EECS 16B
Designing Information Devices and Systems II

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Announcements

● MT 2: Monday 7-9pm
  ○ covers last week’s lectures through Gram-Schmidt and Spectral Theorem
  ○ does not cover minimum energy control, SVD, and later

● student support meetings
  ○ see Ed post
Today

- review
- Singular Value Decomposition (SVD)
Suppose $A$ and $D$ are rectangular matrices, and $D$ is square and diagonal.

Assuming the dimensions of $A$ and $D$ allow for the below matrix multiplications, which of the following will result in a symmetric matrix?

1. $AA^T$
2. $A^TAA^T$
3. $ADA$
4. all of the above
5. 1 and 2 only
What is the column rank of $A$?

$$A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \\ 3 & 6 \end{bmatrix}$$
What is the column rank of $A$?

What is the row rank of $A$?

$A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \\ 3 & 6 \end{bmatrix}$
What is the column rank of $A$?

What is the row rank of $A$?

Can the column rank of a matrix ever be different from its row rank?
Suppose $A$ is a matrix with $m$ rows and $n$ columns.

Which of the following must be true?

1. the rank of $A$ is the greater of $m$ and $n$
2. the rank of $A$ is the lesser of $m$ and $n$
3. the rank of $A$ is at most the greater of $m$ and $n$
4. the rank of $A$ is at most the lesser of $m$ and $n$
5. none of the above
Suppose A is a matrix with \( m \) rows and \( n \) columns, and was generated by adding together two rank 1 matrices.

Which of the following must be true?

1. the rank of A is 2
2. the rank of A is 1 or 2
3. the rank of A is 0, 1, or 2
4. the rank of A could be anything up to the lesser of \( m \) and \( n \)