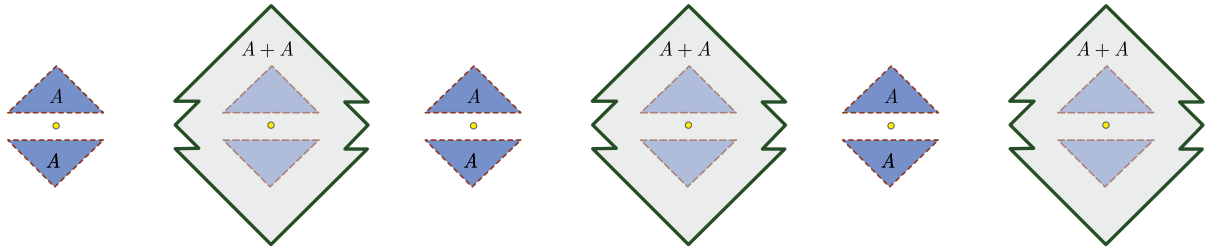
COLLOQUIUM

MATHEMATICS AND STATISTICS

QUEEN'S UNIVERSITY



THE CONVEXIFYING EFFECT OF MINKOWSKI SUMMATION

Abstract.For a compact subset A of $\mathbb{R}^d$, let $A(k)$ be the Minkowski sum of k copies of A, scaled by $1/k$. By a 1969 theorem of Emerson, Folkmann, Greenleaf, Shapley and Starr, $A(k)$ approaches the convex hull of A in Hausdorff distance as k goes to infinity; this fact has important applications in a number of areas including mathematical economics. A few years ago, the speaker conjectured that the volume of $A(k)$ is non-decreasing in k, or in other words, that when the volume deficit between the convex hull of A and $A(k)$ goes to 0, it actually does so monotonically. While this conjecture holds true in dimension 1 (as independently observed by F. Barthe), we show that it fails in dimension 12 or greater. Then we consider whether one can have monotonicity of convergence of when non-convexity is measured in alternate ways. Our main positive result is that Schneider's index of non-convexity of $A(k)$ converges monotonically to 0 as k increases; even the convergence does not seem to have been known before. As a by-product, we also obtain optimal rates of convergence. We also obtain analogous results for the Hausdorff distance to the convex hull, as well as for the inner radius, and demonstrate applications to discrepancy theory. Joint work with Matthieu Fradelizi (Marne-la-Vallée), Arnaud Marsiglietti (CalTech), and Artem Zvavitch (Kent State).

Mokshay Madiman (University of Delaware)

Mokshay Madiman has been an Associate Professor in the Department of Mathematical Sciences at the University of Delaware since January 2013. Dr. Madiman received his Ph.D. degree in applied mathematics from Brown University in 2005. From 2005 to 2012, he worked at the Department of Statistics at Yale University, New Haven, CT, first as a Gibbs Assistant Professor, then as an Assistant Professor, and finally as an Associate Professor of Statistics and Applied Mathematics. From 2014 to 2017, he was also an Adjunct Professor of Mathematics at the Tata Institute of Fundamental Research, Mumbai. He has spent a semester each in visiting positions at the Tata Institute; the Indian Institute of Science, Bangalore; Princeton University; and the Institute for Mathematics and its Applications, Minneapolis. Dr. Madiman's research is primarily in probability and information theory, but also interacts with combinatorics, functional analysis, and statistics.

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