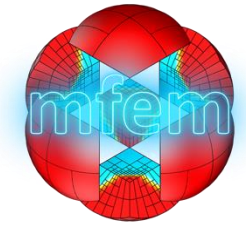
Welcome to the Fourth Annual MFEM Community Workshop

October 22–24, 2024

mfem.org/workshop

Lawrence Livermore National Laboratory



Prepared by LLNL under Contract DE-AC52-07NA27344.

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HYBRID EDITION!!!

October 22–24, 2024

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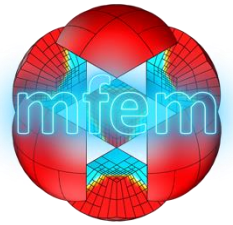


Prepared by LLNL under Contract DE-AC52-07NA27344.

- LLNL established in 1952
- ~ 8,900 LLNS employees
- 1 square mile
  and 521 facilities
- Annual budget: ~ $3.3B
- Operated by LLNS, LLC
  for U.S. Dept. of Energy
  (LLNS: University of California,
  Bechtel, BWXT, and Amentum)

Experimental Test Site
(11 square miles near Tracy, CA)

Organizers

Aaron Fisher

Tzanio Kolev

Will Pazner

Ketan Mittal

Haley Shuey

Holly Auten

Justin Laughlin

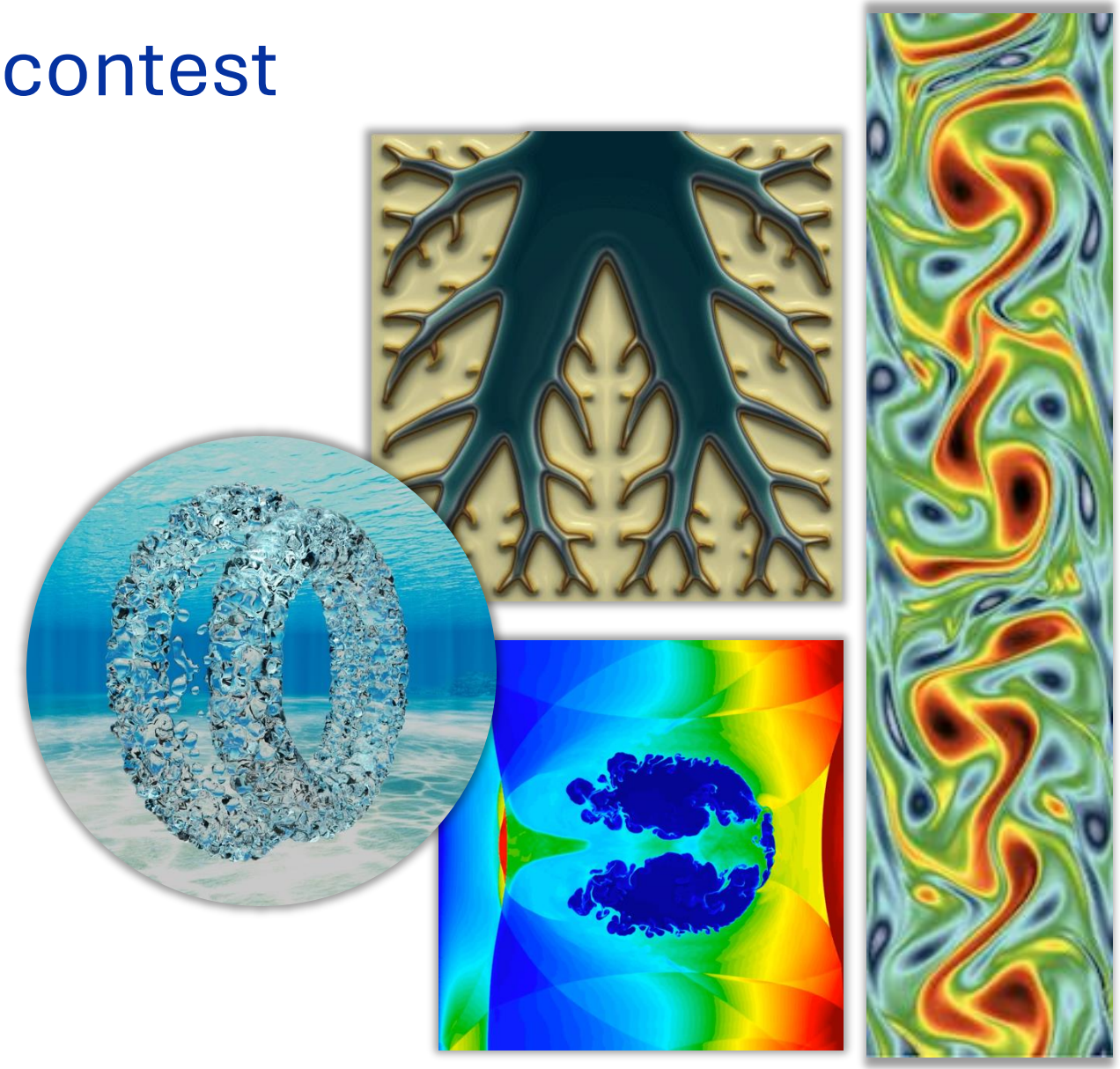
Sohail Reddy

Agenda

PDT	Tuesday	Wednesday	Thursday
8:30	Welcome	Vis contest awards	Office hours
9:00	Talks	Talks	
10:00	*Break*	*Break*	
10:30	Talks	Talks	
12:00	*Lunch*	*Lunch*	*Lunch*
1:00	Students	Talks & breakouts	
3:00	*Break (group photo)*	*Break until 3:30*	
4:00	Talks	Talks	

