

Graph Me If You Can: Modern Python Meets HEP Statistical Models

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Statistical tooling in the scientific python ecosystem continues to advance, while at the same time ROOT has recently adopted the HEP Statistics Serialization Standard (HS3) as the way of serializing RooWorkspaces for any probability model that has been built. There is a gap between packages such as `jax` and `scipy.stats` and what HS3 provides. This is where `pyhs3` comes in—a modern Python implementation of HS3 designed with modern scientific python development practices. Prioritizing a developer-friendly interface and cross-platform compatibility, `pyhs3` provides a python-callable function built from the computational graph encoded in serialized HS3 probability models.

The goal of this effort is to facilitate existing efforts in statistical inference (`pyhf`, `zfit`, `cabinetry`) and auto-differentiability (`neos`, `MadJax`, `evermore`, `relaxed`) by providing a common core for bidirectional translation of HS3-compatible workspaces.

We'll discuss the design of the library, how the pieces are defined, how to extend or contribute to it, and proof-of-concept with a real-world workspace from the ATLAS $HH \rightarrow bb\gamma\gamma$ analysis. The talk presents the `pyhs3` package as a step towards a common 'inference API' and providing implementations of many mathematical probability distributions common in HEP.

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