

## POSITIVE SPLITTINGS OF MATRICES AND THEIR NONNEGATIVE MOORE-PENROSE INVERSES

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### Abstract

In this short note we study necessary and sufficient conditions for the nonnegativity of the Moore-Penrose inverse of a real matrix in terms of certain spectral property shared by all positive splittings of the given matrix.

**Keywords:** Moore-Penrose inverse, positive splitting.

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### REFERENCES

- [1] A. Ben-Israel and T.N.E. Greville, *Generalized Inverses: Theory and Applications*, 2nd edition, Springer Verlag, New York 2003.
- [2] A. Berman and R.J. Plemmons, *Monotonocity and the generalized inverse*, SIAM J. Appl. Math. **22** (1972), 155–161.
- [3] A. Berman and R.J. Plemmons, *Nonnegative Matrices in the Mathematical Sciences*, Classics in Applied Mathematics, SIAM 1994.
- [4] L. Collatz, *Functional Analysis and Numerical Mathematics*, Academic, New York 1966.
- [5] M.I. Gil, *On positive invertibility of matrices*, Positivity **2** (1998), 65–170.

- [6] M.I. Gil, *On invertibility and positive invertibility of matrices*, Lin. Alg. Appl. **327** (2001), 95–104.
- [7] M.A. Krasnosel'skij, J.A. Lifshits and A.V. Sobolev, *Positive linear systems*, Heldermann Verlag, Berlin 1989.
- [8] T. Kurmayya, *Nonnegative Moore-Penrose inverses of operators between Hilbert spaces*, Ph.D. Dissertation, Indian Institute of Technology Madras, Submitted, December 2007.
- [9] T. Kurmayya and K.C. Sivakumar, *Nonnegative Moore-Penrose inverses of operators over Hilbert spaces*, Positivity, Online First, DOI 10.1007/s11117-007-2173-8.
- [10] O.L. Mangasarian, *Characterizations of real matrices of monotone kind*, SIAM. Rev. **10** (1968), 439–441.
- [11] J.E. Peris, *A new characterization of inverse-positive matrices*, Lin. Alg. Appl. **154–156** (1991), 45–58.
- [12] M. Weber, *On the Positiveness of the Inverse Operator*, Math. Nachr. **163** (1993), 145–149. *Erratum*, Math. Nachr. **171** (1995), 325–326.

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