XXXVIII International Enlarged Sessions of the Seminar of Ilia Vekua Institute of Applied Mathematics of Ivane Javakhisvili Tbilisi State University
April 22-24, 2024
Tbilisi

PROGRAM

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The peer-reviewed manuscripts will be published. The source tex and the corresponding pdf files of the English version of the talk, prepared using the template (information how to prepare an article, together with a LaTeX template is available for download from http://www.viam.science.tsu.ge /en_ses.htm) and not exceeding four A4-format pages should be uploaded in the system

http://www.viam.science.tsu.ge/userspace/login

before May 31, 2024.

I. Vekua Institute of Applied Mathematics (University str. 11, 0186 Tbilisi, Georgia).

Participating organizations and independent research units

- A. Razmadze Mathematical Institute of I. Javakhishvili Tbilisi State University (Razmadze Institute of TSU)
- A. Tsereteli Kutaisi State University
- European University
- Georgian National University (SEU)
- Georgian Technical University (GTU)
- Gori State University
- I. Javakhishvili Tbilisi State University (TSU)
- Ilia State University
- International Black Sea University
- I. Vekua Institute of Applied Mathematics of I. Javakhishvili Tbilisi State University (Vekua Institute of TSU)
- Kutaisi International University
- Niko Muskhelishvili Institute of Computational Mathematics of the Georgian Technical University (Muskhelishvili Institute of GTU)
- Sokhumi State University
- University of Georgia
- Vladimir Chavchanidze Institute of Cybernetics of the Georgian Technical University (Chavchanidze Institute of GTU)
- St. Andrews Georgian University
- Joint Institute for Nuclear Research, Dubna Moscow region, Russia
- Institut Supérieur de l'Automobile et des Transports, Nevers, France
- Institut Supérieur de Mécanique de Paris, Saint Ouen sur Seine, France
- Salahaddin University, Erbil, Iraq
- Stevens Institute of Technology, Hoboken, USA
- Université de Technologie de Compiègne, ROBERVAL Laboratory, Compiègne, France
- University of Antwerp, Department of Biosciences Engineering, Belgium
- University of Göttingen, Germany
- University of Granada, Granada, Spain
- University of Salerno, Italy

Section of Mathematical Logic and Foundations

Chairs: Alexander Kharazishvili, Roland Omanadze
Co-chair: Archil Kipiani

Monday, April 22
Room № 110 (VIAM)

10:00 - 10:20 Irakli Chitaia, Roland Omanadze (Department of Mathematics, Faculty of Exact and Natural Sciences of TSU)
  Some notes on $Q_{1,N}$-reducibility

10:20 - 10:40 Antonio Di Nola[1], Revaz Grigolia[2], Giacomo Lenci[1]
([1]University of Salerno, Salerno, Italy, [2]TSU)
  Finitely generated free and projective MV(C)-algebras

10:40 - 11:00 Archil Kipiani (Department of Mathematics, Faculty of Exact and Natural Sciences of TSU)
  Partial mono-unary algebras and continuum hypotheses

11:00 - 11:20 Konstantine Razmadze (TSU, University of Göttingen, Germany)
  BI-modal logics of mappings

11:20 - 11:40 Tengiz Tetunashvili (Vekua Institute of TSU, GTU)
  On Mazurkiewicz type sets from the measure-theoretical and Baire property viewpoint

Break 11:40 – 12:10

12:10 - 12:30 Mariam Beriashvili (Vekua Institute of TSU, GTU)
  On topological and measure-theoretical properties of some point sets

12:30 - 12:50 Tamar Kasrashvili (Vekua Institute of TSU, TGU)
  About some finite systems of vectors

12:50 - 13:10 Shalva Beriashvili (Ilia State University)
  On K-semi-regular polyhedra

13:10 - 13:30 Marika Khachidze (TGU)
  On the stability of certain types of sets in commutative groups with respect to surjective homomorphisms of these groups

Section of Applied Logics and Programming

Chair: Matthias Baaz (Austria)
Co-chair: Jemal Antidze, Besik Dundua, Mikheil Rukhaia

Wednesday, April 24
Room № 208 (VIAM)

