

Seminar of the Chair of Optimization and Control
under prof. Stanisław Migórski
winter semester 2020-2021, Thursday, 10:15-11:45

October 8, 2020

Piotr Bartman, Modeling the dynamics of the size of water droplets in clouds

ABSTRACT: Two key phenomena influencing the evolution of water droplet size in atmospheric clouds are coalescence and condensation/evaporation. They will be presented at the seminar sample numerical simulations of both phenomena made with PySDM software developed at the Jagiellonian University. PySDM features bespoke implementation of solvers enabling simulations which combine ODEs (condensation/evaporation) and Monte-Carlo method (coalescence).

October 15, 2020

Anna Valette, Poincare inequality for subanalytic sets

ABSTRACT: Let Ω be a subanalytic bounded open subset of \mathbb{R}^n , with possibly singular boundary. We will show that given $p \in [1, \infty)$, there is a constant C such that for any $u \in W^{1,p}(\Omega)$ we have

$$\|u - u_\Omega\|_p \leq C \|\nabla u\|_p,$$

where we have set $u_\Omega := \frac{1}{|\Omega|} \int_\Omega u$.

October 22, 2020

Bai Yunru, Well-posedness of variational-hemivariational inequalities with applications: PhD thesis

ABSTRACT: Three classes of various generalized mixed variational-hemivariational inequalities with constraints will be discussed. The first goal is to deliver new results on well-posedness of these classes including existence, uniqueness, regularity, and stability of solutions. The techniques based on fixed-point theorems, elements of convex analysis, and nonsmooth analysis are exploited. The second purpose is to illustrate the applicability of abstract results to certain mathematical models: a static contact model in the theory of nonlinear elasticity, a boundary value problem for an elliptic equation with mixed boundary conditions, a static unilateral frictionless contact model involving the generalized subgradient inclusion, a dynamic frictional contact model with long memory in viscoelasticity, and an evolution semipermeability problem with nonmonotone subdifferential boundary conditions.

November 12, 2020

Anna Ochal, Minimization principles for elliptic hemivariational inequalities

ABSTRACT: We show that for an elliptic variational-hemivariational inequality, under the usual assumptions that guarantee the solution existence and uniqueness, if an additional condition is satisfied, the solution of the variational-hemivariational inequality is also the minimizer of a corresponding energy functional.

A talk is based on the paper of Weimin Han, NARWA 54 (2020) 103-114

November 19, 2020

Anna Ochal, Generalized monotonicity and convexity of non-differentiable functions

ABSTRACT: We show the relationships between different types of convexity of non-differentiable functions and (corresponding) different types of monotonicity of set-valued mappings

The talk is based on the paper of Liya Fan, Sanyang Liu and Shuping Gao, J. Math. Anal. Appl. 279 (2003), 276-289

November 26, 2020

Stanisław Migórski, On some hemivariational inequalities.

ABSTRACT: We provide comments on existence and uniqueness of solution to the elliptic hemivariational inequality without the relaxed monotonicity condition.

December 3, 2020

Anna Kulig, Numerical analysis of a history-dependent variational-hemivariational inequality for a viscoplastic contact problem

The talk will be based on the paper of Xiaoliang Cheng and Xilu Wang.

December 10, 2020

Krzysztof Winowski, Local minimizer type theorems

ABSTRACT: I will tell about new local minimizer type theorems, the stress will be laid on methods how to prove such theorems.

December 17, 2020

Yunru Bai, Optimal control for a class of mixed variational problems

ABSTRACT: The author proved a general convergence result about the mixed variational problem, which shows the continuous dependence of the solution with respect to the data by using arguments of monotonicity, compactness, lower semicontinuity and Mosco convergence.

The talk will be based on the paper of Mircea Sofonea, Andaluza Matei and Yi-bin Xiao.

January 14, 2021

Michał Jureczka, Solving Nonlinear and High-Dimensional Partial Differential Equations via Deep Learning (<https://arxiv.org/abs/1811.08782>)

ABSTRACT: In this work we present a methodology for numerically solving a wide class of partial differential equations (PDEs) and PDE systems using deep neural networks. The PDEs we consider are related to various applications in quantitative finance including option pricing, optimal investment and the study of mean field games and systemic risk. The numerical method is based on the Deep Galerkin Method (DGM) described in Sirignano and Spiliopoulos (2018) with modifications made depending on the application of interest.

January 21, 2021

Leszek Gasiński, Multiplicity of solutions for a degenerate nonlocal problem

ABSTRACT: We consider a nonlinear boundary value problem with degenerate non-local term and a Laplace (or maybe p-Laplace) operator. We prove the multiplicity of positive solutions for the problem, where the number of solutions doubles the number of „positive bumps” of the degenerate term. The solutions are also ordered according to their L^p -norms.