A scaling law for the intrinsic complexity of high frequency wave fields, random fields and random matrices

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We characterize the intrinsic complexity of a set S in a metric space $\mathcal{W}$ by the least dimension $\underline{N}^\epsilon$ of a linear space $\mathcal{V} \subset \mathcal{W}$ that can approximate S to an ϵ error. We show a scaling law for $\underline{N}^\epsilon$ for high frequency wave fields, random fields and random matrices.