JP1.22   CLOUD CLASSIFICATION OF SATELLITE RADIANCE DATA
BY MULTICATEGORY SUPPORT VECTOR MACHINES

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Abstract

Two category Support Vector Machines (SVM) have been very popular in the machine learning community for the classification problem. Treating multicategory problems as a series of binary problems is very common in the SVM paradigm. However, this approach may fail under a variety of circumstances. We have proposed the Multicategory Support Vector Machine (MSVM), which extends the binary SVM to the multicategory case, and has good theoretical properties. The proposed method provides a unifying framework when there are either equal or unequal misclassification costs.

In this paper, we illustrate the potential of the multicategory SVM as an efficient cloud detection and classification algorithm for use in Earth Observing System models, which require knowledge of whether a radiance profile is cloud free, or not. If the profile is not cloud free, it is valuable to have information concerning the type of cloud, for example ice or liquid water. We have applied the MSVM to simulated MODIS type channels data to classify the radiance profiles as clear, liquid clouds, or ice clouds, and the results are promising. Although this study is not yet comprehensive, it is believed that the MSVM will be a very useful tool for classification problems in atmospheric sciences.

URLs for related papers

Details of this work can be found in Lee (2002), and Lee, Lin, and Wahba (2002). Those papers are available from www.stat.wisc.edu/~wahba/trindex.html, or www.stat.ohio-state.edu/~yklee/paper.html. Lee, Wahba, and Ackerman (2002) will be posted later on the same websites.

References

[1] Lee, Y. (2002). Multicategory Support Vector Machines, Theory, and Application to the Classification of Microarray Data and Satellite Radiance Data, PhD thesis, Department of Statistics, University of Wisconsin-Madison, Also available as Technical Report 1063.

[2] Lee, Y., Lin, Y., and Wahba, G. (2002). Multicategory Support Vector Machines, Theory, and Application to the Classification of Microarray Data and Satellite Radiance Data, Technical Report 1064. Department of Statistics, University of Wisconsin-Madison

[3] Lee, Y., Wahba, G., and Ackerman, S. A. (2002) Cloud classification of Satellite Radiance Data by Multicategory Support Vector Machines, in preparation.

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