UNIWERSYTET
MIKOŁAJA KOPERNIKA
W TORUNIU

Toruń, 30.10.2025

**Name of the doctoral student:** Martyna Górska

## ABSTRACT OF THE DOCTORAL DISSERTATION

**Academic discipline:** Mathematics
**Title of the doctoral dissertation:** Disjointness of Measure-Preserving Automorphisms, Orthogonality of Sequences, and Arithmetic Functions

**Abstract:**
**Chapter 1** presents the motivation for the subject of the dissertation and results from two papers co-authored by the doctoral student.

**Chapter 2** provides background material in the areas of measure theory, ergodic theory, topological dynamics, spectral theory, and multiplicative functions, which are used throughout the work. The following chapters form the core of the dissertation, containing the main research findings.

**Chapter 3** is devoted to results in ergodic theory. The key result for dissertion is so called characterization theorem for elements of the class $\mathrm{Erg}^{\perp}$, also in a version for characteristic classes. It is shown that the class of multipliers of $\mathrm{Erg}^{\perp}$ is trivial (consists only of identity systems). Nevertheless, the class $\mathrm{Erg}^{\perp}$ is closed under taking Cartesian products and we identify a non-empty family of non-identity elements whose all infinite self-joinings remain in $\mathrm{Erg}^{\perp}$.

**Chapter 4** addresses Boshernitzan's problem, interpreted as the characterization of sequences orthogonal to the class of uniquely ergodic systems. We give a description of the elements of the weakly ergodic part of the space $L^2(X, \mu)$ for an automorphism T of the space $(X, \mathfrak{B}, \mu)$. Bounded sequences orthogonal to the class UE of uniquely ergodic systems are characterised. In addition, we show a connection between self-joinings of Furstenberg systems and the combinatorics of quasi-generic points.

**Chapter 5** presents a version of the characterization theorem for characteristic classes, and we describe bounded sequences that are orthogonal to uniquely ergodic systems from a certain characteristic class $\mathcal{F}$.

UNIWERSYTET
MIKOŁAJA KOPERNIKA
W TORUNIU

**The final chapter** contains number-theoretic applications. Equivalent conditions to the averaged Chowla hypothesis are provided, and it is shown that the only pretentious multiplicative functions orthogonal to uniquely ergodic systems are precisely the Archimedean characters.

Martyna Abrla