

Curriculum Vitae

updated: 2024-12-31

Jan Nordström

ORCID 0000-0002-7972-6183

date of birth: November 16, 1953

Married, 4 children

Degrees

- | | |
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| 1980 | Master of Science in Aeronautics, The Royal Institute of Technology (KTH) Stockholm, Sweden |
| 1993 | PhD in Numerical Analysis, The Department of Scientific Computing Uppsala University (UU), Uppsala, Sweden |
| 1999 | Docent (Habilitation) in Numerical Analysis, UU |

Current positions

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|-------------|--|
| 2022 - | Professor (Emeritus) in Scientific Computing, Department of Mathematics, Linköping University (LiU), Sweden |
| 2020 - 2025 | Distinguished Visiting Professor, Department of Mathematics and Applied Mathematics, University of Johannesburg (UJ), South Africa |
| 2024 - 2026 | Consultant, Industrial CFD Research Group, Department of Mechanical Engineering, University of Cape Town (UCT), South Africa |
| 2025 - 2029 | Distinguished Visiting Professor, Department of Mathematics and Applied Mathematics, University of Johannesburg (UJ), South Africa |

Honorary affiliations and memberships

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|-------------|--|
| 2005 - 2007 | Senior Visiting Fellow, Center for Turbulence Research (CTR), Stanford University (SU), USA |
| 2009 - 2010 | Senior Research Fellow, Center for Turbulence Research (CTR), Stanford University (SU), USA |
| 2010 - 2013 | Honorary Professor, School of Computational and Applied Mathematics, University of the Witwatersrand (WITS), South Africa |
| 2018 - 2023 | Honorary Professor in Computational Mathematics, Department of Mechanical Engineering, University of Cape Town (UCT), South Africa |
| 2024 - 2029 | Honorary Professor in Computational Mathematics, Department of Mechanical Engineering, University of Cape Town (UCT), South Africa |
| 2024 - | Member of the Academy of Science of South Africa (ASSAf) |

Board work

2012 - 2020	Member of the board of Linköping Institute of Technology (LiTH)
2012 - 2020	Member of Advisory group for research/graduate education LiTH
2013 -	Editorial board (associate editor) of BIT Numerical Mathematics
2014 - 2018	Member of the board of the National Supercomputer Centre (NSC)
2016 -	Editorial board (associate editor) of Journal of Computational Physics

Previous positions and affiliations

1980 - 1995	Research Scientist, The Aeronautical Research Institute of Sweden (FFA)
1986 - 1991	Acting head at the Viscous Flow Branch, FFA
1995 - 2001	Senior Scientist, FFA
1995 - 1999	Research leader for the Unsteady Aerodynamics group at FFA
1999 - 2001	Research leader for the Wave Propagation group at FFA
1999 - 2001	Research leader for the Numerical Methods group at FFA
2001 - 2002	Senior Scientist, The Swedish Defense Research Agency (FOI)
2001 - 2004	Adjunct Professor, Numerical Analysis (Adjungerad), UU
2002 - 2010	Director of Research (Forskningschef) in Numerical Analysis, FOI
2006 - 2009	Adjunct Professor, Numerical Analysis, UU
2007 - 2009	Visiting Professor, 6 months, Department of Mechanical Engineering, Stanford University (SU), USA
2009 - 2010	Adjunct Professor, Scientific Computing, UU
2009 - 2010	Professor in Aeronautical Engineering, School of Mechanical, Industrial and Aeronautical Engineering, University of the Witwatersrand (WITS), South Africa
2009 - 2010	Head of Division of Aeronautical Engineering, School of Mechanical, Industrial and Aeronautical Engineering, WITS, South Africa
2010 - 2013	Visiting Professor, School of Electrical and Information Technology, WITS, South Africa
2011 - 2011	Visiting Professor, 3 months, Department of Mechanical Engineering, Stanford University, USA
2012 - 2020	Head of Division in Computational Mathematics, LiU, Sweden
2020 - 2021	Professor in Scientific Computing, Department of Mathematics, Linköping University (LiU), Sweden

