Today’s Topic

Gaussian Elimination without Pivoting
LU Decomposition
Gaussian Elimination

- Given a matrix $A$
- Eliminates the lower triangular elements
- Solving linear equations
  - $Ax = b$
  - $U\hat{x} = \hat{b}$
Gaussian Elimination

- Eliminates the lower triangular elements
- \( M = M_{n-1} \times \cdots \times M_1 \)
- \( M_i \) is an elementary matrix to eliminate the \( i \)th column
Gaussian Elimination

- Eliminates the lower triangular elements
- \( M = M_{n-1} \times \cdots \times M_1 \)
- \( M_i \) is a lower triangular elementary matrix
Gaussian Elimination

- Eliminates the lower triangular elements
- \( M = M_{n-1} \times \cdots \times M_1 \)
- \( M^{-1} = M_1^{-1} \times \cdots \times M_{n-1} \)
- \( U = M \times A, L = M^{-1} \)
How to determine $M_i$?

- $u_{j,i} = m_{j,i} \cdot a_{i,i} + a_{j,i} = 0 \ (\text{for } j > i)$
- $m_{j,i} = -\frac{a_{j,i}}{a_{i,i}} \ (\text{for } j > i)$
- $M_i(i + 1 : n, i) = -\frac{A(i+1:n,i)}{a_{i,i}}$
Thanks