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ParaMonte: Plain Powerful Parallel Monte Carlo Library AMIR SHAHMORADI, FATEMEH BAGHERI, SHASHANK KUMBHARE, University of Texas — Bayesian probability theory lies at the heart of machine learning, scientific inference, and predictive computing. A major challenge in developing and deploying Bayesian models is often the mathematical and computational complexity of the final objective function of the Bayesian models which is intractable to explore using traditional Monte Carlo techniques. Here we present our efforts in developing a parallel scalable delayed-rejection adaptive Monte Carlo algorithm for sampling and integrating the mathematical objective functions of arbitrary shapes and dimensions. The principal design goals of ParaMonte are: 1. full automation of all Monte Carlo simulations, 2. interoperability of the core library with multiple programming languages, 3. high-performance 4. parallelizability and scalability of simulations, 5. virtually zero-dependence on external libraries, 6. fully-deterministic reproducibility of simulations, 7. automatic comprehensive-reporting and post-processing of the simulation results. We discuss how these design goals can help ParaMonte users readily and efficiently solve a variety of machine learning and scientific inference problems on a wide range of platforms, from Jupyter notebooks on perosnal laptops to supercomputers.

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