Research visits and Consultant positions

1987	Visiting Scientist, 3 months, NASA Ames, USA
1996 - 1997	Visiting Scientist, 2 months, ICASE, USA
1998 - 2002	7 months as ICASE (Institute of Computer Applications in Science and Engineering) Consultant
2003 - 2005	Visiting Scientist, 3 months, National Institute of Aerospace (NIA), USA
2003 - 2005	Consultant, 3 months, Appl. Math., Brown University, USA
2005 - 2007	Senior Visiting Fellow, 3 months, Center for Turbulence Research, SU, USA
2006 - 2008	Consultant 2 months/year for the Dept. of Vehicle and Aeronautical Engineering, KTH, Sweden
2010	Visiting Scientist, 1 month, NIA, USA
2011	Visiting Scientist, 1 week, Caltech, USA
2013	Visiting Scientist, 1 week, Caltech, USA
2014	Senior Visiting Fellow, 1 week, CTR, Stanford University, USA
2014	Visiting Scientist, 1 week, University of Zurich, Switzerland
2015	Visiting Scientist, 1 week, Florida State University, USA
2015	Visiting Scientist, 1 month, NIA, USA
2015	Senior Visiting Fellow, 1 week, CTR, Stanford University, USA
2015	Visiting Scientist, 1 week, University of Zurich, Switzerland
2016	Visiting Scholar, 1 month, Department of Mechanical Engineering, Stanford University, USA
2017	Visiting Scholar, 1 month, Department of Mechanical Engineering, Stanford University, USA
2017	Visiting Academic, 2 weeks, Department of Mechanical Engineering, University of Cape Town, South Africa
2018	Visiting Scientist, 1 week, Caltech, USA
2018	Visiting Scientist, 1 week, Department of Mechanical Engineering, Technion - Israel Institute of Technology, Israel
2018	Visiting Scientist, 1 week, National Institute of Aerospace (NIA), USA
2018	Visiting Academic, 2 weeks, Department of Mechanical Engineering, University of Cape Town, South Africa
2019	Visiting Scientist, 1 week, Department of Computing + Mathematical Sciences (CMS), Caltech, USA
2019	Visiting Scientist, 1 week, National Institute of Aerospace (NIA), USA
2019	Visiting Scholar, 2 weeks, Department of Mechanical

2019 Engineering, Technion - Israel Institute of Technology, Israel
 Visiting Academic, 3 weeks, Department of Mechanical
 Engineering, University of Cape Town, South Africa
 2020 Visiting Academic, 2 weeks, Department of Mathematics and
 Applied Mathematics, University of Johannesburg, South Africa
 2021 Visiting Academic, 4 weeks, Department of Mechanical
 Engineering, University of Cape Town, South Africa
 2021 Visiting Academic, 4 weeks, Department of Mathematics and
 Applied Mathematics, University of Johannesburg, South Africa
 2022 Visiting Academic, 8 weeks, Department of Mathematics and
 Applied Mathematics, University of Johannesburg, South Africa
 2022 Visiting Academic, 4 weeks, Department of Mechanical
 Engineering, University of Cape Town, South Africa
 2023 Visiting Academic, 8 weeks, Department of Mathematics and
 Applied Mathematics, University of Johannesburg, South Africa
 2023 Visiting Academic, 6 weeks, Department of Mechanical
 Engineering, University of Cape Town, South Africa
 2023 Visiting Academic, 2 weeks, INRIA Bordeaux,
 Bordeaux, France
 2024 Visiting Academic, 5 weeks, Department of Mathematics and
 Applied Mathematics, University of Johannesburg, South Africa
 2024 Visiting Academic, 8 weeks, Department of Mechanical
 Engineering, University of Cape Town, South Africa
 2024 Visiting Academic, 1 week, Department of Mathematics
 Stellenbosch University, South Africa
 2024 Visiting Scholar, 1 month, Department of Mechanical
 Engineering, Stanford University, USA

Evaluation and committee work

2004 Independent Expert, EU 6th framework program, EST
 2004 Independent Expert, EU 6th framework program, OIF
 2004 Independent Expert, EU 6th framework program, IIF
 2004 Member PhD Thesis evaluation committee
 2004 Scientific reviewer for the Swedish Research Council
 2005 Member PhD Thesis evaluation committee
 2006 Independent Expert, EU 6th framework program, TOK
 2007 - 2009 Scientific reviewer for the Georgian Research Council
 2008 Member International Scientific Committee for Africomp2009

