Title:	Kakeya Sets in Harmonic Analysis
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Abstract:	Kakeya sets (or Besicovitch sets) were first introduced as a solution to a geometri- cal problem. But, as it turns out, they have applications in solving many seemingly unrelated problems in v various areas of mathematics. This dissertation aims at studying the appearance of Kakeya sets in Harmonic analysis. We begin with a brief introduction to the Kakeya Needle Problem, which asks for the smallest area of a set in which a unit line segment can be continuously turned around. Besicovitch's solution that such sets can have arbitrarily small area, is explained. The first application of Kakeya sets in Harmonic analysis was seen in disprov- ing the multiplier problem of the ball, and as a result invalidating the spherical convergence of multiple Fourier series. When the more regularized Bochner-Riesz means are considered, it is proven to be L p´ bounded, at least in large dimensions. The second part of the thesis begin by investigating the Kakeya conjecture, and its known result in the two dimensional case. A result on the hausdroff dimension of line segments and its extended lines is also briefly explained. The Kakeya conjectue in the finite field case is easily solved by polynomial method, as explained in Chapter 4. The last part of the thesis contains a recent study on closed sets with Kakeya prop- erty. It is proven that there are no non trivial closed sets with Kakeya property, other than those which can be covered by a null set of parallel lines or concentric circles.
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