Alessandro Contri

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Summary

I am a **PhD student in computational mathematics** with 4 years of experience in numerical methods to solve partial differential equations for engineering and science. I have demonstrated experience working across **interdisciplinary scientific laboratories**, honing my skills in teamwork through these collaborations. I am looking for a dynamic job where my knowledge can be applied to explore, design and implement **innovative technological solutions**.

Education

Norwegian University of Science and Technology — *Norway*
PhD Candidate - Computational Mathematics — *Jan 2022 - Present*
Supervisors: André Massing, Elena Celledoni

University of California San Diego — *USA*
Visiting Scholar — *Jan 2023 - Jun 2023*
Supervisor: Padmini Rangamani

University of Padova — *Italy*
Master of Science - Mathematical Enginnering — *Sep 2018 - Dec 2021*
Supervisors: Antonia Larese De Tetto, Stefano Lanzoni

University of Padova — *Italy*
Bachelor of Science - Aerospace Enginnering — *Sep 2015 - Sep 2018*
Supervisor: Stefano Casotto

Experience

Numerical Methods for Fluid Deformable Membranes — *Jan 2022 - Present*
- I am investigating the effectiveness of a new algorithm for the simulation of fluid-elastic surfaces, such as cell membranes, to ease simulations on geometries resulting from traditional imaging.
- I am implementing and maintaining a Python package using the NgSolve library, a multiphysics high performance software with more than 500 users, to make the code user-ready.
- I derived a new proof of optimal convergence for unsteady Stokes equations, which describe the behavior of fluids in non-turbulent regimes. It resulted in a paper accepted in the SIAM - Numerical Analysis Journal (Impact factor 2.8).
- I tutored various courses in numerical methods for nonlinear equations, ODEs and PDEs with up to 1000 students.

Fluid simulation using Material Point Method — *Jan 2021 - Dec 2021*
- I designed a new elasticity tensor to include fluid dynamics simulations in a solid mechanics framework. It allowed multiphysics simulations in a unified environment. The algorithm used the Material Point Method (MPM), an uprising numerical method used for simulations with very large displacements, such as debris flows and avalnches.
- I implemented the above mentioned constitutive law in Kratos Multiphysics, an extensible, high performance software for multiphysics simulations with more than 1000 users.

Numerical solution of ODEs for interplanetary trajectories — *Jan 2018 - Sep 2018*
- I used NASA Spice Kernels Data to reconstruct the interplanetary trajectory of the spacecrafts Cassini and Rosetta and compare the influence of different external factors such as multiple external bodies, radiation pressure and general relativity correction.

Publications

- Alessandro Contri, Christina Taylor, Justin Tso, and Ingeborg Gjerde. *Inducing Flow Instabilities in Aneurysm Geometries via the Reynolds-Orr Method*, pages 79–89. Springer Nature Switzerland, Cham, 2023. Link to report **- Published**
- Alessandro Contri, Balázs Kovács, and André Massing. Error analysis of BDF 1-6 time-stepping methods for the transient Stokes problem: velocity and pressure estimates, 2023. Arxiv link **- Accepted in SINUM**
- Alessandro Contri, André Massing, and Padmini Rangamani. A biologically-driven fem framework for coupled pdes on realistic geometries, 2024 **- In preparation**

Core skills

Finite Element Method ⊗ Mathematical Modeling ⊗ Structural & Fluid Mechanics ⊗ Numerical PDEs on Manifolds
Parallel Computing ⊗ Python & C++