2009 Expert opinion for a succesful promotion at Stanford University
 2009 Expert opinion for a succesfull application for the PECASE
 (Presidential Early Career Award for Scientists and Engineers) award
 2010 Member International Scientific Committee for Africomp2011
 2011 Scientific evaluator for the Cyprus Research Promotion Foundation
 2011 Member PhD Thesis evaluation committee
 2011 Scientific reviewer for National Science Foundation, Georgia
 2011 Expert opinion for a succesful application to a faculty position
 at the U.S. Naval Post Graduate School in Monterey
 2012 Member of two Docent evaluation committees
 2012 Member International Scientific Committee for Africomp2013
 2012 Member PhD Thesis evaluation committee
 2013 Chairman, Numerical Treatment of Boundary Conditions, 21st
 AIAA CFD conference, San Diego, USA.
 2013 Member PhD Thesis evaluation committee
 2014 Member Evaluation Panel, Mathematical Sciences, Swedish Research
 Council
 2014 Chairman for the Applied Mathematics panel, Academy of Finland
 2014 Reviewer for the Mathematics panel, Swiss National Science
 Foundation
 2014 Member PhD Thesis evaluation committee
 2014 Member of three Docent evaluation committees
 2014 Member International Scientific Committee for Africomp2015
 2014 Member Organizing Committee for 3rd International Workshop
 on High-Order CFD Methods
 2014 Expert opinion for a succesful promotion at Stanford University
 2015 Member PhD Thesis evaluation committee
 2015 Member of two Docent evaluation committees
 2015 Member Organizing Committee for 4th International Workshop
 on High-Order CFD Methods
 2016 Member PhD Thesis evaluation committee
 2016 Member of Docent evaluation committee
 2016 Member Scientific Committee for 6th EASN International
 Conference on Innovation in European Aeronautics Research
 2017 Member Organizing Committee for 5th International Workshop
 on High-Order CFD Methods
 2017 Member PhD Thesis evaluation committee
 2017 Member Scientific Committee for 7th EASN International
 Conference on Innovation in European Aeronautics Research
 2017 Expert opinion for a succesful promotion at Rensselaer

Polytechnic Institute
 2018 Member PhD Thesis evaluation committee
 2019 Member PhD Thesis evaluation committee
 2020 Organizer of Workshop Swedcomp2020, Motala, Sweden
 2023 Member International Scientific Committee for Africomp 6

Grants

1995 VINNOVA-NFFP project: Unsteady aerodynamics of compressible flow, coloboration between FFA and SAAB, 1500.000 SEK in two years
 1999 FFA internal funds: Stable High Order Finite Difference Methods for Aerodynamics, coloboration with UU, 1000.000 SEK in two years
 2004 The Swedish Research Council: Unsteady aerodynamics of compressible flow, coloboration with WITS South Africa, planning grant, 75.000 SEK
 2005 The Swedish Research Council: Generation and propagation of vortices in aerodynamic applications, coloboration with WITS South Africa, 450.000 SEK in 3 years
 2007 The Swedish Governmental Agency for Innovation Systems: Numerical methods for micromechanical systems in space, coloboration with Nanospace AB, 1600.000 SEK in 4 years
 2009 The Swedish Research Council: Nonlinear generation of internal waves in the deep ocean by tides, coloboration with MISU, Stockholm University, 1600.000 SEK in 3 years
 2010 Professor Career Contract for research, 2200.000 SEK/year in 5 years issued by Linköping University
 2010 Financing of 3 PHD students from Linköping University
 2010 Startup Grant, 500.000 SEK from Linköping University
 2010 The European Union, FP7: IDIHOM Industrialisation of High-Order Methods, 181564 euro in 3 years
 2012 The SeRC FLOW Community. Stable High-Order Boundary Conditions for In- and Outgoing Waves for Fluid Flow Problems, 2400.000 SEK in 4 years
 2012 Swedish Meteorological and Hydrological Institute (SMHI). Numerical methods for Climate Problems, 1900.000 SEK in 4 years
 2012 The Swedish Research Council: Summation-By-Parts Operators and Weak Initial Conditions for Time Discretisation of Initial Boundary Value Problems, 1800.000 SEK in 3 years
 2013 The European Union, FP7: UMRIDA Uncertainty Management

