

Curriculum vitae with track record

Personal information

First name, Surname:	Espen Robstad Jakobsen		
Date of birth:	11.04.1972	Sex:	Male
Nationality:	Norwegian		
Researcher unique identifier:	https://orcid.org/0000-0003-4432-1589		
URL for personal website:	folk.ntnu.no/erj		

Education

2001	Ph.D., Department of Mathematical Sciences, NTNU, Norway
1996	Master, Department of Mathematical Sciences, NTNU, Norway

Positions

2008-	Professor/NTNU/Norway
2005-2008	Associate Professor/NTNU/Norway
2002-2005	National NFR PostDoc / NTNU + University of Oslo + University of Tours / Norway + France Associate Professor (temporary) / NTNU + University of Bergen / Norway
1998-2001	PhD fellow/NTNU/Norway
2009, 2015	Sabbaticals: University of Tours (2009-2010), Ecole Normale Supérieure Paris (2015-2016)

Project management experience

Year	Project owner - Project - Role - Funder
2022-2028	IMod. Partial differential equations, statistics and data: An interdisciplinary approach to data-based modelling. 25 million NOK – PI (Main PI M. Ehrnstrøm) - Research Council of Norway (FriPro).
2016-2022	IE/NTNU - Toppforsk project (research excellence): <i>Waves and Nonlinear Phenomena</i> . 25 million NOK - PI (Main PI H. Holden) - Research Council of Norway (FriPro)
2012-2016	IME/NTNU - Researcher Project: <i>Discrete Models in Mathematical Analysis</i> . 8 million NOK - PI (Main PI Y. Ljubarski) - Research Council of Norway (FriPro)
2006-2010	IME/NTNU - Researcher Project: <i>Integro-PDEs: Numerical methods, Analysis, and Applications to Finance</i> . 3.5 million NOK - Main PI - Research Council of Norway (eVITA)
2003-2005	IME/NTNU - PostDoc Project: <i>Viscosity methods, Hamilton-Jacobi-Bellman equations, and applications to finance</i> - Main PI - Research Council of Norway (FriPro)

Supervision of students

Master students	32	NTNU (29), University of Bergen (2), Ecole Normale Superieur Paris (1)
Ph.D. students	5 (+6)	Department of Mathematical Sciences / NTNU / Norway (co-advisor of 6)
PostDocs	7	Department of Mathematical Sciences / NTNU / Norway

Other relevant professional experiences

2021-2025	Elected member of IE faculty board , NTNU (IE has about 1000 staff and 1 bn NOK budget). Member of IE faculty hiring board , NTNU.
2011-2020	Head of Differential Equations and Numerical Analysis group, NTNU (50+ scientific staff) Member of Math-Department board (utvidet ledergruppe), NTNU
2005-	Math-Department NTNU : deputy head of research group, administrator of several Professor and PhD committees; PhD hiring and pedagogical committees; organiser of research group seminars. IME/IE Faculty NTNU : Member of the Research committee. External : Member of 8 PhD committees (3 x Paris, Oslo, Madrid, Rome, Copenhagen, Uppsala), 3 Professor and Associate Professor evaluation committees (Stavanger, Oslo, Bergen), referee for Professor positions (India, Australia), funding proposal evaluator (Canada, Poland).
2019-	Associate editor , IMA journal of Numerical Analysis / UK (a top journal in its field)
2018-	Elected member of the Royal Norwegian Society of Sciences and Letters (DNKVS)
2017-2023	Host for 5 incoming ERCIM Alain Benssousan postdoc fellowships.
1999-	Major collaboration : <i>N. Alibaud</i> (Besancon), <i>E. Chasseigne</i> and <i>G. Barles</i> (Tours), <i>K. H. Karlsen</i> (Oslo), <i>F. del Teso</i> (Madrid), <i>Jørgen Endal</i> (NTNU), <i>Indranil Chowdhury</i> (Kanpur).
2003-	Referee of 65+ papers for 30+ international research journals, including top journals Acta Math, JMPA, MAAN, JLMS, AIHPC, SINUM, SICON, SIMA, JDE, CPDE, MCOMP, JSAA, AAP.
Meetings organised (member of committee)	
2023	The Abel Symposium 2023 , Orkanger, Norway. 40 participants, international, top speakers, refereed proceedings. Workshop on nonlocal and nonlinear PDEs , NTNU. 25 participants, international.
2022	Second Norwegian meeting on PDEs , Bergen, Norway. 50 participants, international. Waves and Nonlinear Phenomena , workshop, NTNU. 40 participants, international.
2020	The Abel Symposium 2020 , Røros, Norway. <i>Cancelled due to covid-19</i> .
2019	First Norwegian meeting on PDEs , Trondheim, Norway. 50 participants, international. First national meeting on partial differential equations in Norway. Head of committee .
2016	Non-linear PDEs, mathematical physics, and stochastic analysis . A conference in honour of Helge Holden. Trondheim. International conference, refereed proceeding. 60+ participants.
2017	Stability for evolution problems , Gaeta, Italy. Mini-symposium in the International Conference on Elliptic and Parabolic Problems.
2013	Symposium on Nonlinear PDEs , Trondheim. International conference, 40+ participants.

