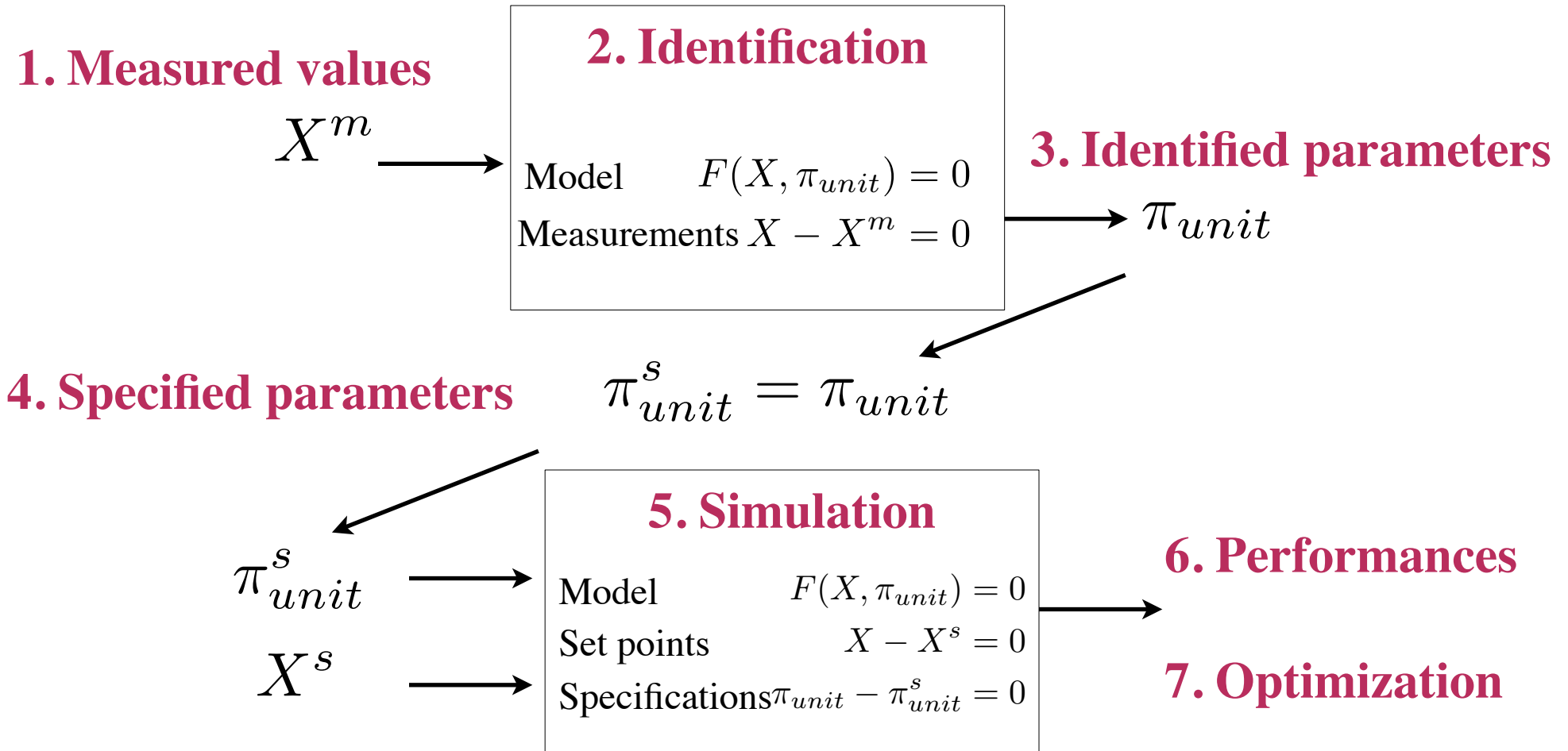

Parameter identification

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Measurement and parameter identification



In a perfect world : DOF = 0

1. Measured values

measured value of X_i in experiment e

$$\downarrow \quad \forall X_i^m \text{ \& \; } \forall e : X_{i,e}^m$$

2. Identification

$$\text{Model } F_u(X_{i,e}, \pi_{p,u,e}) = 0 \quad \forall e \in \{n_e\} \quad \forall u \in \{n_u\}$$
$$\text{Measurements } X_{i,e} - X_{i,e}^m = 0$$



$$\pi_{p,u,e}$$

value of parameter π_u in experiment e

3. Identified parameters

Parameter identification from a set of experiments

1. Measured values

$$X_{i,e}^m$$

2. Identification

$$\min_{X_{i,e}, Y_{i,e}, \pi_{p,u}} \sum_{e=1}^{n_e} \sum_{i=1}^{n_m} \frac{(X_{i,e} - X_{i,e}^m)^2}{\sigma_i^2}$$

s.t.

$$F_u(X_{i,e}, Y_{i,e}, \pi_{p,u}) = 0 \quad \forall e \in \{n_e\} \quad \forall i \in \{n_s\} \quad \forall u \in \{n_u\}$$

n_m : number of measured values

n_e : number of set of experiments

n_u : number of units

n_s : number of state variables in the model

$$\pi_{p,u} \quad \forall u \in \{n_u\}$$

3. Identified parameters

$$\text{and } X_{i,e}, Y_{i,e}, \forall i \in \{n_s\} \forall e \in \{n_e\}$$

Validity of the parameter identification

- Number of parameters (p)
- Number of measurement set (n)
- Regression coefficient

$$R^2 = \frac{\sum(\hat{Y}_i - \bar{Y})^2}{\sum(Y_i - \bar{Y})^2} \quad \bar{Y} = \frac{1}{n} \sum_{i=1}^n Y_i$$

- Regression validity : Fischer test

$$F = \frac{(n - p)R^2}{(p - 1)(1 - R^2)} > F(p - 1, n - p, 1 - \alpha)$$

Fisher value from a table
 α : significativity level