Math 690

Topics in Analysis

Discrete Operators

Arithmetic Perspectives

Welcome to Math 690! Discrete analogues of operators in harmonic analysis appeared concurrently with the original development of real-variable operators, such as the Hilbert transform and Hardy-Littlewood maximal operator, a century ago. These operators share the feature that the basic theory of their discrete analogues may be understood by either imitating the real-variable method of proof, or by deducing a bound for the discrete operator as a consequence of the real-variable result.

However, for many interesting operators that integrate over a lower-dimensional submanifold, such as Radon transforms, the plot thickens…such simple derivations no longer suffice for their discrete analogues.

Around the turn of the new millennium, Jean Bourgain stimulated a wave of interest in discrete operators when he showed that the "circle method," a technique from analytic number theory, is in fact a natural tool for studying discrete operators. This course explains these beautiful operators, using a blend of ideas from harmonic analysis and number theory.

Prerequisites: real analysis (MAT 631); *or* real analysis (MAT 531) and permission of instructor. No particular background in number theory is assumed.

We hope you will join us
for this new course in spring 2026!

Questions about joining the course? Just ask!

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