

$$M\ddot{x} + b\dot{x} + kx = f \quad \text{Stimulus}$$

$x$  is  $N \times 1$  vector  
 $\dot{x}$  is  $N \times 1$  vector  
 $\ddot{x}$  is  $N \times 1$  vector

where  $N$  is number of sampled data

$$A = \begin{bmatrix} x & \dot{x} & \ddot{x} \end{bmatrix} \\
 = \begin{bmatrix} x_1 & \dot{x}_1 & \ddot{x}_1 \\ x_2 & \dot{x}_2 & \ddot{x}_2 \\ \vdots & \vdots & \vdots \\ x_N & \dot{x}_N & \ddot{x}_N \end{bmatrix} \quad \text{Stimulus} \\
 N \times 3$$

$$X = \begin{bmatrix} k \\ b \\ m \end{bmatrix} \quad 3 \times 1 \quad \text{UNKNOWN}$$

$$B = \begin{bmatrix} f_1 \\ f_2 \\ \vdots \\ f_N \end{bmatrix} \quad \text{response} \\
 N \times 1$$

$$B = A X \quad \begin{matrix} AX = B \\ X = A \setminus B \end{matrix} \\
 N \times 1 = N \times 3 \quad 3 \times 1 \\
 X = A \setminus B$$