

A

True cusp bifurcation dynamics :

$$\dot{x} = \phi_1 + \phi_2 x - x^3$$

$$(\phi_1, \phi_2) : (1, 4) \rightarrow (3, 3)$$



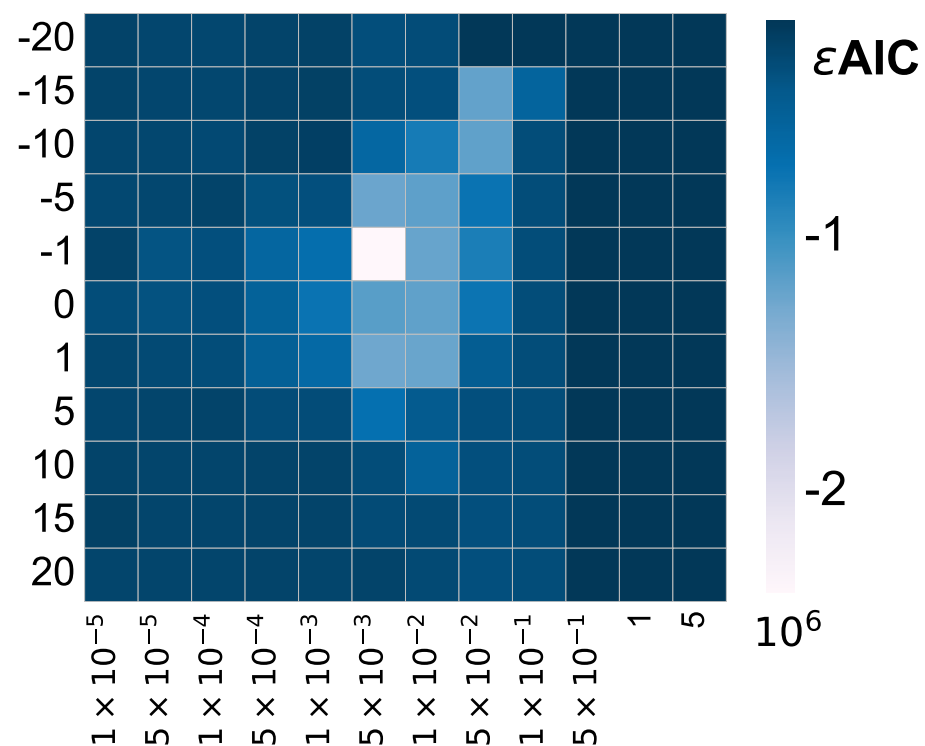
Inferred equation :

