Extended Twin Support Vector Regression via Particle Swarm Optimization for the Asymmetric Interval Data

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Abstract

In many applications, available information is often uncertain, such as the measurements which are never 100% accurate obtained by same/similar measuring instruments. Consider the uncertainty involved in the data, it would be better to utilize the interval to depict the characteristic of the data. A kind of powerful machine learning techniques for modeling crisp data is the support vector regression. For crisp data, Peng (2010) based on the idea of proximal support vector regression to propose the twin support vector regression (TSVR) to establish two hyperplanes without the restriction of parallel. According to the Hausdorff distance, Peng et al. (2015) proposed a novel interval twin support vector regression (ITSVR), which employs two nonparallel functions to identify the upper and lower sides of the interval output data. For modeling the data more flexible, we study an extended twin support vector regression (ETSVR) method, which algorithm models the upper and lower ends of the interval data by two related TSVR functions. Considering the effects of the tuning parameters in the SVR-type algorithm, we adopt Particle Swarm Optimization (PSO) algorithm to reduce the searching burden in the proposed algorithm. In this work, the results of the artificial data show that the constructed interval model by ETSVR gives better performances than those based on ITSVR, especially for the asymmetric interval data.

Keywords：asymmetric, extended twin support vector regression, Hausdorff distance, interval input-output data, kernel function, particle swarm optimization, quadratic programming