Simulation & visualization contest

- Thanks for submitting your images/videos
- Event organizers have selected a winner
- The winner will receive a t-shirt
- Submissions will be featured at mfem.org/gallery



Download a virtual background

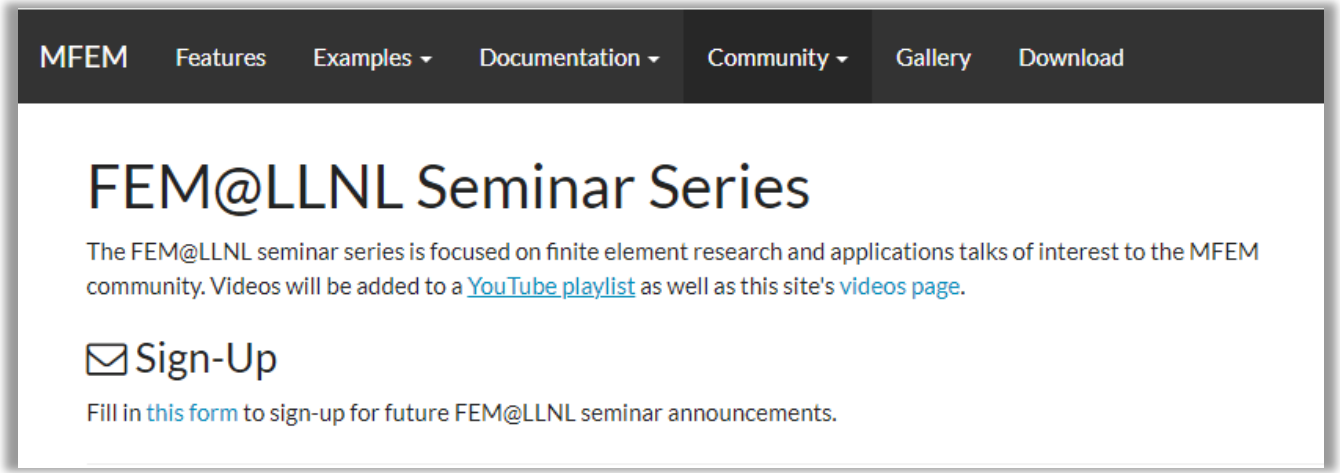
mfem.org/workshop

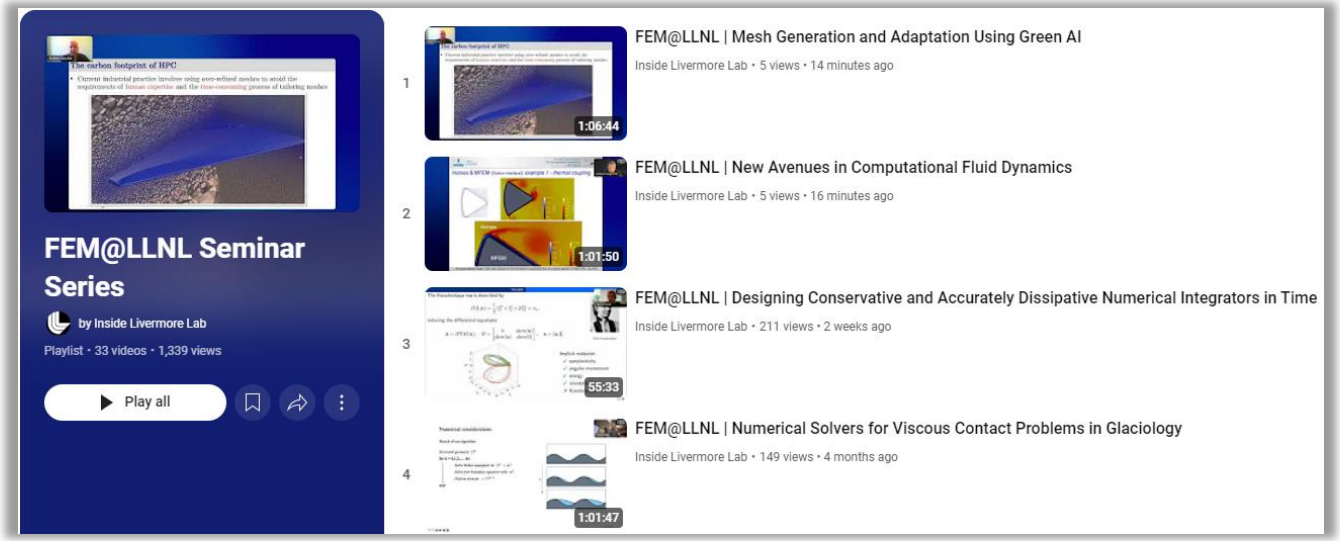
Let’s keep the conversation going

- Docs, examples, news, & more: mfem.org
- Software: github.com/mfem
- Stay in contact & ask for help: mfem@llnl.gov or github.com/mfem/mfem/discussions
- Become an MFEM reviewer! We need help with reviewing contributions as the community grows

