NEWSLETTER

of the Work Group Mathematical Fluid Mechanics

Newsletter no. 19 (2025)

Thomas Schuster submitted his Master thesis

Thomas Schuster submitted his Master thesis: *"Enhancing the prediction of aerodynamic forces based on sparse pressure sensor inputs by using machine learning".*

Given the air flow around the wings of an airplane, measuring the flow at some points, can one deduce the lift on the wings in real time? This thesis shows how this can be achieved using techniques of machine learning.

Wasilij Barsukow submits a paper on DG

Wasilij Barsukow submitted the single author paper: *"Stationarity preservation and the low Mach number behaviour of the Discontinuous Galerkin method on cartesian grids"* (*arXiv:2511.18505*) to a journal.

Here the ability of DG to maintain stationary solutions and also work for low Mach numbers is studied. The conditions under which this is possible are found.

A stationary vortex for linear acoustics in 2-dim. is computed using an appropriate Discontinuous Galerkin method at a low Mach number on a coarse grid.
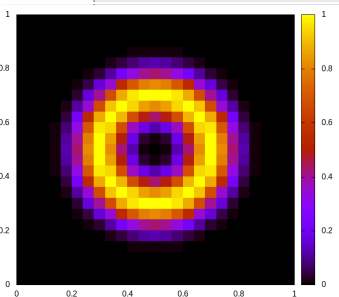
Merry Christmas!

This is the last Newsletter for this year.

Merry Christmas to you and may you have a happy and prosperous New Year!

Lisa Lechner discontinues her PhD studies

Lisa Lechner joined our work group more than three years ago, first for a year as a guest student, and then for two and a quarter years as a PhD student, paid for by a DFG (German Science Foundation) project led by Wasilij Barsukow and myself. She worked on the Active Flux numerical method. She co-authored three papers:

- Wasilij Barsukow, Janina Kern, Christian Klingenberg, *Lisa Lechner*: "Analysis of the multi-dimensional semi-discrete Active Flux method using the Fourier transform", Communications on Applied Mathematics and Computation (2025) *see here*

- Wasilij Barsukow, Praveen Chandrashekar; Christian Klingenberg; *Lisa Lechner*: "A generalized Active Flux method of arbitrarily high order in two dimensions", Computers & Fluids (2025) *see here*

- Wasilij Barsukow, Christian Klingenberg, *Lisa Lechner*, Jan Nordström, Sigrun Ortleb, Hendrik Ranocha: "Stability of the Active Flux Method in the Framework of Summation-by-Parts Operators" (2025) *see here*
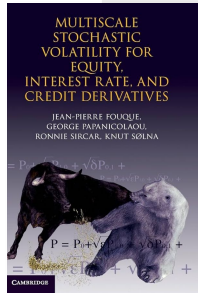

Lisa Lechner   myself

It is unfortunate that now she ceased to work on her PhD studies before completing them. Considering her academic record, she would have been able to finish her studies and earn a PhD.

Lisa was well liked among fellow students. We miss you, and wish you all the best for your future!

three new master students

### Lisa Rüppel began working on her Master thesis

Lisa Rüppel chose for her Master thesis a topic from math finance. She models the volatility of financial derivatives. This can then be useful for example in the well know Black-Scholes model.

MULTISCALE STOCHASTIC VOLATILITY FOR EQUITY, INTEREST RATE, AND CREDIT DERIVATIVES

JEAN-PIERRE FOUQUE, GEORGE PAPANICOLAOU, RONNIE SIRCAR, KNUT SØLNA

CAMBRIDGE

a book by Papanicolaou

Johannes Roth started his Master thesis

Johannes Roth plans to numerically solve waves propagating in inhomogeneous media using machine learning.

a neural network

input layer x   hidden layers $A^{(1)}$ $A^{(2)}$ $A^{(3)}$ output layer y
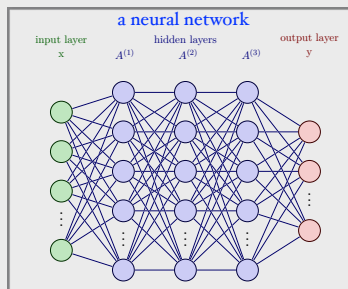
Giacomo Lorelli takes up his Master thesis with us

Giacomo Lorelli will study quantum computing of partial differential equations, in the sprit of Shi Jin's work.

Dimension Liftings for Quantum Computation of Partial Differential Equations and Related Problems
Shi Jin

Shi Jin

news about conferences

ProHyp2026

In Strasbourg from June 1 to 5, 2026 the conference *Perspectives on Multiphase Fluid Dynamics, Continuum Mechanics and Hyperbolic Balance Laws* (ProHyp2026) will take place, organized by Philippe Helluy and others.

The conference will deal with modeling and numerics of multiphase flows, hyperbolic equations and continuum mechanics.

Upcoming scientific conferences

Click on the links and check where you might want to participate.

- Dec 15 - 17, **2025**: *XIX Winter Workshop on Stellar Astrophysics 2025*, organized by Fritz Röpke in Heidelberg

- March 23 - 27, **2026**: *Hyperbolic problems – a comprehensive approach*, in Würzburg, Germany, organized by Wasilij Barsukow, Simon Markfelder, Marlies Pirner, Fritz Röpke, Emil Wiedemann

- March 25 - 27, 2026: *5th European Conference on Non-Equilibrium Gas Flows* (NEGF26), in Toulouse, France, organized by Stéphane Colin among others

- March 30 - April 4, 2026: *International Conference on high-order nonlinear numerical methods for evolutionary PDE* (HONOM) in Trento, Italy, organized by Michael Dumbser

- May 4 - 8, 2026: *Sharing Higher order Advanced Research Known-how on Finite Volume* (SHARK-FV 2026) in Minho, Portugal, organized by Raphael Loubère and others

- May 25 - 29, 2026: *20th International Conference on Hyperbolic Problems (HYP2026)*: Theory, Numerics and Applications, in Stuttgart, Germany organized by Maja Lukacova und Christian Rhode

- June 1 - 5, 2026: *Perspectives on Multiphase Fluid Dynamics, Continuum Mechanics and Hyperbolic Balance Laws* (ProHyp2026), in Strasbourg, organized by Philippe Helluy and others

- June 7 - 13, 2026: Summer School *"Methods & Models of Kinetic Theory"*, in Pesaro (Italy), organized by Maria Groppi and others

- July 19 - 24, 2026: *17th World Congress on Computational Mechanics & 10th European Congress on Computational Methods in Applied Sciences and Engineering*, in Munich, Germany

- Sept. 7 - 11, 2026: *12th International Conference on Numerical Methods for Multi-Material Fluid Flow* (MultiMat 2026) at Biarritz, France, organized by Raphael Loubère and others

- mid June **2027**: Numerical Methods for Hyperbolic Problems (NumHyp 2027), in Verona 2027 organized by Elena Gaburro

- late June/early July 2027: International Conference on Spectral and High-Order Methods (ICOSAHOM 2027), in Milan organized by Marco Verani among others

Three conferences that now have web sites:

in the list above you also find these conferences

- HONOM 2026:

https://tinyurl.com/mv74w8ep (March 30 - April 4, 2026)

- SHARK 2026:

https://shark-fv.eu/home-shark/ (May 4 - 8, 2026)

For this *"Sharing Higher order Advanced Research Known-how on Finite Volume"* (SHARK) workshop one gathers at a wonderful site in Portugal to mainly work in small prearranged collaborations. Also there are some lectures.

- MultiMat 2026:

https://multimat-2026.eu   (Sept. 7 - 11, 2026)

this is where SHARK takes place