

Input

- Restoring force dataset ($\bar{\mathcal{D}}$)
- Applied force ($\mathbf{F}(t)$) and mass (m)
- Numerical integration parameters ($\gamma, \beta, \Delta t$)

$i \leftarrow 1$

$k \leftarrow 0$

Initialize Dynamical State

- Select random initial guess in dataset:

$$\mathbf{s}_j^{*(0)} \leftarrow \text{rnd}(\mathbf{s}_j^*) \in \bar{\mathcal{D}} \mid j = 1 \dots N_T$$

Compute Dynamical State

- Solve first minimization problem:

$$\mathbf{s}_i^{(k)} = \arg \left[\min_{\mathbf{s} \in \bar{\mathcal{S}}} d^2(\mathbf{s}_i, \mathbf{s}_j^{*(k)}) \right]$$

Update Dataset Point

- Solve second minimization problem:

$$\mathbf{s}_j^{*(k+1)} = \arg \left[\min_{\mathbf{s}_j^* \in \bar{\mathcal{D}}} d^2(\mathbf{s}_i^{(k)}, \mathbf{s}_j^*) \right]$$

no

$k \leftarrow k + 1$

$$|\mathbf{s}_j^{*(k+1)} - \mathbf{s}_j^{*(k)}| \leq \epsilon$$

yes

no

$i \leftarrow i + 1$

$$i + 1 = N_T$$

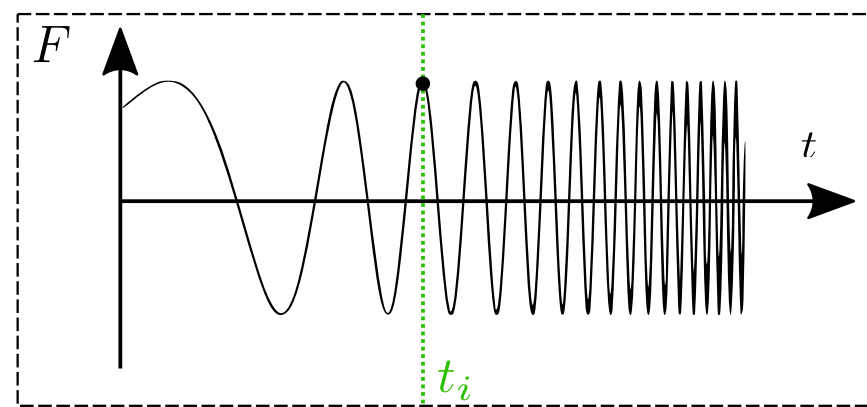
yes

Output

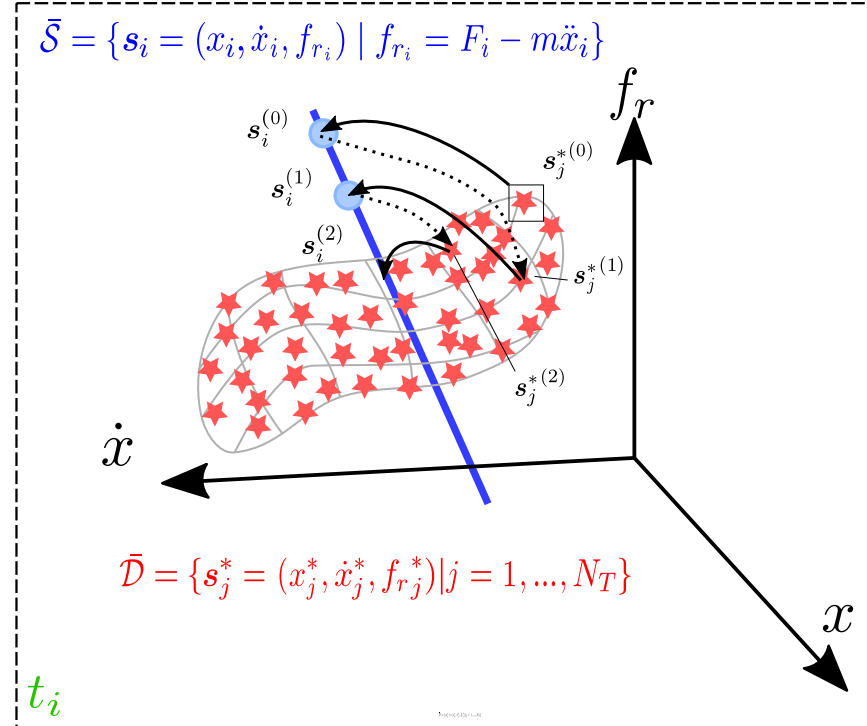
- Dynamic system response:

$$\mathbf{s}_i = (x_i, \dot{x}_i, f_{ri}), i = 0 \dots N_T$$

Applied Force in Time Domain



Restoring Force in Phase-space



Predicted Dynamic System Response

