begin{matrix} 1 & 4 & 3 \end{matrix}$	27

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

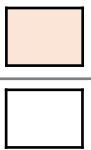
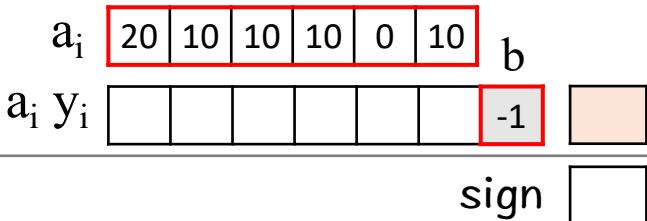
$$b + \sum a_i y_i K$$

RBF

X_i	x'_j
$(x - x')^2$	$\sum \sqrt{-\gamma x - x' ^2}$
$L_2 \text{ distance } x - x' ^2$	$e^{-\gamma x - x' ^2}$
1 2 1	2
0 4 3	4
0 3 0	3
0 3 1	-0.3
5 0 3	0.7
1 4 3	4
1 4 4	0.8
4 0 0	2
0 1 0	1
4 1 4	0.9
9 1 6 0	3
1 0 0	0.7
25	0.6
1	0.9

$-\gamma x - x' ^2$	$e^{-\gamma x - x' ^2}$
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1



12

Linear

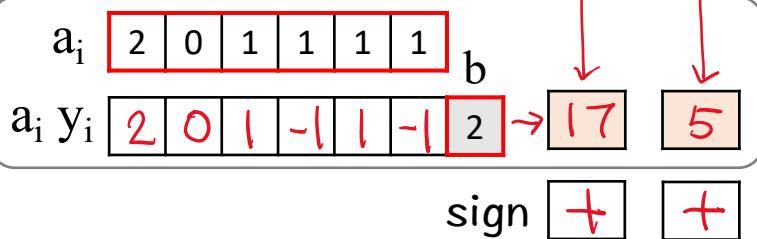
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	x_i	x'_j
1	$x_1 \begin{matrix} 1 & 2 & 1 \end{matrix}$	$x'_1 \begin{matrix} 13 \\ 25 \\ 12 \\ 15 \\ 19 \\ 27 \end{matrix}$
-1	$x_2 \begin{matrix} 0 & 4 & 3 \end{matrix}$	$x'_2 \begin{matrix} 2 \\ 7 \\ 3 \\ 4 \\ 8 \\ 8 \end{matrix}$
1	$x_3 \begin{matrix} 0 & 3 & 0 \end{matrix}$	
-1	$x_4 \begin{matrix} 0 & 3 & 1 \end{matrix}$	
1	$x_5 \begin{matrix} 5 & 0 & 3 \end{matrix}$	
-1	$x_6 \begin{matrix} 1 & 4 & 3 \end{matrix}$	

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

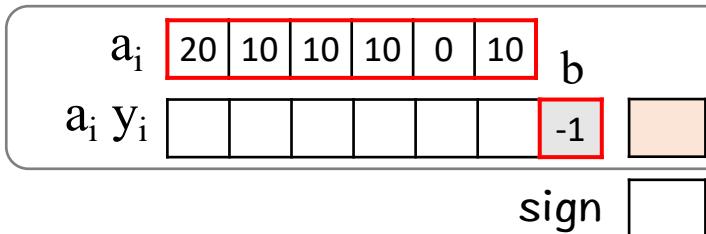
RBF

x_i	x'_j
$(x - x')^2$	$\sum \sqrt{-\gamma x - x' ^2}$
$L2 \text{ distance } x ^2$	$e^{-\gamma x - x' ^2}$
$1 \ 2 \ 1$	2
$0 \ 4 \ 3$	4
$0 \ 3 \ 0$	3
$0 \ 3 \ 1$	
$5 \ 0 \ 3$	
$1 \ 4 \ 3$	

$-\gamma x ^2$	$e^{-\gamma x ^2}$
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

