C++ as a service — rapid software development and dynamic interoperability with Python and beyond

Interactive C++: cling and clang-repl

Vassil Vassilev

11.11.2021

Status. Clang-Repl

- Added several tests for instantiating C++ templates on demand

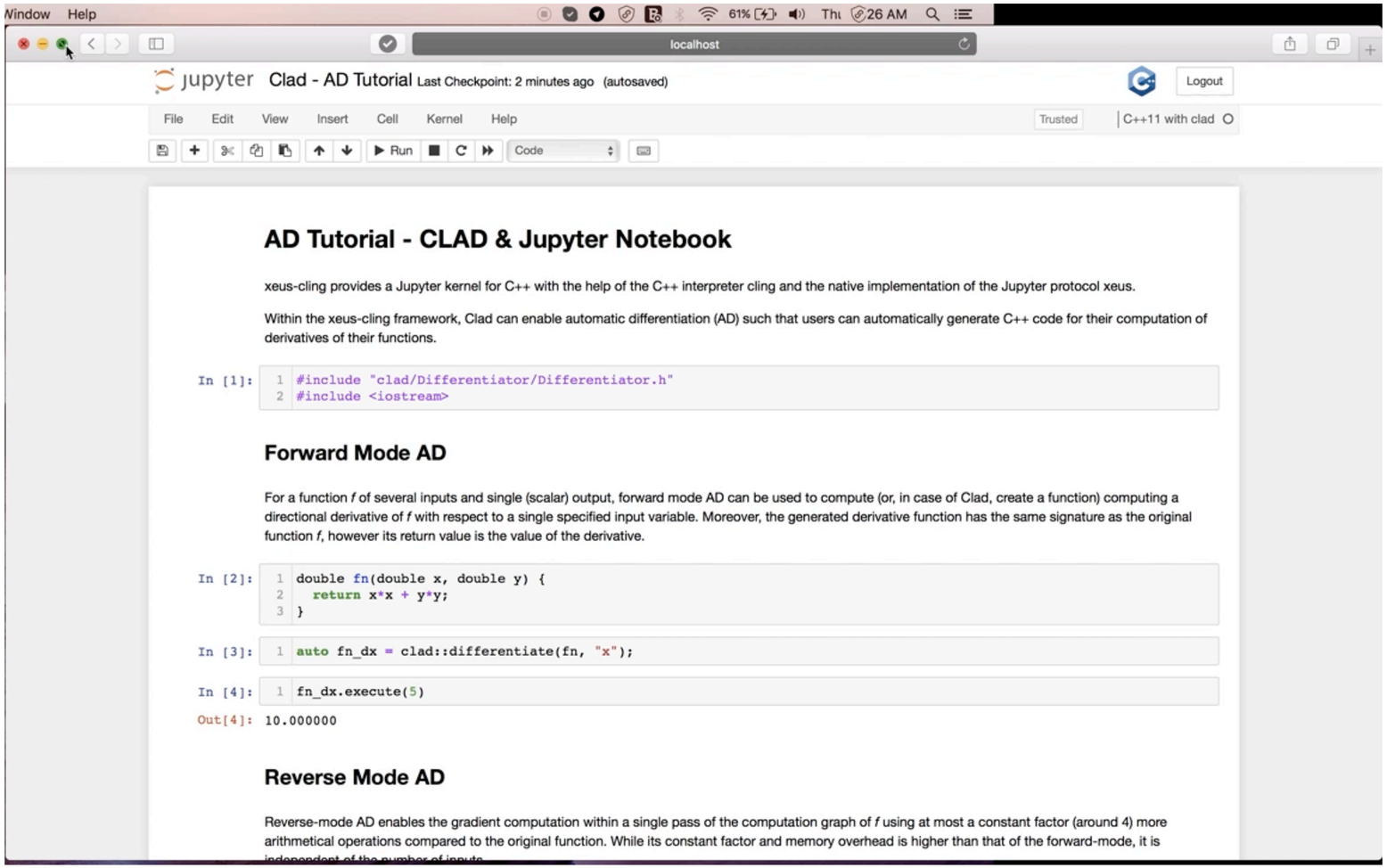
Status. Clang-Repl. CppCon

- CppCon21 talk on Interactive C++ for Data Science and Differentiable Programming for C++
- 60 minute talks, good turnout

Status. Cling

- Continuing to rebase cling on top of llvm13
- xeus-clad is now done! Kudos to Ioana Ifrim and Chris Burr

Status. Clad in Xeus-Cling



Status. InterOp

- The document is ready. We are looking forward to your feedback.
- Addressed several comments and still some minor improvements but mostly happy with the current state.

