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Low-rank computation of the posterior mean in Multi-Output Gaussian Processes

Thursday, September 4, 2025 12:00 PM (30 minutes)

Gaussian processes (GP) are a versatile tool in machine learning and computational science. In this talk we consider the case of multi-output Gaussian processes (MOGP) and present low-rank approaches for efficiently computing the posterior mean of such a MOGP. Starting from low-rank spatio-temporal data, we consider a structured covariance function, assuming separability across space and time. This separability, in turn, gives a decomposition of the covariance matrix into a Kronecker product of individual covariance matrices. Incorporating the typical noise term to the model then requires the solution of a large-scale Stein equation for computing the posterior mean. For this, we propose efficient low-rank methods based on a combination of a LRPCG method with the Sylvester equation solver KPIK adjusted for solving Stein equations. We test the developed method on real world street network graphs by using graph filters as covariance matrices.

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