Announcements

- Assignment 1 due tonight @ 11:59 pm
 - Submit what you have by the deadline; do not resubmit until resubmissions are open in CMS

Su	Μ	Tu	W	Th	F	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

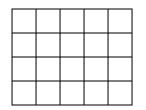
Agenda

- How to search for "the best"
- How to model probabilities
- How to iterate over triangular matrices
- How to write subfunctions

Pattern for traversing a matrix ("row-major")

```
[nr, nc] = size(M)
for r = 1:nr
   % Start of row r
   for c = 1:nc
      % At column c (in row r)
      % Do something with M(r,c) ...
   end
   % End of row r
end
```

Where should end-ofcolumn logic go? Example: minimum value in a matrix



function val = minInMatrix(M)
% val is the smallest value in matrix M

```
function val = minInMatrix(M)
% val is the smallest value in matrix M
```

```
[nr,nc]= size(M);
% ??? (A)
for r = 1:nr
   for c = 1:nc
      % ??? (B)
   end
end
```

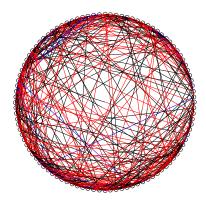
% ??? (C)

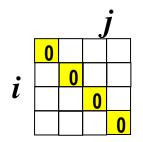
Algorithm: Finding the best in a set

Init bestSoFar
Loop over set
 if current is better than bestSoFar
 bestSoFar ← current
 end
end

Matrix example: Random Web

- N web pages can be represented by an N-by-N Link Array A.
- A(i,j) is 1 if there is a link on webpage j to webpage i
- Generate a random link array and display the connectivity:
 - There is no link from a page to itself
 - If $i \neq j$ then A(i,j) = 1 with probability $\frac{1}{1+|i-j|}$
 - ight
 angle There is more likely to be a link if ${f i}$ is close to ${f j}$



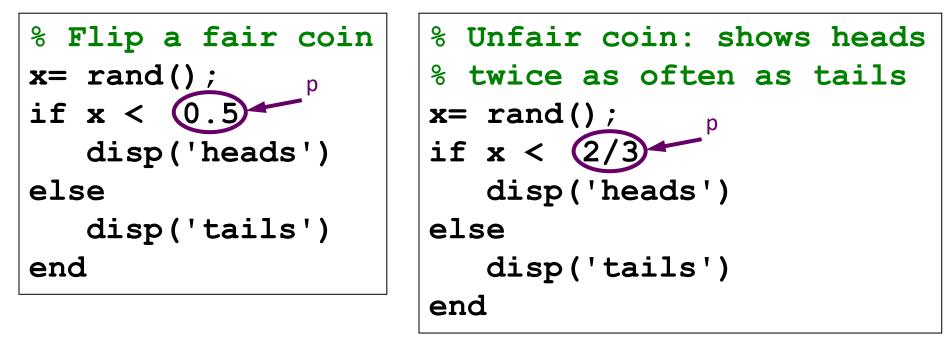


```
function A = RandomLinks(n)
% A is n-by-n matrix of 1s and 0s
% representing n webpages
```

```
A= zeros(n,n); % initialize to 0s
for r = 1:n
  for c = 1:n
    % if A(r,c) not on diagonal,
    % assign 1 with some probability
```

end end

An event happens with probability p, $0 \le p \le 1$



```
% Event Y happens with probability p
x= rand();
if x
```

function A = RandomLinks(n)
% A is n-by-n matrix of 1s and 0s
% representing n webpages

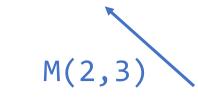
Random web: N=20



December 9, 1874) was an American businessman, politician, and philanthropist. He was the founder of Western Union, founder of Ithaca's first library, and a co-founder of Cornell University. He also served as President of the New York Agriculture Society and as a New York state Senator.

