Dear colleagues and students,

continuous optimization models are important in context of physical models in all engineering sciences. In continuous optimization, as its name suggests, both the objective and the constraints are typically real valued functions.

The field has been introduced and studied by many mathematicians since Euler, Newton, Lagrange and others. Due to its attractivity and essential role in modeling real-world scenarios, there have been substantial practically relevant developments in convex and non-convex as well as smooth and non-smooth optimzation settings.

In this workshop, three internationally recognized and leading scientists will introduce to state-of-the art theory and techniques from different areas of continuous optimization and discuss recent advances as well as research challenges. Besides theoretical developments, various application such as image processing, treatment Planning or machine learning will be presented.

Scientific Coordination

Assoc. Prof. Aviv Gibali
Braude College, Karmiel (IL)

Prof. Karl-Heinz Küfer
Fraunhofer ITWM, University of Kaiserslautern (DE)

Contact (Organization)

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Participation

Everybody interested in the subjects is cordially invited to the lectures. Registration is not required. Admission free.

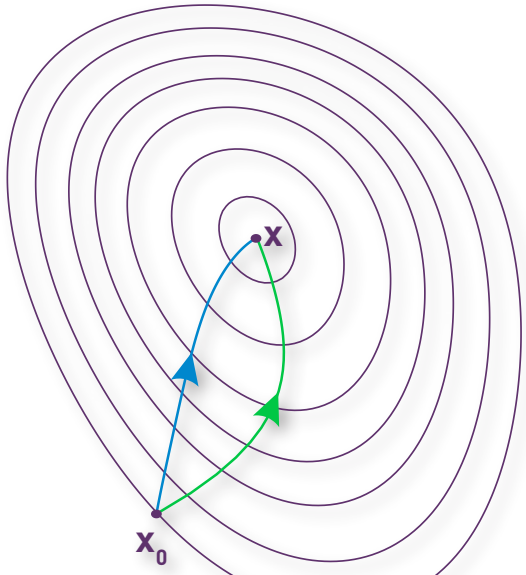
Video conference via zoom

The event takes place in the form of a video conference with zoom. You will receive the **zoom access data** a few days before the event **by e-mail via** your **in-house distribution list.**

www.felix-klein-zentrum.de

www.leistungszentrum-simulation-software.de/coop

HIGH PERFORMANCE CENTER
SIMULATION AND SOFTWARE-BASED INNOVATION



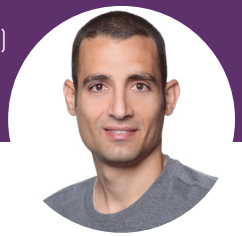
Felix Klein Academy – Online Autumn Workshop

Continuous Optimization

September 16th – 18th, 2020
9:00 h – 11:50 h daily via zoom

FELIX KLEIN
ZENTRUM FÜR
MATHEMATIK

Assoc. Prof. Aviv Gibali
ORT Braude College, Karmiel (IL)



Wednesday, September 16th, 9:00 – 11:50 h
Video conference via zoom*
(Breaks from 9:50 – 10:00 h and 10:50 – 11:00 h)

LINEAR INEQUALITIES, PROJECTION METHODS AND THE CONVEX FEASIBILITY PROBLEM

Linear inequalities appear naturally in many real-world scenarios. The problem has a geometric interpretation of finding a point in the intersection of half spaces defining by these inequalities.

We will discuss a special class of iterative methods that use different kinds of projections to solve this and more general the so-called convex feasibility problem

Aviv Gibali is an Associate Professor and the head of the mathematical department at ORT Braude College, Israel. He specialized in projection methods for feasibility problems and applications such as: IMRT, image processing and more.

Assoc. Prof. Shoham Sabach
The Technion, Haifa (IL)

Thursday, September 17th, 9:00 – 11:50 h
Video conference via zoom*
(Breaks from 9:50 – 10:00 h and 10:50 – 11:00 h)

FIRST ORDER OPTIMIZATION METHODS

This talk will have an algorithmic focus describing recent advances in the theory, design and analysis of First Order Methods (FOM) for specific classes of convex and non-convex optimization problems. The talk is intended to equip the students with a preliminary knowledge on FOM and some of the modern trends.

The talk will discuss the theory necessary to describe and understand fundamental properties of numerous algorithms for high dimensional problems arising in a broad diversity of applied areas, highlighting the ways in which problem structures and data information can be exploited to devise simple and efficient numerical methods.

Shoham Sabach is an Associate Professor at The Faculty of Industrial Engineering and Management, The Technion, Israel. His research topics include: continuous, large scale (non-)smooth and (non-)convex optimization with applications.

Assoc. Prof. Pontus Giselsson
Lund University, Lund (SE)

Friday, September 18th, 9:00 – 11:50 h
Video conference via zoom*
(Breaks from 9:50 – 10:00 h and 10:50 – 11:00 h)

STOCHASTIC GRADIENT DESCENT

Problems with finite sum structure, such as many training problems in machine learning, are often solved using stochastic gradient descent. Finite sum structure means that the objective to be minimized is a sum of many functions, e.g., one for each training example in machine learning. Stochastic gradient descent picks one of the summands at random and performs a gradient step w.r.t. that function.

In this lecture, we will analyze the stochastic gradient descent method in non-convex and convex settings and show its sublinear convergence. We will base the analysis on a general framework for showing sublinear convergence using Lyapunov inequalities. We will also discuss common variations of stochastic gradient descent such as AdaGrad and Adam.

Pontus Giselsson is an Associate Professor at the Department of Automatic Control, Lund University, Sweden. His main research interest is optimization and its wide range of applications.

*You will receive the **zoom access data** a few days before the event **by e-mail via** your **in-house distribution list.**