XXXV International Enlarged Sessions of the Seminar of Ilia Vekua Institute of Applied Mathematics of Ivane Javakhisvili Tbilisi State University April 21-23, 2021 Tbilisi



PROGRAM

Organizing Committee

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In the case of co-authors, the speaker's name is underlined.

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, 2021.

Opening of the Seminar will start on April 21, 2021 at 14:00 using Zoom system (ID number: 519 059 4538).

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
- Batumi Shota Rustaveli State University
- Business and Technology University
- Caucasus University
- European School
- Evgeni Kharadze Georgian National Astrophysical Observatory
- Georgian-American University
- Georgian National Academy of Sciences
- 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
- The Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency
- University of Georgia
- Vladimir Chavchanidze Institute of Cybernetics of the Georgian Technical University (Chavchanidze Institute of GTU)
- Johannes Kepler University, Linz, Austria
- Joint Institute for Nuclear Research, Dubna Moscow region, Russia
- Missouri University of Science and Technology, USA
- New York University Abu Dhabi, United Arab Emirates
- Piri Reis University, Istanbul, Turkish
- Sobolev Institute of mathematics, Omsk, Russia
- Stevens Institute of Technology, Hoboken, USA
- United Arab Emirates University, Al-Ain, United Arab Emirates
- University of Münster, Department for Mathematical Logic and Foundational Research Münster, Germany
- University of Nantes, J. Leray Laboratory of Mathematics, Nantes, France

Wednesday, April 21

(Online, using Zoom system, ID number: 519 059 4538)

14:00 - 14:30 Opening

Friday, April 23

(Online, using Zoom system, ID number: 519 059 4538)

17:00 - 17:20 George Jaiani Some comments concerning hierarchical models

17:20 - 17:30 Closing

Section of Mathematical Logic and Foundations

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

Thursday, April 22

(Online, using Zoom system, ID number: 595 452 9647)

- **16:00 16:20** <u>Mriam Beriashvili</u>¹, Ralf Schindler² (¹Vekua Institute of TSU, ²University of Münster, Department for Mathematical Logic and Foundational Research Münster, Germany) *Mazurkiewicz sets with no well-ordering of the reals*
- **16:20 16:40 Roland Omanadze** (Department of Mathematics of TSU) Minimal pairs of *Q*₁-degrees
- **16:40 17:00 Tamar Kasrashvili** (TGU, Vekua Institute of TSU) On some aspects of equidecomposability of elementary figures
- **17:00 17:20** Marika Khachidze, <u>Alexi Kirtadze</u>, Nino Rusiashvili (TGU) Invariant σ -finite measures on Polish linear spaces

Section of Applied Logics and Programming

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

Friday, April 23

(Online, using Zoom system, ID number: 402 402 4002)

10:00 - 10:20	<u>Anriette Bishara</u> ¹ , Mikheil Rukhaia ² (¹ International Black Sea University, Vekua Institute of TSU)
	Unranked Fuzzy Reasoning
10:20 - 10:40	Merihan Bishara (International Black Sea University)
	Implementation of Unranked Fuzzy Logic
10:40 - 11:00	Merium Bishara (International Black Sea University)
	Measuring the Heart Rate of an Individual Using Mobile Devices
11:00 - 11:20	Besik Dundua^{1,2}, Mikheil Rukhaia², Lali Tibua² (¹ Kutaisi International University, ² Vekua Institute of TSU)
	Unranked Probabilistic Logic
11:20 - 11:40	Nino Amiridze ¹ , Besik Dundua ^{2,3} , Temur Kutsia ⁴ , <u>Ana Chutkerashvili</u> ^{1,5} (¹ TSU, ² Kutaisi International University, ³ Vekua Institute of TSU, ⁴ Johannes Kepler University, Linz, Austria, ^{1,5} GTU)
	Some Notes on Georgian Controlled Language
11:40 - 12:00	Oleg Namicheishvili, <u>Zhuzhuna Gogiashvili</u> , Mzia Kiknadze, Guram Acharadze (Faculty of Informatics and Control Systems of GTU)
	On the Long Short-Term Memory in the Recurrent Neural Networks
12:00 - 12:20	Oleg Namicheishvili, Ekaterine Gvaramia, <u>Konstantine Kulijanov</u> , Guram
	Acharadze (Faculty of Informatics and Control Systems of GTU)
	Deconvolutional Neural Networks
12:20 - 12:40	Lia Kurtanidze (SEU)
	Challenges of Distance Learning in School

