

SCOTTYRANK.JL: AN IMPLEMENTATION OF PAGERANK & HITS

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1. MATHEMATICAL BACKGROUND

1.1. **Definitions.** Positive matrices are defined as matrices with positive entries.

Square matrices are defined as matrices with the same number of columns and rows.

Markov matrices are defined as square matrices with nonnegatives entries and column sum 1 across all of its columns. Note that for a $n \times n$ matrix M , the latter condition is equivalent to $M^T \vec{1} = \vec{1}$, where $\vec{1} \in \mathbb{R}^n$ has all ones as components.

Positive Markov matrices are defined as, well, positive Markov matrices.

1.2. **Properties.** (Perron-Frobenius Theorem) Let A be a positive square matrix. Then A has an eigenvalue λ_0 such that all other