The Asymmetric Proximal Support Vector Machine Based on Multitask Learning for Classification

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Abstract : Multitask learning support vector machines (SVMs) have recently attracted increasing research attention. Given several related tasks, the single-task learning methods trains each task separately and ignore the inner cross-relationship among tasks. However, multitask learning can capture the correlation information among tasks and achieve better performance by training all tasks simultaneously. In addition, the asymmetric squared loss function can better improve the generalization ability of the models on the most asymmetric distributed data. In this paper, we first make two assumptions on the relatedness among tasks and propose two multitask learning proximal support vector machine algorithms, named MTL-a-PSVM and EMTL-a-PSVM, respectively. MTL-a-PSVM seeks a trade-off between the maximum expectile distance for each task model and the closeness of each task model to the general model. As an extension of the MTL-a-PSVM, EMTL-a-PSVM can select appropriate kernel functions for shared information and private information. Besides, two corresponding special cases named MTL-PSVM and EMTLPSVM are proposed by analyzing the asymmetric squared loss function, which can be easily implemented by solving linear systems. Experimental analysis of three classification datasets demonstrates the effectiveness and superiority of our proposed multitask learning algorithms.

Keywords : multitask learning, asymmetric squared loss, EMTL-a-PSVM, classification
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