Section of Number Theory, Algebra and Geometry

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

Thursday, April 22

(online, using Zoom system, ID number: 586 848 9206)

- 15:00 15:20 Mikheil Amaglobelli¹, <u>Alexei Myasnikov</u>², Vladimir Remeslennikov³ (¹TSU, ²Stevens Institute of Technology, Hoboken, USA, ³Sobolev Institute of mathematics, Omsk, Russia) CT₁-groups and algebraic geometry of free 2-nilpotent groups
 15:20 15:40 Time Number of the technology.
- **15:20 15:40 Teimuraz Vepkhvadze** (TSU) On the number of representations of positive integers by the diagonal quadratic forms in nine variables with coefficients that are ones and fours
- **15:40 16:00 Ilia Tavkhelidze** (TSU) Analytic representation of the VV and SV cutting surfaces for generalized Mobius-Listing's bodies
- **16:00 16:20 Tamar Mesablishvili** (Vekua Institute of TSU) On factorization of monoids
- **16:20 16:40** Ahmed Al-Rawashdeh¹, <u>Bachuki Mesablishvili</u>^{1,2} (¹United Arab Emirates University, Al-Ain, United Arab Emirates, ²TSU) *Hilbert's theorem 90 for coalgebra-Galois extensions*

16:40 - 17:00 Ketevan Shavgulidze (TSU) On the upper bounds of the dimensions of some spaces of generalized thetaseries with quadratic forms of five variables

Section of Real Analysis

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

Friday, April 22

(online, using Zoom system)

- **18:00 18:20** <u>Teimuraz Akhobadze</u>, <u>Shalva Zviadadze</u> (Department of Mathematics of TSU) Note on classes of functions of generalized bounded variation
- **18:20 18:40** Larry Gogoladze, Giorgi Cagareishvili (Department of Mathematics of TSU) Unconditional convergence of general Fourier series for Lipschitz class functions
- **18:40 19:00 Anna Danelia** (Department of Mathematics of TSU) On some local properties of the conjugate function and the modulus of smoothness of fractional order
- **19:00 19:20** Givi Nadibaidze (Department of Mathematics of TSU) On the mixed-type $(C, -1 < \alpha < 0, \beta = 0)$ Cesaro summability of double series with respect to block-orthonormal systems
- **19:20 19:40** Sergei Chobanyan¹, <u>Mzevinar Bakuridze²</u>, Vaja Tarieladze¹ (¹Muskhelishvili Institute of GTU, ²Batumi Shota Rustaveli State University) On two definitions of quasi-orthogonality

Section of Complex Analysis and Applications

Chair: Grigor Giorgadze Co-chair: George Akhalaia

Thursday, April 22

(Online, using Zoom system, ID number: 471 734 4156)

- **11:00 11:20** <u>Giorgi Akhalaia</u>¹, Nino Manjavidze², (Vekua Institute of TSU, ²Ilia State University) BVP for the first order elliptic systems in the plane
- **11:20 11:40 Nino Bregvadze** (TSU) On relativistic formulation of Brachistochrone problem
- **11:40 12:00** <u>Grigori Giorgadze</u>¹, Giorgi Khimshiashvili² (Vekua Institute of TSU, ²Ilia State University) Geometry of stable linear deformations of harmonic polynomials
- 12:00 12:20 <u>Lasha Ephremidze¹</u>, Ilya Spitkovsky² (¹Razmadze Institute of TSU, ²New York University Abu Dhabi, United Arab Emirates) On J-spectral factorization of symmetric matrices
- **12:20 12:40 Giorgi Kakulashvili** (TSU) On the algorithm of computation of moduli of quadrilaterals
- **12:40 13:00** <u>Giorgi Makatsaria</u>¹, Lamara Shankishvili² (¹Business and Technology University, ²GTU) On one class of the degenerate system of differential equations

