Supplementary: Auto-Physics-Encoder: Using Physics-Informed Latent Layer Two-Way Physics Flow for Monitoring Systems with Unobservability

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1. Reproducibility Table:

Table 1. List of Hyper-Parameters for the Model-X.

Hyper-Parameter	Description	Selected Value
Number of repetitions	Maximum iterations	400
Step size tolerance	Termination criteria	$1e^{-6}$
Function value tolerance	Termination criteria	$1e^{-6}$
Random number generator	Random state	Seed
Criterion	Performance metric	Mean Squared Error
Performance comparison	Comparison metric	System parameter estimation
Data normalization	Normalize	[-1, +1]
Training:Testing:Validation	Percentage split	70:15:15
Neural network Depth	Number of hidden layers	5
Hidden layer size	Number of hidden nodes	$\mathcal{O}(k)$
Activation Function	ReLU	$f(a) = a^+ = \max(0, a)$
Optimization Algorithm	Solver	Levenberg-Marquardt
Unobservability range	Number of unobservable nodes	[10%, 50%]
Penalty Multiplier	β	1
Library function order	Symbolic Regression	2