SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Mathematics and Data Science

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

Joeri De Ro

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

Equivariant W*-correspondences

Supervisor:
Prof. dr. Kenny De Commer

The defense will take place on

Wednesday, April 23, 2025, at 15h, in VUB Campus Etterbeek, Building D, Room D2.01 ('promotion room').

The defense can also be followed through a live stream. Please send an email to Joeri.Ludo.De.Ro@vub.be to get the link.

Members of the jury

Prof. dr. Eveline Peeters (VUB, chair)
Prof. dr. Ann Dooms (VUB, secretary)
Dr. Jacek Krajczok (VUB)
Prof. dr. Jason Crann (Carleton University, CA)
Prof. dr. Roland Vergnioux (Université de Caen Normandie, FR)

Curriculum vitae

Joeri De Ro obtained his Master's degree in Mathematics at the VUB in 2021. After graduation, he obtained a FWO fellowship 'aspirant fundamental research' and started his doctoral studies at the Research group Mathematics and Data Science at VUB.

The doctoral research resulted in 5 publications in peer-reviewed journals. Additionally, Joeri was involved in teaching exercise classes for several courses.

Abstract of the PhD research

A correspondence over two given von Neumann algebras consists of a Hilbert space endowed with a particular bimodule structure over these von Neumann algebras. The theory of correspondences, pioneered by A. Connes, has led to many breakthroughs in von Neumann algebra theory. It is therefore desirable to extend the notion of a correspondence to the equivariant setting, where the von Neumann algebras are upgraded with actions of a locally compact (quantum) group (= dynamical von Neumann algebras). This leads to a general framework in which questions about locally compact (quantum) groups and their associated dynamical von Neumann algebras can be formulated and solved.

In the first part of the thesis, the notion of an equivariant correspondence is introduced and many natural examples are discussed.

In the second part, we show that the collection of all equivariant correspondences can be endowed with a natural Fell topology, and we use this topology to define the notion of weak containment for equivariant correspondences.

In the third part, the notion of weak containment for equivariant correspondences is used to define natural approximation properties for dynamical von Neumann algebras, and the connections between these properties are investigated.

In the fourth and final part of the thesis, we develop the equivariant Morita theory. Roughly, two dynamical von Neumann algebras are called equivariantly Morita equivalent if there exists a particularly nice equivariant correspondence connecting them. We prove that several approximation properties introduced in the previous part of the thesis are preserved under equivariant Morita equivalence.

The PhD thesis is based on 2 articles written together with Prof. Kenny De Commer and 3 articles written by Joeri De Ro as sole author.