Case 1

Ideal Model:

$$m\ddot{x} + c\dot{x} + kx = 0$$

$$\begin{cases} x(0) = 4.0 \\ \dot{x}(0) = 0.0 \end{cases}$$

$$\begin{cases} m & = 1.0 \\ c & = 0.5 \\ k & = 3.0 \end{cases}$$

To the clean data points, we might add the noise $\epsilon \sim \mathcal{N}(0, \sigma_N^2)$

Computational Model:

$$m\ddot{x} + c\dot{x} + kx = 0$$

$$\begin{cases} x(0) = 4.0 \\ \dot{x}(0) = 0.0 \end{cases}$$

$$\begin{cases} m & = 1.0 \\ c & = \ ? \\ k & = \ ? \end{cases}$$

Likelihood Function is a Gaussian with σ_L

Case 1.1: $\sigma_N = 0.0 \quad \sigma_L = 0.01$

Case 1.2: $\sigma_N = 0.0 \quad \sigma_L = \ ?$

Case 1.3: $\sigma_N = 0.1 \quad \sigma_L = \ ?$

Case 2

Ideal Model:

$$\begin{cases} m\ddot{x} + c\dot{x} + kx = 0 \\ \dot{T} = c(T)\dot{x}^2 - \frac{T - T_0}{t_T} \end{cases}$$

$$\begin{cases} x(0) = 4.0 \\ \dot{x}(0) = 0.0 \\ T(0) = T_0 = 20.0 \end{cases}$$

$$\begin{cases} m & = 1.0 \\ c(T) & = \exp\left(\frac{T_0}{T} - 1\right) \\ k & = 3.0 \\ t_T & = 1.0 \end{cases}$$

To the clean data points, we might add the noise $\epsilon \sim \mathcal{N}(0, \sigma_N^2)$

Computational Model:

$$m\ddot{x} + c\dot{x} + kx = 0$$

$$\begin{cases} x(0) = 4.0 \\ \dot{x}(0) = 0.0 \end{cases}$$

$$\begin{cases} m & = 1.0 \\ c & = \; ? \\ k & = \; ? \end{cases}$$

Likelihood Function is a Gaussian with σ_L

Case 2.1: $\sigma_N = 0.0 \quad \sigma_L = 0.01$

Case 2.2: $\sigma_N = 0.0 \quad \sigma_L = \; ?$

Case 2.3: $\sigma_N = 0.1 \quad \sigma_L = \; ?$