Bachelor / Master project topics
in
Evolution Equations arising from Moving Boundary Problems

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The general area for Bachelor or master projects under my supervision is the study of various evolution equations arising from moving boundary problems, e.g. in the mathematical description of fluid flows or biological or physical growth processes. One might think of:

- phase change problems (melting / freezing / evaporation / condensation)
- free boundary flows in porous media
- surface waves
- osmotic swelling of cells
- growth models for cells and tumors

Typical for these problems is an underlying partial differential equation (PDE) or system of PDEs holding (together with appropriate boundary conditions) in a domain that moves in an a priori unknown way.

Techniques to study such problems include:

- transformations to fixed domains
- linearization, and their study by methods from Fourier and Functional analyis
- time -dependent conformal maps in 2D
- functional analytic methods for “abstract" evolution equations

In many cases, including a numerical component in the problem (with combined supervision from the SC chair) would be interesting.

Both on the BSc and MSc level, projects will typically include getting acquainted with the necessary theoretical background as far as this has not been covered by the lectures.

As prerequisites, students should have taken the elective courses on Functional Analysis and PDE’s on the corresponding level.

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