$\mathcal{GP}$ Write Up 10

November 6, 2018

Checking for machine precision with naive GP

1. Experiments

We are trying to determine if the predictive mean from naive GP and the convolutional method are equal.

That is:

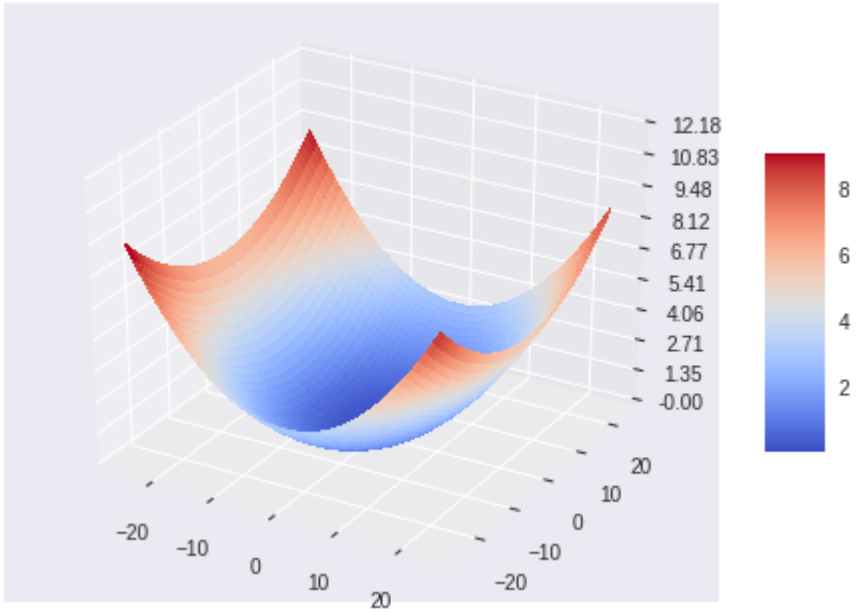
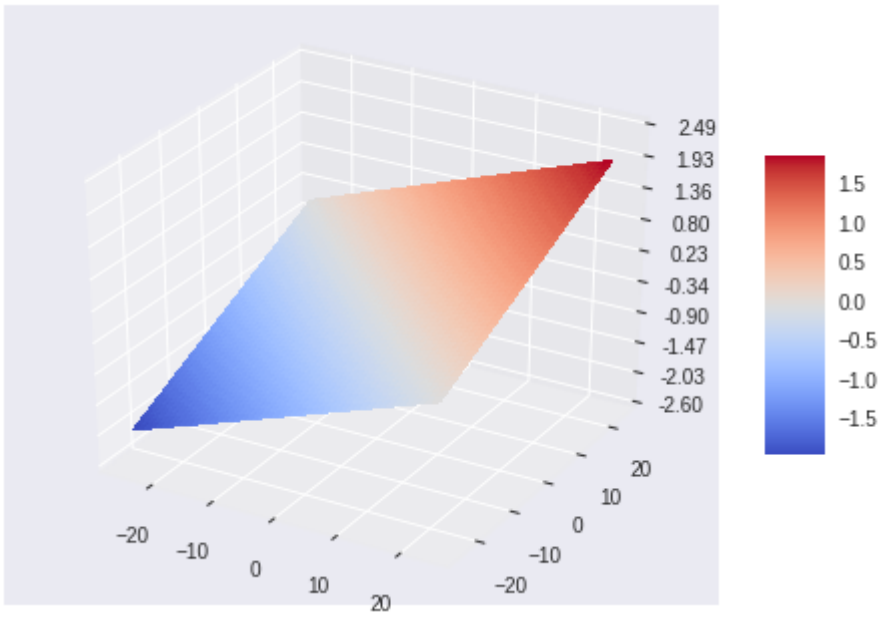
Naive:

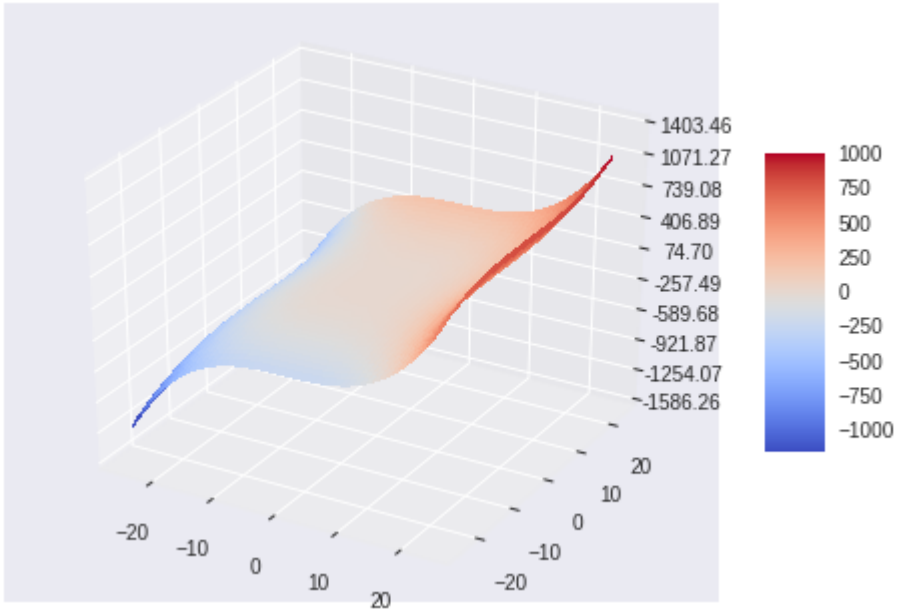
$$\mathbf{f}_* = \mathbf{K}(\mathbf{K} + \sigma_n^2 I)^{-1} y \tag{1}$$

Convolutional method:

$$v = \mathbf{K}^{-1}\mathbf{f}_* \tag{4}$$

We used three different smooth surfaces each defined between $X \in [-25, 25]$, $Y \in [-25, 25]$. We ran the network for 600 iterations, with a learning rate of 10^{-1} and we find that the predictive mean for the convolutional method and the naive GP are within machine precision of 10^{-15}. The observations have noise $\mathcal{N}(0, \sigma_n^2 I)$.

Equation	Predictive mean	SE
$\frac{X^2}{4} + \frac{Y^2}{8}$		1.7e-13
$X + Y$		8.4e-18

Equation	Predictive mean	SE
$\frac{X^3}{16} + \frac{Y^3}{64}$		9.5e-24