10:00 - 10:20 Merium Hazem Anwar Labib Bishara (International Black Sea University)
   Probabilistic primitives in logic
10:20 - 10:40 Merihan Hazem Anwar Labib Bishara (International Black Sea University)
   Data representation by inductive logic programming
10:40 - 11:0 Besik Dundua[1,2], Tata Dundua[1], <u>Mikheil Rukhaia</u>[1] ([1]Vekua Institute of TSU, [2]Kutaisi International University)
   About verification techniques of cyber-physical systems
11:00 - 11:20 Lia Kurtanidze[1,2] (SEU)
   The impact of artificial intelligence in the educational process
11:20 - 11:40 Besik Dundua (Kutaisi International University, Vekua Institute of TSU)
   Pattern calculus with fuzzy similarity matching
11:40 – 12:00 Lali Tibua (Vekua Institute of TSU, SEU)
   First-order unranked probabilistic logic

Section of Algebra, Geometry and Number Theory

Chairs: Mikhail Amaghlobeli, George Khimshiashvili, Teimuraz Vepkhvadze, Malkhaz Bakuradze
Co-chair: Ketevan Shavgulidze

Wednesday, April 24
Room № 110(VIAM)

10:00 - 11:20 <u>Mikheil Amaglobeli</u>[1], Alexei Myasnikov[2], Teona Nadiradze[1] ([1]Department of Mathematics of TSU, [2]Stevens Institute of Technology, Hoboken, USA)
Varieties of exponential R-groups

11:20 - 11:40 Teimuraz Vepkhvadze (Department of Mathematics of TSU)
Prime numbers represented by binary forms with odd discriminant

11:40 - 12:00 Ilia Tavkhelidze (Department of Mathematics of TSU)
Geometric figures which appear after SS cutting of the GML bodies in the radial cross section

12:00 - 12:20 Ketevan Shavgulidze (Department of Mathematics of TSU)
The spaces of generalized theta-series with spherical polynomials of second end fourth order

12:20 - 12:40 Gocha Todua (European University)
Structural equations of the tangent space T(T(Vn))

Wednesday, April 24
(Online, using Zoom system, Meeting ID: 857 013 3513
Zoom Meeting: https://bsu-edu-ge.zoom.us/j/8570133513?omn=86366507409)

15:00 - 15:20 Johan Gielis[1], Diego Caratelli[2] ([1]University of Antwerp, Department of Biosciences Engineering, Belgium, [2]Eindhoven University of Technology, Eindhoven, The Netherlands)
A note on applications and extensions of R-functions

15:20 - 15:40 Tamar Mesablishvili (University of Granada, Granada, Spain)
Factorization, semi-direct product and non-abelian cohomology of monoids

Section of Real Analysis

Chairs: Ushangi Goginava, Leri Gogoladze
Co-chair: Ana Danelia, Aleksandre Aplakovi

Monday, April 22
Room № 110 (VIAM)

15:00 - 15:20 Omar Dzagnidze[1], Irma Tsivtsivadze[2] ([1]Razmadze Institute of TSU, [2]Akaki Tsereteli Kutaisi State University)
Schwarz gradients and differentiability for functions of two variables

15:20 - 15:40 Shakro Tetunashvili[1,2], Tengiz Tetunashvili[1,3] ([1]GTU, [2]Razmadze Institute of TSU, [3]Vekua Institute of TSU)
On universal representing functions for certain classes of functions

15:40 - 16:00 Lerry Gogoladze (Department of Mathematics of TSU)
On luzin's problem on the convergence of double functional series to $+\infty$

16:00 - 16:20 Vakhtang. Tsagareishvili[1], Giorgi Tutberidze[2], Giorgi Cagareishvili[3]
([1,3]I. Javakhishvili Tbilisi State University, [2]I. Javakhishvili Tbilisi State University, The University of Georgia)
Unconditional convergence of general Fourier series

16:20 - 16:40 Rusudan Meskhia (Department of Mathematics of TSU)
On some properties of double Fourier trigonometric series with gaps

16:40 - 17:00 Tamaz Karchava[1], Aleksandre Aplakovi[2] ([1]Sokhumi State University, [2]TSU)
A note on higher modulus of continuity and Fourier series

