SMAC3: A Versatile Bayesian Optimization Package for Hyperparameter Optimization
Broader Impact Statement & Checklist

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Abstract Algorithm parameters, in particular hyperparameters of machine learning algorithms, can substantially impact their performance. To support users in determining well-performing hyperparameter configurations for their algorithms, datasets and applications at hand, SMAC3 offers a robust and flexible framework for Bayesian Optimization, which can improve performance within a few evaluations. It offers several facades and pre-sets for typical use cases, such as optimizing hyperparameters, solving low dimensional continuous (artificial) global optimization problems and configuring algorithms to perform well across multiple problem instances. The SMAC3 package is available under a permissive BSD-license at `https://github.com/automl/SMAC3`.

Broader Impact Statement

After careful reflection, the authors have determined that this work presents no notable negative impacts to society or the environment.

Submission Checklist

1. For all authors...
   (a) Do the main claims made in the abstract and introduction accurately reflect the paper's contributions and scope? [Yes]
   (b) Did you describe the limitations of your work? [Yes]
   (c) Did you discuss any potential negative societal impacts of your work? [No] As SMAC3 is a software package for HPO we see no direct negative societal impacts of our work.
   (d) Have you read the ethics review guidelines and ensured that your paper conforms to them? `https://automl.cc/ethics-accessibility/` [Yes]
2. If you are including theoretical results...
   (a) Did you state the full set of assumptions of all theoretical results? [N/A] No theoretical results.
   (b) Did you include complete proofs of all theoretical results? [N/A] No theoretical results.
3. If you ran experiments...

(a) Did you include the code, data, and instructions needed to reproduce the main experimental results, including all requirements (e.g., `requirements.txt` with explicit version), an instructive `README` with installation, and execution commands (either in the supplemental material or as a URL)? [Yes] Please find our repository here: `https://github.com/automl/SMAC3`.

(b) Did you include the raw results of running the given instructions on the given code and data? [No] As we provide a software package we conducted a brief empirical comparison. The experiments are part of HPOBench (Eggensperger et al., 2021). The code for reproducing the experiments can be found here `https://github.com/automl/HPOBenchExperimentUtils/tree/SMAC_AUTOMLCONF23`.

(c) Did you include scripts and commands that can be used to generate the figures and tables in your paper based on the raw results of the code, data, and instructions given? [No] See above.

(d) Did you ensure sufficient code quality such that your code can be safely executed and the code is properly documented? [Yes]

(e) Did you specify all the training details (e.g., data splits, pre-processing, search spaces, fixed hyperparameter settings, and how they were chosen)? [No] See above.

(f) Did you ensure that you compared different methods (including your own) exactly on the same benchmarks, including the same datasets, search space, code for training and hyperparameters for that code? [Yes]

(g) Did you run ablation studies to assess the impact of different components of your approach? [N/A]

(h) Did you use the same evaluation protocol for the methods being compared? [Yes]

(i) Did you compare performance over time? [Yes]

(j) Did you perform multiple runs of your experiments and report random seeds? [Yes]

(k) Did you report error bars (e.g., with respect to the random seed after running experiments multiple times)? [Yes]

(l) Did you use tabular or surrogate benchmarks for in-depth evaluations? [Yes] We used tabular and surrogate benchmarks from HPOBench.

(m) Did you include the total amount of compute and the type of resources used (e.g., type of GPUs, internal cluster, or cloud provider)? [No] The amount of compute is stated in Eggensperger et al. (2021) from where the experimental results stem.

(n) Did you report how you tuned hyperparameters, and what time and resources this required (if they were not automatically tuned by your AutoML method, e.g. in a NAS approach; and also hyperparameters of your own method)? [N/A] We use the standard preset facades of SMAC3.

4. If you are using existing assets (e.g., code, data, models) or curating/releasing new assets...

(a) If your work uses existing assets, did you cite the creators? [N/A]

(b) Did you mention the license of the assets? [Yes] Our SMAC3 package is available under a permissive BSD-license.

(c) Did you include any new assets either in the supplemental material or as a URL? [Yes] Our SMAC3 repository `https://github.com/automl/SMAC3`.

(d) Did you discuss whether and how consent was obtained from people whose data you're using/curating? [N/A]

(e) Did you discuss whether the data you are using/curating contains personally identifiable information or offensive content? [N/A]

5. If you used crowdsourcing or conducted research with human subjects…

   (a) Did you include the full text of instructions given to participants and screenshots, if applicable? [N/A]

   (b) Did you describe any potential participant risks, with links to Institutional Review Board (IRB) approvals, if applicable? [N/A]

   (c) Did you include the estimated hourly wage paid to participants and the total amount spent on participant compensation? [N/A]

References

Eggensperger, K., Müller, P., Mallik, N., Feurer, M., Sass, R., Klein, A., Awad, N., Lindauer, M., and Hutter, F. (2021). Hpobench: A collection of reproducible multi-fidelity b benchmark problems for HPO. In *NeurIPS Datasets and Benchmarks 2021*.