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 Superieur Paris (2015-2016)

Project management experience

Year	Project owner - Project - Role - Funder
2022-2027	IE/NTNU - Large-scale Interdisciplinary Researcher Project (research excellence): *IMod. PDEs, statistics and data: An interdisciplinary approach to databased modelling.* 25 million NOK - PI (Main PI M. Ehrström) - Research Council of Norway (FriPro)
2016-2022	IE/NTNU - Toppforsk project (research excellence): *Waves and Nonlinear Phenomena.* 25 million NOK - PI (Main PI H. Holden) - Research Council of Norway (FriPro)
2012-2016	IME/NTNU - Researcher Project: *Discrete Models in Mathematical Analysis.* 8 million NOK - PI (Main PI Y. Ljubarski) - Research Council of Norway (FriPro)
2006-2010	IME/NTNU - Researcher Project: *Integro-PDEs: Numerical methods, Analysis, and Applications to Finance.* 3.5 million NOK - Main PI - Research Council of Norway (eVITA)
2003-2005	IME/NTNU - PostDoc Project: *Viscosity methods, Hamilton-Jacobi-Bellman equations, and applications to finance* - Main PI - Research Council of Norway (FriPro)

Supervision of students

Master students	25	NTNU (22), University of Bergen (2), Ecole Normale Superieur Paris (1)
Ph.D. students	3 (+5)	Department of Mathematical Sciences / NTNU / Norway (co-advisor of 5)
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 6 PhD committees (3 x Paris, Oslo, Madrid, Rome), 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-	Host for 5 incoming **ERCIM Alain Benssousan** postdoc fellowships.
	Organised meetings: (member of committee)
2022	**Norwegian meeting on PDEs**, Bergen, Norway, and WaNP research project final meeting.
2020	**The Abel Symposium 2020**, Røros, Norway. *Cancelled due to covid-19.*
2019	**Norwegian meeting on PDEs**, Trondheim, Norway. 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.
2003-	**Referee** of 60+ papers for 30+ international research journals, including top journals like Acta Math, JMPA, MAAN, JLMS, AIHP, SINUM, SICON, SIMA, JDE, CPDE, MCOMP, JSAA.
1999-	**Major collaboration:** *N. Alibaud* (Besancon) convection-diffusion/nonlocal equations; *E. Chasseigne* and *G. Barles* (Tours) fully nonlinear/nonlocal equations; *K. H. Karlsen* (Oslo) fully nonlinear/convection-diffusion/nonlocal equations; *F. del Teso* (Madrid) porous medium equations. The collaboration include analysis, PDEs, numerics, and stochastics.

Track record

49 publications during the career: 42 in journals, 5 in conference proceedings, 2 book chapters. Co-authored with 19 researchers in 8 countries. **74% 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 (May 2022): Google scholar 1819/23, MathSciNet 867/NA, Web of Science 945/18.

Summary of research and 10 selected publications:

Partial differential equations and related fields like stochastic processes, stochastic control/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: 229-242, 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(11): 5735-5763, 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: 78-143, 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(3): 413-441, 2011.

5. N. Alibaud, S. Cifani, and E. R. Jakobsen. *Optimal continuous dependence estimates for fractional degenerate parabolic equations.* Arch. Ration. Mech. Anal. 213(3): 705-762, 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: 1489-1514, 2013.

IV. *Fully nonlinear equations and stochastic control:* Fundamental contributions to analysis and numerics, both for local and nonlocal problems. Pioneering work on nonlocal problems include the first rigorous proof of well-posedness for mixed local-nonlocal equations and switching control for jump processes and 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. 13:137-165, 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(1): 47-80, 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(2): 33–54, 2002.

V*. Mean field game theory:* Mean field games (MFGs) with nonlocal diffusion and fully nonlinear MFG. Pioneering initial work on well-posedness and numerics. Two preprints on arXiv.org and one published paper:

10. O. Ersland and E. R. Jakobsen. *On fractional and nonlocal parabolic mean field games in the whole space.* J. Differential Equations 301: 428-470, 2021.

VI*. Other research directions:* New duality between fully nonlinear equations and divergence form convection-diffusion equations (paper [P4] on homepage), numerical solution of *Fokker-Planck equations* (paper [34]), approximate *stochastic control* (paper [38]), *deep neural net based Monte Carlo* 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:

34 talks at international conferences, 36 talks at seminars. Selected invited presentations:

2022   Nonlocal Equations: Analysis and Numerics, Bielefeld, Germany.

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.

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

Imran H. Biswas (predoc): Associate Professor, IISER Kolkata, India.

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