The Science of
High-Performance
Computing Group

Sharing a BLISful State

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Our Purpose for this Presentation

Gather your input on how to effectively

- Communicate existence of BLIS
- Share the idea that underlie BLIS
- Engage and build broader communities
- Cultivate BLIS contributors
- Develop and promote teaching, training, and learning opportunities

Products We've Developed

- MOOCs
- Electronic books
- Github repositories
- Users' guides
- Journal, conference, and workshop papers.
- Presentations
- Tutorials
- Surveys

The LAFF Trilogy of MOOCs

- Created to share our unique insights
- Hosted on the edX platform
- Can be taken individually or in any order
- All use matrix computations to illustrate topics of importance to HPC
- Host materials and make them available to learners

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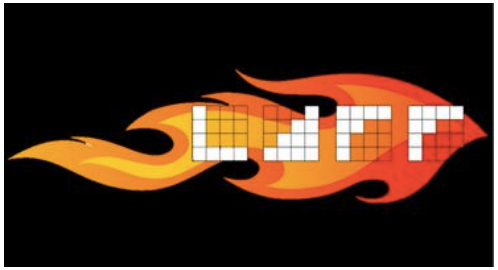
MOOCs Consist Of

- Videos
- Notes
- Activities and problem sets
- Enrichments

Also packaged as electronic books.
http://ulaff.net.



Linear Algebra: Foundations to Frontiers

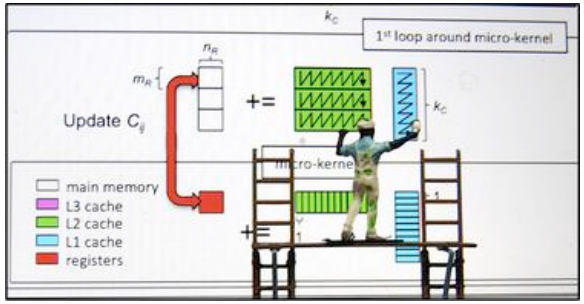
- Fifteen week course offered regularly since 2014
- Audience: learners with varying levels of background, ranging form high school students to Ph.D.s in related fields
- Enrichments relating to HPC include
  - Introduction to BLAS
  - Optimizing GEMM, GotoBLAS, and BLIS
  - Cost of various operations
  - High-performance blocked algorithms

https://www.edx.org/course/linear-algebra-foundations-to-frontiers

LAFF-On: Programming for Correctness

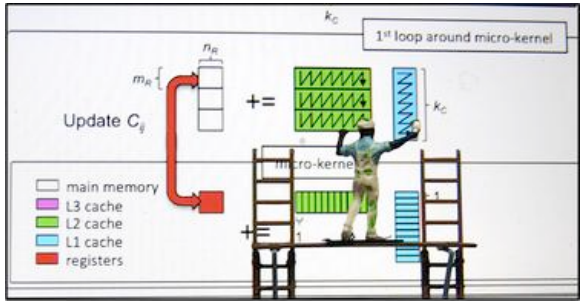
- Six week course offered on edX in Spring 2017 and Summer 2018
- Audience: programmers with varying levels of experience
  - Novices in the field are introduced to the systematic algorithm development and programming
  - Experienced HPC software developers are exposed to formal thinking that underlies their intuition and experience
- Importance to HPC: Demonstrates that formal derivation yields a families of algorithms, from which the most suited can be chosen. This is the FLAME Methodology.

https://www.edx.org/course/laff-on-programming-for-correctnes



LAFF-On Programming for High Performance

- Under construction
- When/Duration: TBD
- Audience: novices, computational scientists, machine learning software developers
- Exposes the learner to issues that were crucial to our own success in HPC



LAFF-On Programming for High Performance

Using matrix-matrix multiplication as the example, introduces the learners to

- Single-core optimizations
  - Instruction-level parallelism
  - Cache blocking
  - Amortizing data movement through data reuse
- Multi-threaded parallelism through OpenMP
- Practical distributed-memory parallel implementations

How Did These MOOCs Evolve?

- Started with materials shared with a few who wanted to join in our research:
  - Graduate students
  - Undergraduates
  - Postdocs
- Evolved into courses at UT
- Scaled to share with the world

What's Next?

We want to thoughtfully and purposefully expand collaborations and encourage involvement in HPC and BLIS.

- Broaden participation (including by underrepresented groups)
- Enhance infrastructures for research and education
- Support and promote teaching, training, and learning opportunities

Your Guidance for Sharing a BLISful State, Please!

- What can we add, subtract, change?
- What materials are needed to further support goals?
- How do we get the word out?
- How do we target harder-to-reach audiences?
- How do we scale and increase capacity?
- How do we fund the effort?

(We in this context means all of us)