- for Robust Industrial Design in Aeronautics, 200000 euro in 3 years
- 2013 VINNOVA-NFFP project: Methods for Improved Accuracy in Unsteady CFD (MIAU), 1800.000 SEK in 3 years
- 2014 The research school in interdisciplinary mathematics at MAI, Linköping University, Duality Based Boundary Conditions for the Navier-Stokes and Elastic Wave Equations, 1300.000 SEK in 5 years
- 2015 Professor Career Contract for research, 2000.000 SEK/year in 5 years issued by Linköping University
- 2019 The Swedish Research Council: Artificial Neural Networks, Thin Layers and Approximate Solutions to Partial Differential Equations, 2475.000 SEK in 3 years
- 2019 The SeRC FLOW Community: ABL, Atmospheric Boundary Layers for Climate Simulations, 1600.000 SEK in 4 years
- 2021 The Swedish Foundation for International Cooperation in Research and Higher Education (STINT), Synergistic Linköping University - Washington State University Exchange Program Integrating Scientific Computing Research and Multinational Corporations, 1950.000 SEK in 3 years
- 2021 The Swedish Research Council: Neural Network Trained Schemes for Efficient Simulation of Complex Physics using Adaptive Mesh Refinement, 1700.000 SEK in 2 years.

Invited talks

- 2007 American Mathematical Society, Mathematical and Computational aspects of Compressible Flow, Albuquerque, USA
- 2008 SIAM Annual meeting, Computational Methods for Compressible Flow, San Diego, USA
- 2010 SACAM10, Keynote talk, Weak Boundary and Interface Conditions with Multi-physics Applications, Pretoria, South Africa
- 2010 SIAM Annual Meeting, Nonlinear Boundary Conditions for Wave Propagation Problems, Pittsburgh, USA
- 2011 Africomp2011, Keynote talk, Initial Boundary Value Problems, Summation-by-parts Operators and Weak Boundary Conditions, Cape Town, South Africa
- 2011 The Popular Applied Mathematics seminar (PAM), Initial Boundary Value Problems, Summation-by-parts Operators and Weak Boundary Conditions, Uppsala, Sweden
- 2011 ICIAM 2011, Initial Boundary Value Problems, Summation-by-parts

- 2012 Operators and Weak Boundary Conditions, Vancouver, Canada
 2012 Linear and Nonlinear Boundary and Interface Problems,
 Oberwolfach workshop, Germany
- 2012 Initial Boundary Value Problems and Boundary/Interface Conditions
 with Multi-Physics Applications, AIM workshop, Palo Alto, USA
- 2012 CTR Seminar: New Developments for Finite Difference
 Approximations of Initial Boundary Value Problems: Time
 Integration and Dual Consistency, Stanford, USA
- 2013 Stable High Order Finite Difference Methods for Wave Propagation
 Problems, SIAM CSE Meeting, Boston, USA
- 2013 SANUM 2013, Plenary talk, Initial Boundary Value Problems,
 Summation-by-parts Operators and Weak Boundary Conditions,
 Stellenbosch, South Africa
- 2013 Flamengro conference 2013, Initial Boundary Value Problems
 and Boundary/Interface Conditions with Multi-Physics Applications,
 Pretoria, South Africa
- 2014 SANUM 2014, Plenary talk, High Order Finite Difference
 Approximations of Multi-Physics Problems, Johannesburg,
 South Africa
- 2015 Well Posed Problems and Boundary Conditions in Computational
 Fluid Dynamics, Aviation 2015, Dallas Texas, USA.
- 2015 Well Posed Problems and Boundary Conditions in Computational
 Fluid Dynamics, Mathematisches Forschungsinstitut Oberwolfach,
 Oberwolfach, Germany.
- 2015 Plenary talk at 28th Nordic Seminar on Computational Mechanics:
 New Developments for Initial Boundary Value Problems
 involving Multi-physics at Linköping University, Tallin, Estonia.
- 2016 An Investigation of Uncertainty Effects in Mixed Hyperbolic-
 Parabolic Problems due to Stochastically Varying Geometry,
 SIAM UQ 2016, Lausanne, Switzerland.
- 2016 A Roadmap to Well Posed and Stable Problems in
 Computational Physics, Stanford University, Stanford, USA
- 2016 New Developments for Initial Boundary Value Problems
 involving Multi-physics at Linköping University, 6th EASN
 International Conference, Porto, Portugal
- 2017 Improved Numerical Performance Using the SBP-SAT
 Technique As the Main Building Block, SIAM CSE 17,
 Atlanta, USA
- 2018 Energy Stable Boundary Conditions for the Nonlinear
 Incompressible Navier-Stokes Equations, CFD IMPACT 2018,

