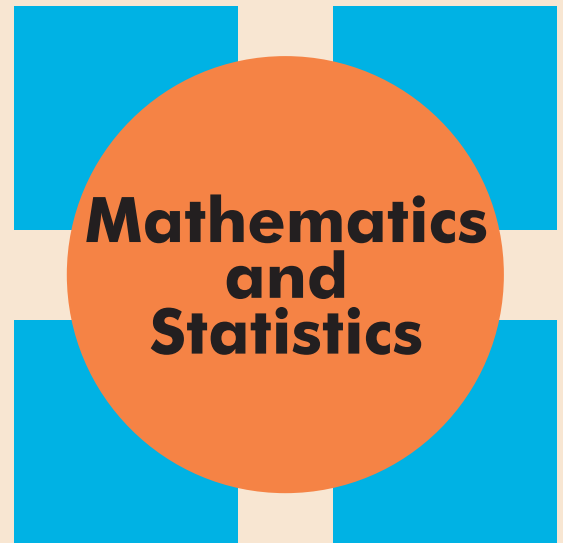


# COLLOQUIUM

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**Positivity preservers  
forbidden to act on  
“diagonal submatrices”**



Date: Friday December 6, 2019

Time: 3:30 - 4:30 PM

Room: RI 208

**Abstract:** I will discuss entrywise positivity preservers, which are functions acting entrywise on matrices and preserving the class of positive semidefinite matrices. The Schur product theorem implies that such functions include convergent power series with nonnegative Maclaurin coefficients. Schoenberg proved the crucial converse for continuous functions over  $[-1, 1]$ : there are no other preservers (in all dimensions). Rudin later showed that the converse holds in general, and for other domains as well (along with other refinements). Subsequently, Herz proved an analogous result for the class of (complex) positive semidefinite matrices, and Vasudeva answered the question for doubly nonnegative matrices. Recently, Guillot–Rajaratnam, motivated by applications to high dimensional probability and statistics, characterized the entrywise positivity preservers in all dimensions that act only on the off-diagonal entries.

We add to these results by classifying the entrywise positivity preservers in all dimensions that are forbidden to act on a specified sequence of “diagonal submatrices”. This unifies the previously mentioned results, and leads to novel classes of preservers, in particular ones that do not preserve the set of nonnegative reals.