

## Some extensions on Total Positivity

A. Barreras<sup>1,3</sup>, J.M. Peña<sup>2,3</sup>

### SUMMARY

Totally positive matrices are matrices with nonnegative minors. Authors extended these matrices to SBD matrices in [2]. We present (see [3]) two new classes of matrices extending structured matrices related to total positivity ([1]) and provide characterizations of these matrices in terms of their decompositions (including LDU and SVD decomposition).

One of the most interesting applications of totally positive matrices is that, provided an adequate parametrization of the matrix (the bidiagonal decomposition), we can perform subtraction-free algorithms to carry out accurate computations (see [4]). We extend these computations, including inverse matrix, eigenvalue and singular value, to a class of matrices that generalize totally positive and SBD matrices ([3]).

Joint work with Juan Manuel Peña.

**Keywords:** Totally positive matrices, matrix decomposition, high relative accuracy.

**AMS Classification:** 15A23, 15A09, 15A18

### References

- [1] T. ANDO. Totally positive matrices. *Linear Algebra Appl.* **90**, 165–219, 1987.
- [2] A. BARRERAS AND J. M. PEÑA. Accurate computations of matrices with bidiagonal decomposition using methods for totally positive matrices. *Numer. Linear Algebra Appl.* **20**, 413–424, 2013.
- [3] A. BARRERAS AND J. M. PEÑA. Similarity to totally positive matrices and accurate computations. *Linear Algebra Appl.* **491**, 317–327, 2016.
- [4] P. KOEV. Accurate computations with totally nonnegative matrices. *SIAM J. Matrix Anal. Appl.* **29**, 731–751, 2007.

<sup>1</sup>Centro Universitario de la Defensa  
Academia General Militar  
Crtra. Huesca s/n, 50090 Zaragoza  
email: [albarrer@unizar.es](mailto:albarrer@unizar.es)

<sup>2</sup>Dept. Applied Mathematics  
Universidad de Zaragoza  
C/Pedro Cerbuna, 12, 50009 Zaragoza  
email: [jmpena@unizar.es](mailto:jmpena@unizar.es)

<sup>3</sup>Instituto Universitario de Matemáticas y Aplicaciones (IUMA)  
Universidad de Zaragoza  
C/Pedro Cerbuna, 12, 50009 Zaragoza