SUPPORT VECTOR MACHINE

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Abstract

The general objective of this work was to perform a theoretical study about SVM, which includes reporting justifications for the use of such technique and showing its geometric interpretation and analytical perspective. In order to apply the technique to classification problems, we seek to base its use mathematically, since it involves a quadratic, convex and constrained programming problem.

Several fields of science make use of Optimization to aid in decision making. In particular, this is observed in Machine Learning, for example, when doing a search on Google or for recognition of friends on Facebook. In this work, we carried out a theoretical study of a supervised machine learning technique: the Support Vector Machine (SVM). It was developed by Vladimir Vapnik, Bernhard Boser, Isabelle Guyon and Corrina Cortes, with their foundations coming from the Statistical Learning Theory [4, 5]. This technique focuses attention on the following quadratic, convex and constrained programming problem

$$\begin{array}{ll} \min\limits_{w,b} & f(w,b) \text{ with } w \in \mathbb{R}^n \text{ and } b \in \mathbb{R} \\ s.a & g(w,b) \leq 0, \end{array}$$

where the functions $f : \mathbb{R}^{n+1} \to \mathbb{R}$ and $g : \mathbb{R}^{n+1} \to \mathbb{R}$ are continuously differentiable.

For the analysis of the technique, we use the theory of Lagrangian duality, to facilitate the calculations and the analysis of the solutions. We worked with the *Kernel* function to solve the problem when it is not possible to find a decision function in the input space.

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