0	1	0	1				
1	9	4	14				
1	4	1	6				
1	4	0	5				
16	1	4	21				
0	9	4	13				



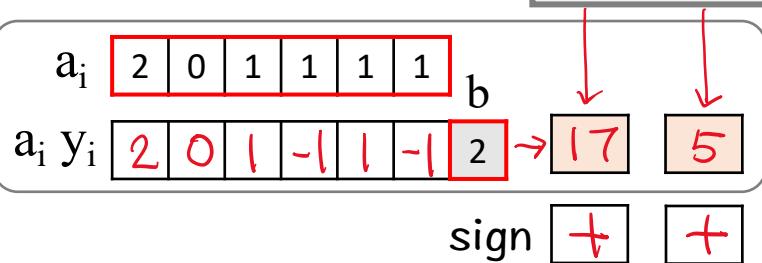
Linear

SVM

y_i	x_i	x'_j	x'_1	x'_2
1	x_1		2	1
-1	x_2		4	1
1	x_3		3	1
-1	x_4			
1	x_5			
-1	x_6			

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

RBF

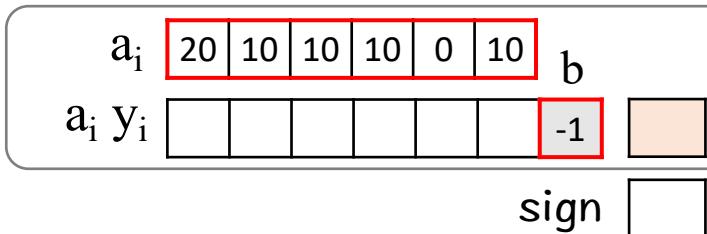
x_i	x'_j	x'_1	x'_2	x'_3
1 2 1		2		
0 4 3		4		
0 3 0		3		
0 3 1				
5 0 3				
1 4 3				

L2 distance $\| \cdot \|^2$
 $(x - x')^2 \sum \sqrt{-\gamma \| \cdot \|^2_{(-0.1)}} e^{-\gamma \| \cdot \|^2}$

$-\gamma \ \cdot \ ^2$	$e^{-\gamma \ \cdot \ ^2}$
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

0	1	0	1	1	
1	9	4	14	3	
1	4	1	6	2	
1	4	0	5	2	
16	1	4	21	4	
0	9	4	13	3	



Linear

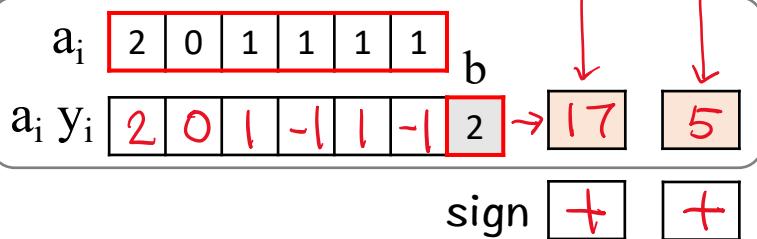
x'_1	x'_2
2	1
4	1
3	1

SVM

y_i	x_i	x'_j
1	$x_1 \begin{matrix} 1 & 2 & 1 \end{matrix}$	$x'_1 \begin{matrix} 13 \\ 25 \\ 12 \\ 15 \\ 19 \\ 27 \end{matrix}$
-1	$x_2 \begin{matrix} 0 & 4 & 3 \end{matrix}$	$x'_2 \begin{matrix} 2 \\ 7 \\ 3 \\ 4 \\ 8 \\ 8 \end{matrix}$
1	$x_3 \begin{matrix} 0 & 3 & 0 \end{matrix}$	
-1	$x_4 \begin{matrix} 0 & 3 & 1 \end{matrix}$	
1	$x_5 \begin{matrix} 5 & 0 & 3 \end{matrix}$	
-1	$x_6 \begin{matrix} 1 & 4 & 3 \end{matrix}$	

