Vienna School of Mathematics

universität wien

Continuous Time Dynamics for Nonsmooth Optimization and Saddle Point Problems (University of Vienna, Supervisor: R.I. Boț)

Nonsmooth optimization has experienced an impressive development during the last decade, driven by its increasingly important role in optimal control of ODEs/PDEs, inverse problems, harmonic analysis, calculus of variations, mathematical finance, real algebraic geometry, etc., as well as by its great relevance for applications in computational science, engineering, and data science. The main topic of this thesis project is related to the study of dynamical systems associated to both nonsmooth optimization and nonsmooth saddle point problems, and of the numerical methods arising from their discretization.

To the topics of interest belong: the formulation of suitable continuous models whose generated trajectories asymptotically approach the set of critical points/saddle points of the objective function, the study of the asymptotic behavior of the trajectories when time goes to infinity and, when relevant, of asymptotic rates of convergence, and the analysis of the stability of the trajectories. Special attention will be paid to the design, analysis and implementation of new numerical algorithms to which such dynamical systems lead via time discretization. The resulting algorithms usually inherit the convergence properties of the dynamical systems they originate from. Their efficiency will be tested in numerical experiments, in particular, in the context of machine learning and neural networks models.

The candidates should have a solid theoretical background in optimization theory, numerical analysis and functional analysis as well as strong computer skills. Applications have to be sent via the Job Center of the University of Vienna at the Reference number 10403. The deadline for application is **March 5, 2020**.