Track record

54 publications during the career: 47 in journals, 5 in conference proceedings, 2 book chapters. Co-authored with 19 researchers in 8 countries. **75% of journal publications in level 2 journals**, the top 20 % journals in the Norwegian ranking. In all publications I have contributed fully in planning, proofs of results, and writing.

Citations/h-index (April 2024): Google scholar 2215/26, MathSciNet 1024/NA, Web of Science 1076/20.

Summary of research and 10 selected publications:

Nonlinear partial differential equations and related fields like stochastic processes, stochastic control, mean field games, and numerical analysis. Both local and nonlocal problems have been studied using a variety of tools from functional, stochastic, and numerical analysis along with probability and control theory:

I. Nonlocal operators: Through a new analysis of the Liouville theorem we have improved a famous classical theory that has been continuously developed since the 19th century. Published in a top journal:

1. N. Alibaud, F. del Teso, J. Endal, and E. R. Jakobsen. *The Liouville theorem and linear operators satisfying the maximum principle*. J. Math. Pures Appl., 142, 2020.

Combining stochastic, probabilistic, and analytic tools, we study Fokker-Planck operators in the paper below.

2. L. Chen and E. R. Jakobsen. *L1 semigroup generation for Fokker-Planck operators associated with general Levy driven SDEs*. Discrete Contin. Dyn. Syst. 38, 2018.

II. Porous medium equations: We develop a new and unified mathematical theory that encompasses a much larger class of equations than previously considered: both local, general nonlocal, and surprisingly to the experts, numerical discretisations. The paper below represents the first theoretical development. The framework has later been used to propose and analyse numerical schemes in a very general setting.

3. F. del Teso, J. Endal, and E. R. Jakobsen. *Uniqueness and properties of distributional solutions of nonlocal equations of porous medium type*. Advances in Mathematics 305, 2017.

III. Nonlocal convection-diffusion: Seminal (according to referee) analytical results explaining how to handle degenerate nonlocal conservation laws. Opened up a new class of equations for mathematical study.

4. S. Cifani and E. R. Jakobsen. *Entropy solution theory for fractional degenerate convection-diffusion equations*. Ann. Inst. H. Poincare Anal. Non Lineaire 28, 2011.
5. N. Alibaud, S. Cifani, and E. R. Jakobsen. *Optimal continuous dependence estimates for fractional degenerate parabolic equations*. Arch. Ration. Mech. Anal. 213, 2014.

Development and analysis of different numerical schemes for such equations, here represented by a paper where we propose and analyse a high order scheme that converges even for discontinuous shock-solutions.

6. S. Cifani and E. R. Jakobsen. *On the spectral vanishing viscosity method for periodic fractional conservation laws*. Math. Comp. 82, 2013.

