



Seminario
on-line

Tuesday July 21, 2020 at 17:00

Hosted on: [Zoom](#)

Aleksandar CVETKOVIĆ

Optimizing the Perron Eigenvalue with Applications to Dynamical Systems and Graphs

Prof. Como introduces the seminar.

Abstract

Optimizing spectral radius on a family of non-negative matrices is, in general, very hard problem, since the spectral radius is a neither convex, nor concave function, nor is it Lipschitz. However, on matrix families having a special product (uncertainty) structure, efficient algorithms can be utilized to find the maximal/minimal spectral radius for a given family. Dr Cvetković will present a novel selective greedy algorithm with a quadratic local convergence, which is able to find an optimal solution for non-negative product families of matrices quite fast and can handle very sparse matrices as well. Further, this method will be generalized for the optimization of spectral abscissa on Metzler matrices. These algorithms can then be applied to construct procedures for finding the closest (un)stable non-negative/Metzler matrix, in Schur/Hurwitz sense.

Dr Cvetković will continue on to discuss the applications of the proposed procedures. Some of the most interesting applications are to the dynamical systems and graph theory. Interconnecting the presented methods with the theory of linear switching systems (LSS) and sign-stability of sign-Metzler matrices, he will propose a procedure for constructing an asymptotically stable LSS of any dimension (under an arbitrary switching signal) from an unstable one, while keeping close to its original structure. As for the applications to graph theory, an algorithm for approximating the maximal acyclic subgraph (MAS) will then be shown. Approximating MAS is a well-known NP-hard problem, with many applications (real and virtual social networks, biology, network flows, etc). The presented algorithm is as efficient as those presented in the literature, while offering a completely innovative approach to the problem.

Dr Cvetković also briefly discuss possible further research paths and application of presented algorithms to machine and deep learning, which is currently one of the most attractive research topics.

Biography

Aleksandar Cvetković completed the Master in Applied Mathematics in Physics at Faculty of Mathematics in Niš, Serbia. He then graduated at Gran Sasso Science Institute in L'Aquila, at the department of Applied Mathematics in Social, Life and Natural Sciences. His research interests include optimization and control, numerical analysis, dynamical and switching systems, graph theory, machine and deep learning, mathematics in biology and medicine, operator theory and functional analysis.