

# Curriculum Vitae

## Joel Dahne

December 2024

### CURRENT POSITION

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Dunham Jackson Assistant Professor at University of Minnesota, USA, August 2024 until August 2027.

### EDUCATION

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- PhD in Mathematics at Uppsala University, Sweden, June 2024.
  - Thesis: *Computer Assisted Studies in Fluid Mechanics and Spectral Geometry*
  - Advisors: Jordi-Lluís Figueras (Uppsala University), Javier Gómez Serrano (Brown University) and Warwick Tucker (Monash University)
- Master in Mathematics at Uppsala University, Sweden, June 2019.
  - Thesis: *Privacy and Analysis of Trajectories and Co-Trajectories*  
Supervisor: Raazesh Sainudiin
- Exchange semester at ENS Lyon, France, through the Erasmus Programme, January 2018 until July 2018.
  - Internship: *Enclosing the First Eigenvalue of the Laplacian on a Spherical Triangle*  
Supervisor: Bruno Salvy
- Bachelor in Mathematics at Uppsala University, Sweden, September 2016.
  - Thesis: *Enclosing Zeros for Systems of Two Analytic Functions*  
Supervisor: Warwick Tucker

### PROFESSIONAL INTERESTS

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Fluid mechanics, spectral geometry, computer algebra and computer assisted proofs.

### APPOINTMENTS

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- Administrator of CIM (Center of Interdisciplinary Mathematics), Uppsala University, January to December 2017 and September 2018 to March 2019.
- Teaching assistant, Uppsala University, July 2014 to December 2017.

### PUBLICATIONS

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- "Self-Similar Singular Solutions to the Nonlinear Schrödinger and the Complex Ginzburg-Landau Equations" (with J-L. Figueras), submitted (2024).

- "Highest Cusped Waves for the Fractional KdV Equations", *Journal of Differential Equations*, 401, 550-670 (2024).
- "Highest Cusped Waves for the Burgers-Hilbert Equation" (with J. Gómez-Serrano), *Archive for Rational Mechanics and Analysis*, 247, 5 (2023).
- "A counterexample to payne's nodal line conjecture with few holes" (with J. Gómez-Serrano, and K. Hou), *Communications in Nonlinear Science and Numerical Simulation*, 103, 105957 (2021).
- "Computation of tight enclosures for laplacian eigenvalues" (with B. Salvy) *SIAM Journal on Scientific Computing*, 42(5), 3210–3232 (2020).
- "Swapping trajectories with a sufficient sanitizer" (with J. Salas, D. Megías, V. Torra, M. Toger, and R. Sainudiin), *Pattern Recognition Letters* (2020).
- "Enclosing all zeros of a system of analytic functions" (with M.F. Ciappina and W. Tucker), *Applied Mathematics and Computation*, Volume 348, (2019).

## GRANTS

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- Knut och Alice Wallenbergs stiftelses resefond (4000 sek), 2024
- Liljewalchs (13,750 sek), 2023.
- SVEFUM (12,500 sek), 2023.
- The Sweden-America Foundation (50,000 sek), 2021.

## TEACHING

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At University of Minnesota

- Multivariable calculus (Instructor)
  - Autumn 2024, Spring 2025

At Uppsala University

- Algebra and Vector Geometry (Teaching Assistant)
  - Autumn 2019
- Basic Course in Mathematics (Teaching Assistant)
  - Autumn 2014, Autumn 2015, Autumn 2016
- Linear Algebra and Geometry (Teaching Assistant)
  - Spring 2016
- Ordinary Differential Equations I (Course administrator and lecturer)
  - Spring 2021, Spring 2022, Spring 2023, Spring 2024
- Single Variable Calculus (Teaching Assistant)

- Spring 2015, Autumn 2016 - Spring 2017, Autumn 2019 - Spring 2020, Autumn 2020 - Spring 2021, Spring 2022, Autumn 2022 - Spring 2023, Autumn 2023 - Spring 2024
- Transformation methods (Teaching Assistant)
  - Autumn 2015, Autumn 2017

