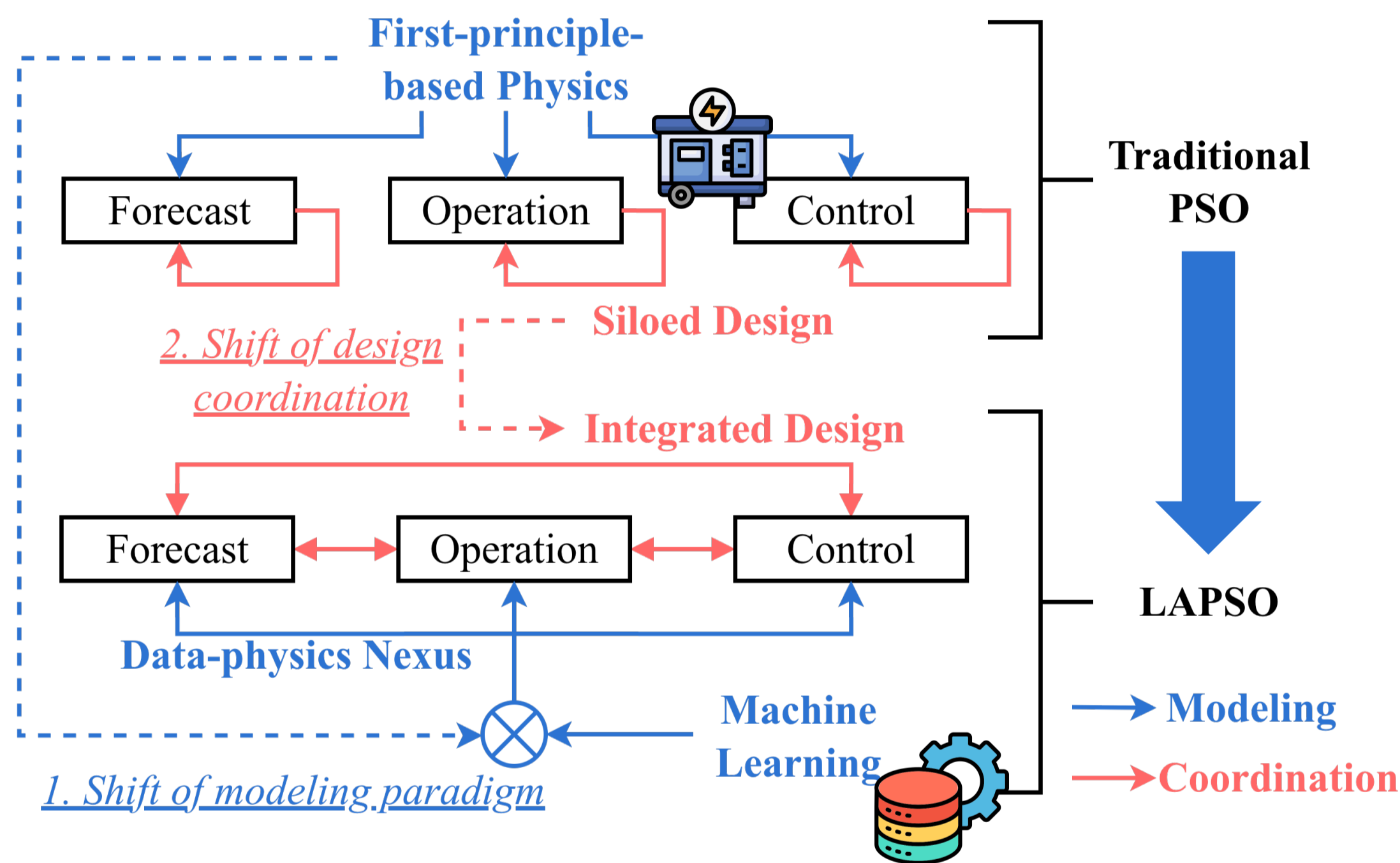


Both DATA and PHYSICS Matter, But How to Integrate Is a Problem! Learning-augmented Power System Operations (LAPSO): A Unified Framework

