Pavel Eichler

Personal data

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WoS h-index 4
Scopus h-index 4

Education

2018-2023 **PhD degree in Mathematical engineering**

Department of Mathematics
Faculty of Nuclear Sciences and Physical Engineering
Czech Technical University in Prague
Doctoral thesis: Mathematical modeling of fluid flow using lattice Boltzmann method
Supervisor: Ing. Radek Fučík, Ph.D.

2016-2018 **Master's degree in Mathematical engineering**

Department of Mathematics
Faculty of Nuclear Sciences and Physical Engineering
Czech Technical University in Prague
Master's thesis: Mathematical modeling of elastic body interaction with incompressible fluid
Supervisor: Ing. Radek Fučík, Ph.D.

2013-2016 **Bachelor's degree in Mathematical engineering**

Department of Mathematics
Faculty of Nuclear Sciences and Physical Engineering
Czech Technical University in Prague
Bachelor's degree project: Mathematical modelling of subsonic flow around obstacles using Lattice–Boltzmann method on GPU
Supervisor: Ing. Radek Fučík, Ph.D.

Language skills

- Czech (native speaker)

- English (B2 CEFR)

- German (B1 CEFR)

Technical skills

- Linux, Windows

- C, C++, CUDA, Python, MPI, Asymptote, GiNaC, LaTeX

- ANSYS Fluent, ANSYS Meshing, ANSYS Design Modeler, OpenFOAM, Matlab, Maple, Paraview, OpenLB

Research interests

- Lattice Boltzmann method

  ▷ Development, analysis, parallel implementation, and applications.

- Immersed boundary method

  ▷ Development, analysis, and applications.

- Multiphase flow

- Quantum computing

  – development of methods to prepare particular states of quantum qubits

- CVD and PVD material coating

  – development of numerical methods for numerical simulations of processes occurring within CVD (Chemical Vapor Deposition) and PVD (Physical Vapor Deposition)

- Application of AI models

  – application of neural network models for the text recognition
  – use of neural network models for dimensionality reduction of numerical methods

Research projects

Participation in the following research projects:

- IIS medic-patient, project no. FW06010667 of Technology Agency of the Czech Republic (2023-2025).

- Off-diagonal thermodynamics and its connection with other factors as a route to predictable selectivity in C-H bond cleavage, project no. 24-11247S of the Czech Science Foundation (2024-2026).

- Analysis of flow character and prediction of evolution in endovascular treated arteries by magnetic resonance imaging coupled with mathematical modeling, project no. NV19-08-00071 of Ministry of Health of the Czech Republic, (2019-2022).

- Research centre for low-carbon energy technologies, project of excellent research no. CZ.02.1.01/0.0/0.0/16_019/0000753, Operational Programme of Research, Development and Education, Ministry of Education, Youth and Sports of the Czech Republic (2018-2022).

- Large structures in boundary layers over complex surfaces under high Reynolds numbers, project no. 18-09539S of the Czech Science Foundation (2018-2020).

- Application of advanced supercomputing methods in mathematical modeling of natural processes, project no. SGS17/194/OHK4/3T/14 of the Grant Agency of the Czech Technical University (2017-2019).

- Quantitative Mapping of Myocard and of Flow Dynamics by Means of MR Imaging for Patients with Nonischemic Cardiomyopathy - Development of Methodology, project No. 15-27178A of Ministry of Health of the Czech Republic, (2015-2018).

- Computational Models and Experimental Investigation of Fluid Dynamics, Mass Transfer and Transport, and Phase Transitions in Porous medium for Environmental Applications, project No. LTAUSA19021 of the Czech Ministry of Education, Youth, and Sports

- Advanced supercomputing methods for mathematical modeling of natural processes, project no. SGS14/206/OHK4/3T/14 of the Grant Agency of the Czech Technical University (2014-2016).

- Application of advanced supercomputing methods for mathematical modeling of natural processes, project no. SGS17/194/OHK4/3T/14 of the Grant Agency of the Czech Technical University (2017-2019).

- Development and application of advanced methods for mathematical modeling of natural and industrial processes using high-performance computing, project no. SGS20/184/OHK4/3T/14 of the Grant Agency of the Czech Technical University (2020-2022).

