fMRI Analysis via One-class Machine Learning Techniques.

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Abstract

One-Class Machine Learning techniques (i.e. "bottleneck" neural networks and one-class support vector machines (SVM)) are applied to classify whether a subject is performing a task or not by looking solely at the raw fMRI slices of his brain. "One-class" means that during training the system only has access to positive (i.e. task performing) examples. "Two-class" means it has access to negative examples as well.

Successful classification of data by a system trained under either of the one-class systems was accomplished at close to the 60% level. (In contrast, an implementation of a standard two class SVM succeeds at around the 70% level.) These results were stable over repeated experiments and for both motor and visual tasks. Since the one-class neural network technique is naturally related to dimension reduction, it is possible that this mechanism may also be used for feature selection.