Generalized Functions Online Workshop

May 12th, 2022

Book of Abstracts

Elena Cordero, 10:15 - 10:40

Symplectic time-frequency representations and characterization of modulation spaces

We introduce new time-frequency representations via the action of metaplectic operators on a tensor product of two functions. Then we study their properties; in particular, the conditions on the symplectic matrix which guarantee the covariant property of the corresponding representation. Finally, we present equivalent norms for modulation spaces by means of symplectic time-frequency representations.

Anita Tomar, 10:40 - 11:05

Application of fixed point techniques in the exploration of fractals

Distinct fixed point iterations perform significant role in the generation of fractals which find applications in numerous real world problems. Aim of this talk is to discuss the development of algorithm for the generation of fractals.

Loc Nguyen, 11:05 - 11:30

Finite mixture model with EM algorithm

Expectation maximization (EM) algorithm is a popular and powerful mathematical method for parameter estimation in case that there exist

both observed data and hidden data. Therefore, EM is appropriate to applications which aim to exploit laten aspects under heterogeneous data. This report focuses on probabilistic finite mixture model which is a popular and successful application of EM, which is fully explained in (Nguyen, Tutorial on EM algorithm, 2020, pp. 78-88). I also proposed a special regression model associated with mixture model in which missing values are acceptable.

Panel discussion (moderated by Elena Cordero): Mathematics in times of crisis - challenges and perspectives

11:45-12:45

Olena Atlasiuk, 14:00 - 14:25

On solvability of one-dimensional boundary-value problems in Sobolev spaces

We investigate the most general class of Fredholm one-dimensional boundary-value problems in the Sobolev spaces. Boundary conditions of these problems may contain derivatives of a higher order than the order of the system of differential equations. It is established that each of these boundary-value problems corresponds to a certain rectangular numerical characteristic matrix with kernel and cokernel having the same dimension as the kernel and cokernel of the boundary-value problem. The conditions for the sequence of characteristic matrices to converge are found.

Hazal Yüksekkaya, 14:25 - 14:50

Blow up of solutions for a hyperbolic-type equation with delay

Controlling the behavior of solutions for partial differential equations with time delay effects has become an active research area. Generally, delay effects occur in many applications and practical problems such as physical, chemical, biological, thermal and economics. In many cases, delay is a source of instability, even an arbitrarily small delay may destabilize a system which is uniformly asymptotically stable in the absence of delay unless additional conditions or control terms have been used. In this paper, we deal with a hyperbolic-type equation with delay. Under suitable conditions, we prove the blow up of solutions.

Anabela Silva, 14:50 - 15:15

Existence and uniqueness results for a fractional differential equation via fixed point techniques

Several studies have shown that fractional operators can describe complex long memory and hereditary properties of many materials and processes, proving to be more practical and realistic than the ones that only consider classical integer-order models. In this work, we discuss the existence and uniqueness of solutions to a fractional differential equation with Caputo derivative and under boundary conditions. The results are obtained by two basic rules, the first rule is the Krasnoselskii's fixed point theorem and the second one is the Banach contraction principle.

Bakhyt Alipova, 16:25 - 16:50

Singular generalized delta-function as the mass force or the heat source in the dynamics of a thermoelastic medium

The dynamics of a thermoelastic medium under the action of concentrated non-stationary heat sources and body forces is considered. It is known that the action of such sources is modeled by the representation of the mass force or the heat source in terms of singular generalized functions. In particular, if the sources are concentrated at a point, then a generalized delta - function is used to describe them.

Jasmina Veta Buralieva, 16:50 - 17:15

Generalized integral transforms and asymptotics

Generalized integral transforms, as one of the powerful tools in mathematical physics, has been elaborated in the last fifty years. Their asymptotic analysis through the asymptotic behavior of distributions is also an important research subject, that took attention on different authors. Obviously, it took our attention too. So, from the generalized asymptotic analysis we give brief summary about quasiasymptotics and S - asymptotics, and some of their properties. But for the integral transform, first we make a short review of known results for already extended integral transforms on distribution spaces and their asymptotics. Then, we provide the results about the extension of the directional short-time Fourier transform and Stockwell transform on the space of distributions. Their asymptotic behavior is illustrated through several Abelian and Tauberian type results.