FEM@LLNL seminars

- Approximately monthly via WebEx (35 speakers so far!)
- YouTube playlist
- View the queue and sign up for notifications: mfem.org/seminar
- Interested in giving a seminar? mfem@llnl.gov





Selected Survey Results

221 Participants from 27 countries and 103 organizations

10 National Laboratories

Centre for Development of Advanced Computing, India
Helmholtz Center, Hereon, Germany
Swiss National Supercomputing Centre
Institute of Software, Chinese Academy of Sciences
Lawrence Livermore National Laboratory
Los Alamos National Laboratory
Naval Nuclear Laboratory
National Center For Medium Range Weather Forecasting, India
STFC Hartree Centre, UK
UK Atomic Energy Authority

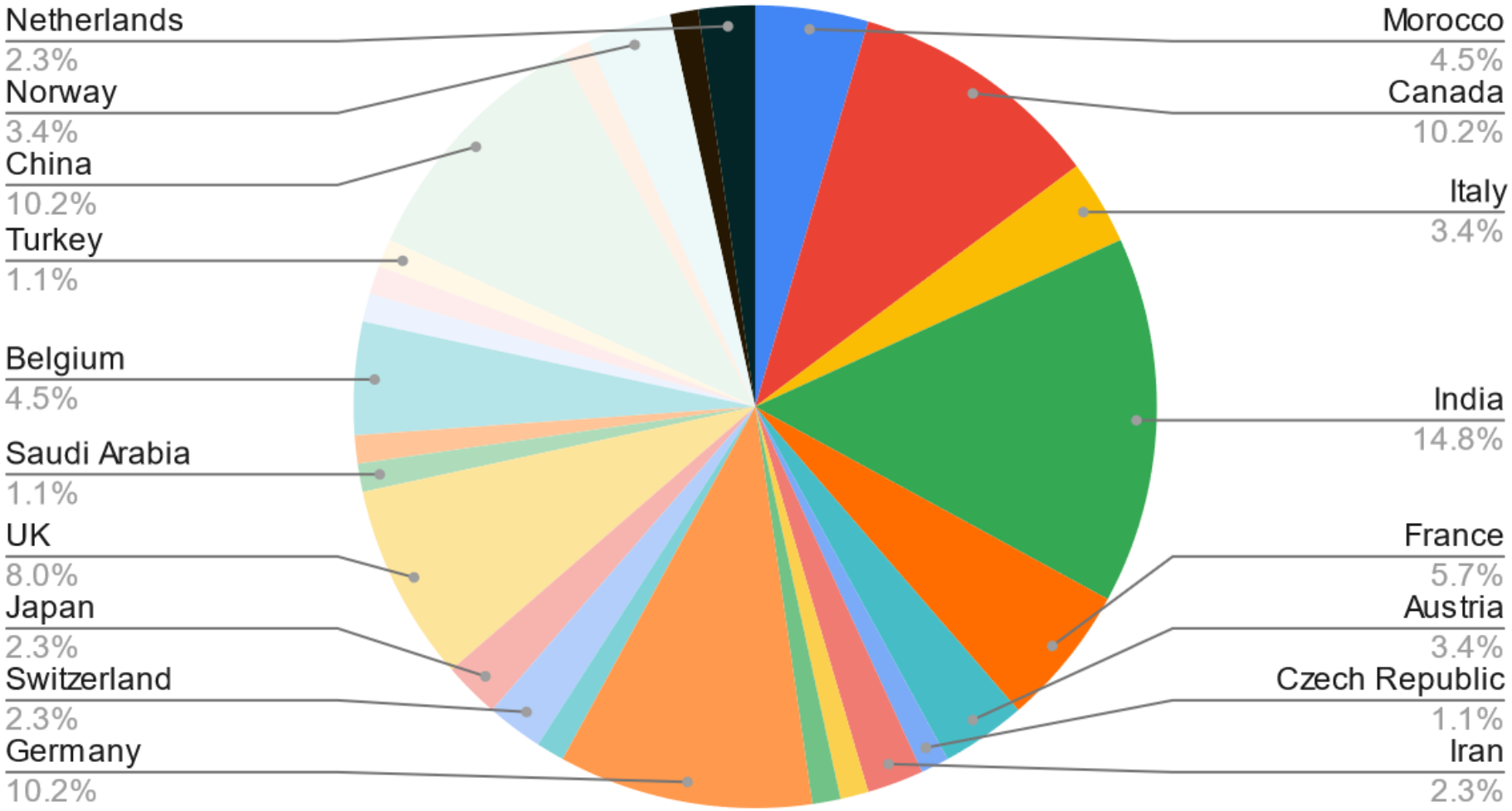
13 Companies

Aalo Atomics
Applied Materials, Inc.
Autodesk Research
AWS Center for Quantum Computing
Braid Technologies, Inc.
Coreform LLC
Cyentech
Cysca Technologies
Divergent3D
Materials Sciences LLC
Tau Motors
X-ScaleSolutions
Xcimer Energy Corp.

