Boğaziçi
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Discrete Fractional Integrals through Lattice Point Counting and Diophantine Approximation

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Abstract:

Arkhipov and Oskolkov started the study of discrete fractional integrals with their work on boundedness of certain Fourier multipliers about thirty years ago. Since then the study of these operators, carried out mostly by E. Stein, his students and collaborators, worked out the cases with translation invariant or quasitranslation invariant phase polynomial, exploiting the applicability of the Fourier transform and the Hardy-Littlewood circle method to these cases. In 2018, in joint work with E. Sert, we introduced methods from number theory to study discrete fractional integral operators along binary quadratic forms. More specifically we investigate the distribution of lattice points on conics via classical theory of binary quadratic forms and apply these to discrete fractional integral operators using delicate decompositions. In 2021, in continuation of this work, using further information about distribution of lattice points on conics obtained from sieving, analogous results for the even more general case of bivariate quadratic polynomials were obtained. Also in this latter work, connections to diophantine approximation were established, and new results on certain well-known conjectures on lattice points concentration were obtained. In this talk we will review these developments, together with their historical and mathematical context.

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