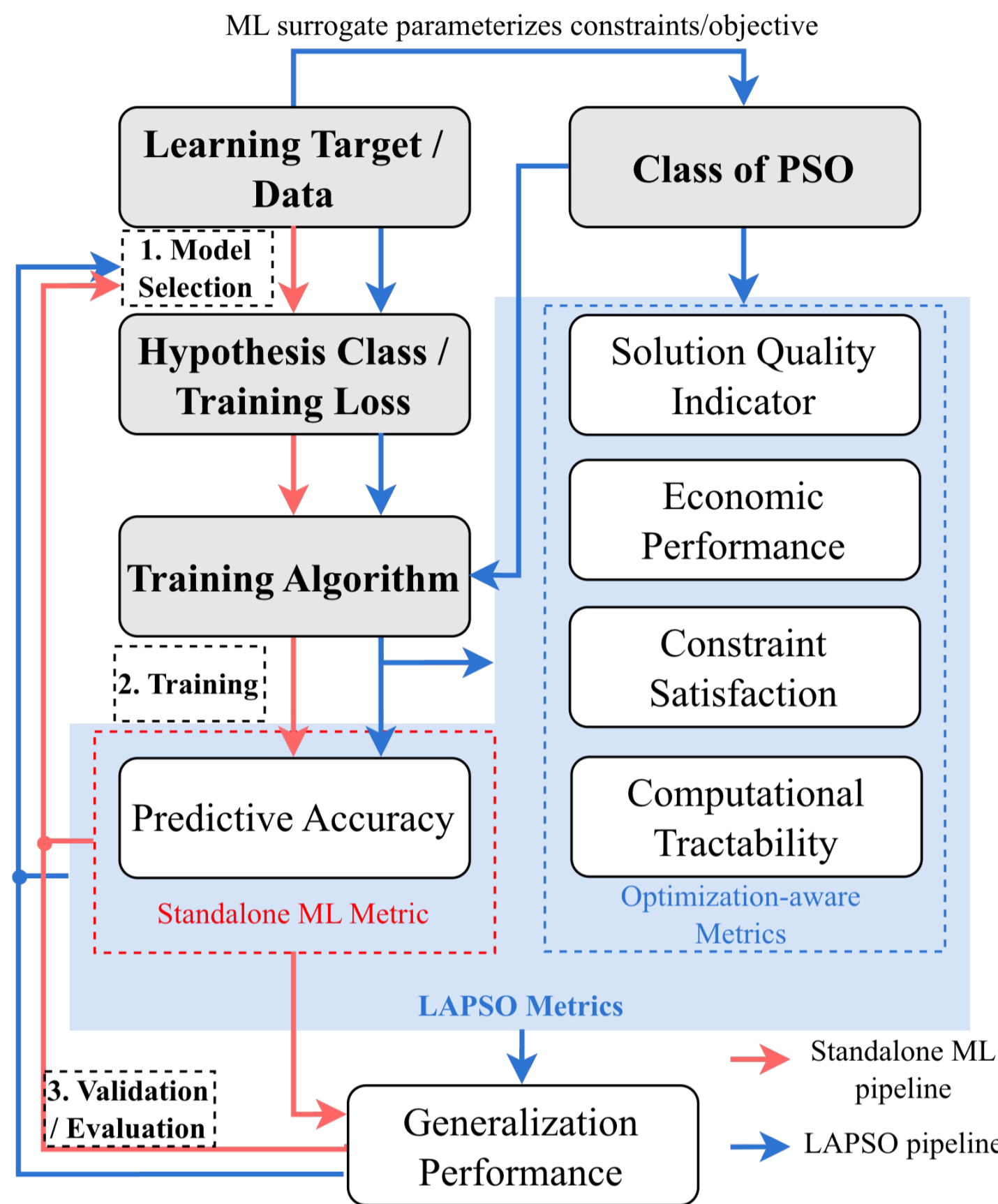
Dr. Wangkun Xu (EPICS-UK, Imperial),
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0. New Transformation in Power System Decision-makings

Power system operation (PSO) faces new challenges for economic efficiency and stability. Machine learning (ML) is a powerful tool for modeling system dynamics to address these challenges.



