# Machine Learning @MIT Lecture Note 3 notes Support Vector Machine 1

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**Question 1.**

Lecture note 3 Support Vector Machine

Some note from Lecture note 3 Support Vector Machine @credit to MIT - maximize geometric margin - optimization problem find minimize22/2subjecttoytTxtforallt= 1, . . . , n minimize122subjecttoytTxt1forallt= 1, . . . , n

GENERAL FORMULATION f(x;, 0)=sign(Tx+0)

- maximum margin solution - minimize22subjecttoyt(Txt+0)1forallt= 1, . . . , n

- maximize margin linear classifier through origin, with offset param

PROPERTIES OF MAXIMUM MARGIN LINEAR CLASSIFIER - Examples lie on the margin is support vector - rest could lie anywhere outside the margin without affecting solution - question related to we would get the same classifier if we had only received the support vector as training example - measure how good a classifier - cross validation - leave one out cross validation - Find max margin linear separator without ith training example leave-one-outCVerror=Lossyi, f(xi;i, 0i) - derive a simple upper bound on the leave one out CV

ALLOWING MISCLASSIFIED EXAMPLES, RELAXATION - solution to permit errors in maximum margin linear classifier is introduce slack variable for classification constraints in the optimization problem - measure degree to which each margin constraint is violated and associate a cost - minimize cost with the norm of param vector - simple relaxed optimization problem minimize2+Ct - penalty for violation and it is traded off with the possible gain in minimizing the squared norm of the param vector - quantitative trade off between norm of param vector and margin violation