80 Universities

Abdelmalek Essaâdi University	Johannes Kepler University Linz	TU Wien
Amirkabir University of Technology	Korea Advanced Institute of Science & Technology (KAIST),	UC Davis
Northeast National University	KAUST	UConn
Beijing University Of Technology	LSU	UMass Dartmouth
BITS-Pilani, Hyderabad Campus	Massachusetts General Hospital/Harvard Medical School	Universidad de Granada
Brown University	Michigan State University	Université Grenoble Alpes
Central South University	Middle East Technical University	University of Antwerp
Charles University	Mines Paris PSL	University of British Columbia
Colorado University, Boulder	MIT	University of California, Merced
Eindhoven University of Technology	Mohammed VI Polytechnic University	University of California, San Diego
Emory University	Morgan State University	University of Cologne
ENSTA Bretagne	NC State University	University of Georgia
EPFL	New York University	University of Glasgow
Faculty of Civil Engineering, Belgrade	Norges teknisk-naturvitenskapelige universitet	University of Ioannina
Faculty of Science and Technology of Tang	Northwestern University	University of Liverpool
Georgia Institute of Technology	Norwegian University of Science and Technology	University of Notre Dame
Harbin Institute of Technology	Polytecnico di Bari	University of Rochester Laboratory
Hasselt University	Portland State University	University of Southern California
Heriot-Watt University	Purdue University	University of Waterloo
Imperial College London	Rensselaer Polytechnic Institute	University of Bristol
Indian Institute of Science	Johann Radon Institute for Computational and Applied Mathematics	Utah State University
Indian Institute of Technology DElhi	Ruhr University Bochum	University of Texas at San Antonio
Indian Institute of Technology Guwahati	School of Mathematics and Computer Science, IBA Karachi	Virginia Tech
Indian Institute of Technology Madras	Stanford University	Western Michigan University
Indian Institute of Technology Roorkee	Sun Yat-Sen University	Zhejiang University
Iowa State University	Tsinghua University	UT Austin
Ispits Safi-Marrakech	TU Dortmund	