Submitted Research projects

List of project submitted as PI or Co-PI:

- Development, analysis, and applications of advanced lattice Boltzmann methods

Registration number:	25-17245M	Type:	Junior Star
Provider:	GAČR	Role:	principal investigator
Duration:	5 years	Initial year:	2025
Total support:	12,092 tis Kč	Status:	in the evaluation process

Conferences

2024   LBM in Kraków 2024, Kraków, Poland
Talk: Grid refinement for lattice Boltzmann method
Website: http://sendzimir.metal.agh.edu.pl/ straka/

CFD in Wroclaw, Wroclaw, Poland
Invited Talk: LBMAT-Equivalent partial differential equations for LBM
Website: http://www.ift.uni.wroc.pl/ maq/cfdwroclaw/cfd11.html

Workshop on Scientific Computing, Děčín, Czech Republic
Talk: Quantum qubit state and Schrödinger equation
Website: https://geraldine.fjfi.cvut.cz/wsc-2024/

2023   LBM in Kraków 2023, Kraków, Poland
Talk: Mesoscopic boundary conditions for lattice Boltzmann method
Website: http://sendzimir.metal.agh.edu.pl/ straka/

Workshop on Scientific Computing, Děčín, Czech Republic
Talk: Non-Newtonian Blood Flow in Aortic Phantom:
An Experimental and Computational Study
Website: https://geraldine.fjfi.cvut.cz/wsc-2023/

2022   LBM in Kraków 2022, Kraków, Poland
Talk: Fluid Flow Simulations through Distributor Plate Using Cumulant Lattice
Boltzmann Method
Website: http://sendzimir.metal.agh.edu.pl/ straka/

18th International Conference on Numerical Combustion, San Diego, USA
Talk: Experimental and numerical investigation of air flow through the distributor
plate in a lab-scale bubbling fluidized bed boiler
Website: https://www.combustioninstitute.org

High Performance Computing in Science and Engineering, Soláň, Czech Republic
Talk: Turbulent fluid flow simulations through distributor plate using cumulant
lattice Boltzmann method on GPU
Website: https://hpcse.it4i.cz/HPCSE22/

Workshop on Scientific Computing, Děčín, Czech Republic
Talk: Lattice Boltzmann Method & Boundary Conditions
Website: https://geraldine.fjfi.cvut.cz/wsc-2022/

5th Spring School Lattice Boltzmann Methods with OpenLB Software Lab, Kraków, Poland
Poster: 3D turbulent fluid flow simulations above rough plate using LBM
Website: https://www.openlb.net/spring-school-2022/

ACOMEN 2022, Liege, Belgium
Talk: Numerical study of air flow through the distributor plate in a laboratory-scale
fluidized bed boiler using lattice Boltzmann method
Website: https://acomen2022.org/

Workshop Doktorandské dny 2022
Talk: Non-Newtonian turbulent fluid flow simulations through aortic phantom using
cumulant lattice Boltzmann method
Website: http://kmwww.fjfi.cvut.cz/ddny/

2021   Czech-Japanese Seminar in Applied Mathematics 2021 (online)
Talk: Turbulent fluid flow simulations above rough surface using cumulant lattice
Boltzmann method
Website: https://geraldine.fjfi.cvut.cz/cjs2021/

LBM in Kraków 2021 (online)
Talk: Turbulent boundary layer flow simulations above rough surfaces using
cumulant lattice Boltzmann method

The 17th International Conference for Mesoscopic Methods in Engineering and Science (online)
Talk: Turbulent boundary layer flow simulations above rough surfaces using
cumulant lattice Boltzmann method
Website: https://www.icmmes.org/icmmes2021/

Workshop on Scientific Computing, Děčín, Czech Republic
Talk: LBM & turbulent fluid flow simulations on different lattices
Website: https://geraldine.fjfi.cvut.cz/wsc-2021/

International Conference on Discrete Simulation of Fluid Dynamics 2021 (online)
Talk: Direct numerical simulations of turbulent boundary layer fluid flow above
rough surfaces using lattice Boltzmann method

Workshop Doktorandské dny 2021 (online)
Talk: Fluid Flow Simulations through Distributor Plate Using Cumulant Lattice
Boltzmann Method

Website: http://kmwww.fjfi.cvut.cz/ddny/

| 2020 | LBM in Kraków 2020, Kraków, Poland
Talk: Boundary layer flow simulations using lattice Boltzmann method above smooth and rough surfaces |
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2020
LBM in Kraków 2020, Kraków, Poland
Talk: Boundary layer flow simulations using lattice Boltzmann method above smooth and rough surfaces

VPH Conference, Paris, France, (online)
Talk: CFD & MRI: Methods & experiments to meet the cardiovascular clinic needs
Website: https://vph2020.sciencesconf.org/

Algoritmy 2020, Vysoke Tatry, Podbanske, Slovakia, (online)
Talk: Lattice Boltzmann simulations of turbulent flow above rough surfaces
Website: http://www.math.sk/alg2020/

Workshop Doktorandské dny 2020 (online)
Talk: Cumulant LBM simulations of turbulent boundary layer flow above rough surfaces
Website: http://kmwww.fjfi.cvut.cz/ddny/

Workshop on Scientific Computing (online)
Talk: Cumulant LBM simulations of turbulent boundary layer flow above rough surfaces
Website: http://geraldine.fjfi.cvut.cz/wsc2020/