2. LAPSO as ML Pipeline

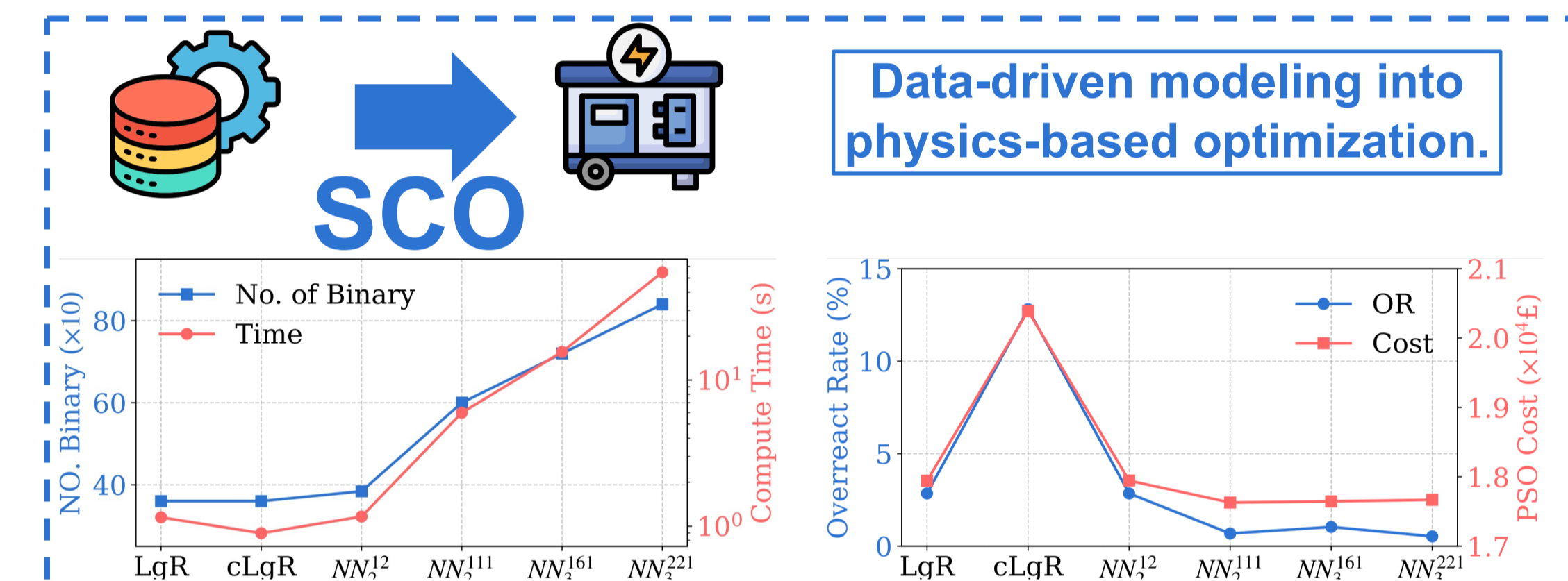


3. LAPSO as Python Package



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Working on ML for power system.

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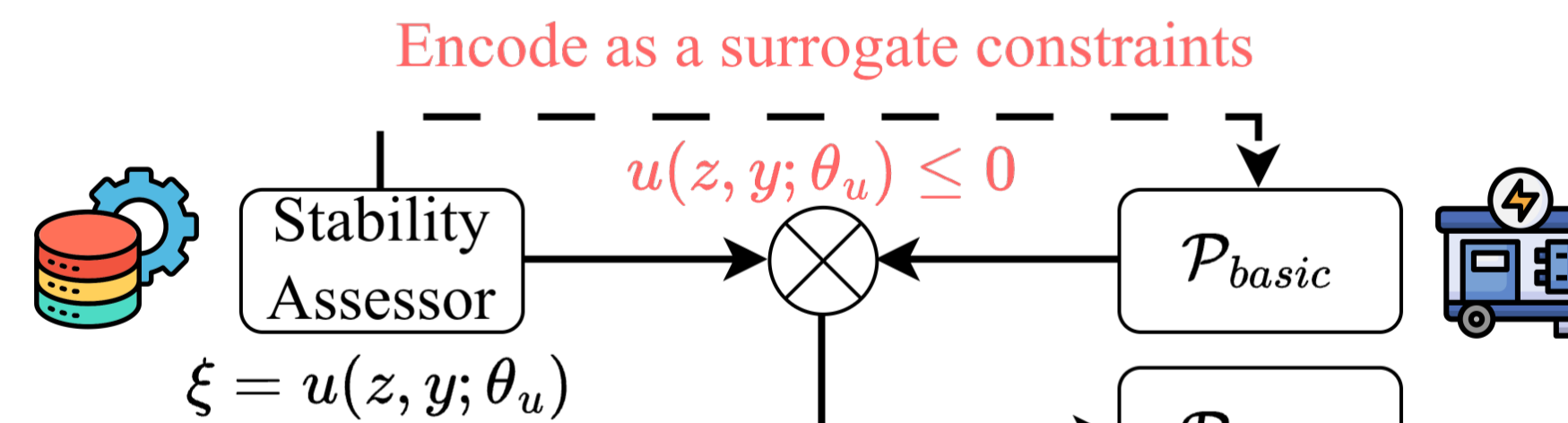


1. LAPSO as Mathematical Template

Traditional PSO $\mathcal{P}_{basic} : \min_z f(z; y) \quad \text{s.t. } g(z; y) \leq 0$

LAPSO $\mathcal{P}_{lapso} : \min_z f(z; y_1, \hat{y}_2) + f_v(z; y_1, \hat{y}_2)$
s.t. $g(z; y_1, \hat{y}_2) \leq 0$

(Decision-dependent constraint)
 $g_v(z; y_1, \hat{y}_2) \leq \tau$
 $\hat{y}_2 = v(z, y_1, x; \theta^*)$
(ML predictor)



2.2: Objective-based Forecast (OBF)

