**Seminar of the Chair of Optimization and Control
under prof. Stanislaw Migórski
summer semester 2017-2018, Thursday, 10:15-11:45, room 1177**

March 8, 2018
Leszek Gasiski, Analysis of a dynamic frictional contact problem for hyperviscoelastic material with non-convex energy density

The talk was based on the paper:

Barboteu, L. Gasiski and P. Kalita, Analysis of a dynamic frictional contact problem for hyperviscoelastic material with non-convex energy density, Mathematics and Mechanics of Solids, 2017, 133, DOI: 10.1177/1081286517718604

Abstract: Using the time approximation method we obtain the existence of a weak solution for the dynamic contact problem with damping and a non-convex stored elastic energy function. On the contact boundary we assume the normal compliance law and the generalization of the Coulomb friction law which allows for non-monotone dependence of the friction force on the tangential velocity. The existence result is accompanied by two numerical examples, one of them showing lack of uniqueness for the numerical solution.

March 15, 2018
Krzysztof Winowski, Eigenvalue problems for the p-Laplacian, part 1

The talk was based on the paper:

An, Le, Eigenvalue problems for the p-Laplacian, Nonlinear Analysis 64 (2006) 1057-1099.

Abstract: We study nonlinear eigenvalue problems for the p-Laplace operator subject to different kinds of boundary conditions on a bounded domain. Using the LjusternikSchnirelman principle, we show the existence of a nondecreasing sequence of nonnegative eigenvalues. We prove the simplicity and isolation of the principal eigenvalue and give a characterization for the second eigenvalue.

March 22, 2018
Bai Yunru, Eigenvalue problems for the p-Laplacian, part 2

The talk was based on the paper:

An, Le, Eigenvalue problems for the p-Laplacian, Nonlinear Analysis 64 (2006) 1057-1099.

April 5, 2018

Biao Zeng, Identification in Variational and Quasi-Variational Inequalities

The talk based on the article:

J. Gwinner, B. Jadamba, A. A. Khan, M. Sama, Identification in Variational and Quasi-Variational Inequalities, Journal of Convex Analysis Volume 25 (2018), No. 2

Abstract: Our objective is to investigate the inverse problem of identifying variable parameters in certain variational and quasi-variational inequalities. To this end we extend a trilinear form based optimization framework that has been used quite effectively for parameter identification in variational equations emerging from partial differential equations. An abstract nonsmooth regularization approach is developed that encompasses the total variation regularization and permits the identification of discontinuous parameters. We investigate the inverse problem in an optimization setting using the output least-squares formulation. We give existence and convergence results for the optimization problem. We also penalize the variational inequality and arrive at an optimization problem for which the constraint variational inequality is replaced by the penalized equation. For this case, the smoothness of the parameter-to-solution map is studied and convergence analysis and optimality conditions are given. We also discretize the identification problem for quasi-variational inequalities and give the convergence analysis for the discrete problems. Examples are given to justify the theoretical framework.

April 12, 2018

Krzysztof Bartosz, Theoretical aspects of Finite Element Method

Abtract: I will tell about basic concept of a powerful and challenging numerical method, i.e. Finite Element Method (FEM). In particular I will present classical results concerning approximation of Sobolev space by means of the finite element space. Next I will discuss its application to the error estimates between the exact solution of particular contact mechanics problem and its finite element approximation. The talk will be mostly based on the books:

1. P. G. Ciarlet, The finite element method for elliptic problems, North-Holland, Amsterdam, 1978.
2. W. Han and M. Sofonea, Quasistatic Contact Problems in Viscoelasticity and Viscoplasticity, American Mathematical Society, Providence, RI–Intl. Press, Sommerville, MA, 2002.

April 19, 2018

Krzysztof Byrski, Cross Entropy Clustering for closed curves and its generalisation to higer dimensional manifolds

Abstract: In my speech I will introduce the concept of the Cross Entropy Clustering for closed curves being the result of my current cooperation with Dr Przemysław

Spurek and Prof. Jacek Tabor. After a brief reminder of the classical Cross Entropy Clustering theory being the foundation of our new method, I will discuss the proposed notion of generalisation of the Gaussian distribution family to the closed curves and finally the higher dimensional closed manifolds embedded in $\mathbb{R}^n$. In the subsequent part of my presentation, I will present the algorithm, which estimates the parameters of the newly introduced model, that optimally approximate the scattering of the arbitrary input data set and consequently partitions the data into the set of disjoint arbitrary dimensional manifolds embedden in $\mathbb{R}^n$

April 26, 2018
Andrii Krutsylo, Dmytro Panchyshyn, Differential games

Abtract: We introduce a model for two-person, zero-sum differential game. The basic idea is that two players control the dynamics of some evolving system, and one tries to maximize, the other to minimize, a payoff functional that depends upon the trajectory.

May 9 - 30, 2018
Mircea Sofonea, Variational inequalities: methods, results and novel applications

The course: Variantional inequalities: methods, results and novel applications, was held on May 9-30, 2018 at the Department of Optimization and Control Theory. Lectures were led by prof. Mircea Sofonea, world-renowned specialist in the field of applications of mathematics in the modeling of mechanical phenomena.

May 10, 2018
Joao Rodrigues Santos Junior Positive solutions for Kirchhoff problems with vanishing nonlocal term

Abstract: In this talk we study a stationary Kirchhoff problem in a bounded domain, allowing the nonlocal term to vanish in many different points. Under an appropriated area condition, by using a priori estimates, truncation techniques and variational methods, we prove a multiplicity result of positive solutions which are ordered in the $H_0^1(\Omega)$-norm.

June 7, 2018
1. Yunru Bai, Nonlinear nonhomogeneous Robin problems with dependence on the gradient
2. Michał Jureczka, On some contact problems with wear - numerical analysis and computational simulations

All talks were general tests before the speakers' presentations at the ETAMM2018 conference.

June 14, 2018
1. Krzysztof Byrski, Cross Entropy Clustering for closed curves and its generalisa-

tion to higer dimensional manifolds, part 2

2. Edoardo Sciubba, SAT problems on graphs: from belief propagation to backtracking survey propagation

Abstract: This talk is focused on Boolean satisfiability problems. In particular about their modeling on factor graphs and how this brought to the idea of message passing alghorithms. BP, belief propagation (or bethe-peierls) is taken into consideration first, even with its limitation on being exact only for treelike structures. To overcome this limitation ideas from the cavity method are implemented to lead to more recent and useful alghorithms, from survey propagation to the backtracking survey propagation.

For the speech these references will be used:

1. Marc Mzard and Andrea Montanari, Information, Physics, and Computation, Oxford University press, 2009
2. A. Braunstein, M. Mezard, R. Zecchina, Survey propagation: an algorithm for satisfiability, Random Structures and Algorithms 27, 201-226 (2005)
3. Raffaele Marino, Giorgio Parisi, Federico Ricci-Tersenghi The backtracking survey propagation algorithm for solving random K-SAT problems Nature Communications 7, 12996 (2016)