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

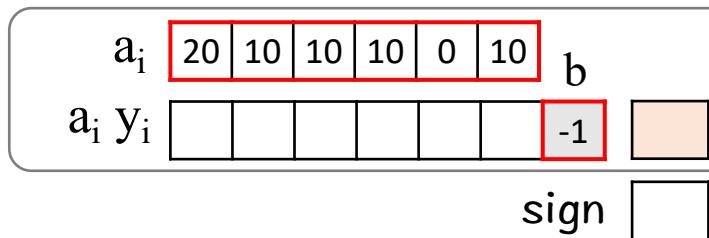
RBF

x_i	x'_j
$(x - x')^2$	$\sum \sqrt{-\gamma x - x' ^2}$
$L_2 \text{ distance } x ^2$	$e^{-\gamma x - x' ^2}$
$1 \ 2 \ 1$	2
$0 \ 4 \ 3$	4
$0 \ 3 \ 0$	3
$0 \ 3 \ 1$	
$5 \ 0 \ 3$	
$1 \ 4 \ 3$	

$-\gamma x ^2$	$e^{-\gamma x ^2}$
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

0	1	0	1	1	-0.1
1	9	4	14	3	-0.3
1	4	1	6	2	-0.2
1	4	0	5	2	-0.2
16	1	4	21	4	-0.4
0	9	4	13	3	-0.3



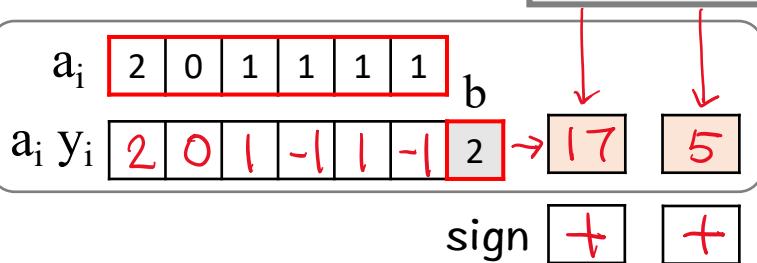
Linear

y_i	x_i	x'_j	x'_1	x'_2
1	x_1	1 2 1	2	1
-1	x_2	0 4 3	4	1
1	x_3	0 3 0	3	1
-1	x_4	0 3 1	13	2
1	x_5	5 0 3	25	7
-1	x_6	1 4 3	12	3

SVM

Kernel Matrix

$$K(x_i, x'_j)$$



Decision Boundary

$$b + \sum a_i y_i K$$

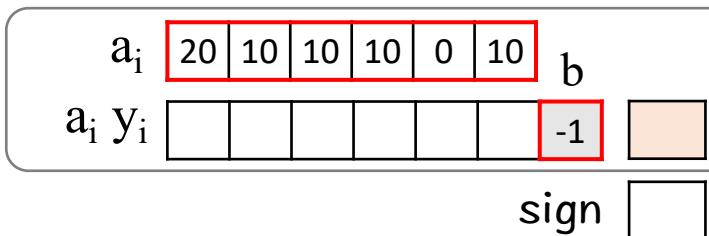
RBF

x_i	x'_j	x'_1	x'_2	x'_3
1 2 1	2	2	4	3
0 4 3	4	4	0	0
0 3 0	0	1	0	0
0 3 1	4	1	4	1
5 0 3	9	16	0	25
1 4 3	1	0	0	1

$-\gamma x ^2$	e^\square
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1

0	1	0	1	1	-0.1	0.9
1	9	4	14	3	-0.3	0.7
1	4	1	6	2	-0.2	0.8
1	4	0	5	2	-0.2	0.8
16	1	4	21	4	-0.4	0.67
0	9	4	13	3	-0.3	0.9



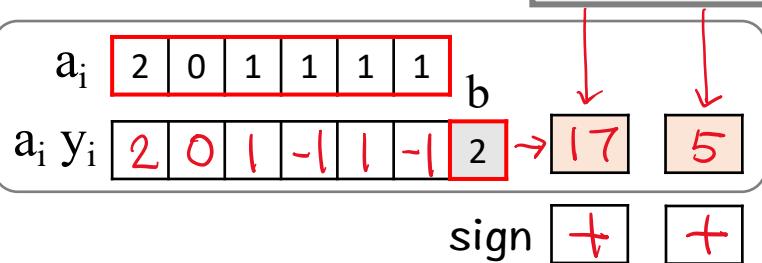
Linear

SVM

y_i	x_i	x'_j	x'_1	x'_2
1	x_1		2	1
-1	x_2		4	1
1	x_3		3	1
-1	x_4			
1	x_5			
-1	x_6			

