

# COLLIN VICTOR

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Department of Mathematics, University of Nebraska-Lincoln, Lincoln, NE 68588-0130, USA

## EDUCATION

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University of Nebraska–Lincoln Ph.D. in Mathematics	Lincoln, NE <i>May 2023</i> (expected)
University of Nebraska–Lincoln B.S. in Mathematics & Computer Science <i>Summa Cum Laude with Honors</i>	Lincoln, NE <i>May 2018</i>

## ACADEMIC AWARDS & RECOGNITION

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DOE SCGSR Award Recipient .....	Spring 2021 – Spring 2022
Total amount: \$34,500	
NSF Graduate Research Fellowship Recipient .....	Fall 2020 – Present
Total amount: \$138,000	
Emeritus Faculty Fellowship Recipient .....	Fall 2019
UNL Chancellor’s Fellowship Recipient .....	Fall 2018 – Spring 2019
Total amount: \$4,000	
UNL Math Chair Prize .....	Spring 2018
UNL UCARE Recipient .....	Fall 2017 – Spring 2018
Total amount: \$2,400	
UNL Regents Scholarship .....	Fall 2014 – Spring 2018
Total amount: \$26,000	
UNL Dean H. and Floreen G. Eastman Scholarship .....	Fall 2014 – Spring 2018
Total amount: \$16,000 and a high-performance laptop	
Dean’s List .....	Fall 2014 – Spring 2018
UNL Honor Student .....	Fall 2014 – Spring 2018

## EMPLOYMENT

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Los Alamos National Laboratory Graduate Research Assistant Paid by DOE SCGSR award, not employed by LANL or DOE.	Los Alamos, NM <i>Spring 2021 - Spring 2022</i>
University of Nebraska-Lincoln Graduate Teaching Assistant	Lincoln, NE <i>Fall 2018 - Spring 2020</i>

## PUBLICATIONS

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6. A. Larios, Y. Pei, C. Victor. *Continuous Data Assimilation for Navier-Stokes Equations with Intermittent Feedback. preprint.*

5. A. Larios, M. Petersen, C. Victor. *Continuous Data Assimilation for Primitive Ocean Equation. preprint.*
4. E. Carlson, A. Larios, C. Victor. *Continuous Data Assimilation for Navier-Stokes Equations with Fractional Diffusion. preprint.*
3. T. Franz, A. Larios, C. Victor. *The bleeps, the sweeps, and the creeps: Convergence rates for dynamic observer patterns via data assimilation for the 2D Navier-Stokes equations.* Computer Methods in Applied Mechanics and Engineering 392 (2022): 114673.
2. D. Foster, B. Frost-LaPlante, J. Restrepo, C. Victor, *Gradient Sensing via Cell Communication.* Physical Review E 103.2 (2021): 022405
1. A. Larios, C. Victor, *Continuous Data Assimilation with a Moving Cluster of Data Points for a Reaction Diffusion Equation: A Computational Study.* Commun. Comput. Phys., 29 (2021), 1273–1298.

## RESEARCH INTERESTS

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My research interests are in the fields of mathematical fluid dynamics, numerical analysis, and partial differential equations. I am particularly interested in the theory of solving partial differential equations and in the development of efficient algorithms to solve these problems numerically. I am interested specifically in fluid dynamics, in both the theory of the Navier-Stokes equations as well as the computational aspects of simulating solutions to these equations. I am also interested in the computational aspects of modeling turbulent dynamical systems, particularly in the application of data assimilation to recover the solutions to these systems.

## INVITED TALKS

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6. “Continuous Data Assimilation Improved by Dynamic Movement Patterns”, AMS Fall Western Sectional, University of Utah, Salt Lake City, UT, 22 October 2022.
5. “Dynamic Movement Patterns for Data Assimilation: Augmenting Convergence Rates with Mobile Observers”, AMS Fall Southeast Sectional, University of Tennessee - Chattanooga, Chattanooga, TN, 15 October 2022.
4. “Data Assimilation in Turbulent Fluids: Movement Patterns for Increased Convergence Rates”, SIAM Central States Section, Oklahoma State University, Stillwater, OK, 1 October 2022.
3. “Lagrangian Particles in Ocean Modeling”, Climate, Ocean, and Sea Ice Modeling (COSIM) seminar, Los Alamos National Laboratory, Los Alamos, NM, 25 August 2021.
2. “Continuous Data Assimilation Enhanced by Mobile Observers”, Harmonic Analysis & PDE Seminar, City University of New York Graduate Center, New York City, NY, 19 October 2020.
1. “Continuous Data Assimilation with Time-Dependent Measurement Points”, SIAM Central States Section Meeting, Iowa State University, Ames, IA, 20 October 2019.

