

## Surrogate Modelling of the Tritium Breeding Ratio

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#### Tritium Breeding in ICF Reactors



## **Problem Description**



#### **Data Generation**



## Dimensionality Reduction





Conventional regression task – search for a cheap surrogate  $\hat{f}(x)$  that minimizes dissimilarity with an expensive function f(x):

- Regression performance (capability to approximate)
  - Absolute: mean absolute error,  $\sigma$  of error
  - Relative: R<sup>2</sup>, R<sup>2</sup><sub>adj.</sub>
- Computational complexity: wall training & prediction time / sample.
- 2 approaches for surrogate training:
  - **1** Decoupled trains models from previously sampled  $\mathfrak{T} = \{(x, f(x))\}.$
  - Adaptive repeats sampling & model training, increases sampling density in low-performance regions.

#### Outline



## Experiments 1 & 2: Hyperparameter Tuning





# Experiment 3: Scaling Benchmark



### Experiment 4: Model Comparison



#### The QASS Algorithm



#### Application on Toy Theory



# Conclusion