Kernel Matrix

$$K(x_i, x'_j)$$



RBF

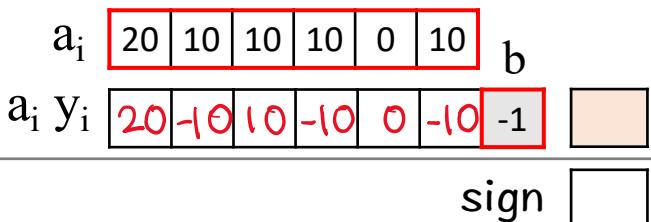
x_i	x'_j	x'_1	x'_2	x'_3
1 2 1		2		
0 4 3		4		
0 3 0		3		
0 3 1				
5 0 3				
1 4 3				

L2 distance $\| \cdot \|^2$

$(x - x')^2 \sum \sqrt{-\gamma \| \cdot \|^2_{(-0.1)}} e^{\frac{x}{\gamma}}$

$-\gamma \ \cdot \ ^2$	$e^{\frac{x}{\gamma}}$
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1



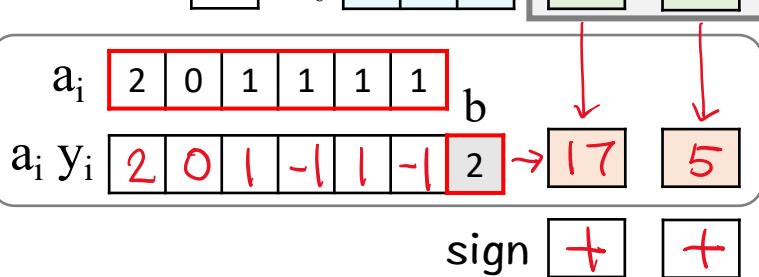
Linear

SVM

y_i	x_i	x'_j	x'_1	x'_2
1	x_1		2	1
-1	x_2		4	1
1	x_3		3	1
-1	x_4			
1	x_5			
-1	x_6			

Kernel Matrix

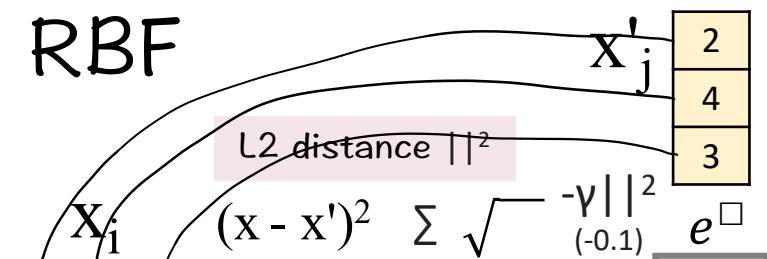
$$K(x_i, x'_j)$$



Decision Boundary

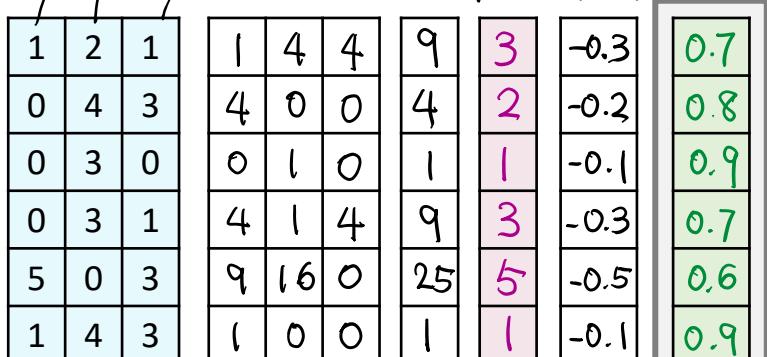
$$b + \sum a_i y_i K$$

RBF



$-\gamma \ \cdot \ ^2$	e^γ
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1



