Abstract:

Dimensionality reduction in Euclidean space, as attainable by the Johnson-Lindenstrauss lemma, has been a fundamental tool in algorithm design and machine learning. The JL lemma states that any n point subset of $l_2$ can be mapped to $l_2^m$ with distortion $1+\epsilon$, where $m = O((\log n) / \epsilon^2)$. In this talk, I discuss our recent proof that the JL lemma is optimal, in the sense that for any n, d, epsilon, where epsilon is not too small, there is a point set $X$ in $l_2^d$ such that any $f:X \rightarrow l_2^m$ with $1+\epsilon$ must have $m = \text{mega}(\epsilon^{-2} \log n)$. I will also discuss some subsequent work and future directions.

Joint work with Kasper Green Larhus (Aarhus University).

Biography:

Jelani Nelson is Associate Professor of Computer Science and John L. Loeb Associate Professor of Engineering and Applied Sciences at Harvard University. His research focus is on streaming and sketching algorithms, dimensionality reduction, compressed sensing, and large-scale linear algebra algorithms.