Algebra, Topology and Analysis: C and A_∞ algebras.*

Gonio, Batumi, Georgia, August 30 - September 3

	Monday 30
10:00 / 12:00	Registration
12:00	Opening Bakuradze, Purtukhia
12:30 / 13:10	Nadareishvili
13:10 / 13:40	Krutov
13:40	Lunch Break
15:30 / 17:00	Strung
17:00 / 17:20	Coffee Break
17:20 / 18:00	Jacelon

	Tuesday 31
11:00 / 14:00	Excursion, mountain area
15:00 / 18:00	Conference dinner

	Wednesday 1
10:10 11:40	Strung
11:40 11:50	Q&A session, Coffee
12:00 13:30	Kadeishvili
13:30 13:40	Q&A session
14:00	Lunch Break
15:10 15:50	Jacelon
15:50 16:30	Krutov
16:30 16:50	Coffee Break
16:50 17:30	Grizelj
17:30 17:55	Meerboer

	Thursday 2
10:30 12:00	Strung
12:00 12:20	Q&A session, Coffee
12:20 13:40	Kadeishvili
14:00	Lunch Break
15:25 16:05	Ospanov
16:05 16:45	Bokayev
16:45 17:05	Coffee Break
17:05 17:30	Abylayeva
17:30 17:55	Temirkhanova
17:55 18:20	Abekova

	Friday 3
10:10 10:50	Gogatishvili
10:50 11:30	Krutov
11:30 12:10	Taugynbaeva
12:10 12:20	Coffee Break
12:20 12:50	Karlygash
12:50 13:15	Razmadze
14:00	Lunch Break
15:10 16:40	Kadeishvili
16:40 17:00	Q&A session
17:00 17:25	Adamadze
17:30	Closing

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Presentation

This summer school is the third in a series of summer schools within the framework of the international doctoral program in mathematics at Tbilisi State University. It will cover wide topics from Algebra, Topology and Analysis, concentrating on C* and A_∞ algebras, it will mainly address graduate students and postdoctoral researchers.

Organizers

Malkhaz Bakuradze
Tbilisi State University, Georgia

Amiran Gogitishvili
Czech Academy of Sciences, Czech Republic

Ralf Meyer
Georg-August University of Göttingen, Germany

Local Committee

Mikheil Amaglobeli
Tbilisi State University, Georgia

Anzor Beridze
Kutaisi International University, Georgia

Omar Purtukhia
Tbilisi State University, Georgia

Vladimer Baladze
Batumi State University, Georgia

Tengiz Bokelavadze
Akaki Tsereteli State University, Georgia

Ruslan Surmanidze
Tbilisi State University, Georgia

Abstracts of courses

Bhishan Jacelon

Institute of Mathematics of the Czech Academy of Sciences, Prague, Czechia

Concentration of measure

Isoperimetric inequalities imply that, probabilistically, Lipschitz functions on high dimensional geometric structures (such as spheres and cubes) are approximately constant. This phenomenon is known as "concentration of measure". In this brief two-lecture introduction, I will describe these geometric situations and discuss examples related to dynamical systems, in particular, groups of measure preserving automorphisms of Lebesgue space, and Anosov diffeomorphisms like Arnold's cat map.

