Department Colloquium
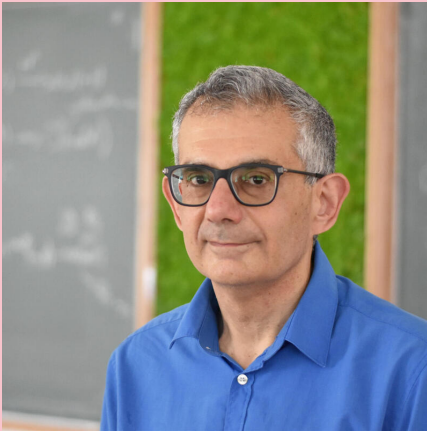## Mathematics and Statistics
York University

Date, Time, and Room

Wednesday September 25, 2024
3:30PM-4:30PM
Ross N638

Speaker

Dr. Ilijas Farah
York University

Title
Coarse geometry and rigidity

Abstract

Coarse geometry is the study of large-scale properties of metric spaces. Roughly, two spaces are coarsely equivalent if their 'large-scale structures' agree. The uniform Roe algebra $C_u^*(X)$ is a norm-closed algebra of bounded linear operators on the Hilbert space $\ell_2(X)$. It is the algebra of all bounded linear operators on $\ell_2(X)$ that can be uniformly approximated by operators of 'finite propagation'. The uniform Roe algebra is a coarse invariant of the space X. It includes $\ell_\infty(X)$ (as the algebra of all operators of zero propagation) and the algebra of compact operators. After introducing the basics of coarse spaces and uniform Roe algebras, we will consider the following questions:

1. If the uniform Roe algebras of X and Y are isomorphic, can we conclude that X and Y are coarsely equivalent?

2. The uniform Roe corona is obtained by modding out the compact operators from $C_u^*(X)$. If the uniform Roe coronas of X and Y are isomorphic, can we conclude that X and Y are coarsely equivalent?

The first question has been resolved, using a rich toolbox that includes even some ideas from mathematical economics (the Shapley-Folkman lemma). The second question has also been resolved, but in an unexpected way: for very concrete spaces X and Y, the answer is independent from ZFC (the standard axiomatization of set theory).

This is a joint work with several groups of coauthors.

Refreshments in Ross N620 at 4:30PM

science | YORK UNIVERSITÉ UNIVERSITY U