Lecture 4

HW1 posted!

Due Sept 10th/11th

(11th @ 7am)

Can't be late!

Is T symmetric in CandyCane? ✓

If IJU is given, then is it faster than Matrix Mult? ✓

What if we have to build CSC? ✓

- SPSD $\iff A = F^T F$ for some F. ✓
  Can F be efficiently computed?
- Hessenberg vs. Triangular... ✓
  When do we want Hessenberg?

- Can we assume Square diag on HW/etc.? ✓
- CSC, Does CSR Exist? ✓
- Row/Col pointers @ the Same time? ✓
- Significance of M-matrices ✓
- Poly fitting of Hankel gives large Condition #.
  - ↳ Better Bases? ✓

- p, q, r = 1/2, 1/4, 1/4 How to generate the Matrix? ✓
- Why 2292 nnz in Candy Land matrix. ✓
- Deadline of HW1 ✓

Let A be spsd.

Then if A is spd..,

we can compute the

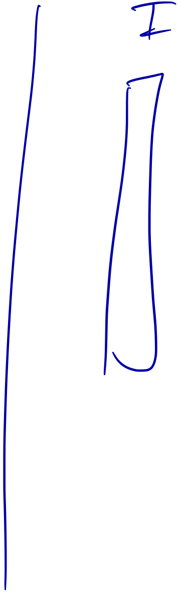
Cholesky factorization (Var. Elim.)

$A = FF^T$ where F is lower-triangular.

$A = V\Lambda V^T$ for an Eigen-val. decomp.

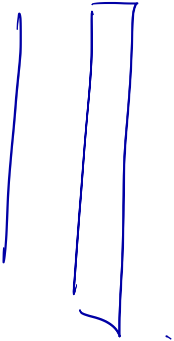
V is ortho.

$$A = \underbrace{V\Lambda^{1/2}}_{W}\underbrace{\Lambda^{1/2}V^T}_{W^T} = WW^T.$$



Sort by this value !

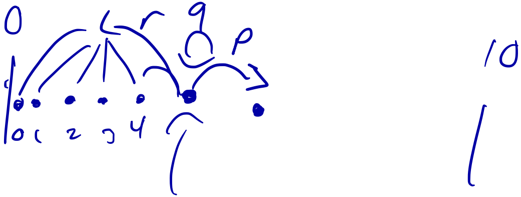
J V



Again, this can be solved by a similar linear system. First, we have $x_{\{0\}} = 1 + (1-p)x_{\{0\}} + px_{\{+1\}}$. The other equations all proceed in a similar fashion.

$$\begin{bmatrix}
p & -p & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-r & (1-q) & -p & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-\frac{1}{2}r & -\frac{1}{2}r & (1-q) & -p & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
-\frac{1}{3}r & -\frac{1}{3}r & -\frac{1}{3}r & (1-q) & -p & 0 & 0 & 0 & 0 & 0 & 0 \\
-\frac{1}{4}r & -\frac{1}{4}r & -\frac{1}{4}r & -\frac{1}{4}r & (1-q) & -p & 0 & 0 & 0 & 0 & 0 \\
-\frac{1}{5}r & -\frac{1}{5}r & -\frac{1}{5}r & -\frac{1}{5}r & -\frac{1}{5}r & (1-q) & -p & 0 & 0 & 0 & 0 \\
-\frac{1}{6}r & -\frac{1}{6}r & -\frac{1}{6}r & -\frac{1}{6}r & -\frac{1}{6}r & -\frac{1}{6}r & (1-q) & -p & 0 & 0 & 0 \\
-\frac{1}{7}r & -\frac{1}{7}r & -\frac{1}{7}r & -\frac{1}{7}r & -\frac{1}{7}r & -\frac{1}{7}r & -\frac{1}{7}r & (1-q) & -p & 0 & 0 \\
-\frac{1}{8}r & -\frac{1}{8}r & -\frac{1}{8}r & -\frac{1}{8}r & -\frac{1}{8}r & -\frac{1}{8}r & -\frac{1}{8}r & -\frac{1}{8}r & (1-q) & -p & 0 \\
-\frac{1}{9}r & -\frac{1}{9}r & -\frac{1}{9}r & -\frac{1}{9}r & -\frac{1}{9}r & -\frac{1}{9}r & -\frac{1}{9}r & -\frac{1}{9}r & -\frac{1}{9}r & (1-q) & -p \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1
\end{bmatrix}
\begin{bmatrix} x_{\{0\}} \\ x_{\{+1\}} \\ x_{\{+2\}} \\ x_{\{+3\}} \\ x_{\{+4\}} \\ x_{\{+5\}} \\ x_{\{+6\}} \\ x_{\{+7\}} \\ x_{\{+8\}} \\ x_{\{+9\}} \\ x_{\{+10\}} \end{bmatrix}
=
\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}.$$

0 1 2 3 4 5



$x_{\{5\}}$ $x_{\{6\}}$

$$x_{\{5\}} = 1 + p\,x_{\{6\}} + q\,\cancel{x}_{\{5\}} + \frac{r}{5}x_{\{0\}} +$$

$\frac{\delta}{5} x_{\{1\}} + - \frac{\delta}{5} x_{\{4\}}$