## Case 2

$$egin{cases} m\ddot{x} + c\dot{x} + kx = 0 \ \dot{T} = c(T)\dot{x}^2 - rac{T - T_0}{t_T} \ x(0) = 4.0 \ \dot{x}(0) = 0.0 \end{cases}$$

Ideal Model: 
$$\begin{cases} m\ddot{x}+c\dot{x}+kx=0\\ \dot{T}=c(T)\dot{x}^2-\frac{T-T_0}{t_T} \end{cases} \begin{cases} m=1.0\\ c(T)=\exp\left(\frac{T_0}{T}-1\right)\\ k=3.0\\ t_T=1.0 \end{cases}$$
 
$$\begin{cases} x(0)=4.0\\ \dot{x}(0)=0.0\\ T(0)=T_0=20.0 \end{cases}$$
 To the clean data points, we might add the noise  $\epsilon \sim \mathcal{N}(0,\sigma_N^2)$ 

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

## Computational Model:

$$m\ddot{x} + c\dot{x} + kx = 0$$
$$\begin{cases} x(0) = 4.0 \\ \dot{x}(0) = 0.0 \end{cases}$$

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

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

Case 2.2: 
$$\sigma_N=0.0$$
  $\sigma_L=~?$ 

Case 2.3: 
$$\sigma_N=0.1$$
  $\sigma_L=~?$ 

# Case 3

### Ideal Model:

$$egin{cases} m\ddot{x} + c\dot{x} + kx &= 0 \ \dot{T} = c(T)\dot{x}^2 - rac{T - T_0}{t_T} \ \end{pmatrix} \ egin{cases} x(0) &= 4.0 \ \dot{x}(0) &= 0.0 \ T(0) &= T_0 &= 20.0 \end{cases}$$

Fal Model: 
$$\begin{cases} m\ddot{x}+c\dot{x}+kx=0\\ \dot{T}=c(T)\dot{x}^2-\frac{T-T_0}{t_T} \end{cases} \begin{cases} m &=1.0\\ c(T) &=\exp\left(\frac{T_0}{T}-1\right)\\ k &=3.0\\ t_T &=1.0 \end{cases}$$
 
$$\begin{cases} x(0)=4.0\\ \dot{x}(0)=0.0 \end{cases}$$

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

$$m\ddot{x} + c\dot{x} + kx = 0$$
$$\begin{cases} x(0) = 4.0\\ \dot{x}(0) = 0.0 \end{cases}$$

$$\begin{array}{lll} \text{Computational Model:} & \begin{cases} m & = 1.0 \\ c & = \mathcal{N}(\mu_C, \sigma_C) \\ \\ \mu_C & = ? \\ \\ \sigma_C & = ? \\ \\ \dot{x}(0) = 0.0 \end{cases} & \begin{array}{lll} m & = 1.0 \\ \\ \mu_C & = ? \\ \\ \sigma_C & = ? \\ \\ \kappa & = ? \end{array} & \begin{array}{lll} \text{Case 3.1: } \sigma_N = 0.0 & \sigma_L = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = ? \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = 0.01 \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = 0.01 \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = 0.01 \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = 0.01 \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = 0.01 \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = 0.01 \end{array} & \begin{array}{lll} \sigma_L & = 0.01 \\ \\ \sigma_L & = 0.01$$

Likelihood Function is a Gaussian with  $\sigma_L$ 

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