

The Infinite Dimensional Busemann Geodesic Space

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Abstract

Busemann Geodesic spaces (G-spaces) are metric spaces with several specific properties which together guarantee the existence of geodesics. Busemann G-spaces are interesting because they are metric spaces which, it is conjectured, have a manifold topology. Though there are many examples of Busemann G-spaces of all finite dimensions, there are no known examples of Busemann G-spaces of infinitely many dimensions. One of the properties of Busemann G-spaces is that infinite bounded subsets have limit points. We examine a hypothetical class of infinite dimensional Busemann G-spaces with a few other other properties, and construct an infinite set with no limit points—a contradiction. This will serve as a first step for future work to show that there are no Busemann spaces of infinite dimensions.