Deep Learning Lab WS2018
Exercise 4 – CV/ML

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In this exercise we combine Bayesian Optimization (BO) with Hyperband (HB) in three steps:

1. Implementing Bayesian Optimization using emukit.
2. Hyperband with its successive halving
3. Combination of Bayesian optimization with Hyperband (BOHB)

To reduce compilation time, we use a surrogate benchmark, a regression model (random forest) of the original benchmark (CNNs).

1 Bayesian Optimization

Operating on the surrogate benchmark, the Bayesian Optimization with emukit using ExpectedImprovement on a Gaussian process as a probabilistic model gives clear optimization steps, as shown in Figure 1. Samples are generated using emukit's RandomDesign.

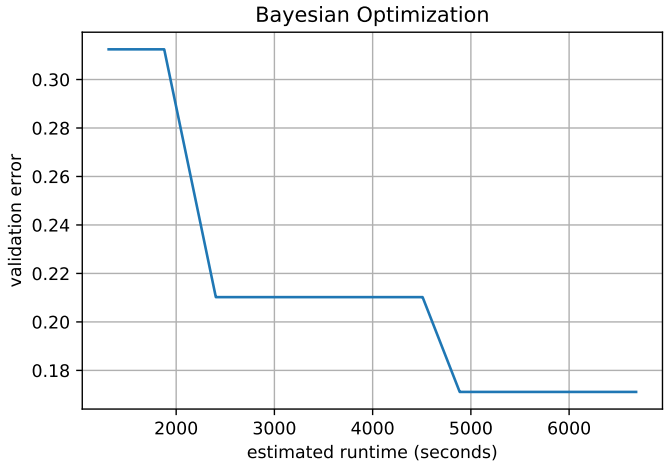

Figure 1: Bayesian Optimization

2 Hyperband

For Hyperband, we use the same uniform random sample generation, as with BO. The results of the successive halving are shown in Figure 2.

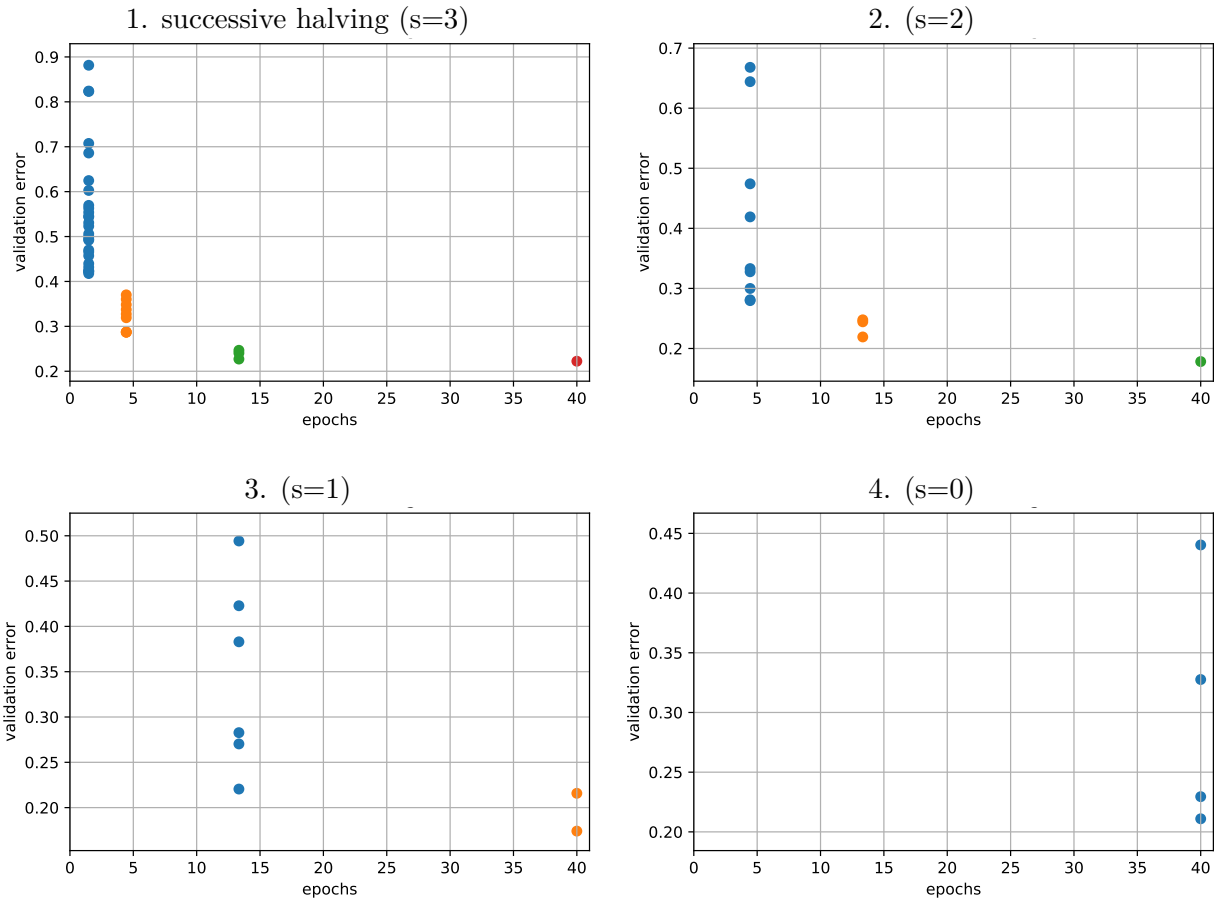

Figure 2: Hyperband: successive halving

3 Bayesian Optimization with Hyperband

You can see in Figure 3, how the sampling from the implemented model with the combination BOHB gives in average a smaller validation error than the random sampled configuration, as expected.

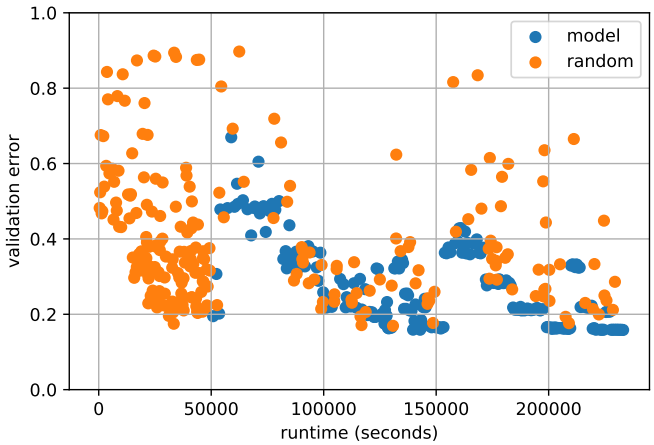

Figure 3: BOHB vs random sampled