Status. Clad

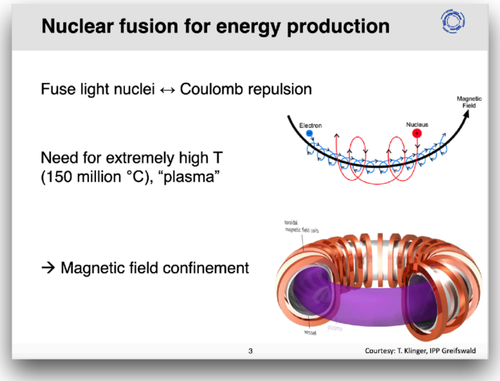
- A talk by Ioana on “Automatic Differentiation for C++ and Cuda using Clad” at the 24th Euro AD Workshop

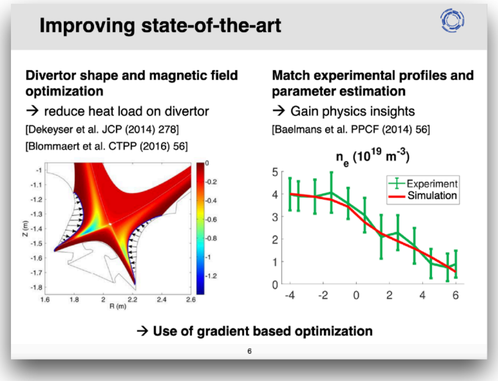
Status. 24th Euro AD Workshop Summary

- An event from 2nd to 4th of Nov (in the afternoons 1500 - 1900 CET)
- Theoretical and practical contributions to automatic differentiation
- AD tools and techniques spanning from OpenMP to C++ to Java to Julia
- The CERN Mode collaboration covered some of the physics-related ideas for AD
- Tribute to Andreas Griewank

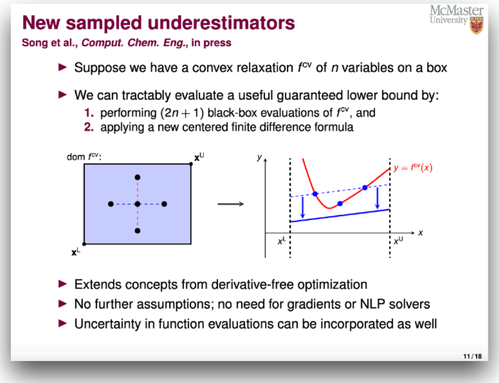
Status. 24th Euro AD Workshop Summary

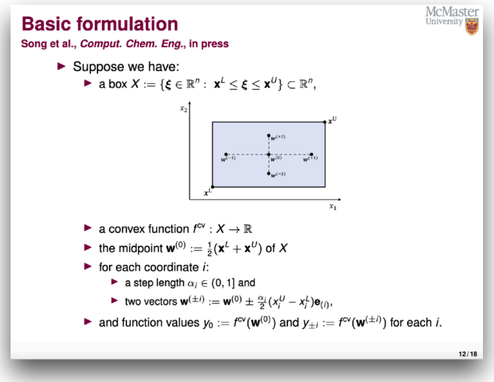
- The agenda is available here.
- Many interesting use-cases.





S. Carli, W. Dekeyser, M. Blommaert and M. Baelmans
KU Leuven, Department of Mechanical Engineering





Yingkai Song Huiyi Cao Kamil A. Khan, Building AD-compatible linear underestimators of convex functions by sampling

