# 1. PARAMETER ESTIMATION METHODS

$$\mathcal{M} = \{ M(\theta) \mid \theta \in D_M \}$$

$$L_{M(\theta)}: \hat{y}(t|\theta) = W_y(q,\theta)\, y(t) + W_u(q,\theta)\, u(t)$$

IF ONE-STEP-PREDICTION FOR

$$y(t) = G(q,\theta)\, u(t) + H(q,\theta)\, e(t)$$

THEN

$$W_y(q,\theta) = \left[1 - H^{-1}(q,\theta)\right]$$

$$W_u(q,\theta) = H^{-1}(q,\theta)\, G(q,\theta)$$

$$M(\theta): \hat{y}(t|\theta) = g(t, Z^{t-1}, \theta)$$

$$Z^N = \{y(1)u(1) \dots y(N)u(N)\} \longrightarrow \hat{\theta}_N \in D_M \longrightarrow M(\hat{\theta}_N)$$

PROPER MODEL

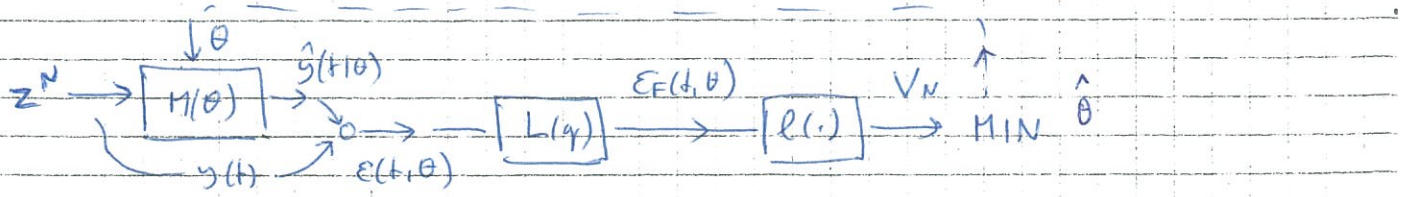
# 2. EVALUATING CANDIDATE MODELS

$\theta_*$, $M(\theta_*)$ PREDICTED BY $\hat{y}(t|\theta_*)$ WITH ERROR:

$$\varepsilon(t,\theta) = y(t) - \hat{y}(t,\theta)$$

GOOD MODEL → "SMALL" ERROR

- SCALAR VALUED NORM OR CRITERION FUNCTION (SIZE OF $\varepsilon$)
- $\varepsilon(t,\theta)$ UNCORRELATED WITH A GIVEN DATA SEQUENCE; "PROJECTION" OF $\varepsilon(t,\theta)$ ON DATA $\equiv \emptyset$




FILTERED ERROR $\varepsilon_F(t,\theta) = L(q)\,\varepsilon(t,\theta)$

$$V_N(\theta, Z^N) = \frac{1}{N}\sum_{t=1}^{N} \ell(\varepsilon_F(t,\theta))$$

$$\hat{\theta}_N = \arg\min_{\theta \in D_M} V_N(\theta, Z^N)$$

**PEM**
PREDICTION ERROR IDENTIFICATION METHOD