On Strongly Infinitely Divisible Matrices

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Roots of a nonnegative matrix (if they exist) may or may not be nonnegative. The matrix exponential $A = e^B$ of an (essentially) nonnegative matrix B is indeed a nonnegative invertible matrix and all of whose nonnegative powers $A^t = e^{tB}$ $(t \geq 0)$ are clearly also nonnegative. The converse is also true, as shown recently by Van-Brunt. If A is an invertible nonnegative matrix all of whose roots exist and are also nonnegative, there exists a nonnegative matrix B such that $A = e^B$. We refer to such an A as a strongly infinitely divisible matrix ($A \in$ **SIDM**). An inverse M-matrix is a particular example of an **SIDM**. Inverse M-matrices play an important role in this study.

Properties and connections of **SIDM**'s to other matrix classes is still under consideration. In my talk we will discuss certain operations that leave **SIDM** invariant, examine submatrices of **SIDM**'s, discover an intimate connection of **SIDM**'s and their roots to P-matrices and eventually nonnegative matrices. Further, we will discuss Hadamard/Kronecker products of **SIDM**'s, monotonicity of roots of **SIDM**'s and eigenvalues of **SIDM**'s.