

# AMS 268 Final Project Description

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Explore the Gaussian Process model fused with a Generalized Double Pareto prior.

The GP model to be explored is

$$\begin{aligned}y|f(X) &= f(X) + \epsilon, \quad \epsilon \sim N(0, \sigma^2 I) \\f(X)|d_1, \dots, d_p &\sim GP(0, \kappa(\cdot, \cdot)) \\d_1, \dots, d_p &\sim GDP(a, b)\end{aligned}$$

$$\begin{aligned}\Rightarrow y|d_1, \dots, d_p &\sim N(0, \sigma^2 I + K) \\d_1, \dots, d_p &\sim GDP(a, b)\end{aligned}$$

with covariance function  $\kappa(x_1, x_2) = \tau \exp(\phi(x_1 - x_2)'D(x_1 - x_2))$ ,  $K_{ij} = \kappa(x_i, x_j)$  and where

$$D = \begin{pmatrix} d_1 & 0 & \cdots & 0 \\ 0 & d_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & d_p \end{pmatrix}$$

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The density for the  $GDP(a, b)$  is  $f(x; a, b) = \frac{1}{2a} \left(1 + \frac{|x|}{ab}\right)^{-a+1}$