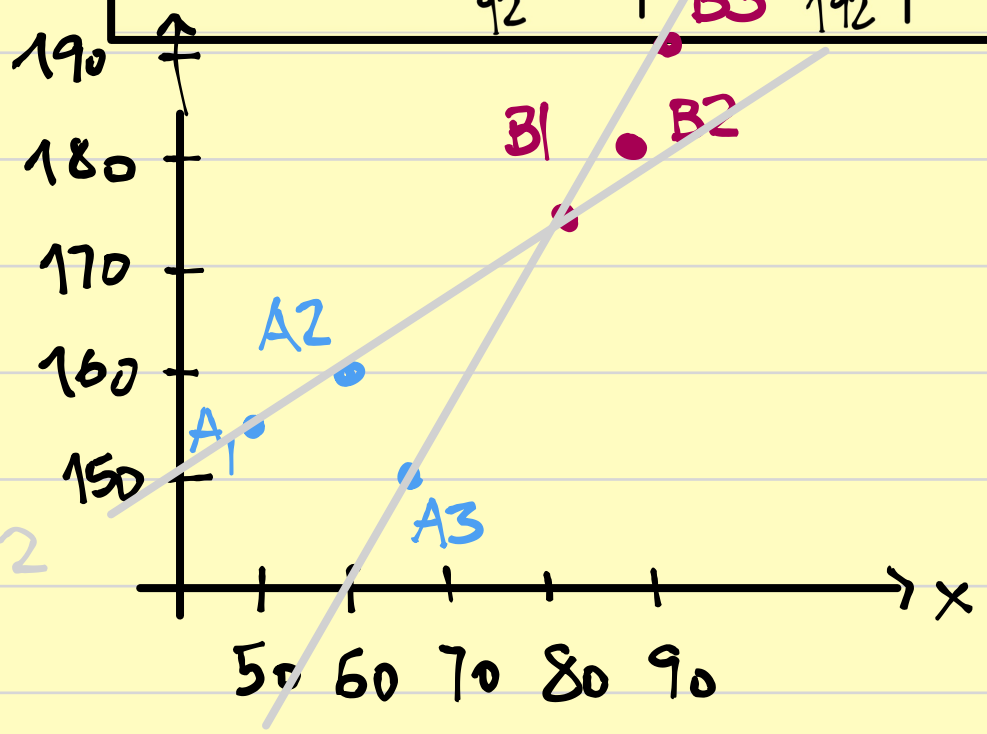
Bitte SVM anwenden...

Beispiel.	x (Gewicht)	y (Größe)	Klasse
	50	155	♀
	60	160	♀
	68	150	♀
	85	175	♂
	90	182	♂
	92	192	♂



Schritt 1. Graphische Darstellung

Schritt 2. $y = mx + b$

Schritt 3. Extrem Fremlinien.

L1: A3[68,150], B3[92,192]

$$\frac{y-150}{x-68} = \frac{192-150}{92-68} \rightarrow y = 150 + 1{,}75(x-68)$$

L2: A2[60,160], B1[85,175]

$$\frac{y-160}{x-60} = \frac{175-160}{85-60} \rightarrow y = 160 + 0{,}33(x-60)$$

$$\left.\begin{aligned} y_\alpha &= 150 + 1{,}75(x_\alpha - 68) \\ y_\alpha &= 160 + 0{,}33(x_\alpha - 60) \end{aligned}\right| - \quad \Rightarrow 0 = -10 + (1{,}75 - 0{,}33)x_\alpha - 68 + 60$$

$$\rightarrow \quad x_\alpha = \frac{18}{1'75 - 0'33} = 12'67 \rightarrow \quad y_\alpha = 53'18$$

Schritt 4. $y = mx + b$

$$d_{A2} = \frac{|m \cdot 60 + 160 + b|}{\sqrt{m^2+1}} \qquad d_{B1} = \frac{|m \cdot 85 + 175 + b|}{\sqrt{m^2+1}}$$

