UNIVERSITY OF AVEIRO
Department of Mathematics

Complex and Hypercomplex Analysis

SEMINAR
on
COMPLEX AND HYPERCOMPLEX ANALYSIS

Online, Departamento de Matemática

26/05/2021 & 02/06/2021, 16:00

Spin representations, Fourier transform, and symbol calculus

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In this seminar, we consider representation theory to develop a full symbol calculus of pseudo-differential operators on the group Spin(4) in the sense of Ruzhansky-Turunen-Wirth. The essential tools are the Spin(4)-representations, its matrix coefficients, and the Fourier transform on Spin(4), which is a matrix-valued operator. To give a more comprehensive view of the topic and the research area we divide the seminar into two parts. In the first part, we give an overview of Spin representations and how to construct models of Spin representations in the Clifford algebra setting based on the work of F. Sommen and his co-authors. Then we concentrate on the study of Spin(3) representations, its connection with SU(2), and S^3 representations, being S^3 identified with the unit sphere in the quaternions. We show recurrence relations for the matrix coefficients, establish a differential calculus for left/right invariant differential operators, and a symbol calculus for Spin(3). In the second part of the seminar, we construct the Spin(4) representations in the spaces of simplicial harmonic polynomials and simplicial spinor-valued monogenic polynomials decomposing them as the tensor product of Spin(3)-representations. Using the Kronecker product and the properties of Spin(3) representations we study recurrence relations for the matrix coefficients of Spin(4) representations and establish a differential and symbol calculus for some left/right invariant differential operators. With the Fourier transform on Spin(4) in hand and a family of admissible first-order difference operators chosen we study pseudo-differential operators on the group Spin(4). We obtain results concerning the ellipticity and the global hypoellipticity of pseudo-differential operators in Spin(4), in terms of their matrix-valued full symbols. Several examples of first and second-order globally hypoelliptic differential operators are given, in particular, of operators that are locally not invertible nor hypoelliptic but globally are.

Zoom Link:
https://videoconf-colibri.zoom.us/j/83947134957?pwd=THVJbDkxV3lHQldrNGNOajhnLzladz09

Meeting ID: 839 4713 4957

Password: 958454

This seminar is supported by CIDMA - Center for Research and Development in Mathematics and Applications, and FCT - Fundação para a Ciência e a Tecnologia with references UIDB/04106/2020 and UIDP/04106/2020,.

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