Section of Complex Analysis and Applications

Dedicated to the 100th anniversary of Professor Giorgi Manjavidze

Chair: Grigor Giorgadze
Co-chair: George Akhalaia

Wednesday, April 23
Ilia Vekua Lecture Hall

11:00 - 11:20 Gia Giorgadze (Vekua Institute of TSU)
On global solutions of confluence Heun equation

11:20 - 11:40 Vagner Jikia (Chavchanidze Institute of GTU)
The regular Fourier image of the Coulomb wave function

11:40 - 12:00 Ioseb Machavariani (Muskhelishvili Institute of GTU)
A necessary and sufficient condition for the existence of a singular integral with cauchy kernel

12:00 - 12:20 Gega Gulagashvili (Vekua Institute of TSU)
Computation of the dimension of the deformation space of holomorphic structures of the vector bundles induced from the Fuchsian system

12:20 – 12:40 Giorgi Kakulashvili (Chavchanidze Institute of GTU)
On the generalized modulus of a polygon

12:40 – 13:00 Tamaz Vashakmadze (TSU, Vekua Institute of TSU)
On the application of complex analysis for the essentially nonlinear system of differential equations

13:00 – 13:20 Break

13:20 - 13:40 Giorgi Akhalaia, Gia Giorgadze (Vekua Institute of TSU)
On the research of GiorgiManjavidze in the theory of generalized analytic functions

13:40 - 14:00 Giorgi Makatsaria[1], Nino Manjavidze[2] ([1] Chavchanidze Institute of GTU, [2]Ilia State University)
The rating of generalized analytic functions and some of its applications

14:00 - 14:20 Nino Bregvadze (TSU)
Pontryagin maximum principle for three-level quantum systems

14:20 - 14:40 Mariam Chakhoiantsi (TSU)
On solution space of the Riemann-Hilbert boundary value problem with shift for generalized analytic functions

14:40 - 15:00 Tinatin Chovelidze (TSU)
On monodromy of Lame equation

15:00 - 15:20 Mariam Kazaishvili (TSU)
Global monodromy problem for hypergeometric equations

15:20 - 15:40 Irakli Sikharulidze (TSU)
A generalization of the Dolbeault lemma

15:40 - 16:00 Nugzar Makhaldiani (Joint Institute for Nuclear Research, Russia)
New physics, semi-inclusive distributions and statistical potentials

Section of Ordinary Differential Equations and Optimal Control

Dedicated to the 90th anniversary of Professor Guram Kharatishvili

Chairs: Roman Koplatadze, Tamaz Tadumadze
Co-chair: Tea Shavadze

Friday, April 24
Room № 110 (VIAM)

12:00 - 12:20 Tamaz Tadumadze (Vekua Institute of TSU, Department of Mathematics of TSU)
Guram Kharatishvili-90

12:20 - 12:40 Bezhan Ghvaberidze (Department of Computer Sciences of TSU)
Mathematical models for creating the optimal structure of knowledge verification tests

12:40 - 13:00 Tea Shavadze[1], Ia Ramishvili[2], Nika Gorgodze[3] ([1]Vekua Institute of TSU,[2] Department of Mathematics of GTU, [3]Akaki Tsereteli Kutaisi State University, Department of Mathematics)
On the representation of solution for a class of perturbed controlled neutral functional-differential equation with the continuous initial condition

13:00 - 13:20 Lela Alkhazishvili[1], Medea Iordanishvili[2] ([1]TSU, Department of Computer Sciences, [2]St. Andrew Georgian University, School of Business, Computing and Social Sciences)
The necessary conditions of optimality for the optimization problem of a market relation

13:20 - 13:40 Vladimer Odisharia[1], Zviad Kalichava[2], Nona Janikashvili[3] ([1]Department of Computer Sciences of TSU, [2] Muskhelishvili Institute of GTU, [3]Tbilisi State Medical University)
A nonlinear mathematical model of the course and therapy of rheumatoid arthritis and its realization

13:40 - 14:00 Besarion Andjaparidze[1], Malkhaz Ashordia[2] ([1] Department of Mathematics of TSU, [2]A. Razmadze Mathematical Institute of TSU, Sokhumi State University)
The criterion on the existence of bounded solutions on real axis r of linear systems of ordinary differential equations

