A Company of the Comp	
	classmate
	SVM () Date
	(Not very parameters to fittle with)
*	W. Alicina Hayolo: The Alicina A
- LA	partial will by 2000 on man
	where we don't find
	where we don't find training samples
	o o o
	Margin: width of a band around decision boundary
	without any training samples.
	Narrain and Chances of the A
<u> Ditiri</u>	Narrow margin > chances of misclassification ?
100 July 1	salas de means if a dataset can be chessifie
	Margin varies with the post & orientation of the seperating
	hyperplane.
	Visualizing Margin: Bubbles around samples.
	margin: Radius of a region ground each training sample,
	through which the decision boundary can't pass
	As margin 1; feasible region reduces.
	probotos mission sondan
	Circles influencing the
	decision boundary.
	O.O.O. O.O. Sonly a few samples controlling.
	decision boundary.
	some samples control the decision bounday.
	inpus south
	-> sample c +1 at a contract the sample contract to
	samples that support the decision boundary are called
	Support vectors.
	Margin of the start
	Margin: Band vs Bubbles
	soth interpretations yield the same decision boundary
J. U.	from nearest support vectors.
	Sym tries to find min distance
	from nearest support vectors.

	distance of the form
=====	Best line SUM: SUM finds the min distance of the frontier
	from the closest S.V (can belong to any class
	SUM learns the best hyperplane by maximizing the
	margin (one that lies
	margir (orac
	probable minus bined a to Adult voish
	Types of SVM: Agreed + Printiples AND Justines
	Types of SVM.
1.	linear SVM: linear SVM is used for linearly seperably
	data which means if a dataset can be classified into
	two-tclasses by vising ransingle straighteline.
produ r	Lestwork classe (209/20031)
2.	Non-linear & SVM62 Series 2012/2019 10/24/14 PHIS WOULD
	as marini Rodins of a region anos com Louisan so
200	a from probated religions by the come come
	La Marcha & State of J. Company 25 1
	Decision Boundary:
	x x 12 = 0
	X ANY
5 - 15 - 15 - 15 - 15 - 15 - 15 - 15 -	Formalizing the Margin: Decision Boundary: Wix + b = 0 me parallel hyperplanes
Millochii.	$\frac{m_{a}x_{imin}}{m_{a}x_{im}}$ $co^{T}x + b = \pm E$
	ensured initials and for those 2 women 2 miles
and the red with	wizit wo = 2 & wizit two dour sent 2 Dames a
	c=0 depending on # of features.
mi	al Intuition
· · · · · · · · · · · · · · · · · · ·	In order; to find max value, it may take large
	Boto Steers or and blain some or and off
2 50	Note
	NOTE: The value of wtz. + b is dependent on the Scale
	σ ω. sependent on The Scale

10 mg	
	Maximizing the Margin
*	CONTRACTOR OF THE PROPERTY OF
	-> we want a classifier (linear seperator) with as big
	a margin as possible.
	-> (xo, yo) to a line Ax+ By+C=0
	=> 1Axo+ Byotcl
	$\sqrt{A^2+B^2}$
	\rightarrow The dist b/ω Ho and H, is; $ \omega^{\dagger}x+b =1$ [1 ω 1]
	-> Total distance bloom H, & H, is; 2
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	[- [2 *]
	estion (2017 = 1 .63 HIZZ als 2im on 2 2 9 or 2 12 12 2
	-> can be combined into: y: (w¹x; +b)≥1
de la companya de la	-> can be combitted those the
	plant state
	PCIVLE INC.
	S. Marine Marine B. S. Santon M.
	impue we set (Constant on) is the set of set of
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	15 00, 507 : N-1, 10 4 Spore - (1)
5)	Ling 2) Whore Y21M. 2Nd 2500 Mah 5 18 W 2
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*	How far is your point from classic to
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p is	The line of the li
	from the classification boundary into the cost or
	from the classification boundary into the cost calculation. Thinge loss increases linearly.
	Le de servicio
	0 2
	- late will get the bree of wid able into-
	→ Minimi el a horm w .
	Total margin: 21 2 h alla comadale andot
	1100!)
	$\frac{1}{2} \frac{ \omega ^2}{ \omega ^2} \frac{4i(\omega^{\dagger}x - 1) > 0}{ \omega ^2} \rightarrow \text{for all points}$ $\frac{1}{2} \frac{ \omega ^2}{ \omega ^2} \frac{4i(\omega^{\dagger}x - 1) > 0}{ \omega ^2} \rightarrow \text{for all points}$
	coire ctly classifier
	2nd Part
***************************************	which samples are misclassified. (outside/inside margn)
	n company bendered so marga)
	n (c)
	Himae Inco E
	tinge loss formula
	linge loss: Minimize
	$\frac{\lambda \ \omega\ ^2 + 1}{\eta} = \frac{\eta}{\xi} \left(\omega; (x_i, y_i)\right) \left(x_i's \text{ are augmented}\right)$
	samples which are misclassified
0	onere;
	l(w; (xi, yi)) = max {0,1-y; \w, x; >}
	1 5c) = max [0,1-y: (ω, χ; >)
	$\cdot < \omega, \times \cdot > \ldots$
	· Note: for correct the inner product of vectors
	y. Classified samples
	yi < w, xi> >1
	relative importance of margin & training loss.
and the second	margin & training me

	* SVM Formulation
	-> Need to maximize relative margin (not absolute)
	· Minimize (w) for mixed margin or maximize
	margin for $ \omega =1$.
	· Training samples should be outside the margin.
	\Rightarrow ie; runimire $J(\omega) = \pm \omega^T \omega$; subject to ,
« ————————————————————————————————————	
	*i; yi(ω ⁷ xi+b) > 1
	> Truis is a constrained quadratic optimization problem.
	- Can be solved by the lagrangian multiplier method
	1. use the method of last and multiplier method
	1. use the method of Lagrange Kultipliers (a) to modify J(w) to Q(a)
	2. USE QP Solver to get a;
and the second second	3. Use & to find w
*	(carning a
	Learning a linear SVM
7	Convert the Constrained minimization to an unconstrained
	grants as ment constraints as much
	w, b Z w + penalty term / D
	M ₂
→	penally vise the following
	$\max_{\alpha_i \geq 0} \frac{\alpha_i \left[1 - y_i \left(\omega^T x_i + b\right)\right]}{\left(\omega^T x_i + b\right)} = \left[0 \text{if } y_i \left(\omega^T x_i + b\right)\right]$
	(00 Otherwise.