Mark Dostalík

mark.dostalik@gmail.com | mark-dostalik.github.io | mark-dostalik | mark-dostalik | Mark Dostalík

Work Experience

MSD Czech Republic *Prague, Czechia*

Data Scientist *Jul. 2022 –*

- Development of software infrastructure for processing spatial transcriptomics image data. Designing novel approaches for their statistical analysis. Image processing, semantic segmentation, hypothesis testing.
- Tools & technologies: Python, PyTorch, AWS, Git, CI/CD (GitHub Actions).

Mathematical Institute of Charles University *Prague, Czechia*

Postdoctoral researcher *Oct. 2021 – Jun. 2022*

- Development of a mathematical model for cell membrane growth using the concepts from continuum mechanics and molecular dynamics. Solving systems of partial differential equations using finite element solvers.
- Tools & technologies: Python, FEniCS, Git.

Spaceknow, Inc. *Prague, Czechia*

Machine Learning Engineer *Nov. 2016 – Sep. 2017*

- Image processing of satellite imagery data. Object detection and instance segmentation via convolutional neural networks. Software development in Python. Running ML pipelines on premises as well as in cloud (Google Cloud Platform).
- Tools & technologies: Python, TensorFlow, Keras, Scikit-learn, Git.

Education

Faculty of Mathematics and Physics, Charles University *Prague, Czechia*

Ph.D. in Mathematical and Computer Modeling *Oct. 2017 – Sep. 2021*

- Stability analysis, Partial Differential Equations, Thermodynamics

Faculty of Mathematics and Physics, Charles University *Prague, Czechia*

M.S. in Mathematical and Computational Modeling in Physics *Oct. 2013 – Jun. 2016*

- Graduated with honors
- Major: Mathematical modeling, Fluid and solid mechanics
- Minors: Partial differential equations, Functional Analysis, Computer Simulations

Faculty of Mathematics and Physics, Charles University *Prague, Czechia*

B.S. in General Physics *Oct. 2010 – Jun. 2013*

- Major: Mathematical modeling, Fluid mechanics
- Minors: Mathematics, Physics

Computer Skills

Python

- Procedural and object-oriented programming, basics of functional programming
- Data science packages: Numpy, Scipy, Pandas, Scikit-learn, Matplotlib, Plotly
- Computer vision frameworks: TensorFlow, PyTorch, Keras, OpenCV

Git, GitHub Actions, AWS, Bash

Languages

English

Full professional proficiency

Czech

Native proficiency

French

Elementary proficiency

Publications

Journals

- Allolio C., Fábián B., Dostalík M.: OrganL: Dynamic Triangulation of Biomembranes using Curved Elements. *Biophys. J.*, 2024
- Boyaval S., Dostalík M.: Non-isothermal viscoelastic flows with conservation laws and relaxation, *J. Hyperbolic Differ. Equ.*, 2022
- Dostalík M., Průša V.: Non-linear stability and non-equilibrium thermodynamics—there and back again. *J. Non-equil. Thermody.*, 2022
- Dostalík M., Matyska C., Průša V.: Weakly nonlinear analysis of Rayleigh–Bénard convection problem in extended Boussinesq approximation. *Appl. Math. Comput.*, 408:126374, 2021
- Dostalík M., Průša V., Rajagopal K. R.: Unconditional finite amplitude stability of a fluid in a mechanically isolated vessel with spatially non-uniform wall temperature. *Contin. Mech. Thermodyn.*, 33:515–543, 2021
- Dostalík M., Průša V., Stein J.: Unconditional finite amplitude stability of a viscoelastic fluid in a mechanically isolated vessel with spatially non-uniform wall temperature. *Math. Comput. Simulat.*, 189:5–20, 2021
- Dostalík M., Málek J., Průša V., Süli E.: A simple construction of a thermodynamically consistent mathematical model for non-isothermal flows of dilute compressible polymeric fluids. *Fluids*, 5(3):133, 2020
- Dostalík M., Průša V., Tůma K.: Finite amplitude stability of internal steady flows of the Giesekus viscoelastic rate-type fluid. *Entropy.*, 21(12), 2019

Proceedings

- Dostalík M., Průša V., Skřivan T.: On diffusive variants of some classical viscoelastic rate-type models. *AIP Conference Proceedings*, 2107(1):020002, 2019

Scientific projects

Charles University Grant Agency project

Prague, Czechia

Principal investigator

Jan. 2019 – Sep. 2021

- Analysis of mathematical models of viscoelastic fluids with stress diffusion.
- Successfully fulfilled objectives of the project with 4 published results.

Scientific activities

Research stay at Laboratoire d'hydraulique Saint–Venant

Paris, France

Visiting researcher

Sep. 2020 – Dec. 2020

- Worked on mathematical modeling of flows of non-isothermal viscoelastic fluids.

International conferences

Oral presenter

- European Congress of Mathematics, Portorož, Slovenia (Jun. 2021)
- Multiscale Models for Complex Fluids: Modeling and Analysis, Banff, Canada (Nov. 2020)
- Bifurcations and Instabilities in Fluid Dynamics, Limerick, Ireland (Jul. 2019)
- Equadiff, Leiden, Netherlands (Jul. 2019)
- European Fluid Mechanics Conference, Vienna, Austria (Sep. 2018)

Honors & Awards

2016 **Winner,** 17th SVOČ competition: Applied Mathematics – mathematical modeling of dynamical systems *Brno, Czechia*

Extracurricular Activity

SIAM Student Chapter Prague

Prague, Czechia

Vice President in 2018, 2019 & President in 2020

Jul. 2018 – Jun. 2021

- Acted as a core member in a student association of applied mathematicians.
- Organized student seminars, workshops, and several talks of top-tier scientists.

Undergraduate courses of calculus

Prague, Czechia

Teacher

Oct. 2019 – Jun. 2020

- Taught 1st year undergraduate students of General Physics at Charles University.
- Homework and exams created for the course are available at https://github.com/mark-dostalik/teaching