13:40 - 14:00 Break

14:20 - 13:40 Akaki Gabelaia (Department of Computational Matematics of GTU)
The problem of forecasting resident real estate price index in Georgia

14:40 - 15:00 Tamaz Tadumadze[1], Phridon Dvalishvili[2], Karzan Berdawood[3] (Department of Mathematics & I. Vekua Institute of Applied Mathematics of TSU, [2]Department of Computer Sciences of TSU, [3]Salahaddin University, Erbil, Iraq)
The representation formula of solution of the perturbed controlled functional differential equation taking into account variation of the initial moment and the continuous initial condition

15:00 - 15:20 Roman Koplatadze (Department of Mathematics of TSU, Vekua Institute of TSU)
On the specific properties of solutions of the first order differential equations with delay argument

Section of Partial Differential Equations

Chairs: Temur Jangveladze, Sergo Kharibegashvili, David Natroshvili
Co-chair: Zurab Kiguradze

Wednesday, April 22
Ilia Vekua Lecture Hall

15:00 - 15:20 Teona Bibilashvili (Faculty of Informatics and Control Systems of GTU)
The boundary value problem for one class of higher-order nonlinear hyperbolic systems

15:20 - 15:40 Mikheil Gagoshidze (Vekua Institute of TSU)
Numerical solution of one multidimensional system of partial differential equations using machine learning

15:40 - 16:00 Irine Sigua[1], Mariam Vardanashvili[2] ([1]Department of mathematics of GTU, [2]Faculty of Informatics and Control Systems of GTU)
Solution of the Cauchy problem in quadratures for one class of strictly hyperbolic equations of high order

16:00 - 16:20 David Natroshvili[1], Maia Mrevlishvili[2], Zurab Tediashvili[3] ([1]Department of mathematics of GTU, [2]School of Technology, Ilia State University)
An alternative potential method for mixed steady state elastic oscillation problems

16:20 - 16:40 Besik Tabatadze (European University)
On machine learning aided numerical solutions for multidimensional systems

16:40 - 17:00 Temur Chilachava, Rusudan Zedashidze (Sokhumi State University)
Mathematical model of detonation shock wave propagation in a nonhomogeneous star

17:00 - 17:20 Teimuraz Chkhikvadze (Department of Mathematics of TSU, Vekua Institute of TSU)
On the semi-discrete scheme correspoding to the fourth-order nonlinear integro-differential equation

17:20 - 17:40 Temur Jangveladze (Vekua Institute of TSU, GTU)
On two multidimensional systems of nonlinear partial differential equations

Section of Probability Theory and Mathematical Statistics

Dedicated to the 60th anniversary of the Nadaraya-Watson formula

Chairs: Elizbar Nadaraia, Omar Purtukhia
Co-chair: Petre Babilua

Monday, April 22
TSU, XI building, the office of prof. Gvanji Mania № 335

11:30 - 11:50 Petre Babilua[1], <u>Elizbar Nadaraya</u>[1,2] ([1]Department of Mathematics of TSU, [2]Vekua Institute of TSU)
On the limit distribution of integral square deviation Between projection type estimators of distribution density in $p \geq 2$ independent samples

11:50 - 12:10 Kartlos Kachiashvili (Faculty of Informatics and Control Systems of GTU, Vekua Institute of TSU, Muskhelishvili Institute of GTU)
Comparison of constrained Bayesian and clssical methods of testing statistical hypotheses in sequential experiments

12:10 - 12:30 Ekaterine Namgalauri[1], Omar Purtukhia[2] ([1]Department of Mathematics of TSU, [2]Department of Mathematics and A. Razmadze Mathematical Institute of TSU)
Cunstructive stochastic integral representation of some path-dependent brownian functional

12:30 - 12:50 <u>Valeri Berikashvili</u>[1,2], Vakhtang Kvaratskhelia[1,3] ([1] Muskhelishvili Institute of GTU, [2]Department of Mathematics of TSU, [3]GTU)
The law of large numbers for weakly correlated random elements in Hilbert spaces