$$60m + 160 = 85m + 175$$

$$m = -0'6$$

$$y = -0'6\,x + b \rightarrow 53'18 = -0'6 \cdot 12'67 + b \rightarrow$$

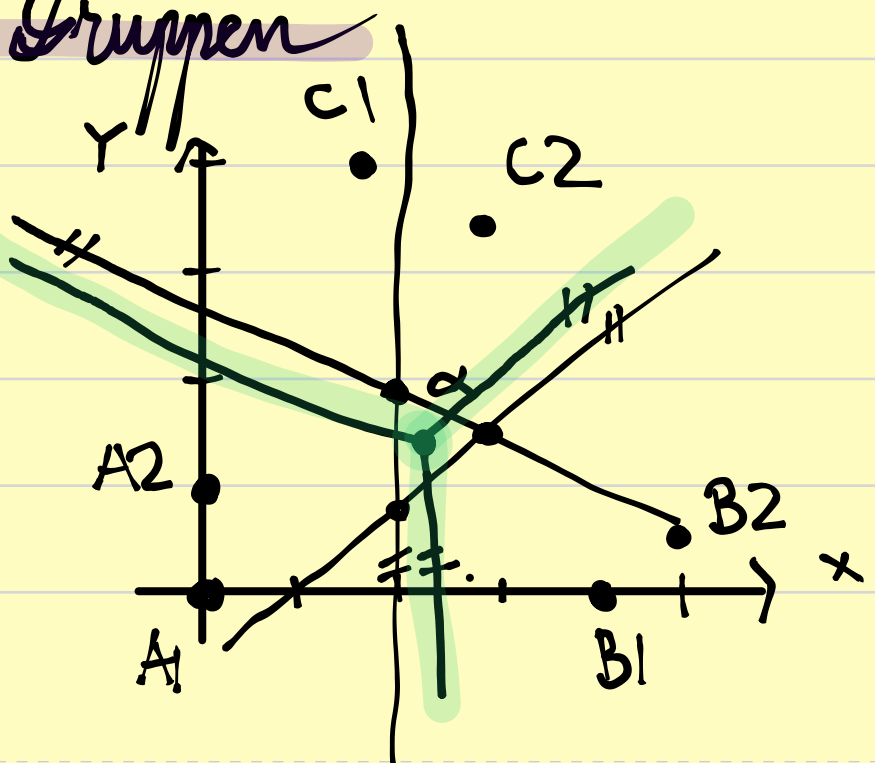
$$\rightarrow b = 60'782$$

$$\boxed{y = -0'6\,x + 60'782}$$

$$d = \frac{|60 \cdot (-0'6) + 160 + 60'782|}{\sqrt{60'782^2 + 1}} = 3'039$$

SVM. 2 Dimensionen + 3 Gruppen

KUNDENTYP	X	Y
A	0	0
	0	1
B	4	0
	5	0'5
C	2	4
	3	3'5



Schritt 1. Graphische Darstellung ✓

Schritt 2. Trennlinie von den Gruppenpaaren

AB · AC · BC

TL: AB: L1: A2/B1: $\frac{y-1}{x-0} = \frac{0-1}{4-0} \rightarrow y = 1 + \frac{-1}{4}x$

L2: A1/B2: $\frac{y-0}{x-0} = \frac{0'5-0}{5-0} \rightarrow y = 0'1x$

$y_{\alpha_1} = 1 - \frac{1}{4} x_{\alpha_1}$
$y_{\alpha_1} = 0'1\, x_{\alpha_1}$

$\Rightarrow 0 = 1 - \left(\frac{1}{4} + 0'1\right) x_{\alpha_1} \rightarrow x_{\alpha_1} = \frac{1}{0'35} = 2'857$

$y_{\alpha_1} = 0'286$

$d_{A2} = \frac{|m.0+1+b|}{\sqrt{m^2+1}}$
$d_{B1} = \frac{|m.4+0+b|}{\sqrt{m^2+1}}$

$\Rightarrow 0+1 = m.4+b \rightarrow m = 0'25$

$y = mx + b \rightarrow 0'286 = 0'25 \cdot 2'857 + b \rightarrow b = -0'428$

TL_{AB} $y = 0'25x - 0'428$ $\alpha_1 [2'857, 0'286]$

TL_{AC}: A2/C2: L1: $\frac{y-1}{x-0} = \frac{3'5-1}{3-0} \rightarrow y = 1 + 0'83x$

