Agenda

- Flop Count
- Least Squares
- A bit of coding

Logistics

- HW2 out due Friday 2/11 9pm
- HW3 released Thursday, due Friday 2/18 9pm
- Ed Forum
- LaTex

Flop Count

$A, B \in \mathbb{R}^{m,n}$, $C \in \mathbb{R}^{n,p}$, $x \in \mathbb{R}^n$, $\alpha \in \mathbb{R}$

matrix operations	flop count
αA	
$A + B$	
$x^T x$	
Ax	
AC	
$A^T A$	

Least Squares $\min_x \|Ax-b\|_2^2$ (A is tall)

- Derive the normal equations

Gram matrix A^TA

1. Show that A^TA symmetric
2. Show that $A^TA \succeq 0$ if columns of A linearly independent

Least Squares interpretation

$$A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{pmatrix} \qquad b = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$$\min_x \|Ax - b\|_2^2$$

Least Squares Orthogonality Principle

$$r = Ax^* - b$$

$$Ax \perp r \quad \text{for any } x$$