

$$\underbrace{\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix}}_{\dot{x}} = \underbrace{\begin{bmatrix} 1 & x_1 & x_2 & x_3 & x_1 x_2 & x_1^2 & x_1 x_3 & \cdots & x_3^2 \end{bmatrix}}_{\phi(x)} \underbrace{\begin{bmatrix} \beta^1 & \beta^2 & \beta^3 \end{bmatrix}}_{\beta} + \varepsilon$$

Diagram illustrating a polynomial expansion of a vector field \dot{x} in terms of a feature vector $\phi(x)$ and a parameter vector β .

The vector \dot{x} (left) is composed of three components: \dot{x}_1 (blue), \dot{x}_2 (red), and \dot{x}_3 (green).

The feature vector $\phi(x)$ (middle) is a row vector of monomials: $1, x_1, x_2, x_3, x_1 x_2, x_1^2, x_1 x_3, \dots, x_3^2$.

The parameter vector β (right) is a column vector of coefficients: $\beta^1, \beta^2, \beta^3$. The third component β^3 is shown with four small circles, indicating a higher-order or more complex relationship.

The equation shows that \dot{x} is equal to the product of $\phi(x)$ and β , plus a residual term $+\varepsilon$.