1148-46-104 **Shyam Narayanan** and **Jelani Nelson*** (`minilek@seas.harvard.edu`). *Optimal terminal dimensionality reduction in Euclidean space.*

Let $\varepsilon \in (0,1)$ and $X \subset \mathbb{R}^d$ be arbitrary with $|X|$ having size $n > 1$. The Johnson-Lindenstrauss lemma states there exists $f : X \to \mathbb{R}^m$ with $m = O(\varepsilon^{-2} \log n)$ such that

$$\forall x \in X \ \forall y \in X, \|x - y\|_2 \leq \|f(x) - f(y)\|_2 \leq (1 + \varepsilon)\|x - y\|_2.$$

We show that a strictly stronger version of this statement holds, answering one of the main open questions of Mahabadi et al. 2018: "$\forall y \in X$" in the above statement may be replaced with "$\forall y \in \mathbb{R}^d$", so that f not only preserves distances within X, but also distances to X from the rest of space. Previously this stronger version was only known with the worse bound $m = O(\varepsilon^{-4} \log n)$. Our proof is via a tighter analysis of (a specific instantiation of) the embedding recipe of Mahabadi et al. (Received January 27, 2019)