- Haifa, Israel
- 2018 Energy Stable Boundary Conditions for the Nonlinear Incompressible Navier-Stokes Equations, NASA Langley Research Center, Hampton, USA
- 2018 Energy Stable Boundary Conditions for the Nonlinear Incompressible Navier-Stokes Equations, Old Dominion University, Norfolk, USA
- 2018 Energy Stable Boundary Conditions for the Nonlinear Incompressible Navier-Stokes Equations, BCAM - Basque Center for Applied Mathematics, Bilbao, Spain
- 2019 New Developments for Initial Boundary Value Problems involving Multi-physics at Linköping University, SDSU, San Diego, USA
- 2019 New Developments for Initial Boundary Value Problems involving Multi-physics at Linköping University, Caltech, Pasadena, USA
- 2019 Stable and accurate filtering procedures, NASA Langley Research Center, Hampton, USA
- 2019 The spatial operator in the incompressible Navier-Stokes, Oseen and Stokes equations, CFD IMPACT 2019, Haifa, Israel
- 2019 The spatial operator in the incompressible Navier-Stokes, Oseen and Stokes equations, ICIAM 2019, Valencia, Spain
- 2019 New Developments for Initial Boundary Value Problems involving Multi-physics at Linköping University, Lawrence Livermore National Lab, Livermore, USA
- 2019 Stable and accurate filtering procedures, Center for Turbulence Research, Stanford University, Stanford, USA
- 2019 New Developments for Initial Boundary Value Problems involving Multi-physics at Linköping University, University of Cape Town, Cape Town, South Africa
- 2020 New Developments for Initial Boundary Value Problems at Linköping University, University of Stavanger, Norway
- 2020 New Developments for Initial Boundary Value Problems at Linköping University, University of Johannesburg, South Africa
- 2020 Combining Machine Learning and Computational Mathematics for Increased Prediction Capability: two recent examples, Workshop: Remaking the World with Machine Learning, University of Johannesburg, South Africa
- 2022 Provably Energy Stable Approximations of Linear and

- Nonlinear Hyperbolic Problems, THE 2ND NORTH AMERICAN HIGH ORDER METHODS CONFERENCE (NAHOMCON)
San Diego, USA
- 2022 Provably Energy Stable Approximations of Linear and Nonlinear Hyperbolic Problems, Africomp 2022,
Cape Town, South Africa
- 2022 New provably energy stable formulations for hyperbolic problems: application to the Euler and shallow water equations, 65TH SAMS CONGRESS, Stellenbosch, South Africa
- 2023 Nonlinear Boundary Conditions for Energy and Entropy Stable Initial Boundary Value Problems in Computational Fluid Dynamics, SIAM Conference on Computational Science and Engineering
Amsterdam, Netherlands
- 2023 Nonlinear Boundary Conditions for Energy and Entropy Stable Initial Boundary Value Problems in Computational Fluid Dynamics, SANUM 2023, Plenary talk, Johannesburg, South Africa
- 2023 Nonlinear Boundary Conditions for Initial Boundary Value Problems with Applications in Computational Fluid Dynamics,
University of Bordeaux, Bordeaux, France
- 2024 Computational Mathematics: What is it? What is it good for?
University of 3rd Age (U3A) Cape Town, South Africa
- 2024 Nonlinear Energy Stable Schemes for Incompressible Multi-phase Flows in the Volume of Fluid (VOF) Formulation, SANUM 2024, Stellenbosch, South Africa
- 2024 Nonlinear Energy Stable Schemes for Incompressible Multi-phase Flows in the Volume of Fluid (VOF) Formulation,
Stanford University, Palo Alto, USA
- 2024 An Energy Stable Nonlinear Incompressible Multi-phase Flow Formulation, HONOM 2024, Chania, Greece
- 2024 An Energy Stable Nonlinear Incompressible Multi-phase Flow Formulation, SWEDCOMP2024, Stockholm, Sweden
- 2024 An Energy Stable Nonlinear Incompressible Multi-phase Flow Formulation, MID-DAY MATHEMATICAL MODELLING (MMM),
University of Witwatersrand, Johannesburg, South Africa

