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Journal of Convex Analysis 28 (2021) 725–728

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### **The Column-Row Factorization of a Matrix**

The active ideas in linear algebra are often expressed by matrix factorizations:  $S = Q\Lambda Q^T$  for symmetric matrices (the spectral theorem) and  $A = U\Sigma V^T$  for all matrices (singular value decomposition). Far back near the beginning comes  $A = LU$  for successful elimination: Lower triangular times upper triangular. This paper is one step earlier, with bases in  $A = CR$  for the column space and row space of any matrix – and a proof that column rank = row rank. The echelon form of  $A$  and the pseudoinverse  $A^+$  appear naturally. The “proofs” are mostly “observations”.

**Keywords:** Matrix, factorizations, rank, echelon form.

**MSC:** 15A23