Tornike Kadeishvili

A. Razmadze Mathematical Institute of Tbilisi State University

A_∞ algebra Structure in Cohomology and its Applications

The main method of algebraic topology is to assign to a topological space certain algebraic object (model) and to study this relatively simple algebraic object instead of complex geometric one. Examples of such models are chain and cochain complexes, homology and homotopy groups, cohomology algebra, etc. The main problem here is to find models that classify spaces up to some equivalence relation, such as homeomorphism, homotopy equivalence, ratio- nal homotopy equivalence (an equivalence relation generate by maps that induce isomorphisms of rational homology), etc.
Usually such models are not complete: the equivalence of models does not guarantee the equivalence of spaces. They can just distinguish spaces. The models which carry richer algebraic structure contain more informa- tion about the space. For example the model "cohomology algebra" allows to distinguish spaces, which can not be distinguished by the model "cohomology groups".
One can not expect the existence of more or less simply complete algebraic models in general case but for the rational homotopy equivalence there are various complete homotopy invariants due to Quillen and Sullivan. The key point here is the existence in the rational case of commutative cochains. Two 1-connected spaces are rationally homotopy equivalent if and only if their commutative cochain algebras are weak equivalent .
But outside of rational case the situation is much more complicated. The ordinary (noncommutative) cochain complex is to poor to determine homotopy type. The structure of differential graded algebra must be enriched with new cochain operations, such as Steenrod operations, which measure the deviation from commutativity. But this structure also is not enough. The further enrichment requires huge structure of cochain operation. The operadic technics is appropriate tool to handle such huge structures. The fi- nal result in this direction is the result of Mandell stating that for some class of topological spaces cochain complex equipped by a structure of algebra over so called E_∞-operad determines homotopy type

Andrey Krutov

Institute of Mathematics of the Czech Academy of Sciences, Prague, Czechia

Introduction to dynamical systems

During the course we will discuss the classical dynamical, systems. In particular, for Hamiltonian dynamical systems will provide, the classical integrability criteria and investigate some topological, properties of their solutions.

Karen Strung

Institute of Mathematics of the Czech Academy of Sciences, Prague, Czechia

Smales spaces and their C*-algebras

Smale spaces are a class of hyperbolic dynamical system defined by Ruelle to model the behaviour of the restriction of a so-called "Axiom A diffeormorphism" to its basic sets. Examples include shifts of finite type, certain tiling spaces, and Anosov diffeormorphisms. From a Smale space we can construct several C*-algebras which capture different aspects of the dynamics. This talk will explore the interactions between Smale spaces and C*-algebras: after introducing Smale spaces, we will see various examples, and then see how to use the dynamics to construct C*-algebras. We will see that properties like simplicity of the C*-algebra coincides to the Smale space being mixing. Time permitting, I will also present further properties of these C*-algebras.

Titles and Abstracts of talks

Azhar Abekova

L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan

On cones of nonincreasing functions generated by generalized fractional maximal functions

Davit Adamadze

Tbilisi State University, Georgia

Some examples of singular extensions of order continuous functionals

In this talk we investigate a boundedness of the Hardy-Littlewood maximal operator in the variable Lebesgue spaces when $p_+ = \infty$. Result obtained here is a generalization of Lerner's theorem.

Nurzhan Bokaev

L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan

On boundedness and compactness of Commutators for singular integrals on Global Morrey-type spaces

Karmen Grizelj

University of Zagreb, Zagreb, Croatia

Harish-Chandra map and primitive invariants

Stein Meereboer

Utrecht University, Utrecht, Netherlands

Crossed products of Banach algebras

George Nadareishvili

Tbilisi State University, Georgia

Approximations of Kasparov categories of noncommutative spaces

This talk will be a very short overview of noncommutative topology. The field being vast, we will concentrate on the theory of abelian approximations of Kasparov categories of noncommutative spaces using relative homological algebra.
If time permits, we will also mention recent results on classification of relevant subcategories and universal coefficient spectral sequences (ongoing joint work with Ralf Meyer, Georg-August University of Göttingen).

Korgan Ospanov

L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan

Maximal Regularity of a System of Second-Order Difference Equations

Konstantine Razmadze

Tbilisi State University, Georgia

Analysis of the multi-modal logics for modal maps

We axiomatize various bi-modal logics arising from maps between Kripke frames or maps between topological spaces. One modality is interpreted using the relational or topological structure, while the other is interpreted using the mapping involved. For some of the axiomatized logics we also prove the finite model property, which implies their decidability.

Bakjan Tuerdebieke

L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan

On products of noncommutative symmetric quasi Banach spaces and applications