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Amended Distance Bounds Using Eigenvalues of the Normalized Laplacian Matrix

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For a connected graph G , its normalized Laplacian matrix can be written as $\mathcal{L} = I - D^{-\frac{1}{2}}AD^{-\frac{1}{2}}$, where A is the $(0, 1)$ adjacency matrix and D is the diagonal matrix of vertex degrees. Suppose that X and Y are subsets of the vertex set of G . We consider two previously published upper bounds that relate the distance between X and Y to the eigenvalues of the normalized Laplacian matrix for G , the volumes of X and Y , and the volumes of their complements. We give a counterexample to both of the bounds, and then go on to provide corrected versions of each upper bound.