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Interactive, multiobjective Bayesian optimization of tokamak scenarios JAKUB URBAN, Institute of Plasma Physics of the CAS, Prague, Czech Republic, JEAN-FRANÇOIS ARTAUD, CEA, IRFM, F-13108 Saint Paul Lez Durance, France — Bayesian optimization is applied to tokamak scenario optimizations. The key advantages are 1) a reduced number of objective function evaluations, 2) no need for derivatives, and 3) the possibility to include a prior knowledge. This is of a great value for optimizing tokamak scenarios, where several (competing) objectives with often unknown magnitudes exist and the number of parameters is large (¿10). The first two properties imply that Bayesian optimization is well suited for heavy, complex objective functions. Reusing previous iterations as priors for next optimization steps effectively enables interactive, multiobjective optimizations, regardless of whether a human decision maker is included or not. We show that these features make Bayesian optimization an outstanding tool for optimizing tokamak scenarios. Objective functions and constraints, targeting, e.g., fusion gain, flux consumption, coils currents limits or q-profile, can be assembled interactively. The optimized parameter vector may include actuators like plasma current or heating waveforms. We demonstrate the capabilities on optimizing ITER and DEMO-like scenarios, simulated by the METIS code.

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