

# Factoring arbitrary matrices into products of structured matrices

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We show that every  $n$ -by- $n$  matrix can be decomposed into (i) a product of  $n/2$  Toeplitz matrices, (ii) a product of  $n/2$  Hankel matrices, (iii) a product of  $4n$  Vandermonde matrices, (iv) a product of  $16n$  bidiagonal matrices, or (v) a product of  $n^2$  companion matrices. We will see that such decompositions do not in general hold with other types of structured matrix factors (e.g. circulant, symmetric Toeplitz, persymmetric Hankel, etc). This is joint work with Ke Ye of the University of Chicago.