Invited to the following workshops and programs

- 2012 Mathematisches Forschungsinstitut Oberwolfach: Recent Developments in the Numerics of Nonlinear Hyperbolic Conservation

2012	Laws and their Use in Science and Engineering American Institute of Mathematic (AIM): Nonlinear solvers for high-intensity focused ultrasound with application to cancer treatment.
2015	Mathematisches Forschungsinstitut Oberwolfach: Recent Developments in the Numerics of Nonlinear Hyperbolic Conservation Laws and their Use in Science and Engineering
2016	The Center for Turbulence Research, CTR summer program, Stanford University
2018	Institut de Mathématiques de Toulouse: NABUCO (NumericAl BoUndaries and COupling)
2018	Advances in PDEs: Theory, Computation and Application to CFD ICERM, Brown University
2019	The CFDLAB summer scholar-in-residence program, Technion - Israel Institute of Technology, Haifa, Israel
2020	The Center for Turbulence Research, CTR summer program, postponed to 2021, Stanford University, USA
2020	Remaking the World with Machine Learning, University of Johannesburg, South Africa
2022	Holistic Design of Time-Dependent PDE Discretizations, ICERM, Brown University
2022	Mathematisches Forschungsinstitut Oberwolfach: Beyond polynomials: Multi-dimensional summation-by-parts operators for general function spaces
2024	The Center for Turbulence Research, CTR summer program, Stanford University

PhD Student supervision

1997 - 2003	Ken Mattsson, Thesis title: Summation-by-Parts Operators for High Order Finite Difference Methods
1999 - 2004	Magnus Svärd, Thesis title: Stable High Order Finite Difference Methods for Aerodynamics
2003 - 2007	Jing Gong, Thesis title: Hybrid Methods for Unsteady Fluid Flow Problems in Complex Geometries
2006 - 2011	Qaiser Abbas, Thesis title: Weak Boundary and Interface Procedures for Wave and Flow Problems
2006 - 2016	Sven-Erik Ekström, (Licenciate) Project: ADIGMA, A Vertex-Centered Dual Discontinuous Galerkin Method for Hyperbolic

- Problems, Martin Berggren UMU 1st advisor
- 2007 - 2012 Sofia Eriksson, Project: Stable Numerical Methods with Boundary and Interface Treatment for Applications in Aerodynamics
- 2007 - 2012 Kenneth Duru, Thesis title: Perfectly Matched Layers and High Order Difference Methods for Wave Equations, Gunilla Kreiss UU 1st advisor
- 2008 - 2013 Jens Berg, Project: Stable and High-Order Finite Difference Methods for Multiphysics Flow Problems
- 2008 - 2013 Per Pettersson, Project: Uncertainty Quantification and Numerical Methods for Conservation Laws, jointly with Gianluca Iaccarino, SU
- 2011 - 2016 Tomas Lundquist, Project: High Order Summation-by-Parts Methods in Time and Space
- 2011 - 2016 Samira Nikkar, Project: Stable High Order Finite Difference Methods for Wave Propagation and Flow Problems on Deforming Domains
- 2011 - 2016 Ossian O'Reilly, Project: High Order Accurate Numerical Methods in Geophysics, jointly with Eric Dunham SU
- 2012 - 2017 Hannes Frenander, Project: High-order finite difference approximations for hyperbolic problems: multiple penalties and non-reflecting boundary conditions
- 2012 - 2017 Cristina La Cognata, Project: High order summation-by-parts based approximations for discontinuous and nonlinear problems
- 2012 - 2017 Viktor Linders, Project: Error analysis of summation-by-parts formulations: Dispersion, transmission and accuracy
- 2013 - 2018 Markus Wahlsten, Project: Uncertainty quantification for wave propagation and flow problems with random data
- 2014 - 2019 Fatemeh Ghasemi, Project: Stability, dual consistency and conservation of summation-by-parts formulations for multi-physics problems
- 2014 - 2019 Andrea Ruggio, Project: Eigenvalue analysis and convergence acceleration techniques for summation-by-parts approximations
- 2016 - 2021 Oskar Ålund, Project: Applications of summation-by-parts operators
- 2017 - 2022 Fredrik Lauren, Project: Summation-by-parts formulations for flow problems

