

# Seminarium geometrów

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## The functoriality of graph algebras and pushout-to-pullback theorems

Abstract: Given a finite group  $G$  and a field  $k$ , there are two natural ways to construct a Hopf algebra out of it: the group ring  $kG$  and the function algebra  $\text{Map}(G, k)$ . The former gives a covariant functor and the latter yields a contravariant functor. In this spirit, assigning different types of graph algebras to directed graphs leads to both covariant and contravariant functors for each type of graph algebras. Unlike in the case of groups, the difference between the covariant and the contravariant scenarios is only in the way morphisms of graphs induce homomorphisms of algebras, while the objects (graph algebras) are the same. The first aim of this talk is to show optimal assumptions on categories of directed graphs making the constructions of path algebras, Cohn path algebras and Leavitt path algebras covariantly or contravariantly functorial. Our second goal is to explain how to apply the contravariant-functoriality results to obtain optimal pushout-to-pullback theorems, i.e. to unravel when applying contravariant functors to pushouts of graphs produces pullbacks of various graph algebras. Finally, I will hint at applications of all this to the noncommutative topology of graph  $C^*$ -algebras.

(This talk is partially based on joint work with Mariusz Tobolski and Alexander Frei.)

*streaming via ZOOM:*

Meeting ID: 967 6507 7409

Meeting password: "GS" (two letters) followed by the Euler characteristic of the closed orientable surface of genus 89.