


# Leonhard KELLERER

## MSc Aerospace

 [github.com/lkellr](https://github.com/lkellr)

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 Buschingstraße 63, 81677, Munich

 Born 17th March 1998 (27 years) in Munich

Recent MSc graduate in Aerospace interested in the development and application of advanced high-order schemes for fluid dynamics.

Experience in the development of various numerical methods, as well as high-performance computing.

## TECHNICAL SKILLS

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<b>Programming Languages</b>	Python, C++, MATLAB, C
<b>Software Libraries</b>	deal.II, NumPy, JAX, SciPy, Cantera, PyTorch, Matplotlib
<b>Other Software</b>	git, OpenFOAM

## RESEARCH INTERESTS

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<b>Numerical Methods</b>	discontinuous Galerkin, finite volume, spectral methods, multigrid, matrix-free methods, Riemann solvers, ODE solvers
<b>Fluid Mechanics</b>	compressible flow, reacting flow, multiphase flow, turbulence

## EDUCATION

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2021–2025	Master of Science in Aerospace at Technical University of Munich <ul style="list-style-type: none"><li>➤ Focus on numerical fluid mechanics</li><li>➤ Graduated with distinction, final grade 1.3 (<math>\approx</math> 3.7 GPA)</li></ul>
2022–2023	Exchange semester at the University of Liège, Belgium
2017–2021	Bachelor of Science in Mechanical Engineering at Technical University of Munich <ul style="list-style-type: none"><li>➤ Graduated with the final grade 2.0 (<math>\approx</math> 3.0 GPA)</li></ul>
2016	German Abitur

## THESES

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### 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 attain an optimal implicit turbulence model.

## PRACTICAL EXPERIENCE

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March 2023	Research Assistant, TUM CHAIR OF AERODYNAMICS AND FLUID MECHANICS
October 2023	Continuation of term paper project : integration of differentiable reaction kinetics into JAX-Fluids. Extension to more advanced reaction mechanisms.
April 2023	Teaching Assistant, TUM ASSISTANT PROFESSORSHIP OF SUSTAINABLE FUTURE MOBILITY
July 2023	Supported the practice sessions of <i>Thermodynamics I for Aerospace</i> .
April 2022	Teaching Assistant, TUM ASSISTANT PROFESSORSHIP OF SUSTAINABLE FUTURE MOBILITY
July 2022	Supported the practice sessions of <i>Thermodynamics I for Aerospace</i> .
October 2021	Research Assistant, TUM CHAIR OF AERODYNAMICS AND FLUID MECHANICS
March 2022	Supported the development of JAX-Fluids, including a test suite to verify the correct behavior of the code

## PROJECTS

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### 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.

## LANGUAGES

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

## REFERENCES

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### Maximilian Bergbauer

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### Andreas Koch

MSc, PROFESSORSHIP OF SIMULATION FOR ADDITIVE MANUFACTURING

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