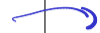


April 29, 2026

## Announcements

HW 9

Monday



• Numerical for PDES (CS555)

Today



• Large Linear system (CS558)

• Parallel (CS554)

FCHZ

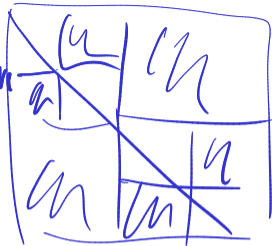


• Topics (CS598 APK)

## Goals

# Big linear systems

- Sparse → direct, iterative
- HODLR ←



- 
- Hacking around LU

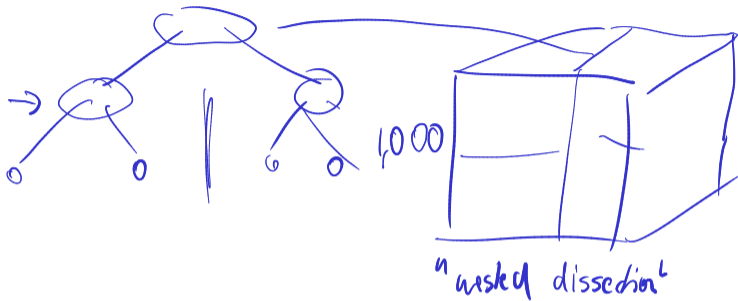
- LU / ordering

- Direct (multifrontal)

↓  
UMFPack



# Multifrontal



# Iterative

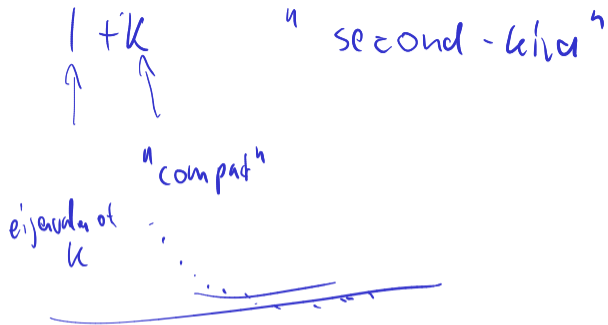
$$A\vec{x} = \vec{b} \quad A = M - N$$

$$M\vec{x} = N\vec{x} + \vec{b}$$

$$M\vec{x}_{k+1} = N\vec{x}_k + \vec{b}$$

$$\mathbf{s}_i^T A \mathbf{s}_j = 0 \text{ if } i \neq j.$$

$$\mathbf{e}_0 = \mathbf{x}_0 - \mathbf{x}^* = \sum_i \delta_i \mathbf{s}_i.$$



$M$

$$Ax = b$$

$$(MA)x = Mb$$