**What is HPO?**

Any machine learning model has some values (hyperparameters) that need to be specified a priori before the training of the dataset. They help adapt the model to the data and they influence the quality of the prediction. Hyperparameter optimization deals with the search of the best combination of values for the given model, and there are already many methods that help us find them.

Our goal here is not to develop an engine for HPO, but some sort of wrapper that will use an already existing engine on top of RCT (EnTK). It will be like adding another layer to our already existing set of RCT. For this, I need to:

1) Have something like a Top-10 HPO libraries that already exist.

2) Explore which of them will benefit us the most: pros/cons?

3) Elaborate a functional requirements document specifying inputs/outputs to/from our HPO library: dataset, parameters, CPUs, GPUs?

**Libraries**

1. Scikit-Optimize
2. Hyperopt
3. Optuna
4. hpbandster
5. BayesianOptimization
6. Sherpa
7. SMAC3

**Scikit-Optimize**

Based on the research that I have done so far, I want to start exploring Scikit-Optimize for the following reasons:

* Simple and easy to use API
* Hyperparameter Search Space: 3 options
  + *space.Real:* for float parameters
  + *space.Integer:* for integer parameters
  + *space.Categorical:* for text parameters
* Optimization Methods: 4 algorithms
* *dummy\_minimize*: Random Search
* *forest\_minimize:* Sequential optimization using decision trees
* *gbrt\_minimize:* Sequential optimization using gradient boosted trees
* *gp\_minimize*: Bayesian optimization using Gaussian Processes
* Extensive documentation with examples
* Visualization: 3 plotting utilities
* *plot\_convergence*: visualizes the progress of your optimization by showing the

best to date result at each iteration

* *plot\_evaluation:* visualizes the evolution of the search
* *plot\_objective:* lets you gain intuition into the score sensitivity with respect to

hyperparameters

**References**

<https://scikit-optimize.github.io>

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