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Software framework testing at the Intensity Frontier

The NOvA experiment at Fermilab is a long-baseline neutrino experiment designed to study nu-e appearance in a nu-mu beam. NOvA has already produced more than 1 million Monte Carlo and detector generated files amounting to more than 1 PB in size. This data is divided between a number of parallel streams such as far and near detector beam spills, cosmic ray backgrounds, a number of data-driven triggers and over 20 different Monte Carlo configurations.

Each of these data streams must be processed through the appropriate steps of the rapidly evolving, multi-tiered, interdependent NOvA software framework. In total there are greater than 12 individual software tiers, each of which performs a different function and can be configured differently depending on the input stream.

In order to regularly test and validate that all of these software stages are working correctly NOvA has designed a powerful, modular testing framework that enables detailed validation and benchmarking to be performed in a fast, efficient and accessible way with minimal expert knowledge.

The core of this system is a novel series of python modules which wrap, monitor and handle the underlying C++ software framework and then report the results to a slick front-end web-based interface. This interface utilises modern, cross-platform, visualisation libraries to render the test results in a meaningful way. They are fast and flexible, allowing us to cater, easily, for new tests and datasets.

In total upwards of 14 individual streams are regularly tested amounting to over 70 individual software processes, producing over 25 GB of output files. The rigour enforced through this flexible testing framework enables NOvA to rapidly verify configurations, results and software and thus ensure that data is available for physics analysis in a timely and robust manner.

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