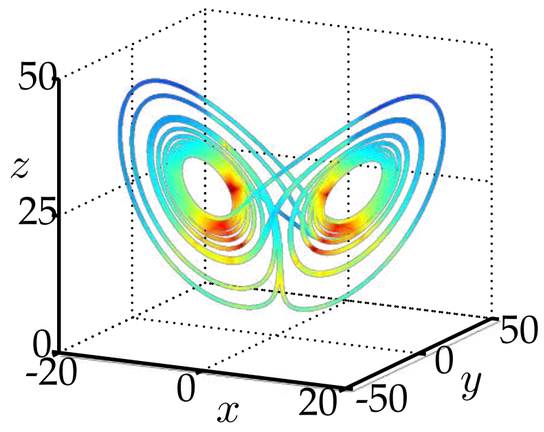
I. True Lorenz System

$$\begin{aligned}\dot{x} &= \sigma(y-x)\\ \dot{y} &= x(\rho-z)-y\\ \dot{z} &= xy-\beta z.\end{aligned}$$



Data In

$\dot{x}\ \dot{y}\ \dot{z}$ $=$ $1\ x\ y\ z\ x^2\ xy\ xz\ y^2\ \cdots\ z^5$ $\xi_1\ \xi_2\ \xi_3$

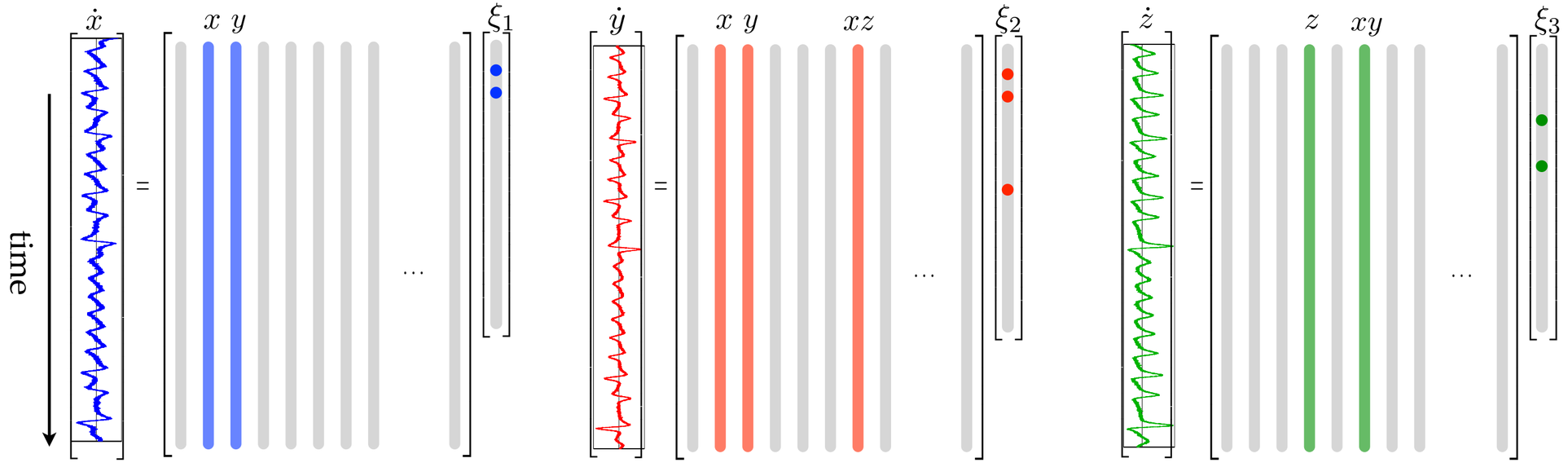
$\dot{\mathbf{X}}$ $\boldsymbol{\Theta}(\mathbf{X})$ Ξ

	'xi_1'	'xi_2'	'xi_3'
'1'	[0]	[0]	[0]
'x'	[-9.9996]	[27.9980]	[0]
'y'	[9.9998]	[-0.9997]	[0]
'z'	[0]	[0]	[-2.6665]
'xx'	[0]	[0]	[0]
'xy'	[0]	[0]	[1.0000]
'xz'	[0]	[-0.9999]	[0]
'yy'	[0]	[0]	[0]
'yz'	[0]	[0]	[0]
...	...	...	...
'yzzzz'	[0]	[0]	[0]
'zzzzz'	[0]	[0]	[0]

Sparse Coefficients of Dynamics

Model Out

II. Sparse Regression to Solve for Active Terms in the Dynamics



III. Identified System

$$\begin{aligned}\dot{x} &= \boldsymbol{\Theta}(\mathbf{x}^T)\xi_1\\ \dot{y} &= \boldsymbol{\Theta}(\mathbf{x}^T)\xi_2\\ \dot{z} &= \boldsymbol{\Theta}(\mathbf{x}^T)\xi_3\end{aligned}$$