SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Mathematics and Data Science

has the honor to invite you to the public defence of the PhD thesis of

Joel Right Dzokou Talla

to obtain the degree of Doctor of Sciences

Title of the PhD thesis

Drinfeld doubles of coideals and quantization of SL(2,R)

Promotor:
Prof. dr. Kenny De Commer

The defence will take place on

Wednesday, October 30, 2024 at 4 p.m. in building D, room D.2.01 (`promotion room')

The defence can also be followed through a live stream. Send an email to joel.right.dzokou.talla@vub.be to get the link.

Members of the jury

Prof. dr. Ann Nowé (VUB, chair)
Prof. dr. Jan De Beule (VUB, secretary)
Prof. dr. Ana Agore (Institute of Mathematics of the Romanian Academy, RO)
Prof. dr. Pierre Bieliavsky (UCLouvain)

Curriculum vitae

J. R. Dzokou Talla obtained his Master's degree in Mathematical sciences at AIMS-Rwanda (African Institute for Mathematical Sciences) in 2018 and a Double Degree Master at Lappeenranta University of Technology in 2019. In 2020, he started as a PhD student at the department of Mathematics and Data Science at the Vrije Universiteit Brussel. Joel is (co-)author of 2 articles which were published in international journals. Moreover, Joel presented his work in several international events.

Abstract of the PhD research

Quantization refers to the process of constructing a quantum theory from a classical system. For Lie groups, this involves constructing quantum groups, which are non-commutative and non-cocommutative analogues of the classical groups, and which have a deformed algebraic structure. Quantum groups are more specifically deformations of the universal enveloping algebras of Lie algebras. They form part of the theory of Hopf algebras, providing a framework for both the algebraic structure and representation-theoretic structures in a noncommutative setting. One can associate quantum groups with real semisimple Lie algebras. For non-compact semisimple Lie algebras, it was still an open question to find the quantization in such a way that the corresponding quantum groups can be integrated.

The contents of this thesis are as follows. In the first part, we provide a novel framework for the quantization of real semisimple Lie algebras. The price we pay here is that our resulting quantum group, also called Drinfeld double coideal, will no longer be a Hopf algebra, but something a bit weaker called right coideal subalgebra. In contrast to earlier proposals for quantizations of real semisimple Lie algebras, our framework is however much easier to consider the associated integrated version.

In the second part of the thesis, we illustrate the considerations of the first part of the thesis in the rank 1 case of the special linear group of degree 2 over the real numbers. We give a complete classification of all irreducible (admissible) representations of the corresponding quantized enveloping algebra realised as the Drinfeld double coideal generated by the equatorial Podleś sphere and its associated orthogonal coideal. Finally, based on ideas due to Takeuchi, Müller-Schneider and Chirvasitu, we are able to relate the latter construction with the function algebra of the dynamical quantum special unitary group of degree 2, which allows us to relate also their representation theories.

This PhD thesis is based on two articles by Prof. K. De Commer and J. R. Dzokou Talla, and also on a work in preparation by J.R. Dzokou Talla.