

# Additive Gaussian Process Models via Convex Combination of Kernels

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## Abstract

Some engineering and scientific computer models that have high dimensional input space are actually only affected by a few essential input variables. If these active variables are identified, it would reduce the computation in the estimation of the Gaussian process (GP) model and help researchers understand the system modeled by the computer simulation. More importantly, reducing the input dimensions would also increase the prediction accuracy, as it alleviates the "curse of dimensionality" problem. In this talk, we propose a new approach to reduce the input dimension of the Gaussian process model. Specifically, we develop an optimization method to identify a convex combination of a subset of kernels of lower dimensions from a large candidate set of kernels, as the correlation function for the GP model. To make sure a sparse subset is selected, we add a penalty on the weights of kernels. Several numerical examples are shown to show the advantages of the method. The proposed method has many connections with the existing methods including active subspace, additive GP, and composite GP models in the Uncertainty Quantification literature.