

NITheCS SEMINAR:

# Symmetries of equations with nonlocal terms

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Friday, 27 October 2023 | 15h00 – 16h00 SAST

**Venue:** in person\* and online

\* Room 1005, Mathematical Sciences & Industrial Psychology Building, Stellenbosch University

## ABSTRACT

Throughout the years, many methods for obtaining particular solutions of differential equations have been developed, whereas for equations with nonlocal terms there are only few methods available. Among them, some methods deal with traveling-wave type solutions, and a number of studies apply the method of separation of variables. One of powerful methods for solving differential equations is the group analysis method [1, 2, 3]. Recently, an approach for applying group analysis to equations with nonlocal terms was developed [4, 5]. It has been shown that the presence of a symmetry in integro-differential equations allows finding an invariant solution. Similar to the theory of partial differential equations, for invariant solutions of equations with nonlocal terms the number of the independent variables is reduced.

The presentation consists of reviewing results obtained by the author with his colleagues related with applications of the group analysis to equations with nonlocal terms such as: integro-differential equations, delay differential equations and stochastic differential equations.

The proposed approach can also be applied for defining a Lie group of equivalence, contact and Lie-Bäcklund transformations for equations with nonlocal terms.

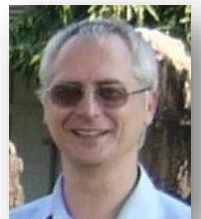
## References

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- [5] Yu. N. Grigoriev, N. H. Ibragimov, V. F. Kovalev, and S. V. Meleshko. Symmetries of integro-differential equations and their applications in mechanics and plasma physics. Lecture Notes in Physics, Vol. 806. Springer, Berlin / Heidelberg, 2010.

## BIOGRAPHY

Sergey V. Meleshko received his MS from Novosibirsk State University and his PhD from the Institute of Hydrodynamics in 1981 under the guidance of Prof Nikolay Yanenko and Prof Vasilii Shapeev. In 1991 he defended his doctor degree "Classification of solutions with degenerate hodograph of the gas dynamic and plasticity equations" at the Institute of Mathematics and Mechanics. He has been a researcher, senior researcher and leading researcher at the Institute of Theoretical and Applied Mechanics since 1979. At the same time he was a professor in Novosibirsk State University, where as of July 1991, he served as the Vice Dean. From 1996 he started working in Suranaree University of Technology, where he has supervised 20 PhD students to date.

His principal research interests include analytical methods for constructing exact solutions of partial differential equations (in particular, method of differential constraints and group analysis of differential equations); symbolic (analytical) computation on a computer; mathematical and numerical modeling. He has co-authored over 200 papers as well as three books (2 published by Springer and one by Nauka (in Russian)) in the area of methods for constructing exact solutions of differential and integro-differential equations.



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