$$\dot{x} = (1.4 + 0.4\nu) + (3.8 - 0.2\nu)x - x^3$$

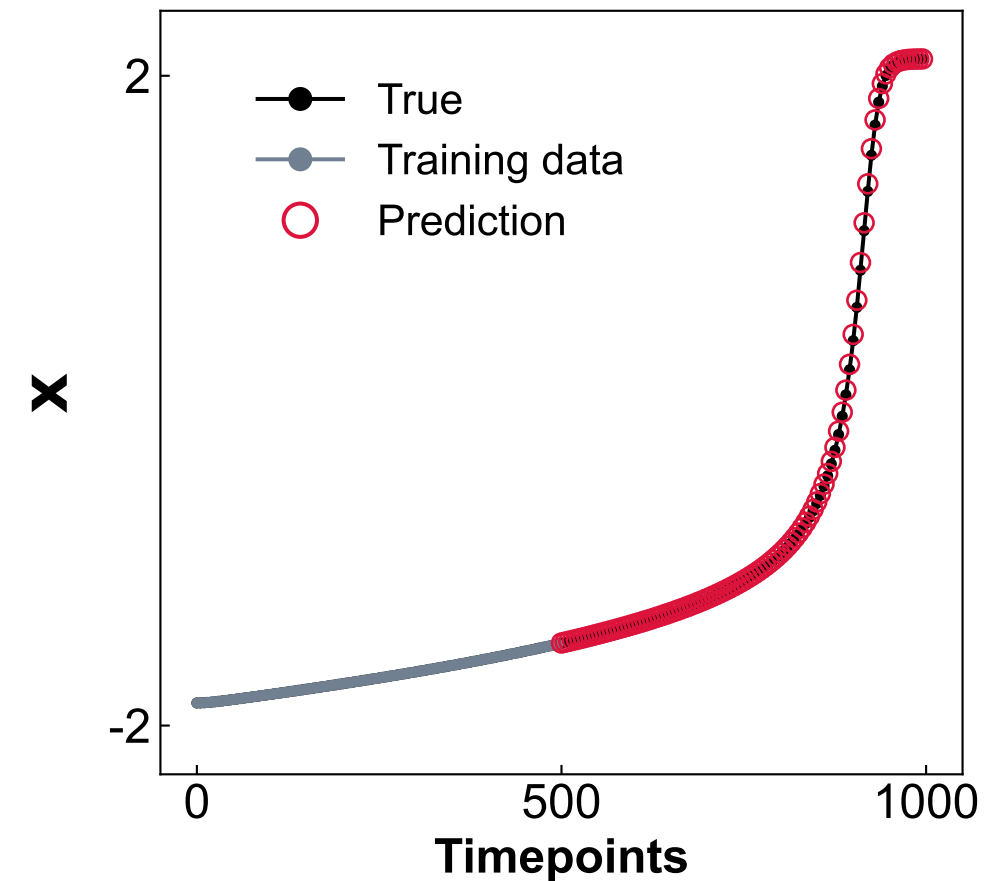
$$\nu : -1 \rightarrow 4$$

Grid search result :

$$\nu_1 = -1, \Delta\nu = 5 \times 10^{-3}$$



Dynamics prediction

**B**

True Kuramoto oscillators dynamics :

$$\dot{\theta}_i = \omega_i + \sigma \sum_{j=1}^N A_{ij} \sin(\theta_j - \theta_i)$$

$$\sum_{i=1}^N \omega_i = 0, \sigma : 0 \rightarrow 1$$



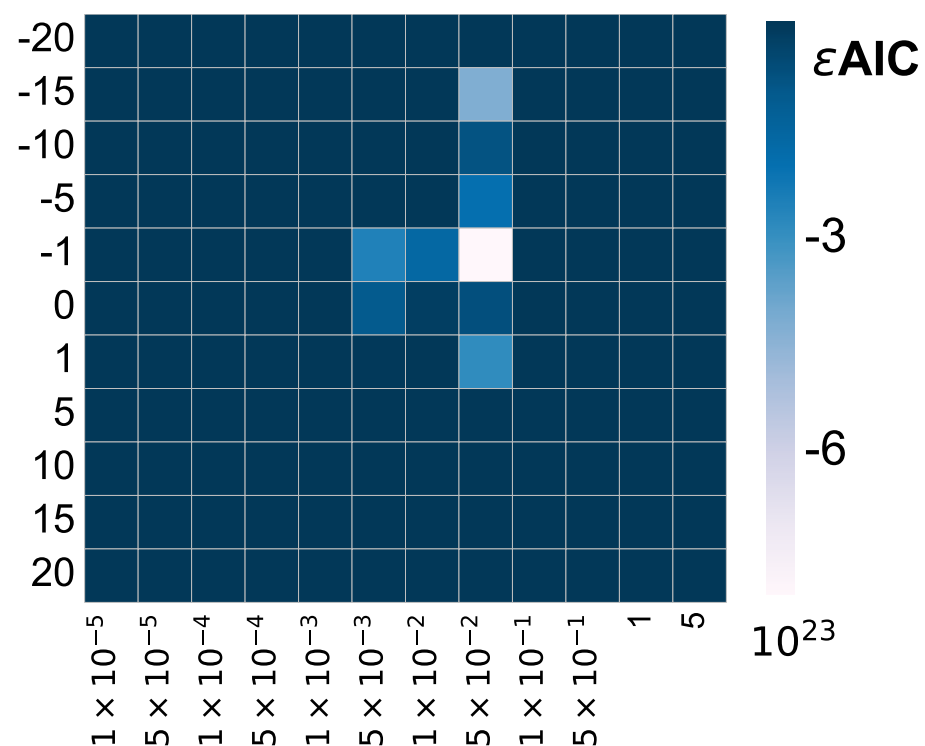
Inferred equation :

$$\dot{\theta}_i = (0.0127 + 0.0202\nu) \sum_{j=1}^N A_{ij} \sin(\theta_j - \theta_i)$$

$$\nu : -1 \rightarrow 49$$

Grid search result :

$$\nu_1 = -1, \Delta\nu = 5 \times 10^{-2}$$



Dynamics prediction

