The Journal of Open Source Software

BATMAN: Statistical analysis for expensive computer codes made easy

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DOI: 10.21105/joss.00493

Software

- Review
- Repository
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Submitted: 29 November 2017
Published: 31 January 2018

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Summary

Bayesian Analysis Tool for Modelling and uncertAinty quaNtification (batman) is an open source Python package dedicated to statistical analysis based on non-intrusive ensemble experiment.

Numerical software has reached a sufficient maturity to represent physical phenomena. High fidelity simulation is possible with continuous advances in numerical methods and in High Performance Computing (HPC). Still, deterministic simulations only provide limited knowledge on a system as uncertainties in the numerical model and its inputs translate into uncertainties in the outputs. Ensemble-based methods are used to construct a numerical or experimental dataset from which statistics are inferred.

batman library provides a convenient, modular and efficient framework for design of experiments, surrogate model and uncertainty quantification. *batman* relies on open source python packages dedicated to statistics (*openTURNS* and *scikit-learn* (Baudin et al. 2015, Pedregosa et al. (2011))). It also implements advanced methods for resampling, robust optimization and uncertainty visualization (Pamphile Tupui Roy, Segui, et al. 2017).

batman handles the workflow for statistical analysis. It makes the most of HPC resources by managing asynchronous parallel tasks. The internal parallelism of each task does not conflict with *batman*'s parallel environment.

batman analysis is launched from a *command line interface* and a setting file. *batman* functionalities can also be accessed through an API. *batman* has been successfully used for geosciences and turbomachinery Computational Fluid Dynamics applications (Pamphile Tupui Roy, Segui, et al. 2017, Pamphile T. Roy et al. (2017), Pamphile Tupui Roy, El Moçayd, et al. (2017)).

batman is CECILL-B licensed; it is actively developed and maintained by researchers at CERFACS.

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