IV. Fully nonlinear equations and stochastic control: Fundamental contributions to analysis and numerics, for local and nonlocal problems. Pioneering work include first rigorous proof of well-posedness for mixed local-nonlocal equations and switching control of jump processes with dynamic programming:

7. E. R. Jakobsen and K. H. Karlsen. *A "maximum principle for semicontinuous functions" applicable to integro-partial differential equations*. NoDEA Nonlinear Differential Equations Appl. 13, 2006.
8. I. H. Biswas, E. R. Jakobsen, and K. H. Karlsen. *Viscosity solutions for a system of integro-PDEs and connections to optimal switching and control of jump-diffusion processes*. Appl. Math. Optim. 62, 2010.

Other analytical results include: Stability, continuous dependence, singular limits, nonlocal boundary value problems, quasilinear nonlocal equations. My work on numerical methods span different methods, equations, and results. Especially well-known are results on (i) nonlocal problems, and (ii) error estimates for fully nonlinear equation, here represented by my most cited paper:

9. G. Barles and E. R. Jakobsen. *On the convergence rate of approximation schemes for Hamilton-Jacobi-Bellman equations*. M2AN Math. Model. Numer. Anal. 36, 2002.

V. Mean field game theory: Mean field games (MFGs) with nonlocal diffusion and fully nonlinear MFGs. Pioneering initial work on well-posedness and numerics. Well received work on the Master equation for MFGs. Several papers in preparation, two preprints on arXiv.org, and two published paper including:

10. O. Erland and E. R. Jakobsen. *On fractional and nonlocal parabolic mean field games in the whole space*. J. Differential Equations 301, 2021.

VI. Other research directions: New duality between Bellman and convection-diffusion equations (paper [47] on homepage), numerical solution of *Fokker-Planck equations* (paper [34]), approximate *stochastic control* (paper [38]), *deep BSDE* approximation of PDEs (in preparation), and *mathematical biology* (paper [41]).

Fellowships, awards, and prizes:

1997 National PhD fellowship (Research Council of Norway)

2002 Esso Prize for best PhD thesis in fundamental research, NTNU

2006 Carl Erik Fröberg Prize for best paper, BIT J. Numerical Math./Sweden

Presentations:

42 talks at international conferences, 37 talks at seminars. Selected invited presentations:

2023 SPDEs, optimal control and mean field games - analysis, numerics and applications, Bielefeld. Euro-Japanese conference on nonlinear diffusions, ICMAT, Madrid, Spain.

2022 Nonlocal Equations: Analysis and Numerics, Bielefeld, Germany. Regularity for nonlinear diffusion equations. Green functions and functional inequalities, Madrid.

2021 Oberwolfach Workshop: Numerical Methods for Fully Nonlinear and Related PDEs, Germany.

2020 NMAC20 Online Conference on Nonlocal Problems, China.

2019 Analysis of nonlocal and nonsmooth models, Bielefeld, Germany.

2018 Joint meeting of the Italian Math. Union, the Italian Society for Industrial and Applied Math., and the Polish Math. Society. Wroclaw, Poland.

2017 The 27th edition of the Biennial Numerical Analysis Conference, Glasgow, UK.

2016 The 3rd Conference on Nonlocal operators and PDEs, Banach center, Poland. HJ2016: Hamilton-Jacobi equations: New trends and applications, Rennes, France.

2015 The 5th Spring School on Nonlinear PDEs, Essaouira, Morocco. Invited lecturer.

Selected early career contributions:

Jørgen Endal (PhD and postdoc): Associate Professor, NTNU. Chorafas Foundation Award winner and Marie Skłodowska-Curie individual Fellow (UAM Spain).

Felix del Teso (pre and postdoc): Assistant Professor, Autonomous University Madrid. UAM PhD Thesis and Vicent Caselles Prizes, ERCIM Alain Benssousan and Juan de la Cierva Fellows, Ramon Y Cajal grant.

Imran H. Biswas (predoc): Associate Professor, TIFR Bangalore, India.

Indranil Chowdhury (postdoc): Assistant Professor, IIT Kanpur, India.

Sehail Mazid (postdoc): Associate Professor, University of Agadir, Morocco.

Miłosz Krupski (postdoc): Assistant Professor, University of Wroclaw, Poland.

Artur Rutkowski (postdoc): Assistant Professor, Technical University of Wroclaw, Poland.