Almost orthogonal vectors

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Abstract

How many lines may one arrange through the origin $in \mathbb{R}^{10}$ in such a way that any two of them are at least 89° apart? How about in \mathbb{R}^{57} ? Or \mathbb{R}^n as n tends to infinity?

Using this simply stated problem as a point of departure, I will explore various areas of pure and applied mathematics where "almost orthogonal" vectors play a role. Our discussion will touch on some challenging unsolved problems and some important questions. We will have the opportunity to discuss problems in combinatorics, geometry, algebra, communications, quantum information theory, and compressive sensing (which might be viewed as a subdiscipline of data science). While some fairly simple jargon will be introduced, the talk should be accessible to a general mathematics audience.