Break

- 14:00 14:20 Nugzar Makhaldiani (Joint Institute for Nuclear Research, Dubna Moscow region, Russia) Space dimension renormdynamics and confining potentials from hadrons to galaxies and periodic structure of universe
- **14:20 14:40 Alexandre Gurchumelia** (TSU, Evgeni Kharadze Georgian National Astrophysical Observatory) Split octonionic representation of SO (4,4) vector and spinors and triality symmetry

14:40 - 15:00 Valerian Jikia (Vekua Institute of TSU) On the integral equations induced from Bers-Carleman-Vekua irregular equations

Section of Ordinary Differential Equations and Optimal Control

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

Thursday, April 22

(Online, using Zoom system, ID number: 628 682 7096)

- 17:00 17:20 Abdeljalil Nachaoui¹, <u>Tea Shavadze</u>² (¹University of Nantes, J. Leray Laboratory of Mathematics, Nantes, France, ²Vekua Institute of TSU)
 On the existence of an optimal element for the neutral optimal problem with discrete delay in controls
- 17:20 17:40 Roman Koplatadze (Department of Mathematics of TSU, Vekua Institute of TSU) About theorems of Xille and Nahary
- **17:40 18:00** <u>Lela Alkhazishvili</u>, Medea Iordanishvili (Department of Computer Sciences of TSU) The linear problem of optimization of delay parameters with the mixed initial condition
- **18:00 18:20 Malkhaz Ashordia** (Razmadze Institute of TSU) On the criterion of the well-posed for the general boundary value problems for the systems of ordinary linear differential equations
- **18:20 18:40** Akaki Gabelaia (Department of Computational Matematics of GTU) *The problem of modifying models for predicting the spread of coronavirus (Covid-19)*
- **18:40 19:00 Tinatin Inashvili** (Department of Mathematics of TSU) *The representation formula of solution for the perturbed controlled differential equation with discrete and distribute delay in controls*
- **19:00 19:20 Bezhan Ghvaberidze** (Department of Computer Sciences of TSU) On genelarized bicriteria assingment problem
- **19:20 19:40 Tamaz Tadumadze** (Department of Mathematics of TSU, Vekua Institute of TSU) Existence theorems of an optimal element for the two-stage variational and optimal problems with discrete delays

Section of Partial Differential Equations

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

Friday, April 23

(Online, using Zoom system)

18:00 - 18:20	Mamuli Zakradze, Murman Kublashvili, Zaza Tabagari (Muskhelishvili Institute of
	GTU)
	On the investigation of an analytical solution of a certain Dirichlet
	generalized harmonic problem
18:20 - 18:40	George Lobzhanidze (Caucasus University)
	On non-classical solutions for some nonlocal Bitsadze-Samarskii boundary
	value problem
18:40 - 19:00	Jemal Rogava ¹ , Mikheil Tsiklauri ² (¹ Department of Numerical Analysis and Computational
	Technologies of TSU, Vekua Institute of TSU, ² Missouri University of Science and Technology,
	USA)
	On the convergence of the symmetrical, semi-discrete scheme for the non-
	linear Charney-Obukhov differential equation
19:00 - 19:20	Irine Sigua ¹ , Mariam Rashoian ² (¹ Department of mathematics of GTU, ² Faculty of
	Informatics and Control Systems of GTU)
	Correctly posed boundary value problems for Maxwell's system of partial
	differential equations
19:20 - 19:40	Temur Jangveladze (Vekua Institute of TSU, GTU)
	On the problem with nonlocal boundary conditions for one nonlinear integro-
	differential equation

Section of Theory of Probability and Mathematical Statistics

Chairs: Elizbar Nadaraia, Omar Purtukhia

Friday, April 23 (Online, using Zoom system, ID number: 330 087 0651)

15:00 - 15:20 <u>Elizbar Nadaraya</u>^{1,2}, Petre Babilua² (¹Vekua Institute of TSU, ² Department of mathematics of TSU)

On the one nonparametric estimator of the Poisson regression function

- 15:20 15:40 Valeri Berikashvili, Sergo Chobanyan, Giorgi Giorgobiani,

 Vakhtang Kvaratskhelia (Muskhelishvili Institute of GTU)

