# (Multi-fidelity) NAS using LLMs

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Introduction

The paper [1] explores the utilization of Large Language Models (LLMs) to improve the performance of Bayesian Optimization (BO) for Hyperparameter Optimization (HPO). The primary focus is on utilizing LLMs to generate better initialization points (warmstarting), to enhance surrogate modeling and candidate sampling. Building on the insights from this paper, our research aims to test the capabilities of LLMs in Neural Architecture Search in a multi-fidelity setting. For this purpose we use NASBench201 benchmark with CIFAR-10 dataset.
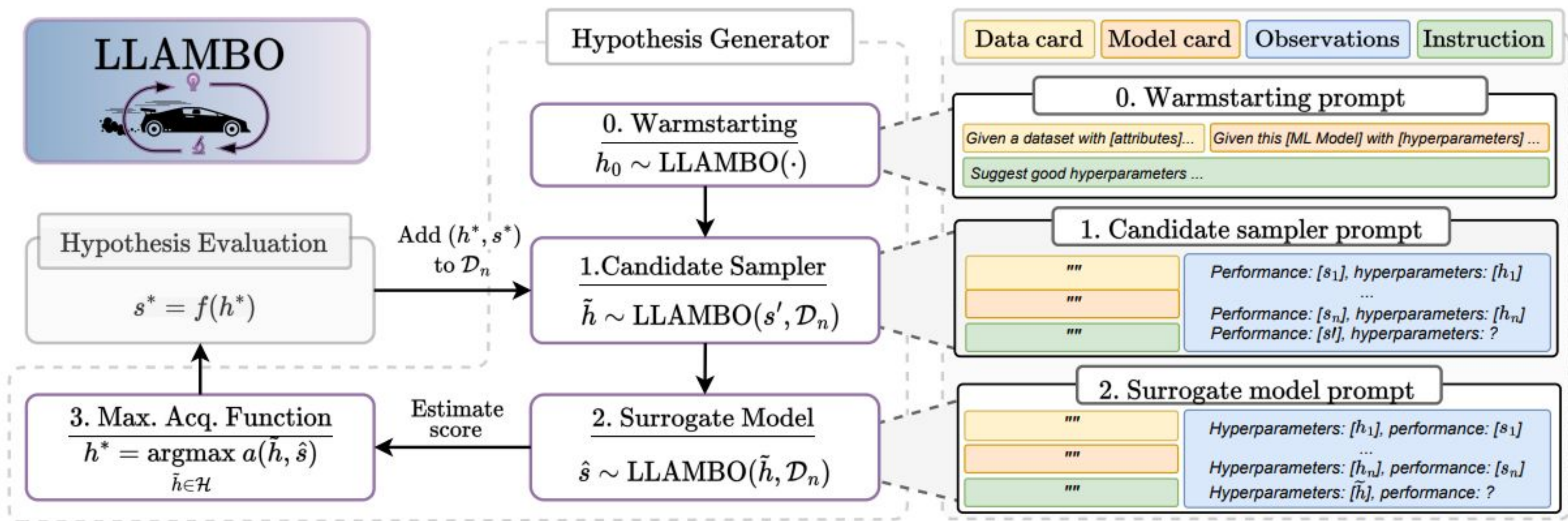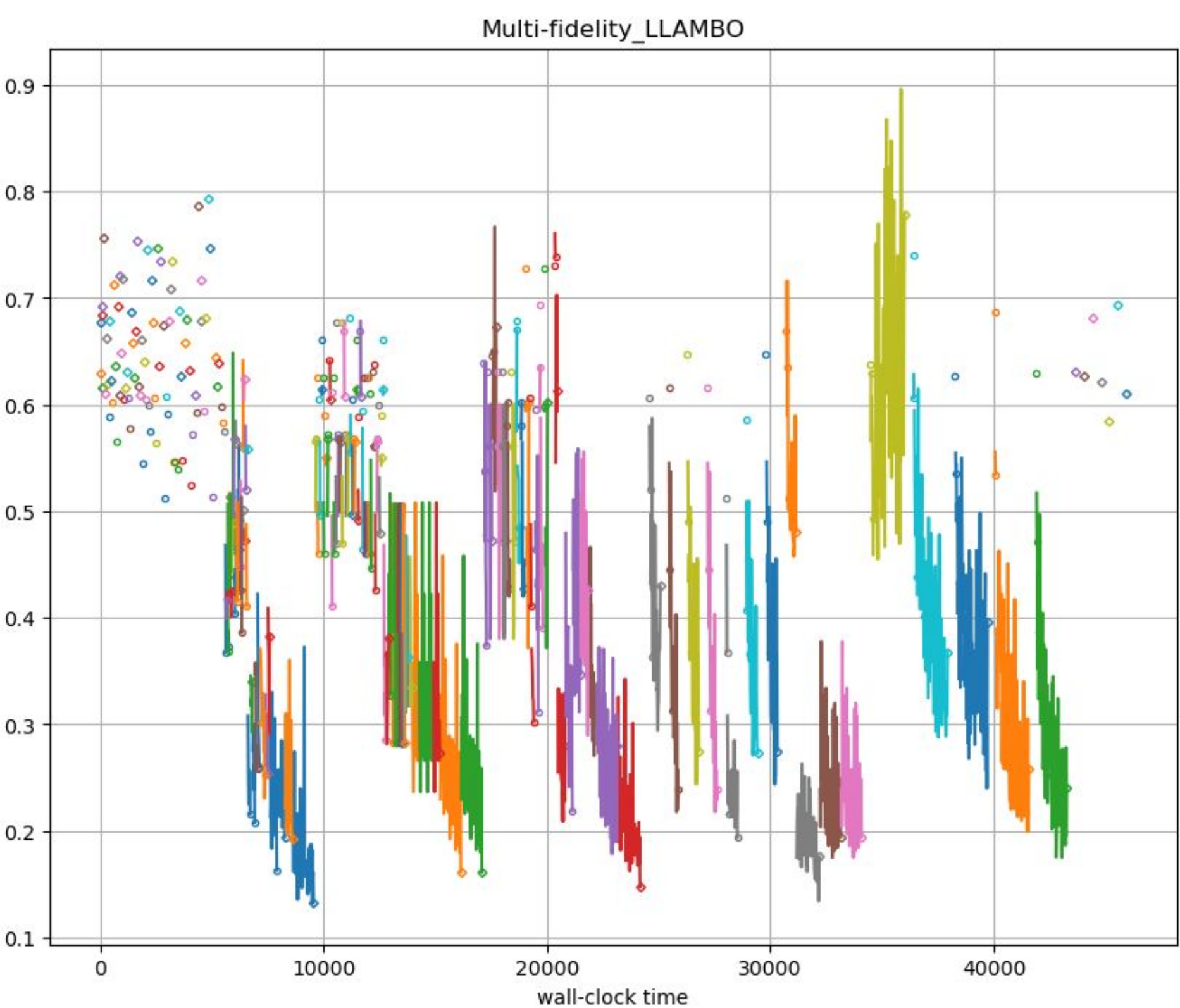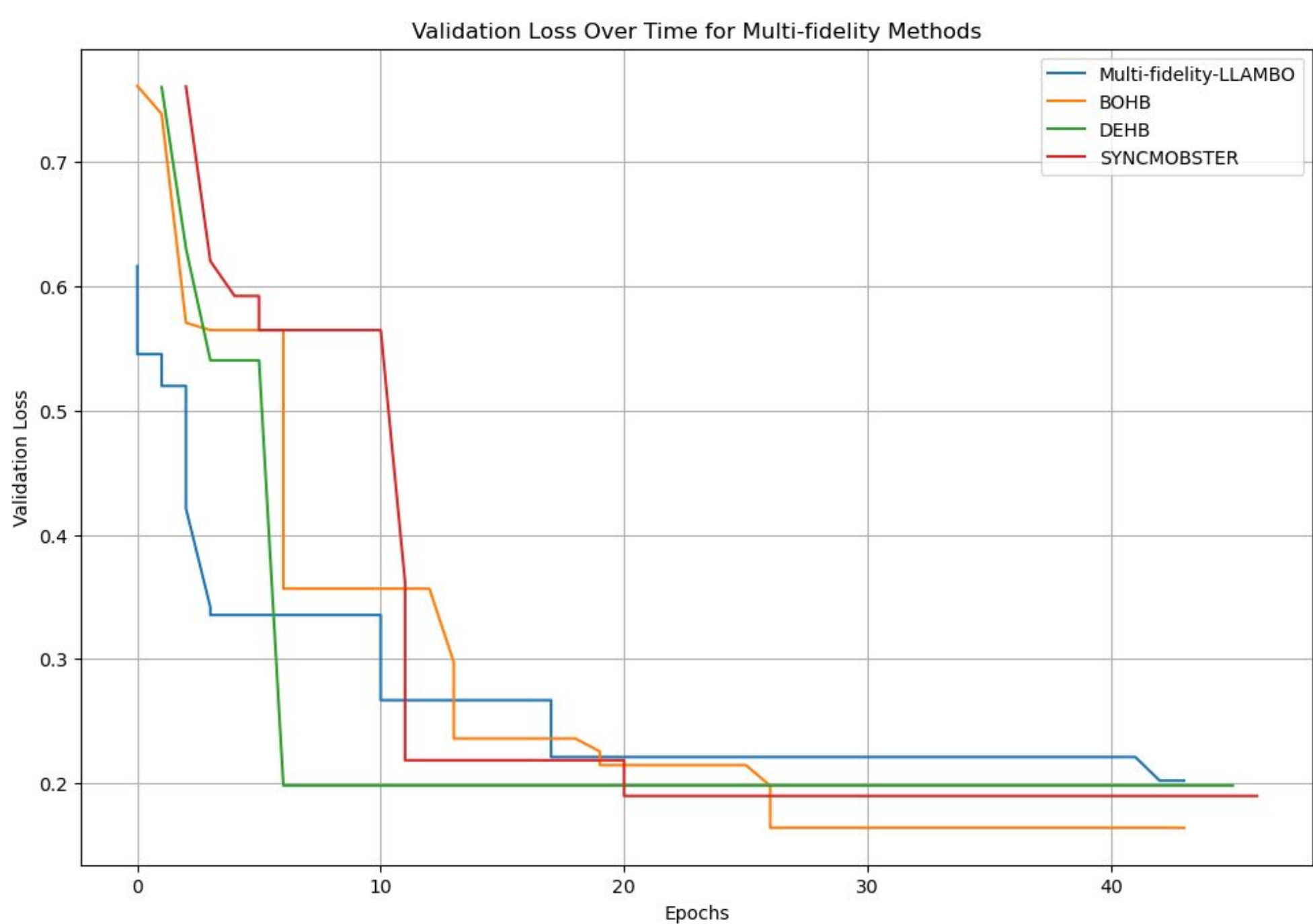

