Jeremy Lilly

jlilly@lanl.gov
jeremy-lilly.github.io

Employment

2024 – Present **Postdoc**, *Los Alamos National Laboratory*
Postdoctoral researcher in the computational physics and methods group (CCS-2) at Los Alamos.

Education

2019 – 2024 **Ph.D., Mathematics**, *Oregon State University*
Advised by Robert Higdon.
Dissertation title: *Efficient Time-Stepping for the Shallow Water Equations on Unstructured Grids*.

2019 – 2021 **M.S., Mathematics**, *Oregon State University*
Advised by Elaine Cozzi.

2016 – 2019 **B.S., Mathematics**, *Oregon State University*
Major in mathematics, minor in computer science.

2014 – 2016 **Associate of Arts Oregon Transfer**, *Portland Community College*

Publications

[1] Jeremy R. Lilly, Giacomo Capodaglio, Darren Engwirda, Robert L. Higdon, and Mark R. Petersen. "Local Time-Stepping for the Shallow Water Equations Using CFL Optimized Forward-Backward Runge-Kutta Schemes". In: *Journal of Computational Physics* 520 (Jan. 2025), p. 113511. ISSN: 0021-9991. DOI: 10.1016/j.jcp.2024.113511.

[2] Jeremy R. Lilly, Darren Engwirda, Giacomo Capodaglio, Robert L. Higdon, and Mark R. Petersen. "CFL Optimized Forward–Backward Runge–Kutta Schemes for the Shallow-Water Equations". In: *Monthly Weather Review* 151.12 (Dec. 2023), pp. 3191–3208. ISSN: 1520-0493, 0027-0644. DOI: 10.1175/MWR-D-23-0113.1.

[3] Jeremy R. Lilly, Giacomo Capodaglio, Mark R. Petersen, Steven R. Brus, Darren Engwirda, and Robert L. Higdon. "Storm Surge Modeling as an Application of Local Time-Stepping in MPAS-Ocean". In: *Journal of Advances in Modeling Earth Systems* 15.1 (Jan. 2023), e2022MS003327. ISSN: 1942-2466. DOI: 10.1029/2022MS003327.

[4] Jim Brown, Beren Gunsolus, Jeremy Lilly, and Felice Manganiello. "Hilbert modular forms and codes over $\mathbb{F}_{p^2}$". In: *Finite Fields and Their Applications* 67 (2020), p. 101731. ISSN: 1071-5797. DOI: 10.1016/j.ffa.2020.101731.

Research

Summer 2023 **National Science Foundation Mathematical Sciences Graduate Internship**, *Los Alamos National Laboratory*
Developed CFL efficient local time-stepping schemes for shallow water models.

2022 – 2023 **Department of Energy Science Graduate Student Research Program**, *Los Alamos National Laboratory*
Investigated the performance of local time-stepping schemes in MPAS-Ocean to increase computational efficiency. Developed CFL optimized Runge-Kutta schemes for the shallow water equations.

Summer 2021 **Parallel Computing Student Research Internship**, *Los Alamos National Laboratory*
Designed, built, and ran performance experiments for local time-stepping schemes for MPAS-Ocean using HPC systems.

2018 – 2019 **Undergraduate Honors Thesis**, *Oregon State University*
An independent study of the gauge integral, including a general overview and major convergence theorems.

Summer 2018 **Research Experience for Undergraduates**, *Clemson University*
Developed a method to construct lattices from linear codes from certain finite fields using tools from algebraic number theory.

Scholarly Presentations

Conference Talks

July 24, 2023 U.S. National Congress on Computational Mechanics
Storm Surge Modeling as an Application of Local Time-Stepping in MPAS-Ocean

March 1, 2022 American Geophysical Union Ocean Sciences Meeting
Speeding Up Ocean Simulations with Local Time-Stepping

Seminar Talks

October 23, 2024 LANL Climate, Ocean, and Sea Ice Modeling Seminar
Efficient Time-Stepping for the Shallow Water Equations on Unstructured Grids

April 12, 2024 OSU Applied Math and Computation Seminar
CFL Optimized Local Time-Stepping for the Shallow Water Equations

August 2, 2023 LANL Climate, Ocean, and Sea Ice Modeling Seminar
CFL Optimized Forward-Backward Runge-Kutta Schemes for the Shallow Water Equations

March 3, 2023 OSU Applied Math and Computation Seminar
Storm Surge Modeling as an Application of Local Time-Stepping in MPAS-O

June 8, 2022 LANL Climate, Ocean, and Sea Ice Modeling Seminar
Storm Surge Modeling as an Application of Local Time-Stepping in MPAS-O

August 11, 2021 LANL Climate, Ocean, and Sea Ice Modeling Seminar
Speeding Up Ocean Simulations with Local Time-Stepping

July 8, 2018 Multi-REU Mock Conference
Codes, Lattices, and Modular Forms

Poster Sessions

Febuary 20, 2024 American Geophysical Union Ocean Sciences Meeting
CFL Optimized Forward-Backward Runge-Kutta Schemes for the Shallow Water Equations

August 9, 2023 Los Alamos Workshop on Time Integration for Multiphysics
CFL Optimized Forward-Backward Runge-Kutta Schemes for the Shallow Water Equations

Awards and Honors

May 2024 Graduate Student Excellence Award

June 2023 Graduate Student Academic Achievement Award

June 2021 Graduate Student Outstanding Performance in Coursework Award

May 2018 Botond Gabor Eross Math Memorial Scholarship

April 2017 & 2018 Drucilla Shepard Smith Award

Other Experience

Professional Service

February 18, 2024 — Session co-organizer at American Geophysical Union Ocean Sciences Meeting
Numerical Methods for Computational Oceanography

Teaching Assistantships

Fall 2019	Multivariable Calculus	Winter 2020	College Algebra
Spring 2020	Differential Calculus	Fall 2020	College Algebra
Winter 2021	Integral Calculus	Spring 2021	Integral Calculus
Fall 2021	Multivariable Calculus	Winter 2023	Multivariable Calculus
Spring 2023	Multivariable Calculus	Fall 2024	Mulitvariable Calculus
Winter 2024	Numerical ODEs	Spring 2024	Linear Algebra

Other Employment

2019 – 2024 — **Graduate Student**, *Oregon State University*
Funded by OSU Graduate Teaching Assistantship, Department of Energy Office of Science Graduate Student Research Award, Los Alamos National Laboratory Parallel Computing Summer Research Internship, and National Science Foundation Mathematical Sciences Graduate Internship.

Summer 2019 & 2020 — **Software Engineering Intern**, *Engineering Design Team*
Wrote computer vision applications on Nvidia Jetson machines using PyTorch and Tensorflow Keras, and wrote applications that perform inference on images pulled from propietary EDT hardware. Used Amazon Web Service virtual machines and Tensorflow to build and train a ML model to classify radio signals.

Winter 2018 — **Grader**, *OSU Math Department*
Graded weekly homework assignments for Introduction to Modern Algebra.