 The law of large numbers for weakly correlated random elements in
 $l_p, 1 \le p < \infty$, spaces
- **15:40 16:00 Kartlos Kachiashvili** (GTU, Vekua Institute of TSU, Muskhelishvili Institute of GTU) Existing approaches and development perspectives for testing statistical hypotheses
- 16:00 16:20 <u>Revaz Tevzadze</u>, Tsotne Kutalia (Georgian-American University, Chavchanidze Institute of GTU)

Utility maximization problem under binomial model uncertainty

16:20 - 16:40 Besik Chikvinidze (Georgian-American University) *Remark on right continuous exponential martingales*

Break

- **17:00 17:20** <u>Badri Mamporia</u>¹, Omar Purtukhia² (¹Muskhelishvili Institute of GTU, ²Department of mathematics of TSU, Razmadze Institute of TSU) On multiple Ito integrals in a Banach space
- **17:20 17:40 Besarion Dochviri,** <u>Zaza Khechinashvili</u> (Department of mathematics of TSU) American option pricing in the multidimensional financial market
- **17:40 18:00 Tristan Buadze**, <u>Vazha Giorgadze</u> (GTU) Some issues on statistical assessment
- **18:00 18:20** <u>Zurab Kvatadze</u>¹, Beqnu Pharjiani¹, Tsiala Kvatadze² (¹Department of mathematics of GTU, ²Georgian Primary Program, European School) An example of a conditionally m-dependent vector sequence
- **18:20 18:40 Aleksandre Tkeshelashvili** (Vekua Institute of TSU) Estimation of solution of first order nonlinear differential equations with random measures parameters
- **18:40 19:00 Zurab Zerakidze** (Gori State University, Faculty of Law and Business) The consistent estimators for Sharlle's statistical structures
- **19:00 19:20** Badri Mamporia¹, Ekaterine Namgalauri², <u>Omar Purtukhia</u>^{2,3}(¹Muskhelishvili Institute of GTU, ²Department of mathematics of TSU, ³Razmadze Institute of TSU) Stochastic integral representation of path-dependent nonsmooth Brownian functionals

Section of Mathematical Modeling and Numerical Analysis

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

Thursday, April 22

(Online, using Zoom system, ID number: 201 249 2642)

- 14:00 14:20 <u>Temur Chilachava</u>, Nato Kakulia (Sokhumi State University) Mathematical modeling of explosive processes in nonhomogeneous gravitating gas bodies
- **14:20 14:40 Jemal Sanikidze, <u>Murman Kublashvili</u>, Manana Mirianashvili** (¹Muskhelishvili Institute of GTU) On the application of direct computational methods to numerical solution of

singular integral equations with the Cauchy kernel

14:40 - 15:00 Ekaterine Gulua (GTU)

Parallelization of the perturbation algorithm for realisation of semi-discrete solution schemes of the evolutionary problem

- **15:00 15:20** <u>David Gulua</u>¹, Jemal Rogava² (¹GTU, ²Department of Numerical Analysis and Computational Technologies of TSU, Vekua Institute of TSU) Splitting of the four-layer semi-discrete schemes of solution the evolutionary equation with variable operator on two-level schemes
- **15:20 15:40** Giorgy Geladze (Vekua Institute of TSU) On one ecological numerical model of the atmoshere
- **15:40 16:00** <u>Teimuraz Davitashvili</u>¹, Lika Megrelidze², Meri Sharikadze¹ (¹Vekua Institute of TSU, ²The Ministry of Environment Protection and Agriculture of Georgia, National Environmental Agency) Modelling of regional climatic extremes based on statistical and dynamical downscaling techniques

Friday, April 23

(online, using Zoom system)

- 12:00 12:20 Tamaz Vashakmadze (Vekua Institute of TSU) On some numerical schemes for the biharmonic operator
- **12:20 12:40 Guram Gabrichidze** (Georgian National Academy of Sciences) Experimental-analytical method based on the general principle of mechanics to study the behavior of existing building during an earthquake
- **12:40 13:00 Malkhaz Ashordia** (Razmadze Institute of TSU) On the criterion of the convergence of the difference schemes for the general boundary value problems for the systems of ordinary linear differential equations
- **13:00 13:20** Nikoloz Kachakhidze¹, Jemal Peradze², Zviad Tsiklauri¹ (¹GTU, ²TSU) On one method for solving of a static beam problem
- **13:20 13:40** <u>Archil Papukashvili</u>¹, Zurab Vashakidze², Meri Sharikadze¹ (¹Vekua Institute of TSU, ²School of Science and Technology, The University of Georgia) An approximate solution of the anti-plane problems of elasticity theory for isotropic composite plane weakened by crack using a method of discrete singularity