12:50 - 13:10 <u>Zurab Kvatadze</u>[1], Beqnu Parjiani[1] Tsiala Kvatadze[2] ([1]Department of Mathematics of GTU, [2]Black Sea University)
On an application of a sequence with chain dependence

13:10 - 13:30 Zaza Khechinashvili (Department of Mathematics of TSU)
The minimal reverse entropy martingale measure in the trinomial financial model

Break

14:40 - 15:00 Nikoloz Maglaperidze (Georgian American University)
Monte carlo methods for comparing two population means

15:00 - 15:20 <u>Revaz Tevzadze</u>, David Iobashvili (Chavchanidze Institute of GTU)
A size structured model of fish based on a stochastic growth equation

15:20 - 15:40 <u>Tamar Chkonia</u>, Mimoza Tkebuchava (Department of Mathematics of TSU)
The "Z-criteria" of hypothesis testing for exponential statistical structure

15:40 - 16:00 <u>Lela aleksidze</u>, Laura Eliauri (Gori State TeachingUniversity)
The "Z-criteria" of hypothesis testing for the haar statistical structure

16:00 - 16:20 <u>Valeriane Jokhadze</u>[1], Omar Purtukhia[2] ([1]Faculty of Economics and Business of TSU, [2]Department of Mathematics and A. Razmadze Mathematical Institute of TSU)
Navigating the frontier: ai model risk in financial institutions - embracing opportunities amidst challenges

16:20 - 16:40 Valeriane Jokhadze[1], <u>Omar Purtukhia</u>[2] ([1]Faculty of Economics and Business of TSU, [2]Department of Mathematics and A. Razmadze Mathematical Institute of TSU)
Enhancing tail risk measurement: a practical approach to managing model risk of tail risk

Section of Mechanics of Continua

Chairs: George Jaiani
Co-chair: Natalia Chinchaladze

Wednesday, April 24
Ilia Vekua Lecture Hall
(Online, using Zoom system, Meeting Zoom Meeting ID: 543 778 1148, Link: https://bsu-edu-ge.zoom.us/j/5437781148?omn=82250489081)

15:00 - 15:20 Orlando Andrianarison[1], Ayech Benjeddou[2,3] ([1]Institut Supérieur de l'Automobile et des Transports (ISAT), Nevers, France, [2]Institut Supérieur de Mécanique de Paris (ISAE-SUPMECA), Saint Ouen sur Seine, France, [3]Université de Technologie de Compiègne (UTC), ROBERVAL Laboratory, Compiègne, France)
A new hamiltonian semi-analytical approach to vibration analysis of elastic multi-layered composite plates

15:20 - 15:40 Gia Avalishvili[1], Mariam Avalishvili[2] ([1]TSU, [2]University of Georgia)
Construction and investigation of non-classical one-dimensional models of thermoelastic bars with three phase-lags

15:40 - 16:00 George Jaiani (Vekua Institute of TSU, Department of Mathematics of TSU)
On well-posedness of IBVPS for cusped prismatic shells with thikness depending on time

16:00 - 16:20 Natalia Chinchaladze (Vekua Institute of TSU, Department of Mathematics of TSU)
Some dynamical problems for cusped prismatic shells with the thickness depending on time

16:20 - 16:40 Guranda Charkseliani[2], Bakur Gulua[1,2] ([1]Vekua Institute of TSU, [2]Sokhumi State University)
Boundary value problems of the coupled theory of plane elasticity for an infinite area with a circular hole with double-porosity

16:40 - 17:00 Natela Zirakashvili (Vekua Institute of TSU)
Studies of electrical conduction processes in blood vessels using cable theory

17:00 - 17:10

17:10 - 17:30 Varden Tsutskiridze (Department of Mathematics of GTU)
The conducting liquid flow between porous walls with heat transfer

17:30 - 17:50 Guliko Asratashvili (Sokhumi State University)
Some boundary problems for the circle with quadruple porosity

17:50 - 18:10 Lia Mumladze (Sokhumi State University)
Some plane problems for the coupled linear theory of elasticity for porous materials

18:10 - 18:30 Giorgi Kapanadze (Vekua Institute of TSU, Razmadze Institute of TSU)
Problem of the plane theory of viscous elasticity for a triangular area with a circular hole

