

Nečas Center for Mathematical Modeling



Institution formed by permanent employees and visiting researchers of three institutions:



School of Mathematics
Faculty of Mathematics and Physics
Charles University in Prague



Mathematical Institute
Academy of Sciences of the Czech Republic



Mathematical Modeling Group
Faculty of Nuclear Sciences and Physical Engineering
Czech Technical University Prague

5 years project financed by the Ministry of education, youth and sports



Permanent researchers

Mathematical Institute of Charles University

HROŇ Jaroslav

- **RESEARCH INTERESTS**
 partial differential equations, equations of continuum physics, fluid-structure interaction

MÁLEK Josef

- **RESEARCH INTERESTS**
 partial differential equations, equations of continuum physics

POKORNÝ Milan

- **RESEARCH INTERESTS**
 Navier-Stokes equations, partial differential equations

ROUBÍČEK Tomáš

- **RESEARCH INTERESTS**
 Nonlinear partial differential equations, optimal control, models of continuum mechanics, calculus of variations

Department of Numerical Mathematics

DOLEJŠÍ Vit

- **RESEARCH INTERESTS**
 Finite element and finite volume methods, scientific computing, compressible fluid flow

FEISTAUER Miloslav

- **RESEARCH INTERESTS**
 Numerical methods for PDE's, finite element methods, discontinuous Galerkin method, finite volume method, numerical methods for the simulation of compressible flows

FELCMAN Jiří

- **RESEARCH INTERESTS**
 Numerical methods for the simulation of compressible flows

HASLINGER Jaroslav

- **RESEARCH INTERESTS**
 Shape optimization, contact problems, finite element methods, variational inequalities

JANOVSKÝ Vladimír

- **RESEARCH INTERESTS**
 Bifurcation theory, numerical methods, partial differential equations, viscoelasticity

KNOBLOCH Petr

- **RESEARCH INTERESTS**
 Finite element method, stabilization techniques, convection-diffusion equations, fluid-structure interaction

Department of Mathematical Analysis

BÁRTA Tomáš

- **RESEARCH INTERESTS**
 Integro-differential partial differential equations

KAPLICKÝ Petr

- **RESEARCH INTERESTS**
 Regularity of nonlinear partial differential equations

MALÝ Jan

- **RESEARCH INTERESTS**
 Real analysis, calculus of variations, functional analysis, partial differential equations, measure theory

PICK Luboš

- **RESEARCH INTERESTS**
 Function spaces, interpolation theory

PRAŽÁK Dalibor

- **RESEARCH INTERESTS**
 Dynamical systems, long-time behavior, differential equations



Researchers presently visiting NCMM

Senior researchers

KRÖNER Dietmar

- **RESEARCH INTERESTS**

Numerics for partial differential equations, particularly conservation equations, numerical fluid mechanics, free boundary value problems, scientific computing

QUITTNER Pavol

- **RESEARCH INTERESTS**

elliptic and parabolic equations and systems, qualitative theory

Junior researchers

BULÍČEK Miroslav

- **RESEARCH INTERESTS**

Partial differential equations; incompressible fluids with temperature, pressure and shear-rate dependent viscosity; long-time behavior of flows of incompressible non-Newtonian fluids; relation between weak and Lagrangian formulation

CONSIGLIERI Luisa

- **RESEARCH INTERESTS**

existence, uniqueness and regularity of solutions, fluid mechanics, heat transfer, electromagnetism, biomechanics, and applications to biomedical problems

ETTWEIN Frank

- **RESEARCH INTERESTS**

Nonlinear partial differential equations in fluid mechanics, existence, regularity and long-time behavior

HNĚTYNKOVÁ Iveta

- **RESEARCH INTERESTS**

Solving systems of linear algebraic equations $Ax=b$ with a large, sparse, nonsingular matrix and linear approximation problems $Ax \sim b$, especially ill-posed problems, by using iterative Krylov subspace methods.

STEINHAUER Mark

- **RESEARCH INTERESTS**

Partial Differential Equations, Calculus of Variations, Function spaces

WOLF Jörg

- **RESEARCH INTERESTS**

Newtonian and non-Newtonian fluid dynamics: Existence and regularity of weak solutions



School of Mathematics

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Nečas

Center for

Mathematical Modeling



____ Ph.D. students

KOUTNÝ Jan

● RESEARCH INTERESTS

nonlinear partial differential equations, calculus of variations, numerical methods for materials with microstructure

KREML Ondrej

● RESEARCH INTERESTS

partial differential equations, Navier-Stokes equations, equations of motion of non-newtonian fluids

KUČERA Vaclav

- RESEARCH INTERESTS Numerical solution of the compressible Euler and Navier-Stokes equations, currently with the discontinuous Galerkin method. Problematic regimes thereof (small Mach numbers, High Reynolds numbers)

MÁDLÍK Martin

● RESEARCH INTERESTS

Numerical solution of fluid-structure interaction with application in bio materials

POŠTA Miroslav

● RESEARCH INTERESTS

elliptic and parabolic PDEs, regularity of solutions, optimal control, fluid mechanics

PROCHÁZKA Antonin

● RESEARCH INTERESTS

Geometry of Banach spaces, Fixed point theory, Operator theory, Spectral theory

PRŮŠA Vít

● RESEARCH INTERESTS

fluid mechanics with a special attention to the stability of fluid flows; partial differential equations