## CONTRIBUTED TALKS

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7. “Dynamic Observer Patterns for Continuous Data Assimilation: The Bleeps, The Sweeps, and The Creeps”, 2022 Shanks Workshop on Mathematical Aspects of Fluid Dynamics, Vanderbilt University, Nashville, TN, 19 February 2022.
6. “Modifications of a Data Assimilation Method for Turbulence Modeling”, KUMUNU-ISU Conference on PDE, Dynamical Systems, and Applications 2021 Poster Session, University of Nebraska – Lincoln, Lincoln, NE, 23 October 2021.

5. “Continuous Data Assimilation Enhanced by Dynamic Sampling”, 2020 Shanks Workshop on Mathematical Aspects of Fluid Dynamics, Vanderbilt University, Nashville, TN, 14 March 2020. Unable to deliver, meeting canceled due to COVID-19 outbreak.
4. “Continuous Data Assimilation Enhanced by Dynamic Observers”, Summer School in Analysis of PDEs and Fluid Dynamics, University of Edinburgh, Edinburgh, United Kingdom, 25 July 2019.
3. “Sweeping Probe Data Assimilation: Time Dependent Grid Interpolation for a Reaction-Diffusion Equation”, Central States Mathematics Undergraduate Research Conference (CeSMUR), University of Nebraska – Lincoln, Lincoln, NE, 20 April 2018.
2. “Sweeping Probe Data Assimilation: Time Dependent Grid Interpolation for a Reaction-Diffusion Equation”, Undergraduate Poster Session and Creative Exhibition, University of Nebraska – Lincoln, Lincoln, NE, 15 April 2018.
1. “Enhancing Models for Gradient Sensing by Chemotaxis and Cell Communication”, Mathematics REU program, Oregon State University, Corvallis, OR, 15 August 2017.

## PRESENTATIONS - UNL SEMINARS

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18. “Navigating Smooth Manifolds”, Student Partially in Differential Equations Reading Seminar (SPIDERS), University of Nebraska–Lincoln, Lincoln, NE, 25 October 2022.
17. “An Introduction to the Hahn-Banach Theorem and It’s Corollaries”, Student Partially in Differential Equations Reading Seminar (SPIDERS), University of Nebraska–Lincoln, Lincoln, NE, 27 September 2022.
16. “Introduction to Stochastic Calculus”, Student Applied Analysis Reading Seminar (STAARS), University of Nebraska–Lincoln, Lincoln, NE, 27 September 2022.
15. “The Galerkin Method II: The Stronger Stuff”, Students Partially in Differential Equations Seminar (SPiDERS), University of Nebraska–Lincoln, Lincoln, NE, 2 November 2021.
14. “The Galerkin Method: Vacationing in Finite Dimensional Space”, Students Partially in Differential Equations Reading Seminar (SPiDERS), University of Nebraska–Lincoln, Lincoln, NE, 26 October 2021.
13. “Lagrangian Particles in Ocean Modeling and Data Assimilation”, Partial Differential Equations Seminar, University of Nebraska–Lincoln, Lincoln, NE, 4 October 2021.
12. “Continuous Data Assimilation with Mobile Observers”, MathBio Seminar, University of Nebraska–Lincoln, Lincoln, NE, 29 October 2020.
11. “Continuous Data Assimilation Enhanced by Mobile Observers”, Partial Differential Equations Seminar, University of Nebraska–Lincoln, Lincoln, NE, 15 September 2020.
10. “Continuous Data Assimilation Improved with Dynamic Sampling”, Graduate Student Seminar, University of Nebraska–Lincoln, Lincoln, NE, 9 March 2020.
9. “Mathematical Aspects of Fluid Dynamics: Helmholtz-Hodge Decomposition and the Stokes Operator - III”, Partial Differential Equations Seminar, University of Nebraska–Lincoln, Lincoln, NE, 25 February 2020.
8. “Mathematical Aspects of Fluid Dynamics: Helmholtz-Hodge Decomposition and the Stokes Operator - II”, Partial Differential Equations Seminar, University of Nebraska–Lincoln, Lincoln, NE, 18 February 2020.
7. “Mathematical Aspects of Fluid Dynamics: Helmholtz-Hodge Decomposition and the Stokes Operator - I”, Partial Differential Equations Seminar, University of Nebraska–Lincoln, Lincoln, NE, 4 February 2020.

