

Sampling theory for regularized least squares approximations

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For many computational problems in science and engineering, building blocks that naturally represent the solution do not constitute an orthonormal basis. For example, multivariate approximation schemes might use basis functions defined on a tensor-product domain, whilst in practice the function to be approximated is only defined on an irregular subdomain. For such non-standard approximation sets, the associated least squares systems are often heavily ill-conditioned, indicating that the best approximation to a bounded function might have unbounded expansion coefficients. A popular technique to obtain accurate approximations with bounded coefficients is regularization of the least squares system. However, this makes the effective approximation space smaller and hence results in slower convergence. In this talk we will explore a complementary advantage of regularization: it also lowers the amount of data that is required from a function in order to stably compute its approximation.