



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Undergraduate Research Seminar

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3:00 - 4:00 p.m.

Zoom

Incidences and projections: discrete and continuous

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Abstract. A number of difficult problems in geometric measure theory stem from discrete geometry results, such as Beck's theorem about the number of lines spanned by a set of points in the plane, and exceptional set estimates in projection theory. These discrete results can be proven relatively directly using the Szemerédi–Trotter theorem, about the number of r -rich lines formed by a set of points. In this talk, we will begin by presenting how the Szemerédi–Trotter theorem implies such results. Then, we will discuss continuum versions of such results, such as the continuum version of Beck's theorem proven by Orponen–Shmerkin–Wang (2022) and Ren (2023), and a recent generalization of this result (a continuum Erdős–Beck theorem by B.–Marshall). This section of the presentation will highlight the connection between the discrete results and these continuum (geometric measure theory) problems. We will end with an illustrative example of how Hausdorff dimension lower bounds are proved in the continuum setting using ideas from the discrete world by considering Marstrand's projection theorem.