0	1	0	1	1	-0.1
1	9	4	14	3	-0.3
0	4	0	1	2	-0.2
0	0	1	6	2	-0.2
0	1	4	5	2	-0.2
5	9	16	21	4	-0.4
1	1	0	13	3	-0.3

$$a_i [20 10 10 10 0 10] b$$

$$a_i y_i [20 -10 10 -10 0 -10] \rightarrow -2$$

$$\text{sign } \boxed{}$$

1

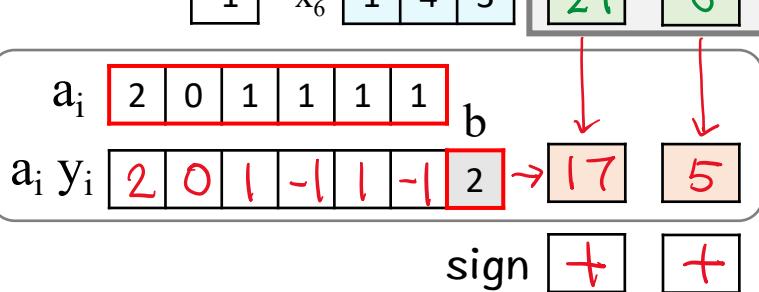
Linear

SVM

y_i	x_i	x'_j	x'_1	x'_2
1	x_1		2	1
-1	x_2		4	1
1	x_3		3	1
-1	x_4			
1	x_5			
-1	x_6			

Kernel Matrix

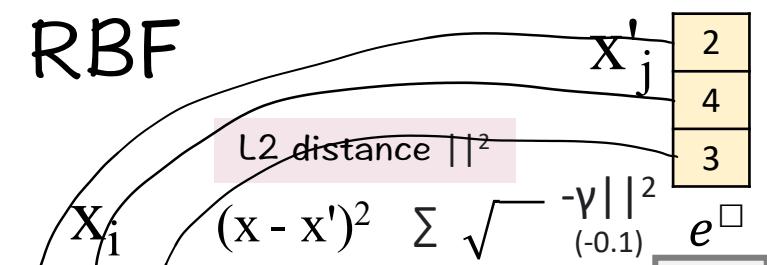
$$K(x_i, x'_j)$$



Decision Boundary

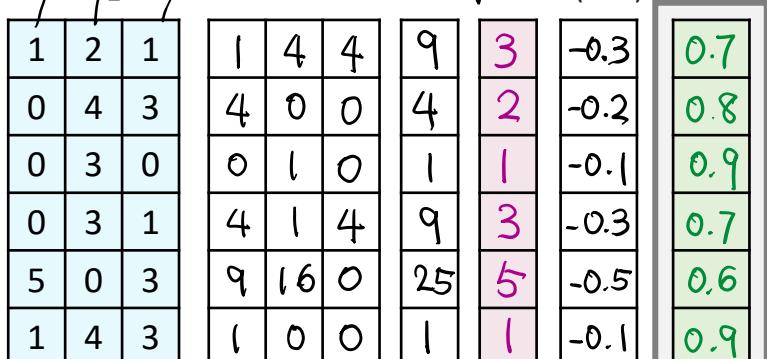
$$b + \sum a_i y_i K$$

RBF

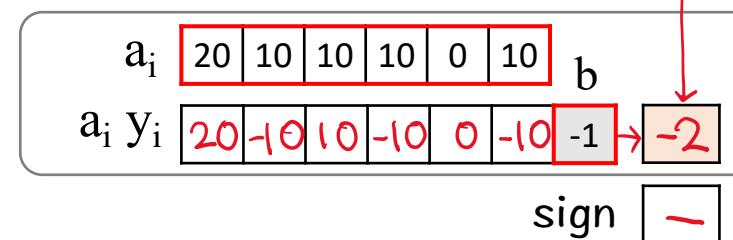


$-\gamma x ^2$	e^\square
-0.5	0.6
-0.4	0.67
-0.3	0.7
-0.2	0.8
-0.1	0.9

1
1
1



0	1	0	1	1	-0.1
1	9	4	14	3	-0.3
1	4	1	6	2	-0.2
1	4	0	5	2	-0.2
16	1	4	21	4	-0.4
0	9	4	13	3	-0.3



1
+