Status. 24th Euro AD Workshop Summary

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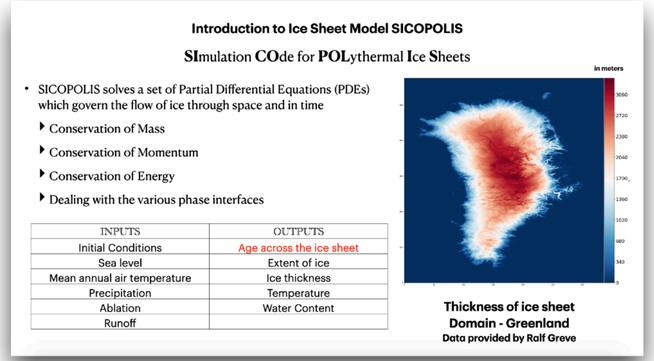
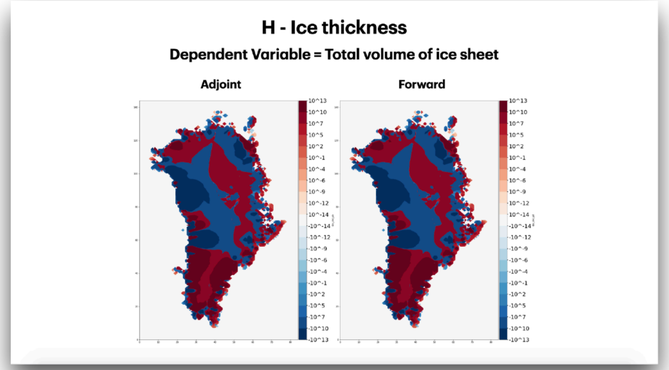
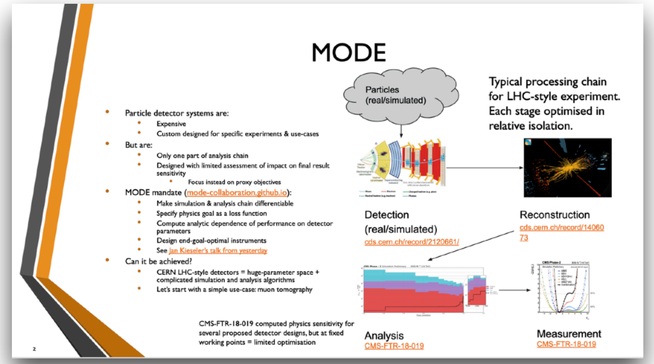
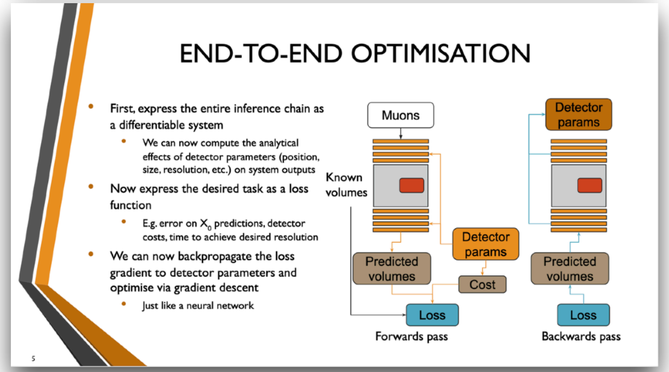




Shreyas Gaikwad, et al, An open-source tangent-linear and adjoint modeling framework for ice-sheet simulation enabled by the AD tool Tapenade





Giles Strong for the MODE Collaboration, TOMOPT: Differential Muon Tomography Optimisation

Plans

- Prepare a paper about the work we've completed.
- Enable error recovery for advanced C++ code (eg template instantiation)
- Accelerate upstreaming clang patches
- Automatically differentiate the CUDA kernels (including computation scheduler)

CaaS Open Projects

- Patches against clang.git
  - Implement FileManager uncaching
  - Adapt the user of invalidateCache to its new signature
  - Mark the file entry invalid, until reread
  - Propagate cache flags from LookupFile() to FileManager::getFile()
  - Pass the OpenFile flag also to DirectoryLookup
  - Do not load the source file just to get an irrelevant SourceLoc (ROOT-7111)
  - Allow interfaces to operate on in-memory buffers with no source location info [Pratyush Das]
- Open projects are tracked in our open projects page.

Next Meetings

- Monthly Meeting — 2nd December, 1700 CET/0800 PDT
- Tentative talk schedule:
  - LLDB, Raphael Isemann, Apple, Dec

If you want to share your knowledge/experience with interactive C++ we can include presentations at an upcoming next meeting

Thank you!