

Mikkel Paltorp

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EXPERIENCE

Technical University of Denmark (DTU Compute)

Kgs. Lyngby

PostDoc, Optimization-based Nonlinear Solvers for Finite Element Analysis, Advisor: Martin Andersen *2024*

- Developing efficient interior point methods for civil engineering applications.

Technical University of Denmark (DTU Electro)

Kgs. Lyngby

Ph.D. in Computational Acoustics, Supervisors: Vicente Cutanda Henríquez & Niels Aage *2020–2024*

- Lead the research into applying Fast Multipole Methods and \mathcal{H} -matrices to viscothermal acoustics.
- International collaboration with Prof. Dr.-Ing. Steffen Marburg and PhD Student Simone Preuss at TU Munich.
- Developed a Boundary Element code in Julia. The code is now used at the Technical University of Munich.
- Taught Finite & Boundary Element Methods and guided student projects in the course Numerical Acoustics.

EDUCATION

Technical University of Denmark

Kgs. Lyngby

B.Sc.Eng & M.Sc.Eng in Mathematical Modeling and Computation *2014–2020*

- Took an interest in differential equations, numerical algorithms, and optimization methods.
- Did my master's thesis on rank-structured matrices for Gaussian processes / Smoothing Splines.

McGill University

Montreal

Exchange semester *2016*

- Took courses in complex analysis, non-linear and partial differential equations, and mathematical biology.

TEACHING

Technical University of Denmark

Kgs. Lyngby

Assistant Lecturer, Advanced Engineering Mathematics 1 *2018–2020*

- Responsibilities included correcting problem sets and supervision/examination of a larger mathematics project.
- Topics: Linear algebra, (systems of) ODEs, multivariate calculus, and mathematical modeling.

Technical University of Denmark

Kgs. Lyngby

Teaching Assistant *2015–2018*

- Courses: Advanced Engineering Mathematics 2, Calculus and Algebra 1 & 2 and Intro to Numerical Algorithms.
- Topics: Infinite series, Fourier series, stability of ODEs, complex variables, numerical solution of ODEs.

SOFTWARE

BoundaryIntegralEquations.jl / FMM2D.jl

A Julia package for solving Boundary Integral Equations using the (collocation) Boundary Element Method.

- Utilizes the Flatiron Institute Fast Multipole Libraries. Developed a wrapper for the 2D library (`FMM2D.jl`).
- Includes SOTA techniques for large-scale viscothermal acoustics that mixes sparse linear algebra with the FMM.

- Learned how to automatically generate documentation using `Documenter.jl` and `Literate.jl`.

GeneralizedSmoothingSplines.jl / SymSemiseparableMatrices.jl

A Julia package for fitting (constrained) smoothing splines using the Gaussian process view.

- All (rank-structured) linear algebra is handled efficiently using the $\mathcal{O}(n)$ -algorithms implemented in my `SymSemiseparableMatrices.jl` package.
- Learned about `git`, automated tests, and code coverage using `GitHub actions`.

BlockDiagonalMatrices.jl

A Julia package for efficient computations with block diagonal matrices.

- Implements fast linear algebra by utilizing the a block diagonal structure.

TECHNICAL SKILLS

- **Proficient:** Julia, Python, MatLab, CI/CD
- **Experience:** R, C, C++, Linux, Git

LANGUAGES

- **Danish:** Native
- **English:** Fluent

CONFERENCES AND WORKSHOPS

International Congress on Acoustics (ICA2022)

A reduced order model including viscothermal losses

Gyeongju, South Korea

Oral presentation

KAIST-DTU Workshop 2022

Towards Large-scale Viscothermal Acoustics Simulations using the Boundary Element Method

Daejeon, South Korea

Oral presentation

Forum Acusticum 2023

An Open-Source Boundary Element Framework for Large-scale viscothermal acoustics

Turin, Italy

Oral presentation

EXTRACURRICULAR ACTIVITIES

- Organizer of Julia Meetups in Copenhagen *2022–Current*
The meetups have had around 30 participants and have included speakers from Novozymes, PumasAI, and MIT.
- Volunteering at Nørrebro Climbing Club *2019–Current*
Participating in club days, route setting, and other social events.

PUBLICATIONS

- [1] M. **Paltorp** and V. Cutanda Henríquez, “An open-source Boundary Element framework for large-scale viscothermal acoustics”, in *Proceedings of the 10th Convention of the European Acoustics Association Forum Acusticum 2023*, ser. FA2023, European Acoustics Association, Jan. 2023.
- [2] M. **Paltorp**, V. Cutanda Henríquez, N. Aage, and P. R. Andersen, “A Reduced Order Series Expansion for the BEM Incorporating the Boundary Layer Impedance Condition”, Accepted to the Journal of Theoretical and Computational Acoustics, 2023.
- [3] M. **Paltorp**, S. Preuss, V. Cutanda Henríquez, and S. Marburg, “Large-scale Boundary Element Computations Including Viscous and Thermal Losses”, Manuscript, 2023.
- [4] S. Preuss, M. **Paltorp**, A. Blanc, V. Cutanda Henríquez, and S. Marburg, “Revising the Boundary Element Method for Thermoviscous Acoustics: An Iterative Approach via Schur Complement”, Accepted to the Journal of Theoretical and Computational Acoustics, 2023.
- [5] M. **Paltorp**, V. Cutanda Henríquez, N. Aage, and P. R. Andersen, “A reduced order model including viscothermal losses”, in *A16 Proceedings of 24th International Congress on Acoustics*, 2022, pp. 38–45.