## TALKS

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- *Self-similar singular solutions for the complex Ginzburg-Landau equation.* Equadiff, Karlstad, Sweden, 13 June 2024.
- *Highest Cusped Waves for the Burgers-Hilbert and Fractional KdV equations.* DNA Seminar, NTNU, Norway, 18 January 2024.
- *Cusped waves and special functions.* Certified and Symbolic-Numeric Computation, Lyon, France, 25 May 2023.
- *Highest Cusped Waves for the Burgers-Hilbert and Fractional KdV equations.* VI Congress of Young Researchers RSME, León, Spain, 7 February 2023.
- *Highest Cusped Waves for the Burgers-Hilbert and Fractional KdV equations.* Analysis seminar, Lund University, 16 November 2022.
- *Rigorous computations of eigenvalues and eigenfunctions of the Laplacian.* The Kolchin seminar (online), City University of New York, 23 September 2022.
- *A counterexample to Payne's nodal line conjecture with few holes.* PhD Math Fest, Stockholm, 3 June 2022.
- Mini course in Computer-assisted proofs in PDEs during the thematic semester in *Hamiltonian Methods in Dispersive and Wave Evolution Equations* at ICERM, together with Javier Gomez Serrano, September 2021.
- *A computer assisted counterexample to Payne's nodal line conjecture with few holes.* Online AriC Seminar, ENS de Lyon, 20 May 2021.
- *A computer assisted counterexample to Payne's nodal line conjecture with few holes.* CRM-CAMP, Montréal, 27 April 2021.
- *Computation of tight enclosures for Laplacian eigenvalues.* CRM-CAMP Spotlight on Graduate Research, Montréal, 3 December 2020.
- *Enclosing the Eigenvalues of the Laplacian on a Spherical Triangle.* Workshop on validated numerics for dynamical systems and related topics, IMPA, Rio de Janeiro, 27 February 2019.
- *Finding Zeros for Systems of Two Analytic Functions.* SWIM (Summer Workshop on Interval Methods) 2016, Lyon, France, 21 June 2016.

## CONFERENCES AND WORKSHOPS

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- *Equadiff*, Karlstad, Sweden, 12-14 June 2024.
- *2023 FLINT development workshop*, RPTU Kaiserslautern, Germany, 9-13 October 2023.

- *Computer assisted proofs for stability analysis of nonlinear waves*, AIM Workshop, San Jose, USA, 5-9 June 2023.
- *Certified and Symbolic-Numeric Computation*, Lyon, France, 22-26 May 2023.
- *VI Congress of Young Researchers RSME*, León, Spain, 6-10 February 2023.
- *Computational mathematics in computer assisted proofs*, AIM Workshop (online), 12-16 September 2022.
- Semester Program on *Hamiltonian Methods in Dispersive and Wave Evolution Equations*, ICERM, USA, Autumn 2021.
- Workshop on validated numerics for dynamical systems and related topics, IMPA, Rio de Janeiro, Brazil, 25 February - 1 March 2019.
- International Workshop for Young Scientists 2017, Analysis and its Applications to Geometry, Tokyo Institute of Technology, Japan, 5-9 June 2017.
- SWIM (Summer Workshop on Interval Methods) 2016, Lyon, France, 19-22 June 2016.

## SCHOOLS

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- *EWM-EMS Summer School: Water Waves and Nonlinear Dispersive Equations*, Institut Mittag-Leffler, Sweden, 27-31 May 2024.
- PDC Summer school, *Introduction to High Performance Computing*, KTH, Sweden, 15-26 August 2022.
- Geilo Winter Schools in eScience, *2020: Modern Techniques and Algorithms in HPC*, SINTEF, Norway, 19-24 January 2020.
- School in Validated Numerics, UFRJ, Rio de Janeiro, Brazil, 18-22 February 2019.

## RESEARCH VISITS

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- *NTNU*, Norway, January 2024. Visiting Mats Ehrnström.
- *Lund University*, Sweden, November 2022. Visiting Erik Wahlén.
- *Brown University*, Providence, Fall 2021. Visiting Javier Gómez Serrano and participating in the ICERM Semester Program on *Hamiltonian Methods in Dispersive and Wave Evolution Equations*
- *Princeton University*, USA, August 2019. Visiting Javier Gómez Serrano
- *ENS Lyon*, France, July 2019. Visiting Bruno Salvy.

## ACTIVITIES ORGANIZATION AND SERVICE

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- Co-organizer of the Graduate student and Post-doc seminar during the semester program on *Hamiltonian Methods in Dispersive and Wave Evolution Equations* at ICERM, USA, Autumn 2021.

## SELECTED POSITIONS OF TRUST

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- PhD representative in the board of the Department of Mathematics, Uppsala University, July 2020 to June 2024.
- Student representative in the Educational Board of Science, NUN, at Uppsala University, June 2018 to June 2019.
- Student representative in the Committee for Studies in Science on Advanced Level, SNUA, at Uppsala University, June 2018 to June 2019.
- Chairman of the student council for the mathematics students, Uppsala University, May 2015 - May 2016.
- Student representative in the board of the Department of Mathematics, Uppsala University, January 2015 to December 2017.