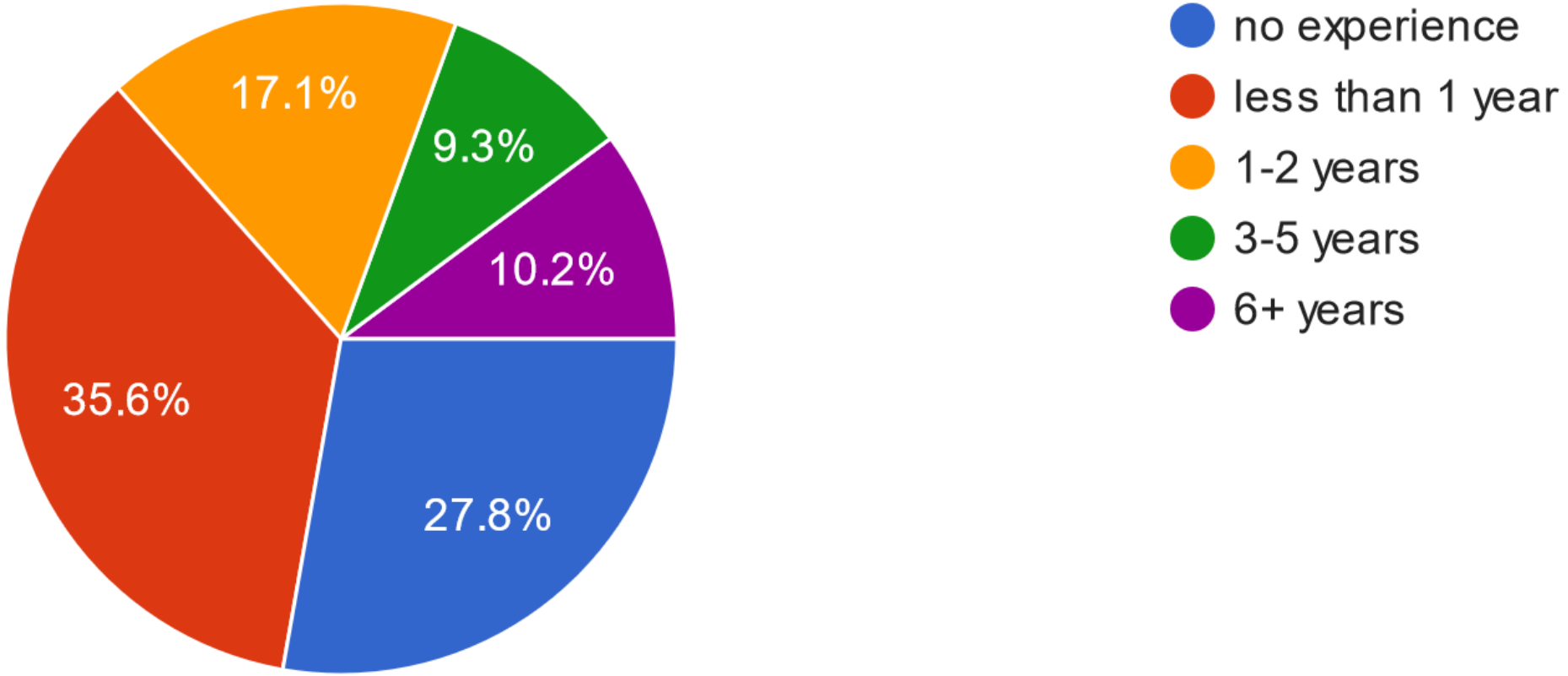
Non-USA Participation



60% of participants come from USA

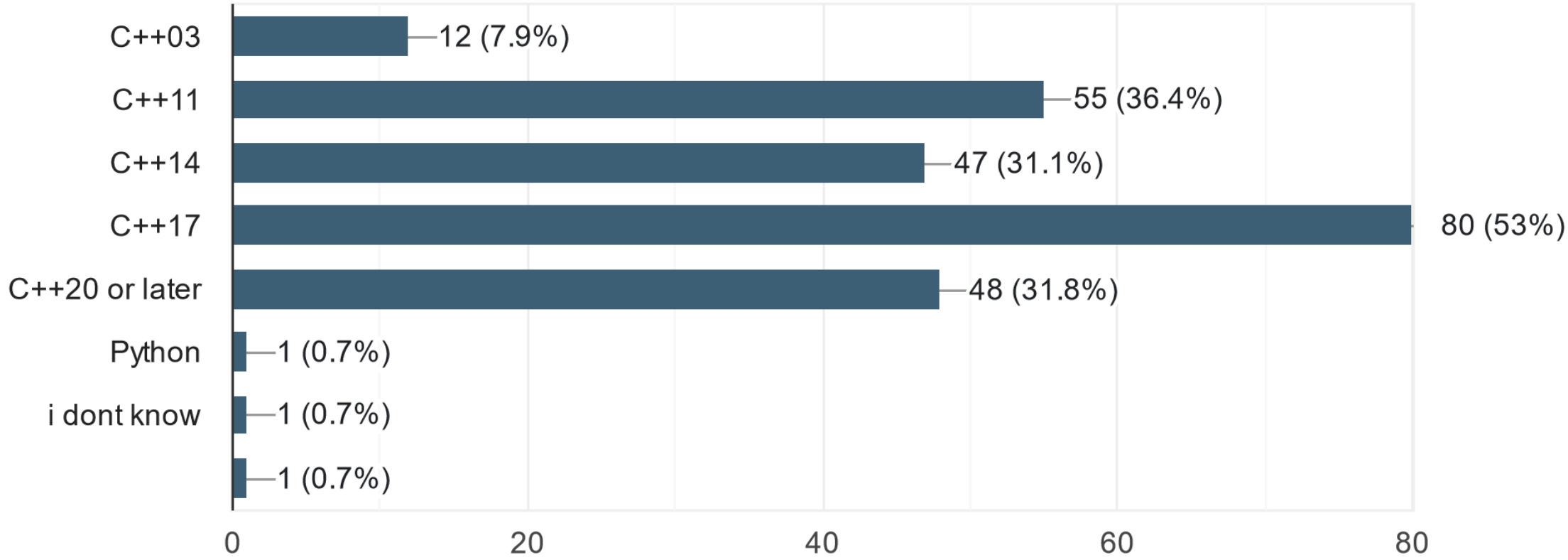
Experience with MFEM

216 responses



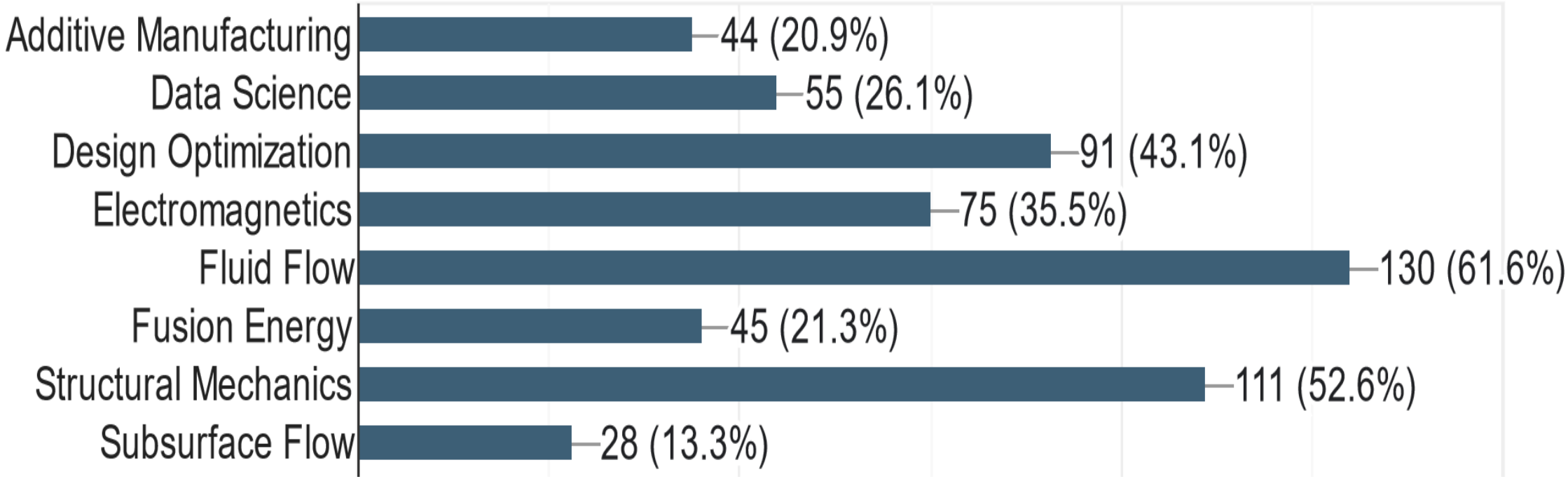
C++ standard

151 responses



I'm interested in the following application areas:

