Mikkel Paltorp

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Experience

Technical University of Denmark (DTU Compute) Kgs. Lyngby
PostDoc, Scientific Machine Learning for Structural Health Monitoring, Advisor: Martin Andersen *2025–now*

- Applying Scientific Machine Learning techniques to predict the structural health of offshore structures.
- Keywords: Kalman Filtering, Time Series Classification, Probabilistic ODE solutions, JAX, PyTorch.

Technical University of Denmark (DTU Compute) Kgs. Lyngby
PostDoc, Conic Optimization for Nonlinear Finite Element Analysis, Advisor: Martin Andersen *2024*

- Developing conic interior point algorithms. Worked with sparse linear algebra, CUDA, Rust, C++, and Julia.
- Collaboration with industry partner (OPTUM CE) implementing our solutions into their software.

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. Using these methods we were able to solve problems orders of magnitudes larger than previously possible.
- 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 Computational Science and Engineering *2014–2020*

- Took an interest in differential equations, numerical methods, and optimization algorithms.
- For my thesis I implemented scalable (i.e. linear time and storage) algorithms for Gaussian processes.

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, 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: 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.

Skills

- **Proficient:** Julia, Python, PyTorch, uv, CI/CD, HPC, Mathematical Programming, Element Methods.
- **Experience:** Rust, R, C, C++, MatLab, Linux, Git, CUDA, SciML, JAX.

Conferences and Workshops

International Congress on Acoustics (ICA2022) Gyeongju, South Korea
A reduced order model including viscothermal losses Oral presentation

KAIST-DTU Workshop 2022 Daejeon, South Korea
Towards Large-scale Viscothermal Acoustics Simulations using the Boundary Element Method Oral presentation

Forum Acusticum 2023 Turin, Italy
An Open-Source Boundary Element Framework for Large-scale viscothermal acoustics Oral presentation

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.
- Includes automatically documentation generation using `Documenter.jl` and `Literate.jl`.

Pardiso.jl (Maintainer)
A wrapper for the sparse direct solvers MKL/Panua-Pardiso. The solvers are used throughout the Julia ecosystem.

Activities

- Organizing committee of the Copenhagen Julia user group *2022–Current*
  Our events have around 30 participants and have included speakers from Novonesis, PumasAI, and MIT.