18:30 - 18:50 Ivane Tsagareli (Vekua Institute of TSU)
Explicit solution of boundary value problems for the elastic circle with triple porosity

18:50 - 19:10 Roman Janjgava (Vekua Institute of TSU)
Some boundary value problems for multi-connected plates with voids

19:10 - 19:30 Round Table

Section of Mathematical Modeling and Numerical Analysis

Chairs: Teimuraz Davitashvili, Jemal Rogava, Tamaz Vashakmadze
Co-chair: Archil Papukashvili

Monday, April 22
Ilia Vekua Lecture Hall

11:30 - 11:50 Giorgi Buzhghulashvili, <u>Tamaz Vashakmadze</u> (TSU I.Vekua Institute of Applied mathematics)
To application of multipoint method

11:50 - 12:10 Temur Chilachava, <u>Gia Kvashilava</u>, George Pochkhua (Sokhumi State University)
Mathematical and computer models of the transformation of the proto-kartvelian population into the svan and georgian-colchian populations

12:10 - 12:30 Jemal Peradze[1], <u>Nikoloz Kachakhidze</u>[2], Archil Papukashvili[3] ([1]TSU, [2]GTU, [3]I. Vekua Institute of Applied Mathematics TSU)
A numerical algorithm and the test results for the nonlinear inhomogeneous kirchhoff string equation

12:30 - 12:50 Jemal Rogava[1], <u>Zurab Vashakidze</u>[2] ([1]Faculty of Exact and Natural Sciences of TSU, Vekua Institute of TSU, [2]Institute of Mathematics, School of Science and Technology, The University of Georgia, Department of Numerical Mathematics and Modelling I Vekua Institute of TSU)
On convergence of a three-layer semi-discrete scheme for the nonlinear dynamic string equation of Kirchhoff-type with time-dependent coefficients

12:50 - 13:10 David Gulua (Georgian Technical University)
Realisation the m -layer semi-discrete schemes for approximation solution   the abstract evolutionary problems

13:10 - 13:30 <u>Khatuna Ebakidze</u> [1,2,3], Oleg Kharshiadze [2,4], Konstantine Kutalia[5] ([1] I.Vekua Institute of Applied Mathematics of TSU, [2] M. Nodia Institute of Geophysics, TSU, [3] Business and Technology University, [4] Physics Department, TSU, [5] International Black Sea Unioversity)
Climate change via solar - terrestrial interactions

13:30 - 13:50 <u>Mamuli Zakradze</u>[1], Zaza Tabagari[1], Manana Mirianashvili[1], Nana Koblishvili[1], Tinatin Davitashvili[2] ([1]Department of Computational Methods, Muskhelishvili Institute of GTU, [2]The Faculty of Exact and Natural Sciences TSU)
On the solution of Dirichlet generalized and classical spatial harmonic problems by the MPS in neighborhood of the considered domain surface

Wednesday, April 24
Ilia Vekua Lecture Hall

11:30 - 11:50 George Bolotashvili (Chavchanidze Institute of GTU)
The class of non-integer vertices for the initial relaxation polytope of the linear order problem

11:50 - 12:10 <u>David Kaladze</u>, Luba Tsamalashvili (Vekua Institute of TSU)
Exact traveling wave solution of the (2+1) – gardner equation

12:10 - 12:30 Nino Khatiashvili (Vekua Institute of TSU)
The 2D Navier-Stokes equations for the incompressible fluids

12:30 - 12:50 <u>Archil Papukashvili</u>[1,2], Giorgi Geladze[1], Meri Sharikadze[1] ([1]Vekua Institute of TSU, [2]School of Science and Technology the University of Georgia)
On the approximate solution of the j. Ball's beam equation in the case of temperature dependence of effective viscosity

12:50 - 13:10 <u>**Teimuraz Davitashvili[1]**</u>**, Dimitri Amilakhvari[2], Giorgi Rukhaia[1]** ([1]Vekua Institute of TSU, [2] M. Nodia Institute of Geophysicsof TSU)

Modeling variations of the buba and tbilisa glaciers against the backdrop of regional climate change