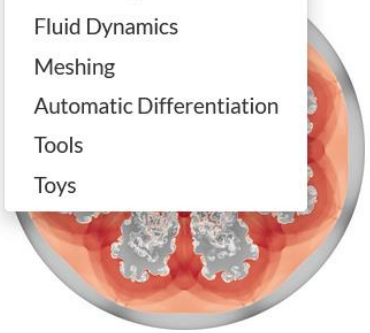
211 responses



MFEM Resources

MFEM | Features | Examples | Documentation | Community | Gallery | Download | GitHub

- Example Codes
- Electromagnetics
- Fluid Dynamics
- Meshing
- Automatic Differentiation
- Tools
- Toys



High-order multi-material hydrodynamics in the BLAST code

MFEM is a *free*, *lightweight*, *scalable* C++ library for finite element methods.

Features

- Arbitrary high-order finite element meshes and spaces.
- Wide variety of finite element discretization approaches.
- Conforming and nonconforming adaptive mesh refinement.
- Scalable from laptops to GPU-accelerated supercomputers.
- ... and many more.

MFEM is used in many projects, including BLAST, Cardioid, VisIt, RF-SciDAC, FASTMath, xSDK, and CEED in the Exascale Computing Project. See also our Gallery, Publications, Videos and News pages.

News

Oct 22, 2022	Version 4.5 released.
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Jan 20, 2022	FEM@LLNL seminar series starting.

Latest Release

New features ¦ Examples ¦ Code documentation ¦ Sources

Download mfem-4.5.tgz

Older releases ¦ Python wrapper ¦ launch binder

Documentation

Building MFEM ¦ Getting Started ¦ Finite Elements ¦ Performance

New users should start by examining the example codes.

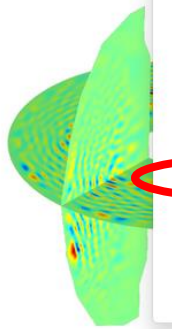
We also recommend using GLVis for visualization.

Contact

Use the GitHub issue tracker to report bugs or post questions or comments.
See the About page for citation information.

MFEM | Features | Examples | Documentation | Community | Gallery | Download | GitHub

- Getting Started
- HowTo Articles
- Finite Elements
- Performance
- GPU Support
- Mesh Formats
- Doxygen
- Publications
- About
- Search...



