Support Vector Machines

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1. **SUPPORT VECTOR MACHINE (SVM)**

If a data point (x,y) is a support vector, then the corresponding multiplier $\alpha_{x,y}$ must be equal to zero.	**False**
The margin of the SVM classifier is given by $1/2\|\|\theta\|\|^2$.	**False**
If the hyperparameter λ in the objective function $\frac{1}{n}\sum_{\text{data }(x,y)} \max\{1-y(\theta^\top x+\theta_0),\ 0\}+\frac{\lambda}{2}\|\|\theta\|\|^2$ decreases, then the margin of the classifier increases.	**False**
The SVM without slack variables applies to data that is not linearly separable.	**False**
Consider the SVM with slack variables, whose training loss is given by $\frac{1}{2}\|\|\theta\|\|^2+\frac{C}{n}\sum_{(x,y)\in\mathcal{S}_n} \max\{1-y(\theta^\top x+\theta_0),\ 0\}.$ To increase the margin, one must increase the hyperparameter C.	**False**
For the SVM with slack variables, if the multiplier $\alpha_{x,y}$ for a data point (x,y) is equal to C, then the point (x,y) must lie on the edge of the margin.	**False**
For the SVM without slack variables, if a data point (x,y) lies on the edge of the margin, then it must be a support vector.	**True**
Computing the SVM classifier with slack variables involves solving a convex optimization problem.	**True**
The size of the margin of the SVM classifier is proportional to $\|\|\theta\|\|^{-1}$.	**True**

2. Classification of Kernel Functions:

$K(x,x')=x\cdot x'$	Linear
$K(x,x')=(x\cdot x'+1)^k$	Polynomial
$K(x,x')=\exp((-1/2\sigma^2)\|\|x-x'\|\|^2)$	Radial Basis Kernel

2015:

Support Vector Machine (SVM) optimizes what objective function?

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mean hinge loss with squared ℓ_2-norm $\|w\|_2^2=\sum_{d=1}^{D} w_d^2$ on weights w