SVM-based classification algorithms with interval-valued data

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Robust one-class and binary classification models by interval-valued training data are considered. The models are based on analyzing the expected classification risk measure in the framework of Dempster-Shafer theory with respect to the minimax strategy. It is shown that the dual optimization problems to special forms of the support vector machine (SVM) have a nice property allowing to represent the problem as a set of simple linear programs. It is proposed also to replace the Gaussian kernel in the obtained linear support vector machines by the well-known triangular kernel or Epanechnokov kernel which can be regarded as an approximation of the Gaussian kernel. This replacement allows us to get a finite set of simple linear optimization problems in the case of the triangular kernel or a set of quadratically constrained linear programs by the Epanechnokov kernel for dealing with interval-valued data. The proposed models can be applied to imprecise data (not only interval-valued data) which can be represented as convex sets.