Electromagnetic wave propagation in the NSTX-U tokamak

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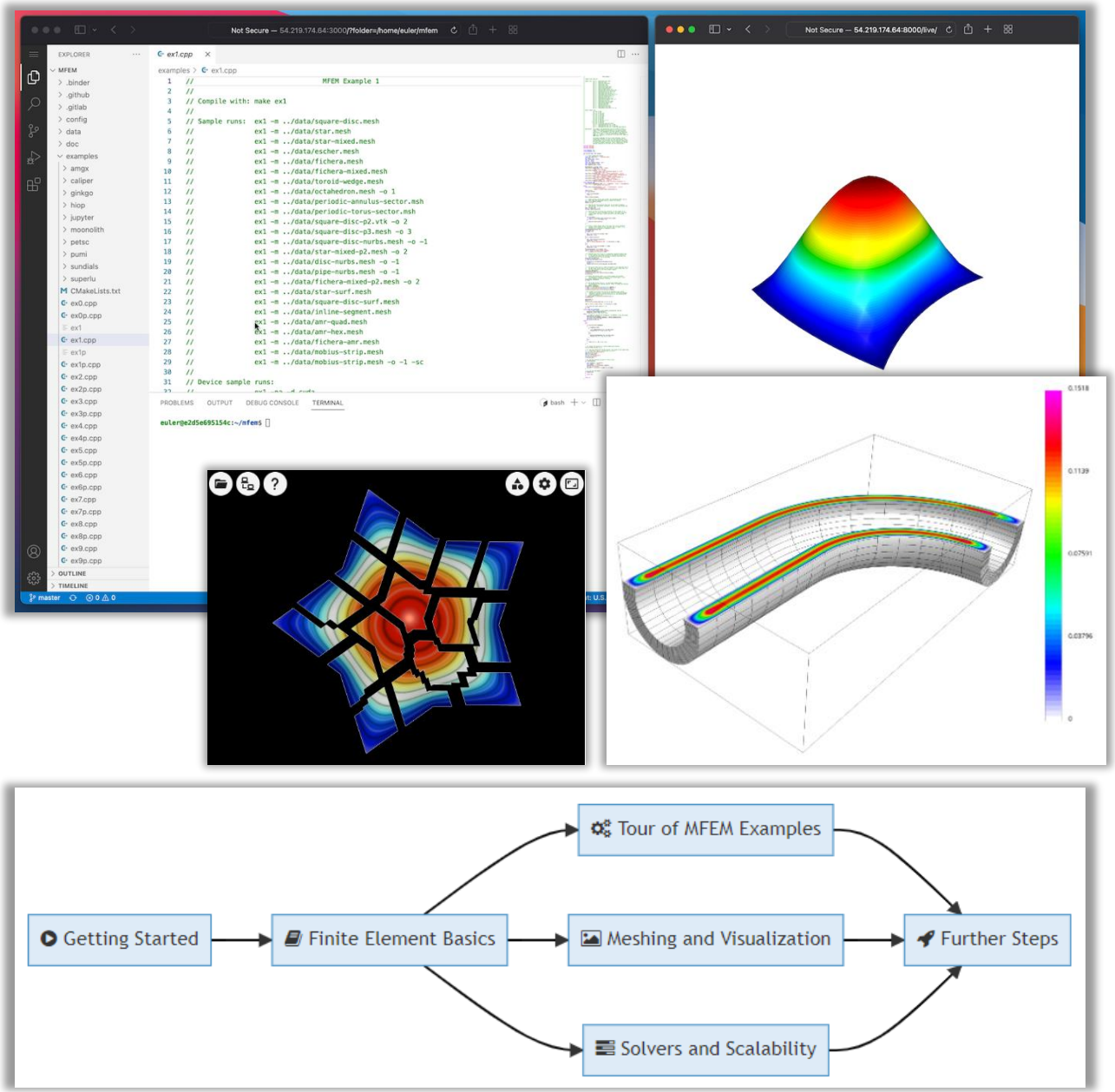
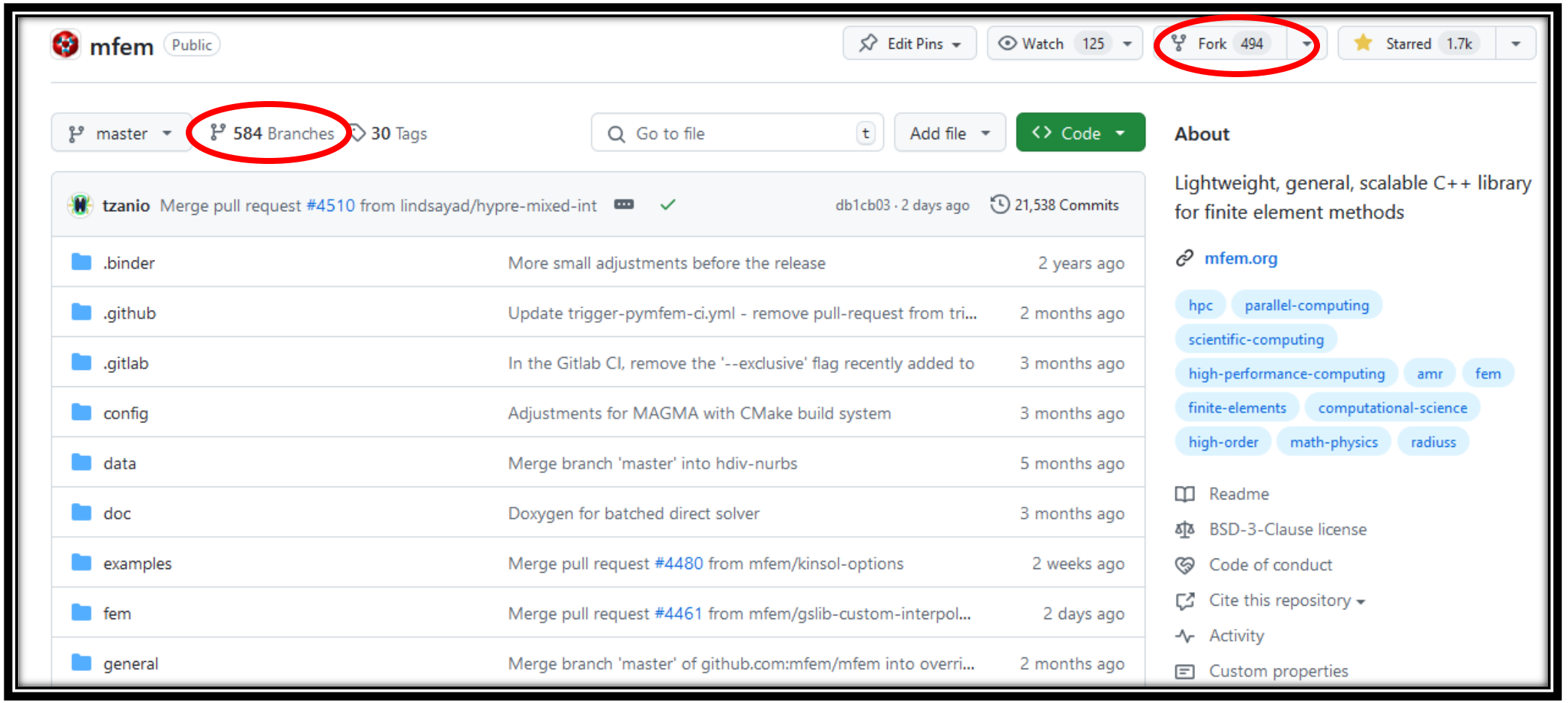
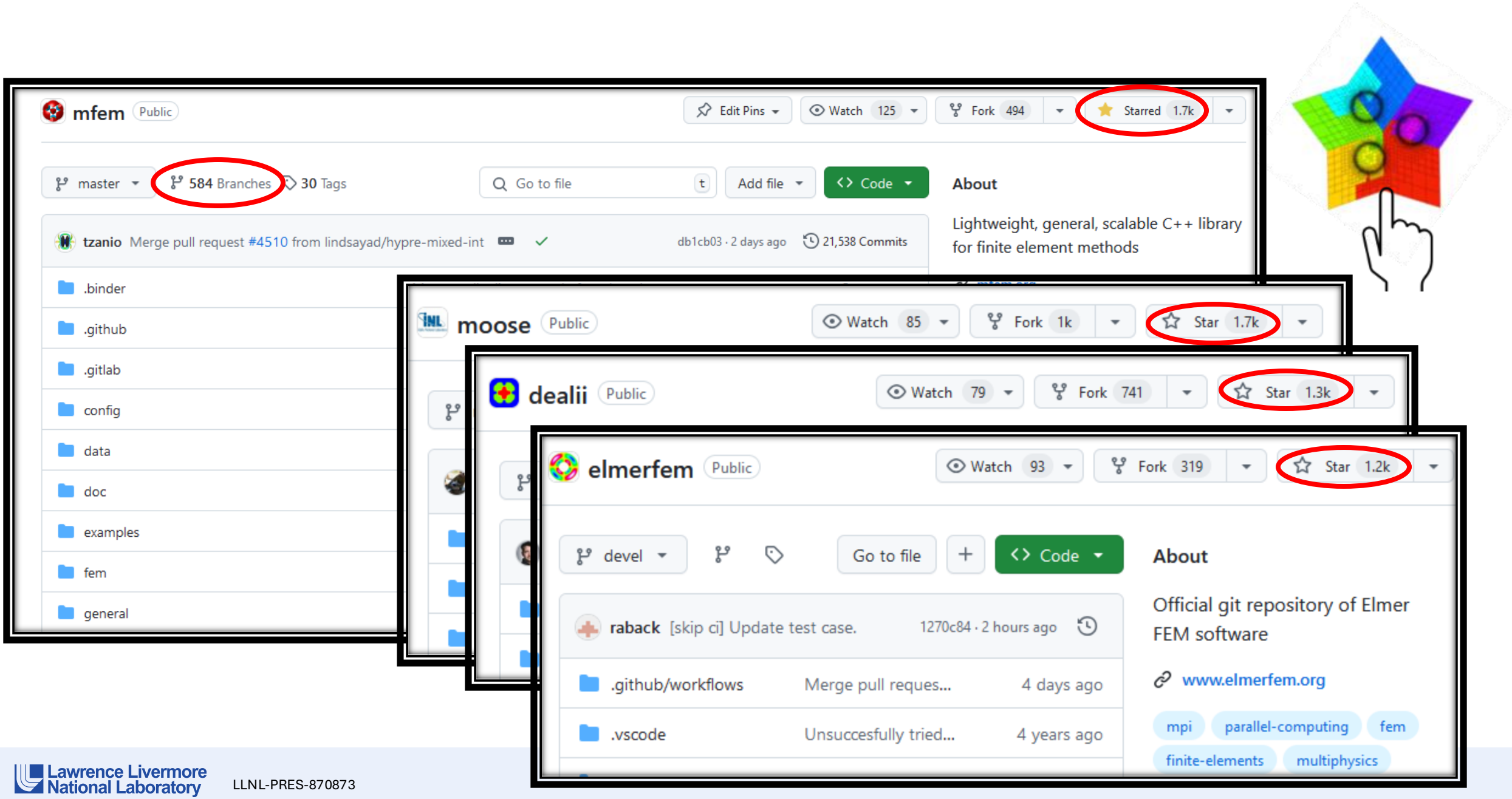
Self-paced tutorial

