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Learnability of Gaussians with flexible variances. (English) Zbl 1222.68339

J. Mach. Learn. Res. 8, 249-276 (2007).

Summary: Gaussian kernels with flexible variances provide a rich family of Mercer kernels for learning algorithms. We show that the union of the unit balls of reproducing kernel Hilbert spaces generated by Gaussian kernels with flexible variances is a uniform Glivenko-Cantelli (uGC) class. This result confirms a conjecture concerning learnability of Gaussian kernels and verifies the uniform convergence of many learning algorithms involving Gaussians with changing variances. Rademacher averages and empirical covering numbers are used to estimate sample errors of multi-kernel regularization schemes associated with general loss functions. It is then shown that the regularization error associated with the least square loss and the Gaussian kernels can be greatly improved when flexible variances are allowed. Finally, for regularization schemes generated by Gaussian kernels with flexible variances we present explicit learning rates for regression with least square loss and classification with hinge loss.

MSC:

68T05 Learning and adaptive systems in artificial intelligence

62H30 Classification and discrimination; cluster analysis (statistical aspects)

Cited in **1** Review

Cited in **31** Documents

Keywords:

Gaussian kernel; flexible variances; learning theory; Glivenko-Cantelli class; regularization scheme; empirical covering number

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