13:40 - 14:00 Davit Kaladze¹, Luba Tsamalashvili¹, Dimitri Javrishvili² (¹Vekua Institute of TSU, ²TSU)

On the exact solution of the Zakharov-Kuznetsov type nonlinear partial differential equation

14:00 - 14:20 George Chelidze^{1,2}, Mikheil Nikoleisvili^{1,3}, Vaja Tarieladze¹ (¹Muskhelishvili Institute of GTU, ²Kutaisi International University, Georgian Institute of Public Affairs) On a problem of integer valued optimization

14:20 - 14:40 Nino Khatiashvili (¹Vekua Institute of TSU) On 3D stokes flow in the cylindrical and prismatic pipes

Section of Mechanics of Continua

Chairs: Tengiz Meunargia, George Jaiani Co-chair: Natalia Chinchaladze

Thursday, April 22

(online, using Zoom system, ID number: 519 059 4538)

- **11:40 12:00 Giorgi Kapanadze** (Vekua Institute of TSU, Razmadze Institute of TSU) The punch problem of the viscous half-plane with a friction
- **12:00 12:20** <u>Edison Abramidze</u>, Elene Abramidze (Muskhelishvili Institute of GTU) Numerical analysis of linear deformation of corrugated layered cylindrical shell by surface force and temperature field influence based on distinct theories
- 12:20 12:40 <u>Badri Tsutskiridze</u>¹, Levan Jikidze², Eka Elerdashvili¹ (¹Department of mathematics of GTU, ²Department of engineering mechanics and technical expertise in construction of GTU) On exact solution of one task of magnetic hydrodynamics
- **12:40 13:00 Lamara Bitsadze** (Vekua Institute of TSU) Explicit solution of the Dirichlet type boundary value problem of elasticity for porous spherical layer

Break

14:00 - 14:20	Bakur Gulua ^{1,2} , Tengiz Meunargia ¹ , Roman Janjgava ^{1,3} (¹ Vekua Institute of TSU,
	Sokhumi State University, SEU)
	Some problems for materials with voids
14:20 - 14:40	Natela Zirakashvili (Vekua Institute of TSU)
	Explicit solutions of some boundary value problems for an incompressible
	confocal elliptic ring
14:40 - 15:00	Bachuki Pachulia (GTU)
	The bending problem of infinite anisotropic plate with a circular hole and cuts
15:00 - 15:20	Ivane Tsagareli (Vekua Institute of TSU)
	The main contact problem for an elastic plane with voids
15:20 - 15:40	Tsiala Jamaspishvili, Nugzar Shavlakadze (GTU)
	The contact problem for the piecewise-homogeneous viscoelastic plate with
	inclusion
15:40 - 16:00	Kosta Svanadze (Department of mathematics of A. Tsereteli Kutaisi State University)
	On the solution of the Bitsadze-Samarskii problem for two-dimensional

equation of statics of the theory of elastic mixture by the variation method

Friday, April 23

(Online, using Zoom system, ID number: 519 059 4538)

14:00 - 14:20 <u>Gia Avalishvili¹</u>, Mariam Avalishvili² (¹TSU, ²University of Georgia) One-dimensional models of thermoelastic bars within the framework of Lord Shulman theory

(Online, using Zoom system, ID number: 943 865 4026)

15:00 - 15:20 Yusuf Gulver¹, <u>Tamaz Vashakmadze</u>² (¹Piri Reis University, Istanbul, Turkish, ²Vekua Institute of TSU) On the satisfaction of boundary conditions on face of surfaces for cusped plates

(Online, using Zoom system, ID number: 519 059 4538)

17:00 - 17:20 George Jaiani (Vekua Institute of TSU) Some comments concerning hierarchical models