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## Teaching Automatic Differentiation with Interactive C++ Jupyter Notebooks

*Wednesday, December 10, 2025 9:40 AM (20 minutes)*

The compiler research group pioneered interactive C++ notebooks with `xeus-clang-repl`, and its successor `xeus-cpp`. The ability to write automatic differentiation code in an interactive context eliminates the need for long edit-compile-run cycles and simplifies the approach to teaching computational methods.

By leveraging the `clang-repl` C/C++ interpreter, we create an interactive notebook environment for teaching autodiff concepts and evaluating the efficiency and correctness of differentiated code. This approach combines the performance of compiled C++ with the accessibility of Jupyter notebooks, making advanced automatic differentiation techniques more approachable for students and researchers.

This talk demonstrates how various C++ automatic differentiation tools, such as `CoDiPack`, `Clad` and `boost-autodiff` integrate with the `xeus-cpp` Jupyter kernel to enable interactive differentiable programming.

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