Postdoc supervision

- 2011 - 2014 Marco Kupiainen, Project: InDustrIalisation of Higher Order Methods (IDIHOM)

Teaching experience

2001	Graduate course in Computational Aeroacoustics (UU)
2004	Graduate course in Artificial Boundary Conditions (UU)
2007	Undergraduate course in Scientific Computing (UU)
2007	Undergraduate course in Analysis of Numerical Methods (UU)
2008	Undergraduate course in Computational Fluid Dynamics (KTH)
2008	Graduate course in Initial Boundary Value Problems (UU)
2009	Graduate course in Numerical Methods for Initial Boundary Value Problems, Institute of Computational Mathematics in Engineering (iCME), Stanford University
2011	Graduate course in Numerical Methods for Initial Boundary Value Problems, Institute of Computational Mathematics in Engineering (iCME), Stanford University
2011	Graduate course in Numerical Methods for Initial Boundary Value Problems, Linköping University (LiU)
2013	Short course in Numerical Solution of Initial Boundary Value Problems, Council for Scientific and Industrial Research (CSIR), Pretoria, South Africa
2013	SeSE Graduate course in Numerical Solution of Initial Boundary Value Problems, (LiU)
2014	Graduate course, Selected articles on well posed problems and numerical approximations, (LiU)
2016	SeSE Graduate course in Stochastic Galerkin Methods for Partial Differential Equations, (LiU)
2017	SeSE Graduate course in Numerical Solution of Initial Boundary Value Problems, (LiU)
2017	SeSE Graduate course in Numerical Solution of Initial Boundary Value Problems, University of Cape Town
2019	SeSE Graduate course: Combining Partial Differential Equations, Machine Learning and Measurements for Increased Prediction Capability, (LiU)
2023	Undergraduate project course in Scientific Computing for visiting Washington State University students in Exchange Program Integrating Scientific Computing Research and Multinational Corporations
2024	Undergraduate project course in Scientific Computing for visiting Washington State University students in Exchange Program Integrating Scientific Computing Research and Multinational Corporations

Editorial work

- 2008 - 2011 Editorial board of International Journal of Mechanics and MEMS
- 2013 - Editorial board of BIT Numerical Mathematics
- 2016 - Editorial board of Journal of Computational Physics (JCP)

Recent projects

- 1996 - 2010 High order finite difference approximations, collaboration with ICASE, NIA and NASA, USA
- 1998 - 2010 Accelerating coordinate systems, collaboration with CSIR, South Africa
- 2004 - 2010 Unsteady Supersonic Aerodynamics, collaboration with WITS, South Africa
- 2005 - 2009 Hybrid Methods for Unsteady Aerodynamics, collaboration with CTR, the Centre for Turbulence Research, SU, USA
- 2007 - 2013 Uncertainties in Aerodynamics, collaboration with the Department of Mechanical Engineering, SU, USA
- 2008 - 2012 Computational methods for heat transfer in micro-mechanical systems, collaboration with Nanospace AB, Swedish Space Corporation Group, Sweden
- 2009 - 2011 Nonlinear generation of internal waves in the deep ocean by tides, collaboration with MISU, Stockholm University
- 2009 - 2016 Computational Methods for Earthquake Simulations, collaboration with the Department of Geophysics, SU, USA
- 2010 - 2013 The European Union, FP7: IDIHOM Industrialisation of High-Order Methods, 181564 euro in 3 years
- 2012 - 2017 The SeRC FLOW Community. Stable High-Order Boundary Conditions for In- and Outgoing Waves for Fluid Flow Problems
- 2012 - 2017 Swedish Meteorological and Hydrological Institute (SMHI). Numerical methods for Climate Problems
- 2012 - 2015 The Swedish Research Council: Summation-By-Parts Operators and Weak Initial Conditions for Time Discretisation of Initial Boundary Value Problems
- 2013 - 2016 The European Union, FP7: UMRIDA Uncertainty Management for Robust Industrial Design in Aeronautics