6. “Galerkin Methods Part Two”, Students Partially in Differential Equations Seminar (SPiDERS), University of Nebraska–Lincoln, Lincoln, NE, 28 January 2020.
5. “Continuous Data Assimilation with Dynamic Observers”, Continuum Mechanics Seminar, University of Nebraska–Lincoln, Lincoln, NE, 26 September 2019.
4. “Stability of Numerical Methods for Time-Dependent Problems”, Partial Differential Equations Seminar, University of Nebraska–Lincoln, Lincoln, NE, 24 September 2019.
3. “Consistency of Numerical Methods for Time-Dependent Problems”, Partial Differential Equations Seminar, University of Nebraska–Lincoln, Lincoln, NE, 17 September 2019.
2. “Space Camp (Part II)“, Students Partially in Differential Equations Seminar (SPiDERS), University of Nebraska–Lincoln, Lincoln, NE, 10 September 2019.
1. “Continuous Data Assimilation Enhanced by Dynamic Observers”, Summer School in Analysis of PDEs and Fluid Dynamics, University of Edinburgh, Edinburgh, United Kingdom, 25 July 2019.

## SUMMER SCHOOLS

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**“Recent Advances in Mathematical Fluid Dynamics”** May 20-24, 2019  
*University of Southern California*

Featured four courses on recent work on various topics in mathematical fluid dynamics including non-uniqueness of weak solutions to the Euler and Navier-Stokes equations, water waves, theory of relativistic fluids, nonlinear dynamics of Schrödinger equation with periodic boundary conditions.

**“Analysis of PDEs and Fluid Dynamics”** July 23-26, 2019  
*University of Edinburgh*

Featured courses on analysis of PDEs that arise in fluid dynamics, and in particular in Geophysical Fluid Dynamics, including multidimensional hyperbolic conservation laws, variational and free boundary problems, and bounds on turbulent convection.

**“Recent Topics in Well-Posedness”** July 18-29, 2022  
*MSRI-NCTS Joint Workshop*

Featured courses meant to introduce graduate students to fundamental results on the Navier-Stokes and the Euler equations, with special emphasis on the solvability of its initial value problem with rough initial data as well as the large time behavior of a solution.

## TEACHING EXPERIENCE

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**University of Nebraska-Lincoln** Fall 2018 - Spring 2020  
*Graduate Teaching Assistant* *Lincoln, NE*

Served as a Graduate Teaching Assistant for Math 101, Intermediate Algebra

Instructor of record for this course.

Designed and implemented lesson plans in classroom to teach curriculum to students.

Served as a Graduate Teaching Assistant for Math 107, Calculus II.

Organized and leads recitation section where students practice solving problems from lecture.

Served as a Grading Teaching Assistant for Math 104, Applied Calculus, and Math 407, Mathematics for High School Teaching I.

Proctored and assisted in grading of exams for Math 104.

Graded weekly assignments for Math 407.

**University of Nebraska-Lincoln**

*Undergraduate Teaching Assistant*

Spring 2017

*Lincoln, NE*

Served as a Teaching Assistant for CSCE 310H, Data Structures and Algorithms - Honors.

Assisted in judging class-wide programming contests.

Served as a Grading Teaching Assistant for Math 221, Differential Equations.

**University of Nebraska-Lincoln**

*Undergraduate Teaching Assistant*

Fall 2016

*Lincoln, NE*

Served as a Teaching Assistant for CSCE 310, Data Structures and Algorithms.