A1/C1: L2: $\frac{y-0}{x-0} = \frac{2-0}{4-0} \rightarrow y = 0'5x$

$y_{\alpha_2} = 1 + 0'83 x_{\alpha_2}$

$y_{\alpha_2} = 0'5 x_{\alpha_2}$

$\Rightarrow 0 = 1 + (0'83 - 0'5) x_{\alpha_2}$

$x_{\alpha_2} = 3 \rightarrow y_{\alpha_2} = 1'5$

$d_{C1} = \dfrac{|m.2 + 4 + b|}{\sqrt{m^2+1}}$

$d_{A2} = \dfrac{|m.0 + 2 + b|}{\sqrt{m^2+1}}$

$\Rightarrow 2m + 4 + b = b + 2 \rightarrow m = -1$

$y = -1 . x + b \rightarrow 1'5 = -3 + b \rightarrow b = 4'5$

$TL_{AC}: \; y = -x + 4'5$

$\alpha_2 [3, 1'5]$

TL_{BC}:

L1: B1/C2: $\dfrac{y-0}{x-4} = \dfrac{3'5-0}{3-4} \rightarrow y = -3'5(x-4)$

L2: B2/C1: $\dfrac{y-0'5}{x-5} = \dfrac{4-0'5}{2-5} \rightarrow y = 0'5 - 1'67(x-5)$

$y_{\alpha_3} = -3'5(x_{\alpha_3} - 4)$

$y_{\alpha_3} = 0'5 - 1'67(x_{\alpha_3} - 5)$

$\Rightarrow 0 = -3'5 x_{\alpha_3} + 14 - 0'5 + 1'67 x_{\alpha_3} - 8'35$

$x_{\alpha_3} = \dfrac{14 - 0'5 - 8'35}{3'5 - 1'67} = 2'814 \rightarrow y_{\alpha_3} = 4'15$

$d_{C2} = \dfrac{|m.3 + 3'5 + b|}{\sqrt{m^2+1}}$

$d_{B2} = \dfrac{|m.5 + 0'5 + b|}{\sqrt{m^2+1}}$

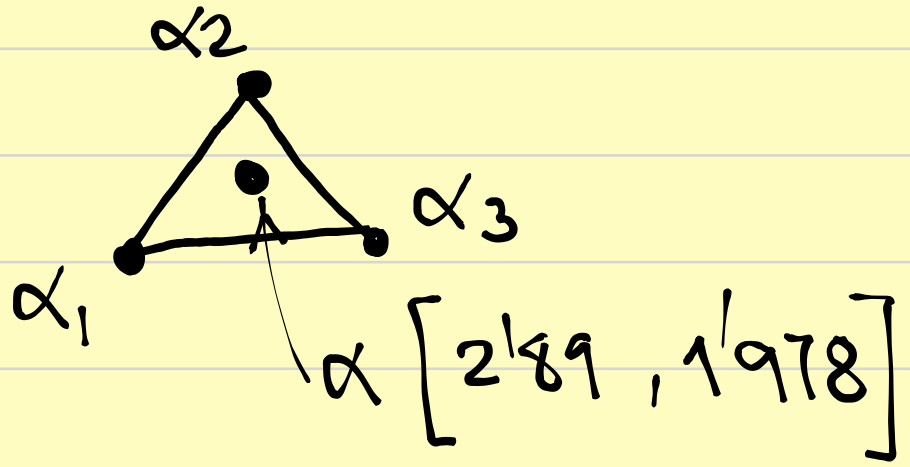
$\Rightarrow 3m + 3'5 + b = 5m + 0'5 + b$

$m = 1'5$

$y = 1'5x + b \rightarrow 4'15 = 1'5 \cdot 2'814 + b \rightarrow$

$\rightarrow b = -0'071 \rightarrow$

$\boxed{TL_{BC}: y = 1'5x - 0'071} \rightarrow \alpha_3 \equiv [2'814, 4'15]$



$\alpha_x: \dfrac{x\alpha_1 + x\alpha_2 + x\alpha_3}{3} = \dfrac{2'857 + 3 + 2'814}{3} = 2'89$

$\alpha_y: \dfrac{y\alpha_1 + y\alpha_2 + y\alpha_3}{3} = \dfrac{0'286 + 1'5 + 4'15}{3} = 1'978$

$TL_{AB} \equiv y = 0'25x - 0'428$

$y = 0'25x + (1'978 - 0'25 \cdot 2'89)$

TL'_{AB} $\boxed{y = 0'25x + 1'256}$

$TL_{AC} \equiv y = -x + 4'5$

$y = -x + (1'978 - (-1) \cdot 2'89)$

TL'_{AC} $\boxed{y = -x + 4'868}$

$TL_{BC} \equiv y = 1'5x - 0'071$

$$y = 1'5x + (1'978 - 1'5 \cdot 2'89)$$

T_{LBC}' $\boxed{y = 1'5x - 2'357}$