



Dear Colleagues!

The V. Kupradze Institute of Mathematics at the University of Georgia is pleased to invite you to the Online Tbilisi Analysis & PDE Seminar. The seminar is held bi-weekly on Wednesdays at 20:00 (GMT+4) local time in Tbilisi.

Talk on May 20, 2026

**Speaker:** Professor **Roland Duduchava**, Victor Kupradze Institute of Mathematics, The University of Georgia & A. Razmadze Mathematical Institute, Georgia;

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<https://ug.edu.ge/en/persons/full/9048>

**The title of the lecture: “Convolution equations and BVPs for the Generic Laplacian on Lie groups”**

**Abstract:** Lie group  $\mathbf{G}$  is a manifold where each element has the inverse  $x \circ x^{-1} = e$  and  $e$  is the neutral element (identity). Then on  $\mathbf{G}$  we have a unique invariant Haar Measure  $d\mu_{\mathbf{G}}$ , Fourier transform  $\mathcal{F}_{\mathbf{G}}$  with its inverse  $\mathcal{F}_{\mathbf{G}}^{-1}$  and associated Generic differential operators  $\mathfrak{D}_1, \dots, \mathfrak{D}_n$ , generated by vector fields from the associated Lie algebra. We consider commutative (Abelian) Lie groups, homeomorphic to  $\mathbb{R}^n$  and, therefore, the dual group coincides with  $\mathbb{R}^n$ .

That allows definition of convolution integro-differential equations

$$\begin{aligned} (\mathcal{W}_{\mathbf{G},a}^0 \varphi)(x) := \mathcal{F}_{\mathbf{G}}^{-1} a \mathcal{F}_{\mathbf{G}} \varphi(x) = \sum_{\|\alpha\| \leq m} [c_{\alpha} \mathfrak{D}^{\alpha} \varphi(x) \\ + \int_{\mathbf{G}} k_{\alpha}(x \circ y^{-1}) \mathfrak{D}^{\alpha} \varphi(y) d_{\mathbf{G}} y] = f(x), \quad x \in \mathbf{G} \end{aligned} \quad (1)$$

with the symbols of polynomial growth

$$a(\xi) := \sum_{\|\alpha\| \leq m} [c_{\alpha} (-i\xi)^{\alpha} + (-i\xi)^{\alpha} \mathcal{F}_{\mathbf{G}} k_{\alpha}(\xi)], \quad \xi \in \mathbb{R}^n$$

and of Generic Bessel Potential Spaces  $\mathbb{G}\mathbb{H}_p^s(\mathbf{G}, d_{\mathbf{G}}x)$ .

In this framework we study convolution integro-differential equation (1) in the setting

$$\varphi \in \mathbb{G}\mathbb{H}_p^s(\mathbf{G}, d_{\mathbf{G}}x), \quad f \in \mathbb{G}\mathbb{H}_p^{s-m}(\mathbf{G}, d_{\mathbf{G}}x) \quad (2)$$

and Boundary Value Problems (BVPs) on domains  $\Omega \subset \mathbf{G}$  for the Generic Laplacian:

$$\begin{aligned} \Delta_{\mathbf{G}}(\mathfrak{D})\psi(x) = h(x), \quad \Delta_{\mathbf{G}} := \mathfrak{D}_1^2 + \dots + \mathfrak{D}_n^2 \quad x \in \Omega, \quad \psi \in \mathbb{G}\mathbb{H}_p^s(\mathbf{G}, d_{\mathbf{G}}x), \\ (P(\mathfrak{D})\psi)^+(t) = g(t), \quad t \in \Gamma := \partial\Omega, \quad h \in \mathbb{G}\mathbb{H}_p^{s-2}(\mathbf{G}, d_{\mathbf{G}}x), \quad g \in \mathbb{G}\mathbb{H}_p^{s-r}(\mathbf{G}, d_{\mathbf{G}}x) \end{aligned}$$

where  $A(\mathfrak{D})$  is the operator of order  $r$ -either the Dirichlet or Neumann trace operator on the boundary.

As an example we consider the Lie group  $I = (-1, 1)$ , where the group operation is  $x \circ y = \frac{x+y}{1+xy}$ , neutral element is 0, the inverse to  $x \in I$  is  $-x$ , the Haar measure is  $d\mu_I = \frac{dx}{1-x^2}$  and the generic differential operator is  $(1-x^2) \frac{d}{dx}$ .

**Date:** May 20, 2026

**Time:** 20:00 (GMT+4) local time in Tbilisi;

(Compare to your local time: <https://www.timeanddate.com/worldclock/georgia/tbilisi/>);

## How to join:

The seminar is organized on the **Google Meet** platform. If you are already registered, you do not need to register again. Otherwise, to join the seminar, please send an email to [kim@ug.edu.ge](mailto:kim@ug.edu.ge) or register here:

<https://forms.gle/xfQJ9fg1uqe7CrZw6>.

You will then receive further information.

**WEB of Seminar:** <https://ug.edu.ge/en/tbilisi-analysis-and-pde-seminars>.

- **Video Call Link:** <https://meet.google.com/fes-ughx-mob>
- **Invitation (Calendar) Link:** <https://calendar.app.google/7GxkYetKVZVAEpcz8>

## Organizers:

1. R. Duduchava, Institute of Mathematics, University of Georgia, Tbilisi, Georgia
2. E. Shargorodsky, Department of Mathematics, King's College London, UK
3. A. Meskhi, Kutaisi International University, Kutaisi, Georgia

## Secretary:

M. Tsaava, Institute of Mathematics, University of Georgia, Tbilisi, Georgia

## Technical support:

G. Tutberidze, Institute of Mathematics, University of Georgia, Tbilisi, Georgia  
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## Google Meet Join Information

- **Video Call Link:** <https://meet.google.com/fes-ughx-mob>
- **Invitation (Calendar) Link:** <https://calendar.app.google/7GxkYetKVZVAEpze8>