2013 - 2017	VINNOVA-NFFP project: Methods for Improved Accuracy in Unsteady CFD (MIAU)
2014 - 2019	The research school in interdisciplinary mathematics at MAI, Linköping University, Duality Based Boundary Conditions for the Navier-Stokes and Elastic Wave Equations
2019 - 2021	The Swedish Research Council: Artificial Neural Networks, Thin Layers and Approximate Solutions to Partial Differential Equations
2019 - 2022	The SeRC FLOW Community: ABL, Atmospheric Boundary Layers for Climate Simulations
2021- 2023	The Swedish Research Council: Neural Network Trained Schemes for Efficient Simulation of Complex Physics using Adaptive Mesh Refinement

Main advisor for the following PhD thesis

1. K. Mattsson, Summation-by-Parts Operators for High Order Finite Difference Methods, Acta Univ. Ups. Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology 828. 23 pp. Uppsala ISBN 91-554-5596-4. 2003.
2. M. Svärd, Stable High Order Finite Difference Methods for Aerodynamics, Acta Univ. Ups. Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology 1026. 25 pp. Uppsala ISBN 91-554-6063-1. 2004.
3. J. Gong, Hybrid Methods for Unsteady Fluid Flow Problems in Complex Geometries, Acta Univ. Ups. Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology 374. 28 pp. Uppsala ISBN 978-91-554-7046-3, 2007.
4. Q. Abbas, Weak Boundary and Interface Procedures for Wave and Flow Problems, Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology, ISSN 1651-6214; 862, 2011.
5. S. Eriksson, Stable Numerical Methods with Boundary and Interface Treatment for Applications in Aerodynamics, Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology, ISSN 1651-6214; 985 2012.

6. J. Berg, Stable and High-Order Finite Difference Methods for Multiphysics Flow Problems, Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology, ISSN 1651-6214; 1004, 2013.
7. P. Pettersson, Uncertainty Quantification and Numerical Methods for Conservation Laws, Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology, ISSN 1651-6214; 1008, 2013.
8. T. Lundquist, High order summation-by-parts methods in time and space, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524; 1740, 2016.
9. S. Nikkar, Stable High Order Finite Difference Methods for Wave Propagation and Flow Problems on Deforming Domains, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 1774, 2016.
10. O. O'reilly, Numerical methods for wave propagation in solids containing faults and fluid-filled fractures, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 1806, 2016.
11. H. Frenander, High-order finite difference approximations for hyperbolic problems: multiple penalties and non-reflecting boundary conditions, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 1824, 2017.
12. C. La Cognata, High order summation-by-parts based approximations for discontinuous and nonlinear problems, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 1880, 2017.
13. V. Linders, Error analysis of summation-by-parts formulations: Dispersion, transmission and accuracy, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 1886, 2017.
14. M. Wahlsten, Uncertainty quantification for wave propagation and flow problems with random data, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 1921, 2018.

15. F. Ghasemi, Stability, dual consistency and conservation of summation-by-parts formulations for multiphysics problems, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 1988, 2019.
16. A. A. Ruggiu, Eigenvalue analysis and convergence acceleration techniques for summation-by-parts approximations, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 2002, 2019.
17. O. Ålund, Applications of summation-by-parts operators, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 2106, 2021.
18. F. Lauren, Summation-by-parts formulations for flow problems, Linköping Studies in Science and Technology. Dissertations, ISSN 0345-7524, 2022.
19. M.P. Nchupang, (Jointly with A. Malan, University of Cape Town) Stable and high order accurate finite difference method for the incompressible laminar boundary layer equations, University of Cape Town, March 2025.

Currently co-supervising the following Masters and PhD students

1. T. Jagutpal, with Professor A. Malan, at Department of Mechanical Engineering, University of Cape Town, South Africa.
2. K. Singh, with Professor B. Jacobs, at Department of Mathematics and Applied Mathematics, University of Johannesburg, South Africa.
3. P. Ersing, with Professor A. R. Winters, at Department of Mathematics, Applied Mathematics, Linköping University, Sweden.
4. A. M. Bhamani with Professor A. Malan, at Department of Mechanical Engineering, University of Cape Town, South Africa.

Main advisor for the following Masters thesis

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