

FoKL-GPy Example - Pyomo Maximize

Known (i.e., toy problem):

$$t \in [0, 1]$$

$$\begin{cases} x_0 = \sin(3\pi t) \\ x_1 = \cos(3\pi t) \end{cases}$$

$$y = -\sin(\pi t) (\mathcal{B}_1(x_0) + \mathcal{B}_2(x_1) + \mathcal{B}_2(x_0) \mathcal{B}_3(x_1)) + \text{noise}$$

where $\mathcal{B} \equiv$ orthonormal Bernoulli polynomial scaled by BSS-ANOVA eigen-decomposition

Goal:

Find t for $y = y_{\max}$.

Method:

- A FoKL model was trained to find $y = f(x_0, x_1)$.
- The FoKL model was converted to Pyomo.
- Pyomo constraints were added for $x_0 = f(t)$ and $x_1 = f(t)$.
- The multistart solver was used to run IPOPT at various initial points to find a global solution.

Results:

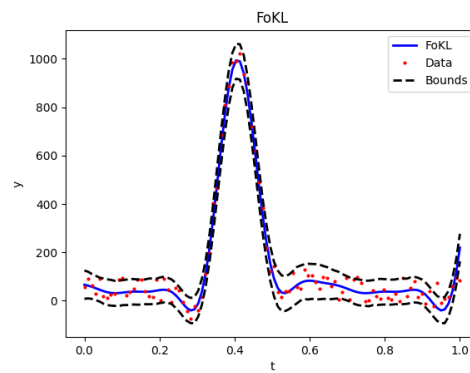


Figure 1. FoKL model 'coverage3' plot

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Pyomo solution:
y = 964.641776937593
x0 = 0.1767866144502644
x1 = 0.11851198262399118
t = 0.40791247100188405
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Figure 2. Pyomo solution via multistart solver using IPOPT as local solver