CSE 255 Quiz 3

Tuesday April 23, 2013

Instructions. Do this quiz in partnership with exactly one other student. Write both your names at the top of this page. Discuss the answer to the question with each other, and then write your joint answer below the question. Use the back of the page if necessary. It is fine if you overhear what other students say, because you still need to decide if they are right or wrong. You have seven minutes.

Question. Suppose that you have trained RBF and linear SVM classifiers carefully for a learning task with $n$ training examples and $d$ features. Given optimal hyperparameters for each classifier, which balance overfitting and underfitting, both classifiers achieve equal accuracy.

Now, you are given many times more training examples for the same task. After finding optimal hyperparameters again, do you expect the linear classifier or the RBF classifier to yield better accuracy? Explain briefly.

Answer. We expect the RBF classifier to achieve better accuracy. Its flexibility depends on $n$ whereas the flexibility of a linear classifier depends on $d$. More flexibility implies more ability to fit the data closely. More training examples implies more ability to avoid overfitting while still fitting a flexible model.

Additional notes. Flexibility and complexity are more or less synonyms. Above, accuracy refers to accuracy on an independent test set, possibly as estimated by cross-validation. Accuracy on a training set is of little interest. The hyperparameters for each classifier are separate. Even with the same data, the optimal $C$ for an SVM with one kernel is usually different the optimal $C$ for an SVM with a different kernel.