Caleb Logemann

Curriculum Vitæ

Education

2015–Present **Masters/Ph.D.**, *Iowa State University*, Applied Mathematics, GPA — 3.88.
Graduate Minor: Aerospace Engineering

2011–2015 **Bachelor of Arts**, *Bethel University*, GPA — 3.96, Majors — Mathematics, Physics, Computer Science.
Honors Program

Research

2016–Present **Computational Mathematics**, *Dr. James Rossmanith*, Iowa State University.

- Developed new stable and high order numerical methods for solving thin film equations. Detailed acheivements:
  - Adapted the Local Discontinuous Galerkin method to solve the thin film equation.
  - Developed C++ software to compute said methods in DogPack software package
  - Used preconditioners and the geometric multigrid method to accelerate solver
- Developing high-order discontinuous Galerkin methods for the shallow water equations on the sphere with an icosahedral mesh. Pursuing method for generalized shallow water equations with vertical structure.

Summer 2019 **Computational Fluid Mechanics**, *Dr. Travis Fisher*, Sandia National Labs, Albuquerque, NM.
Explored Error Transport techniques using Defect Correction method for Hyperbolic Conservation Laws. Detailed achievements:

- Developed model for the truncation error
- Used Summation By Parts (SBP) Finite Difference Operators
- Presented work in oral and written report

396 Carver Hall, 411 Morrill Road – Ames, IA 50011
☎ *(515) 494 7256* • ✉ *logemann@iastate.edu*
caleblogemann.github.io

2015 **Mathematical Neuroscience**, *Dr. Brian Turnquist*, Bethel University.
Researched the developement of new mathematical techniques for quantifying and classifying neural data. Developed efficient algorithms for computing said mathematical techniques. Detailed acheivements:
- Created novel use of silhouette statistic to differentiate neural responses to itch and pain.
- Developed efficient algorithms for computing said statistic by incorporating genetic algorithms.

2014 **NanoOptics**, *Dr. Nathan Lindquist*, Bethel University.
Researched the creation of a scattering based optical trap for the control of mirco particles.
Detailed achievements:
- Developed LabView software to control and monitor the focus of the laser.
- Measured the strength of the trap.
- Optimized the strength of the trap.

2013 **Atomic and Molecular Optics**, *Dr. Chad Hoyt*, Bethel University.
Individually researched the developement of a cheap and portable iodine spectroscopy setup which could be used as locked absolute reference in the frequency space. Also collaborated with group working on trapping cold lithium in magneto-optical trap.
Detailed achievements:
- Built and fine-tuned a enclosed cavity diode laser.
- Calibrated apparatus to acheive maximum interaction between the laser and the iodine.
- Built and tested circuitry for the precise measurement of the temperature of lithium.

Professional Experience

2015–Present **Graduate Teaching Assistent**, Iowa State University, Ames, IA.
Taught undergraduate recitations in mathematics.
Detailed achievements:
- Worked closely with professors to develop class materials.
- Taught one hour lectures in Calculus and Differential Equation to smaller sections of students.
- Guided students through a team based learning (TBL) approach to Precalculus.

Summer 2017 **Graduate Mentor of Undergraduate Research**, Iowa State University, Ames, IA.
Lead and mentored group of four undergraduate students in computational research
Detailed achievements:
- Advised students in research techniques
- Explored Space-Time/Lax-Wendroff Discontinuous Galerkin Method
- Developed positivity preserving limiters and oscillation limiters

2014–2015 **Intern Software Developer**, Relationship One, Minneapolis, MN.
Developed Java based sofware in an agile software developement environment.
Detailed achievements:
- Created Java applications to assist companies in managing their costumer data.
- Used advanced Javascript and HTML for the continued developement of company website.
- Integrated web application with a SQL Database through a Node.js server.

Projects

2016–Present **DoGPack Developer**, *Iowa State University*.
Developed additions to C++ package for solving Hyperbolic Conservation Laws with Discontinuous Galerkin Method. Detailed Achievements:
- Utilized design patterns to limit code reuse
- Added unit testing framework
- Experienced with version control systems

2016 **MATH 610 Early Graduate Research**, *Iowa State University*.
Expanded on Stochastic Galerkin Method for Hamilton-Jacobi Equations. Detailed Achievements:
- Uncertainty Quantification through Stochastic expansion of Galerkin Method
- Utilized Runge Kutta IMEX time stepping scheme
- Implemented method in MATLAB

Leadership Experience

2017–2019 **President, SIAM, Iowa State Chapter**.
Student President of the Iowa State Chapter of the Society for Industrial and Applied Mathematics. Detailed Achievements:
- Lead seminar for graduate students interested in Applied Math
- Organized student trips to SIAM Central States Sectional Meetings
- Advised younger graduate students

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Publications

2018 **C. Felton, M. Harris, C. Logemann, S. Nelson, I. Pelakh, and J. Rossmanith**, *A Positivity-Preserving Limiting Strategy for Locally-Implicit Lax-Wendroff Discontinuous Galerkin Methods*, Advances in Computational Mathematics, Submitted, (arXiv: 1806.06756).

2019 **C. Logemann and J. Rossmanith**, *An Implicit-Explicit Discontinuous Galerkin Scheme using a Newton-Free Picard Iteration for a Thin-Film Model*, In Preparation.

2019 **C. Logemann and J. Rossmanith**, *A Discontinuous Galerkin Method for Generalized Shallow Water Equations on the Sphere*, In Preparation.

Invited and Contributed Talks

2019 SIAM Central States Section Meeting, *An Implicit-Explicit Discontinuous Galerkin Scheme using a Newton-Free Picard Iteration for a Thin-Film Model*

2019 ISU Chapter of SIAM Seminar, *Error Transport using the Defect Correction Equations with Summation By Parts Operators*

2019 SIAM Conference on Computational Science and Engineering, *High Order Discontinuous Galerkin Scheme for Thin-Film Equations*

2019 Midwest Numerical Analysis Days, *High Order Discontinuous Galerkin Scheme for Thin-Film Equations*

2018 Graduate Student Seminar at Iowa State University. *Overview of Discontinuous Galerkin Methods*

2017 SIAM Central States Section Meeting, *Local Discontinuous Galerkin Method for Thin-Film Equations*

Conferences Attended

2016, 2018 SIAM Central States Section Meeting

2017, 2018 Midwest Numerical Analysis Days

Computational and Applied Math Coursework

MATH 561, 562 — Numerical Analysis and Numerical Linear Algebra

MATH 517, 666, 667 — Finite Difference Methods, Finite Volume Methods, Finite Element Methods

MATH 565, 566 — Continuous and Discrete Optimization

MATH 519, 520 — Applied Analysis I and II

AERE E 510, 546 — Fluid Mechanics and Continuum Mechanics
AERE E 504X — Reinforcement Learning
MATH 680 — Regularity of Elliptic PDEs

Awards

2019 AMS Travel Grand — JMM 2020
2018 SIAM Student Travel Award — SIAM CSE 2019
2012 Richard Peterson Scholarship in Physics Recipient
2013–2015 Pamela Olson Math/Physics Scholarship Recipient
2014–2015 Anderson Math/Physics Scholarship Recipient

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