

Atlantic Association for Research in the Mathematical Sciences
Memorial University of Newfoundland
Atlantic Algebra Centre

October 1 - 5, 2012

AAC Mini Course

Tropical linear algebra and its applications



Professor Alexander Guterman

Department of Mechanics and Mathematics
Moscow State University, Russia

Professor Alexander Guterman was born in 1975 in Moscow, Russia. He received his Ph.D. (Candidate of Science) degree in 2001 and Habilitation (Doctor of Science) in 2009 from Moscow State University, where he is working as a full professor at the Department of Mechanics and Mathematics. His research interests are mostly in Linear Algebra and its applications. His work has been supported by a number of research grants in Russia and abroad. In 2005, he received a prize of Academia Europaea for young Russian scholars.

Alexander Guterman is a member of Moscow Mathematical Society and International Linear Algebra Society. He delivered invited talks at many international conferences in his research area. He held appointments as a visiting professor at numerous universities including École Polytechnique (Paris),

Stockholm University, University of Lisbon, University College Dublin and University of Manchester. He published more than 60 research papers in well-known professional journals and is a member of the editorial board of the Journal “Fundamental and Applied Mathematics”.

ABSTRACT OF THE MINI COURSE

Tropical algebra (sometimes called max algebra) is the set of real numbers with the additional symbol $-\infty$ and with unusual way to define the operations, namely, the sum of two elements is their maximum, and the product is their sum. Under these operations tropical algebra is an algebraic structure called a semiring. Note that there is no subtraction in this semiring, however the addition and the multiplication are commutative, associative and satisfy the usual distributive laws.

Tropical algebra naturally appears in different applications as an efficient tool to solve problems in optimization theory and algebraic geometry. Tropical arithmetic allows to reduce difficult non-linear problems to the linear problems but over tropical algebra. Therefore, to investigate these problems it is necessary to develop linear algebra in the tropical case.

In fact, tropical linear algebra is nowadays an actively developed research subject with many interesting and deep results. For example, it turns out that there are several approaches to define the notion of linear independence over tropical semirings and there are more than twenty different rank functions over semirings, in particular, over the tropical algebra. Even the determinant function admits several interesting and useful generalizations for tropical matrices.

The main purpose of the course is to describe tropical linear algebra and its various applications. The preference will be given to applications to modern scheduling theory and transport networks. It is planned to discuss the modern progress in the theory including our recent results.

Everybody is invited! A support is available for the full time students of the universities of Atlantic Canada upon the recommendation of the supervisor.

THE LECTURES WILL BE HELD IN HH-3017 ON MONDAY OCTOBER 1, 3 - 4 PM, WEDNESDAY, OCTOBER 3, AT 1 - 2 AND 3 - 4 PM AND FRIDAY OCTOBER 5 AT 3 - 4 PM