Method

The LLAMBO codebase was adapted from its original use in HPO to focus on Neural Architecture Search (NAS), specifically targeting the cell-based search in NASBench201.

In our study, we leveraged Syne Tune library [2]. We extended LLAMBO to work in a multi-fidelity setting by creating a custom searcher for Syne Tune and integrating it with the library's Synchronous Hyperband Scheduler. The custom searcher is used by the scheduler for warmstarting, to sample new configurations and to predict their mean performance and variance which are then used in the acquisition function.
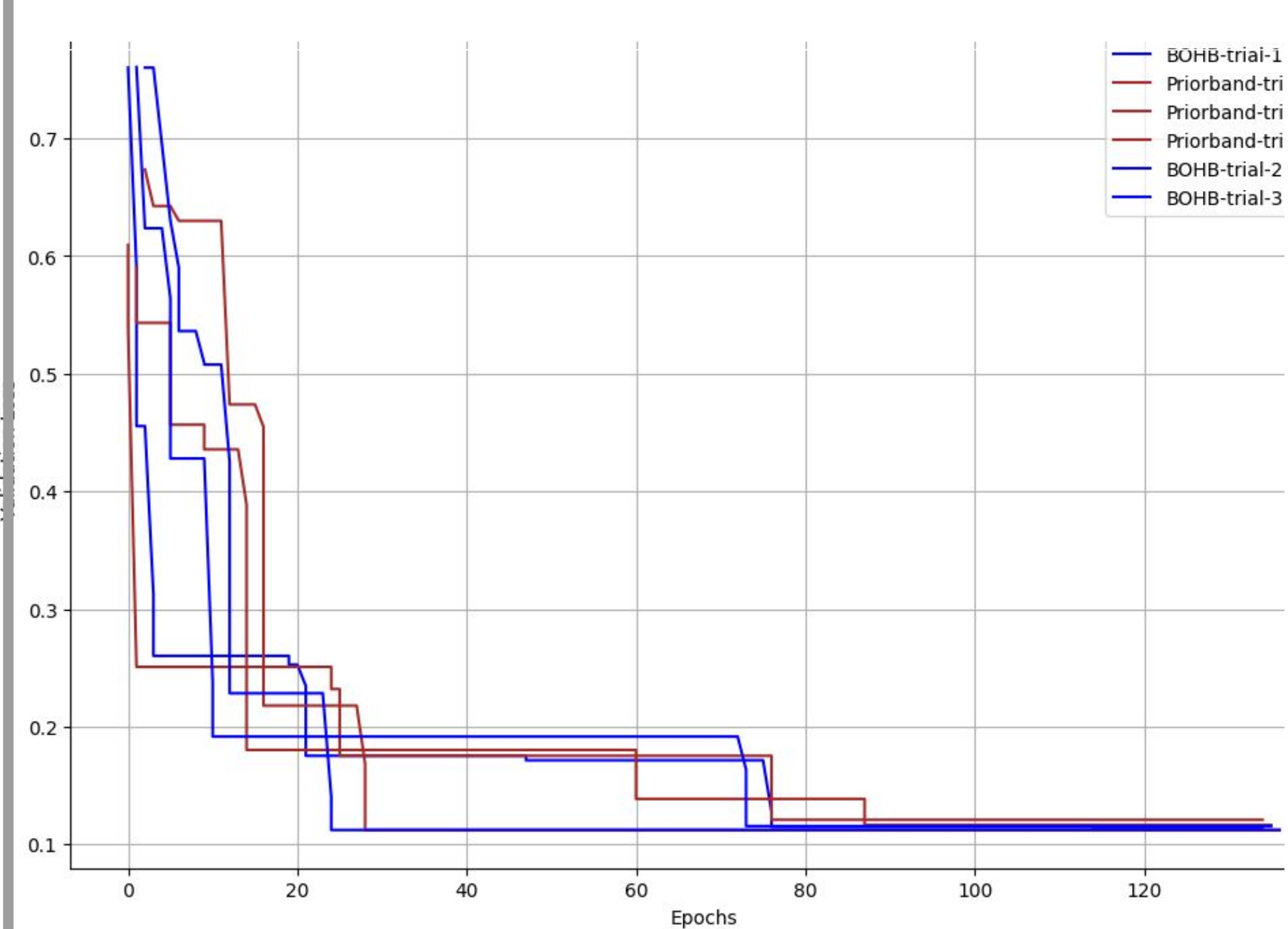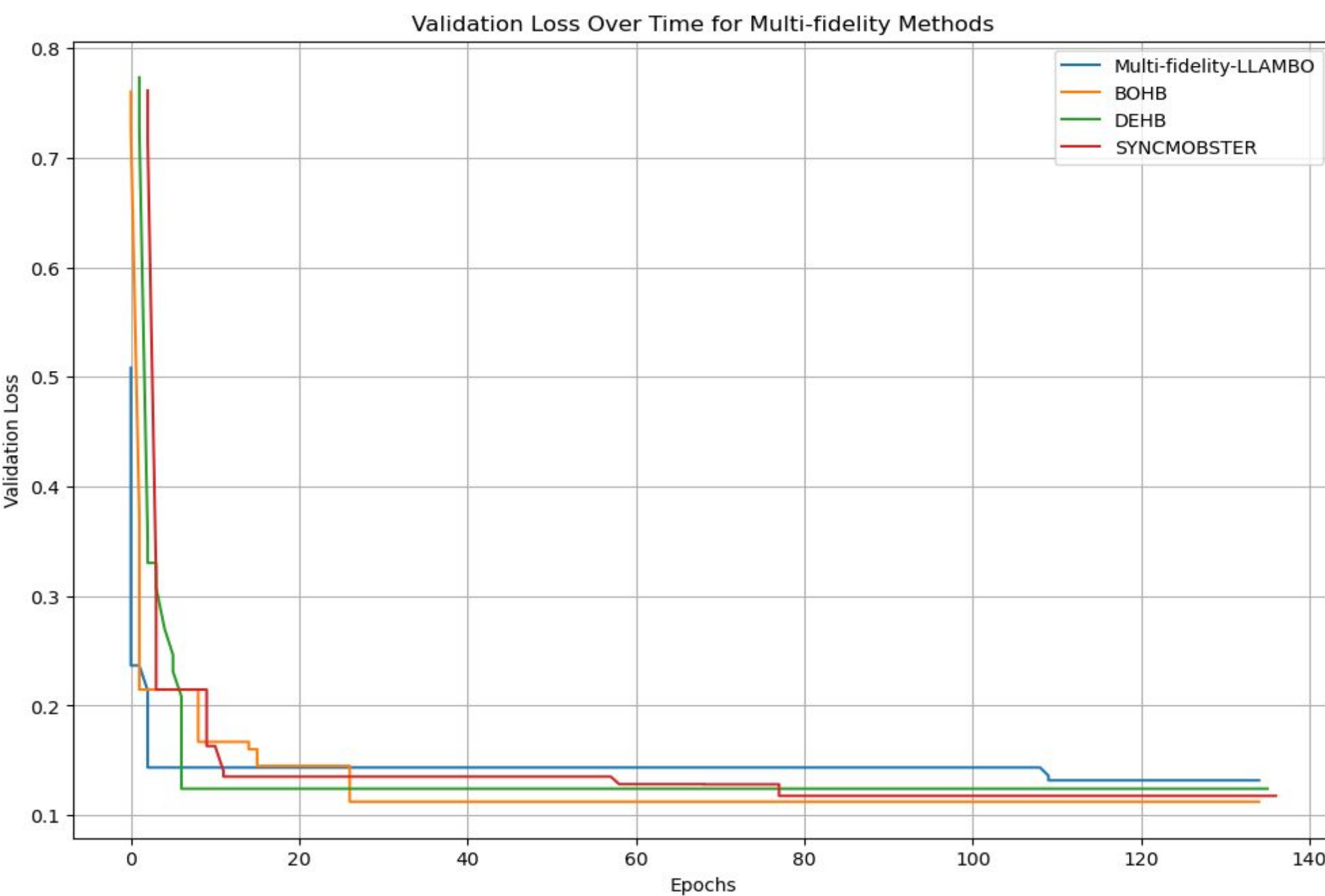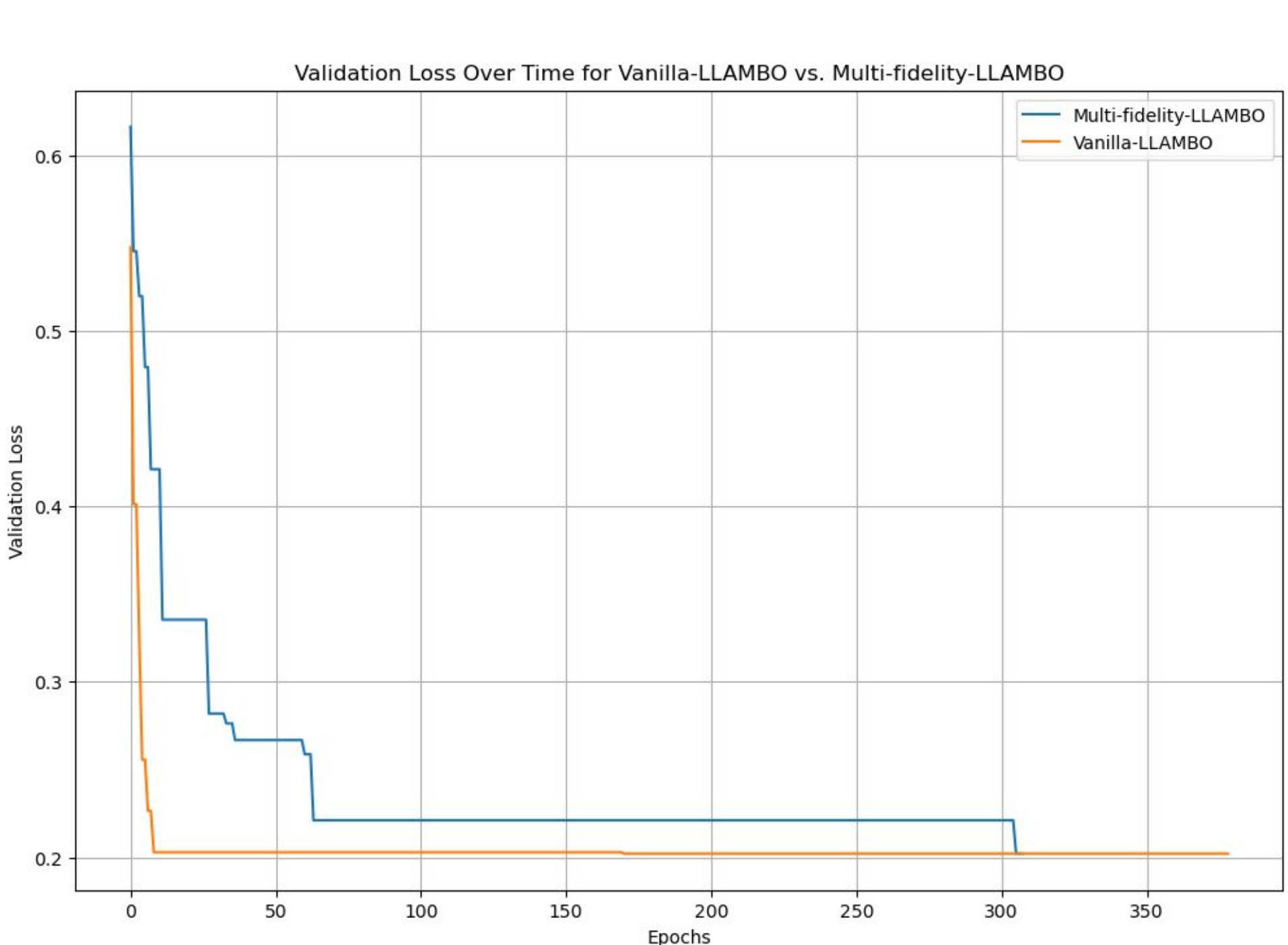
Configurations on different fidelities

Multifidelity vs Vanilla Llambo

Llambo vs multifidelity methods

BOHB with Llambo warmstart

Conclusions

- Provides good initialization points that can be used for warmstarting in different methods
- Performance highly depends on the LLM used and its number of parameters
- The delay of the LLM can be a bottleneck for performance

References

[1] LARGE LANGUAGE MODELS TO ENHANCE BAYESIAN OPTIMIZATION
[2] Syne Tune