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One-Class Support Measure Machines for Group Anomaly Detection

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We propose one-class support measure machines (OCSMMs) for group anomaly detection which aims at recognizing anomalous aggregate behaviors of data points. The OCSMMs generalize well-known one-class support vector machines (OCSVMs) to a space of probability measures. By formulating the problem as quantile estimation on distributions, we can establish an interesting connection to the OCSVMs and variable kernel density estimators (VKDEs) over the input space on which the distributions are defined, bridging the gap between large-margin methods and kernel density estimators. In particular, we show that various types of VKDEs can be considered as solutions to a class of regularization problems studied in this paper. Experiments on Sloan Digital Sky Survey dataset and High Energy Particle Physics dataset demonstrate the benefits of the proposed framework in real-world applications.

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