

# Gaussian Processes Visual Tool

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GP Visual Tool is called to be a system for the interactive modeling, fitting and interpreting of Gaussian processes.

TODO: Overall image

It allows the user to rigorously specify a model by choosing different sets of hyperparameters.

# What is a Gaussian process?

Typically, Gaussian processes (GPs) can be seen as a generalization of the Bayesian Regression. Suppose we want to model a  $f : \mathbb{R} \rightarrow \mathbb{R}$  as a GP. We would define it as following:

$$\begin{aligned}\mathbf{y} \mid (\mathbf{f}, \mathbf{x}) &\sim \mathcal{N}(\mathbf{f}, \sigma^2 I), \\ \mathbf{f} \mid \mathbf{x} &\sim \mathcal{GP}(m, k) \equiv \mathcal{N}(m(\mathbf{x}), k(\mathbf{x}, \mathbf{x})),\end{aligned}$$

for  $\mathbf{x} = x_1, \dots, x_N$ ,  $\mathbf{y} = y_1, \dots, y_N$  and  $\mathbf{f} = f(x_1), \dots, f(x_N)$ . We often refer to  $m$  as the mean function (usually  $m(x_i) = 0$ ) and  $k$  as the kernel function. Our goal is to find the *posterior* distribution of  $f$ .



# Finding the *posterior* distribution

# Some approaches to get optimal hyperparams

# Applications of GPs

Life could be a dream.



# Developing a visual tool

# Objectives and interactions.

# Let's start sampling

Some marginals are not that bad<sup>1</sup>

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<sup>1</sup>Marginal distributions :D

# Beyond choosing a kernel

Math is actually important

Customization is allowed

# Time to play!



# Thanks!