Leonhard **Kellerer**

MSc Aerospace

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Buschingstraße 63, 81677, München
Born 17th March 1998 (27 years) in Munich

Recent MSc Aerospace graduate with interest in modern high-order methods for the solution of

I have experience in implementing [matrix-free CutFEM] finite-element methods in deal.ii.

I am especially interested by bringing my skills together in the development of advanced high-order schemes for fluid dynamics. (intersection of my skills) - solving adavanced physics porblems

Technical Skills

Programming Languages [and Frameworks]	**Python** (NumPy, JAX, Matplotlib, SciPy, Cantera, PyTorch), **C++**, MATLAB
Frameworks	deal.II
CFD/Software	git, OpenFOAM

Education

2021–2025	Master of Science in Aerospace at Technical University of Munich
	› Focus on numerical fluid mechanics
	› Graduated with distinction, final grade 1.3 (≈ 3.7 GPA)
2022–2023	Erasmus exchange to the University of Liège, Belgium
2017–2021	Bachelor of Science in Mechanical Engineering at Technical University of Munich
	› Graduated with the final grade 2.0 (≈ 3.0 GPA)
2016	German Abitur

Theses

A High-Order Matrix-Free CutFEM Approach for Parabolic Two-Phase Problems with Moving Interfaces — 2024–2025

Master's Thesis, Advisors : Maximilian Bergbauer, MSc and Andreas Koch, MSc
Development of a matrix-free CutFEM scheme for the two-phase heat equation, with special focus on the interface movement at high polynomial order. Implemented in the deal.II-based framework *Cut*.

Investigation of Reacting Shock-Bubble Interactions in JAX-Fluids — 2022

Term Paper, Advisor : Deniz A. Bezgin, MSc
Establishment of the reactive flow module (multiple components, diffusive fluxes, transport and thermodynamic properties, chemical kinetics solver) for the differentiable finite volume code *JAX-Fluids*. Evaluation in the reactive shock-bubble interaction case.

Analysis of Deep Reinforcement Learning Strategies for Implicit LES Modeling — 2020–2021

Bachelor's Thesis, Advisor : Deniz A. Bezgin, MSc
Implementation of WENO finite-volume schemes for the turbulent Burgers and Kuramoto-Sivashinsky equations. Control of stencil weights by an RL-agent to achieve an optimal implicit turbulence model.

Professional Experience

March 2023 October 2023	**Research Assistant, TUM Chair of Aerodynamics and Fluid Mechanics** Continuation of term paper project : integration of differentiable reaction kinetics into JAX-Fluids. Extension to more advanced reaction mechanisms.
April 2023 July 2023	**Teaching Assistant, TUM Assistant Professorship of Sustainable Future Mobility** Supported the practice sessions of *Thermodynamics I for Aerospace*.
April 2022 July 2022	**Teaching Assistant, TUM Assistant Professorship of Sustainable Future Mobility** Supported the practice sessions of *Thermodynamics I for Aerospace*.

October 2021 – March 2022 | **Research Assistant, TUM Chair of Aerodynamics and Fluid Mechanics**
Supported the development of JAX-Fluids, including a test suite to verify the correct behavior of the code

Projects

ODEsolvers 2025

https://github.com/lKellr/ODEsolvers

Python implementations of several solvers for ODEs. Main focus is on extrapolation methods, but (embedded) Runge-Kutta and multistep methods are available to provide efficiency comparisons.

Deep learning in the context of multiphase flows 2019/2020

Project seminar

Training of a neural network to find cut-cell properties from level-set data.

Machine components 3D printing project 2019

Voluntary project

Design and manufacture of a SL-sintered planetary gearbox and winch.

Languages

German	●●●●●
English	●●●●●
French	●●○○○
Swedish	●○○○○

References

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Andreas Koch
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