1106-26-2009 **Dominique Guillot*** (dguillot@stanford.edu), **Apoorva Khare** (khare@stanford.edu) and **Bala Rajaratnam** (brajarat@stanford.edu). *Entrywise functions preserving positivity for rank-constrained matrices.*

We consider the problem of characterizing real-valued functions f which preserve positive semidefiniteness when applied entrywise to $n \times n$ matrices. This classical problem has been studied by numerous authors, most notably by Schoenberg and Rudin. One of their most significant results states that f preserves positive semidefinite matrices of all dimensions, if and only if f has a Taylor series with nonnegative coefficients.

In this work, we focus on functions preserving positivity for matrices of a given rank. We are motivated by applications in high-dimensional statistics, where functions are often applied to covariance/correlation matrices to improve their properties. In that setting, the rank corresponds to the sample size and is thus known. We obtain several new characterizations of these functions. Additionally, our techniques apply to classical problems such as the one considered by Schoenberg and Rudin. In contrast to previous work, our approach is transparent, and enables us to provide intuitive, elegant, and enlightening proofs.

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