STEBEL Jan

● RESEARCH INTERESTS

partial differential equations, fluid mechanics, shape optimization, finite elements method

VLASÁK Miloslav

● RESEARCH INTERESTS

Discontinuous Galerkin method

____ Graduate students

CENDULA Peter

● RESEARCH INTERESTS

modeling epitaxial growth of quantum nanostructures, continuum mechanics, numerical methods(FEM,pseudo spectral)

KREML Ondrej

● RESEARCH INTERESTS

partial differential equations, Navier-Stokes equations

PAVLICEK Libor

● RESEARCH INTERESTS

nonsmooth analysis, calculus of variations, PDE

PUSTĚJOVSKÁ Petra

● RESEARCH INTERESTS

Mathematical modeling of joint fluids in human bodies (visco-elastic fluids). Biological and chemical analysis and to create proper mathematical model. To find the analytical (if possible) or numerical solution of created model.

QUITTNEROVÁ Katarina

● RESEARCH INTERESTS

Calculus of variations, functional analysis, partial differential equations

Secretary: **Jana Šťastná**

Network administration: **Oldřich Ulrych**

Web administration: **Stanislava Novotná**



Permanent researchers

FEIREISL Eduard

- **RESEARCH INTERESTS**

Partial differential equations, infinite-dimensional dynamical systems, fluid mechanics

KRBEC Miroslav

- **RESEARCH INTERESTS**

Function spaces, partial differential equations

NEČASOVÁ Šárka

- **RESEARCH INTERESTS**

Partial differential equations, fluid dynamics

NEUSTUPA Jiří

- **RESEARCH INTERESTS**

Partial differential equations, fluid dynamics

PETZELTOVÁ Hana

- **RESEARCH INTERESTS**

Partial differential equations, fluid dynamics

STRAŠKRABA Ivan

- **RESEARCH INTERESTS**

Partial differential equations, fluid mechanics



Researchers presently visiting NCMM

____Junior researchers

NAMLYEYeva Yuliya

- **RESEARCH INTERESTS**

The Dirichlet problem for the Navier-Stokes equations with singular right-hand side is homogenized. Behavior of variational eigenvalues to the Dirichlet problems for nonlinear elliptic equations in perforated domains is studied.

TRIVISA Konstantina

- **RESEARCH INTERESTS**

Hyperbolic Systems of Conservation Laws Models of Compressible Fluids Formulated by the Navier-Stokes Equations Variational Problems and Phase Transition Applications to Materials Science, Fluid Dynamics and Combustion



____ Ph.D. students

BŘEZINA Jan

● **RESEARCH INTERESTS**

Navier-Stokes equations, PDE theory,
thermodynamics; porous media, parallel solvers

CHMELOVÁ Sona

● **RESEARCH INTERESTS**

Navier-Stokes equations Optimal controls

KUKUČKA Peter

● **RESEARCH INTERESTS**

fluid dynamics, partial differential equations,
functional analysis, continuum mechanics,
dynamical systems

POUL Lukáš

● **RESEARCH INTERESTS**

dynamics of viscous compressible and heat-
conducting fluids

____ Graduate students

BELLA Peter

● **RESEARCH INTERESTS**

Navier-Stokes equations



Permanent researchers

BENEŠ Michal

- **RESEARCH INTERESTS**

Free boundary problems arising in phase transitions, reaction-diffusion systems, porous-media flow and transport, turbulent transport in boundary layer, numerical solution of conservation laws, application of degenerate parabolic PDEs in image processing, parallel algorithms in numerical solution of nonlinear evolution PDEs

LISKA Richard

- **RESEARCH INTERESTS**

Applied computer algebra, quantifier elimination, symbolic-numeric interfaces, problem solving environments, finite difference methods for partial differential equations, conservation laws

MIKYŠKA Jiří

- **RESEARCH INTERESTS**

Thermal flow and heat transfer, convection-diffusion problems, method of characteristics



Visiting researchers

____Senior researchers

HOLUB Robert

- **RESEARCH INTERESTS**

Aerosols (radioactive and inert), aerosols in soil air (geoaerosols) and their transport in environment

____Junior researchers

POSTA Severin

- **RESEARCH INTERESTS**

Representations of deformations of Lie algebras, superposition formulas for differential equations, generating functions, construction of integrable models

YAZAKI Shigetoshi

- **RESEARCH INTERESTS**

Mathematical analysis and numerical computations for interfacial motions and free boundary problems, including: (crystalline) curvature flows, crystalline algorithm, CSM, blow-up, Hele-Shaw flow, bubble, crystal growth and so on.



____ Ph.D. students

MINARIK Vojtech

● **RESEARCH INTERESTS**

Mathematical modeling by parabolic differential equations, numerical solution, programming in C, software projects

STRAKA Robert

● **RESEARCH INTERESTS**

Chaos, fractals, dynamical systems, CFD, turbulence phenomenon, evolution equations in biology.

____ Graduate students

BEDNARIK Lubos

● **RESEARCH INTERESTS**

Programming in C/C++, Parallelization, Numerical solution of partial differential equations

KRISTAN Josef

● **RESEARCH INTERESTS**

Continuum mechanics, differential equations, differential geometry

STRACHOTA Pavel

● **RESEARCH INTERESTS**

Visualization methods based on nonlinear partial differential equations in fluid mechanics