

# Case 3

**Ideal Model:**

$$\begin{cases} m\ddot{x} + c\dot{x} + kx = 0 \\ \dot{T} = c(T)\dot{x}^2 - \frac{T-T_0}{t_T} \end{cases} \quad \begin{cases} m = 1.0 \\ c(T) = \exp\left(\frac{T_0}{T} - 1\right) \\ k = 3.0 \\ t_T = 1.0 \end{cases}$$

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

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

**Computational Model:**

$$\begin{cases} m\ddot{x} + c\dot{x} + kx = 0 \\ \begin{cases} x(0) = 4.0 \\ \dot{x}(0) = 0.0 \end{cases} \end{cases} \quad \begin{cases} m = 1.0 \\ c = \mathcal{N}(\mu_C, \sigma_C) \\ \mu_C = ? \\ \sigma_C = ? \\ k = ? \end{cases}$$

**Case 3.1:**  $\sigma_N = 0.0$      $\sigma_L = 0.01$

**Case 3.2:**  $\sigma_N = 0.0$      $\sigma_L = ?$

**Case 3.3:**  $\sigma_N = 0.1$      $\sigma_L = ?$

Likelihood Function is a Gaussian with  $\sigma_L$

---

# Questions?

---

[sventuri@illinois.edu](mailto:sventuri@illinois.edu)

Talbot Lab, Room 302E