- Available at mfem.org/tutorial
- No previous experience necessary
- Use an Amazon EC2 instance or local Docker container
- Explore FEM basics, meshing, vis, and scalable solvers
- Lots of examples!
- Video walkthrough available




mfem
Public
Edit Pins
Watch 125
Fork 494
Starred 1.7k
master
584 Branches
30 Tags
Go to file
t
Add file
Code
tzanio Merge pull request #4510 from lindsayad/hypre-mixed-int
db1cb03 · 2 days ago
21,538 Commits
.binder More small adjustments before the release 2 years ago
.github Update trigger-pymfem-ci.yml - remove pull-request from tri... 2 months ago
.gitlab In the Gitlab CI, remove the '--exclusive' flag recently added to 3 months ago
config Adjustments for MAGMA with CMake build system 3 months ago
data Merge branch 'master' into hdiv-nurbs 5 months ago
doc Doxygen for batched direct solver 3 months ago
examples Merge pull request #4480 from mfem/kinsol-options 2 weeks ago
fem Merge pull request #4461 from mfem/gslib-custom-interpol... 2 days ago
general Merge branch 'master' of github.com:mfem/mfem into overri... 2 months ago
About
Lightweight, general, scalable C++ library for finite element methods
mfem.org
hpc
parallel-computing
scientific-computing
high-performance-computing
amr
fem
finite-elements
computational-science
high-order
math-physics
radiuss
Readme
BSD-3-Clause license
Code of conduct
Cite this repository
Activity
Custom properties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.binder
.github
.gitlab
config
data
doc
examples
fem
general
moose
Public
Watch 85
Fork 1k
Star 1.7k
dealii
Public
Watch 79
Fork 741
Star 1.3k
elmerfem
Public
Watch 93
Fork 319
Star 1.2k
devel
Go to file
Code
About
Official git repository of Elmer FEM software
raback [skip ci] Update test case.
1270c84 · 2 hours ago
.github/workflows
Merge pull reques...
4 days ago
.vscode
Unsuccesfully tried...
4 years ago
www.elmerfem.org
mpi
parallel-computing
fem
finite-elements
multiphysics