**RESEARCH EXPERIENCE**

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**Los Alamos National Laboratory (LANL)**

*DOE SCGSR Award*

Spring 2021 – Spring 2022

*Los Alamos, NM*

- Received DOE SCGSR award to fund a research project at LANL conducted under direction of Dr. Mark Petersen.
- Research involved application of a data assimilation algorithm to a realistic high resolution model of the Earth's oceans.

**Los Alamos National Laboratory (LANL)**

*Parallel Computing Summer Research Institute*

Summer 2021

*Los Alamos, NM*

- Attended summer school for parallel computing at LANL with a computational project concerning the implementation of Lagrangian particles.
- Research involved the verification and optimization of aspects of the Lagrangian particle module of MPAS-Ocean.

**University of Nebraska – Lincoln**

*UCARE Recipient*

Fall 2017 – Spring 2018

*Lincoln, NE*

- Conducted undergraduate mathematical research on computational fluid dynamics and data assimilation under direction of Dr. Adam Larios.
- Researched application of data assimilation on transition layers for advection diffusion equation.

**Oregon State University**

*Math REU Participant*

Summer 2017

*Corvallis, OR*

- Attended 8-week math REU program held by Oregon State University.
- Conducted undergraduate research under direction of Dr. Juan Restrepo.
- Gave 30 minute talk detailing findings on a theoretical model for cellular chemotaxis

**SERVICE AND LEADERSHIP**

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**UNL All Girls All Math**

Fall 2022 – Present

Currently serving on organizational committee for All Girls All Math, a cryptography summer school held by UNL in the summer for high school girls.

- UNL Math Day Volunteer** Fall 2017 – Present  
Regularly volunteers for UNL Math Day, an annual event hosted by UNL that invites over a thousand of high school students from across Nebraska to participate in math related events and activities.
- NSF Fellowship Application Panel** September 14, 2022  
Volunteered to be on a panel discussing applying for the NSF GRFP for undergraduates.
- Los Alamos District Science Fair** Spring 2022  
Served as a judge for the Junior Chemistry section of the Los Alamos District Science Fair.
- Graduate Student Seminar Fellowship Panel** October 4, 2021  
Volunteered to be on a panel discussing fellowship opportunities for graduate students.
- Graduate Student Seminar Fellowship Panel** September 7, 2020  
Volunteered to be on a panel discussing fellowship opportunities for graduate students.
- Great Plains Alliance Supporting Student** November 6, 2018  
Supported graduate student giving talk at Augustana University in Sioux Falls, SD.  
Advised undergraduates about preparing for graduate school.

- Senior Design** Fall 2017 – Spring 2018  
*CSCE 486–487: Computer Science Professional Development I and II*
  - Led a team of 5 in the development of a product for a sponsor.
  - Managed the team’s vision of the product and brought it in-line with the sponsor’s vision.
  - Managed scheduling of team meetings and keeps in regular contact with sponsor and design studio staff.

**MEMBERSHIPS**

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- Society for Industrial and Applied Mathematics (SIAM) ..... Fall 2019 – Present
- American Mathematical Society (AMS) ..... Fall 2018 – Present
- Phi Beta Kappa National Honor Society ..... Spring 2018 – Present
- Upsilon Pi Epsilon National Computer Science Honor Society ..... Spring 2017 – Present
- Pi Mu Epsilon National Math Honor Society ..... Fall 2016 – Present
- Phi Eta Sigma National Honor Society ..... Spring 2015 – Present
- Alpha Lambda Delta National Honor Society ..... Spring 2015 – Present

**COMPUTATIONAL SKILLS**

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- Fluent in programming languages: C/C++, Java, Python, Matlab, Fortran.
- Proficient in programming languages: JavaScript, Haskell, and Prolog.
- Fluent in document typesetting system LaTeX.

- Algorithms and Methods: Finite Difference Schemes, Pseudo-Spectral Methods, Implicit/Explicit Methods, Exponential Time Differencing Methods, and Integrating Factor Methods used for numerical simulations of nonlinear multi-dimensional PDEs.
- Proficient in shell scripting in linux/unix using bash.
- Experience in submitting and running SLURM jobs for high-performance computing.
- Experience in processing and visualizing large data sets using ParaView.