2019
High Performance Computing in Science and Engineering, Soláň, Czech Republic
Talk: A modified immersed boundary-lattice Boltzmann method for incompressible fluid flow in 2D and 3D on GPU
Website: http://hpcse.it4i.cz/HPCSE19/

Workshop on Scientific Computing, Děčín, Czech Republic
Talk: A modified IB-LB method for incompressible fluid flow in 2D and 3D on GPU
Website: http://geraldine.fjfi.cvut.cz/wsc2019/

Programming and Tuning Massively Parallel Systems + Artificial Intelligence summer school 2019
Poster: An improved immersed boundary-LBM for Newtonian incompressible flow in 2D and 3D on GPU
Website: https://pumps.bsc.es/2019/

The 16th International Conference for Mesoscopic Methods in Engineering and Science
Talk: A modified immersed boundary-lattice Boltzmann method for simulating incompressible fluid flow in 2D and 3D on GPU
Website: https://www.icmmes.org/icmmes2019/

Workshop Doktorandské dny 2019
Talk: Boundary Layer Flow Simulations UsingLattice Boltzmann Method
Website: http://kmwww.fjfi.cvut.cz/ddny/

2018
Workshop on Scientific Computing, Děčín, Czech Republic
Talk: Numerical analysis of immersed boundary - lattice Boltzmann method for interaction of fluid flow and elastic body
Website: http://geraldine.fjfi.cvut.cz/wsc2018/

Czech-Japanese Seminar in Applied Mathematics 2018
Talk: Numerical analysis of immersed boundary–lattice Boltzmann method for fluid–structure interaction
Website: https://sites.google.com/site/cjs2018noto/

Workshop Doktorandské dny 2018

Talk: Analysis of Immersed Boundary – LBM for Fluid-Structure Interaction
Website: http://kmwww.fjfi.cvut.cz/ddny/

2017   Workshop on Scientific Computing, Děčín, Czech Republic
Talk: Numerical simulation of the fluid structure interaction based on the
Lattice – Boltzmann method coupled with the Immersed boundary method
Website: http://geraldine.fjfi.cvut.cz/wsc2017/

2016   Workshop on Scientific Computing, Děčín, Czech Republic
Talk: Numerical analysis of the Lattice-Boltzmann method in 2D
Website: http://geraldine.fjfi.cvut.cz/wsc2016/

Invited lectures

30. 9. 2022   Current Problems in Numerical Analysis organized by the Institute of Mathematics
of the Czech Academy of Sciences: *3D turbulent fluid flow simulated by LBM*

Teaching activities

- Exercises
  - ▷ Calculus 1, 2, 3, 4 (10 semesters total)
  - ▷ Mathematics 1, 2 (5 semesters total)
- Seminars
  - ▷ Modern Trends in Corporate Information Technologies (1 semester)
- Lectures
  - ▷ Lattice Boltzmann Method (5 semesters total)
  - ▷ Introduction to computational physics (3 semesters total)
  - ▷ Probability and statistics (1 semesters total)
  - ▷ Web environment (2 semesters total)
  - ▷ Repetition of mathematics (1 semesters total)
- Supervising students
  - ▷ Supervisor of 2 MSc students at FNSPE
  - ▷ Co-supervisor of 3 MSc students at FNSPE
  - ▷ Supervisor of 2 BSc students at FNSPE
  - ▷ Co-supervisor of 4 BSc students at FNSPE

Other activities at FNSPE

- Promotion of the faculty (Open Days, Festival Vědy, Noc vědců, lectures at high schools)
- Assistance with bureaucratic matters (organization of Mathematical Olympiad, enrolment of new students, preparatory week, preparation of new accreditation)

Stays abroad

- July 10-13 2018. Kanazawa Institute of Technology, Kanazawa, Japan.

- June 24-29 2019. PUMPS+AI Summer School 2019, Barcelona, Spain.

- January 18-25 2020. Center for Experimental Study of Subsurface Environmental Processes (CE-SEP), Colorado School of Mines, Golden, Colorado, USA.

- February 7-15 2022. Center for Experimental Study of Subsurface Environmental Processes (CE-SEP), Colorado School of Mines, Golden, Colorado, USA.

- June 6-10 2022. 5th Spring School Lattice Boltzmann Methods with OpenLB Software Lab, Kraków, Poland.

Awards

2018   Award of Nadace Josefa, Marie a Zdeňky Hlávkových for excellent master's thesis

2022   Award of 5th Spring School Lattice Boltzmann Methods with OpenLB Software Lab for best scientific poster

Soft skills

- Communication skills, Teamwork

- Reliability, Self-Discipline, Time management skills

- Critical and analytical thinking, Problem solving skills