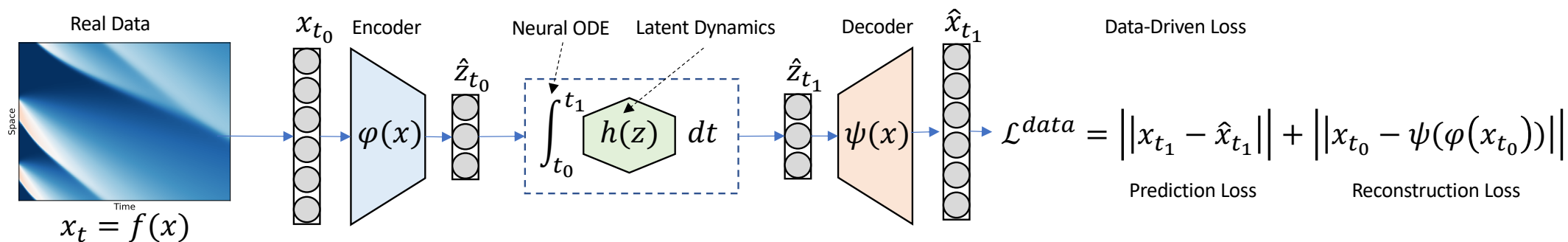


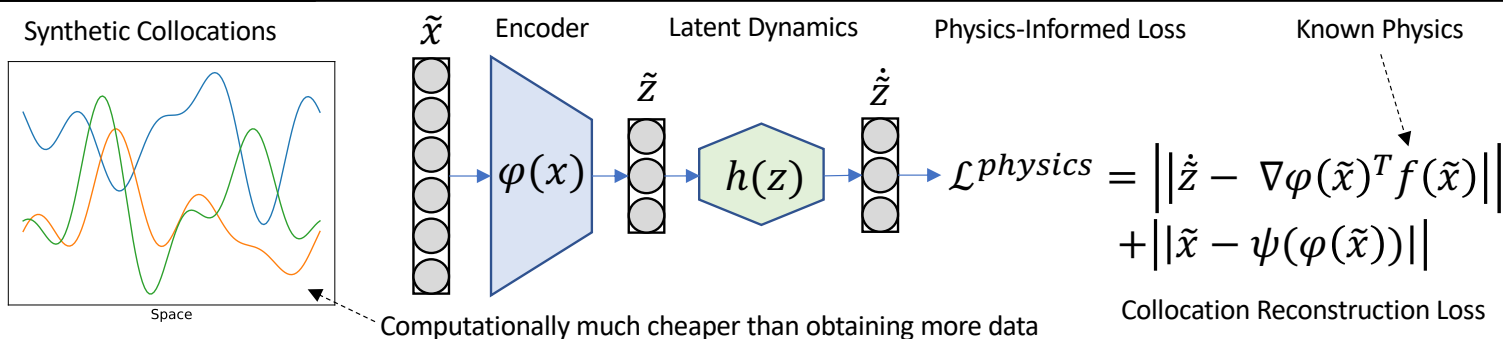
Data-Driven Reduced-Order Model

Problem: model is excellent in interpolation quality but data-hungry and unstable for long-term out-of-distribution prediction



Physics-Informed Loss

Solution: integrate knowledge of physics into the model via collocation points technique



Hybrid Model

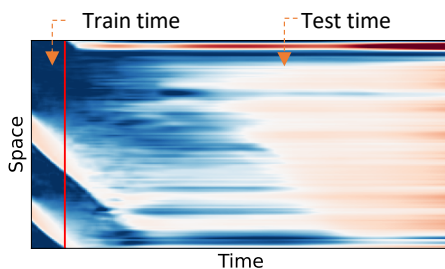
$$\mathcal{L}^{data} + \mathcal{L}^{physics} = \mathcal{L}^{hybrid}$$

| | | | |
|--------------------------|---|---|---|
| Prediction Accuracy | ✓ | ✗ | ✓ |
| Long-Term Stability | ✗ | ✓ | ✓ |
| Out-of-Distribution Acc. | ✗ | ✓ | ✓ |
| Robustness to Noise | ✗ | ✓ | ✓ |

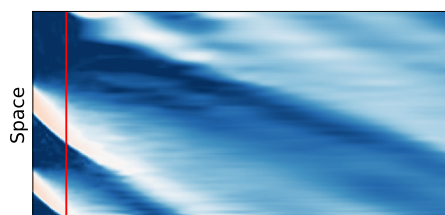
Results

① Stable Far-Out Forecasting

Data-Driven Only Model

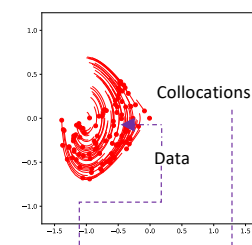


Hybrid Model (Ours)

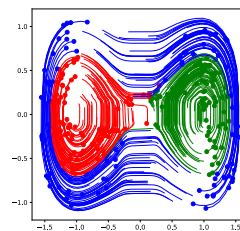
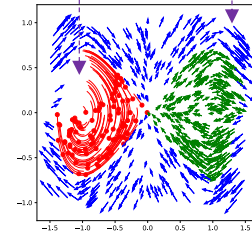
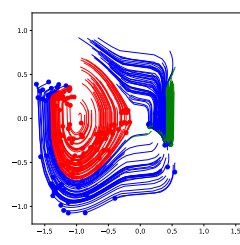


② Out-of-Distribution Prediction

Train Dataset

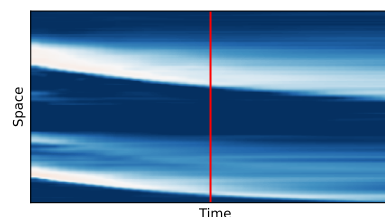


Model's Predictions



③ Robustness to High-Noise in Data

Low Noise in Data



High Noise in Data