Ezra Cornell







ŻΑ

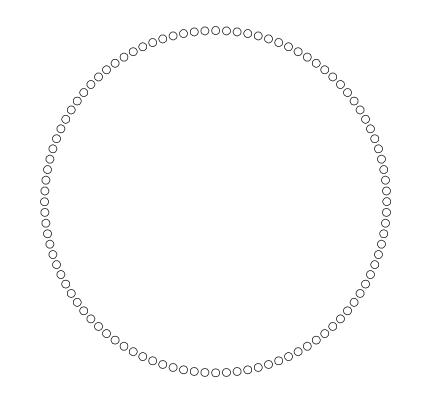
Space Shuttle

Q

☆

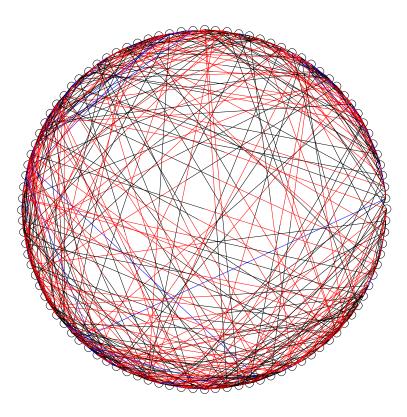
The **Space Shuttle** was a partially reusable low Earth orbital spacecraft system that was operated from 1981 to 2011 by the U.S. National Aeronautics and Space Administration (NASA) as part of the Space Shuttle program. Its official program name was Space Transportation System (STS), taken from a 1969 plan for a system of reusable spacecraft of which it was the only item funded for development.^[9] The first of four orbital test flights occurred in 1981, leading to operational flights beginning in 1982. In addition to the prototype whose completion was cancelled, five complete Shuttle systems were built and used on a total of 135 missions from 1981 to 2011, launched from the Kennedy Space Center (KSC) in Florida. Operational missions launched numerous satellites, interplanetary probes, and the Hubble Space

Represent the web pages graphically...



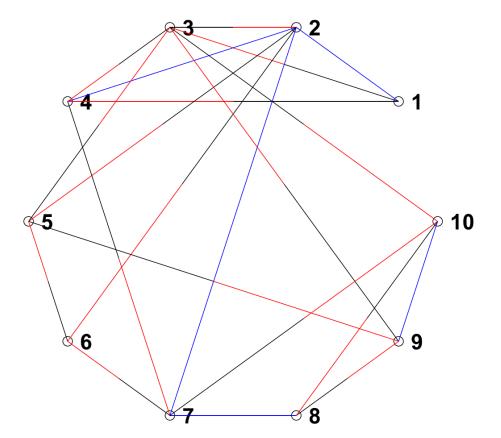
100 Web pages arranged in a circle. Next display the links....

Represent the web pages graphically...



Bidirectional links are blue. Unidirectional link is black as it leaves page c, red when it arrives at page r.

Represent the web pages graphically...

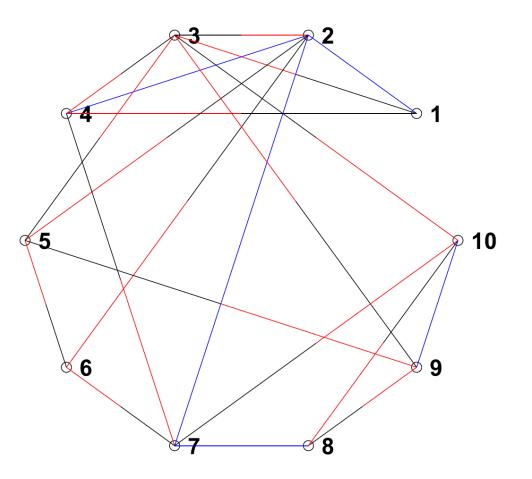


	1	2	3	4	5	6	7	8	9	10
1	0	1	0	0	0	0	0	0	0	0
2	1	0	1	1	0	0	1	0	0	0
3	1	0	0	0	1	0	0	0	1	0
4	1	1	1	0	0	0	0	0	0	0
5	0	1	0	0	0	1	0	0	0	0
6	0	1	0	0	0	0	1	0	0	0
7	0	1	0	1	0	0	0	1	0	0
8	0	0	0	0	0	0	1	0	0	1
9	0	0	0	0	1	0	0	1	0	1
10	0	0	1	0	0	0	1	0	1	0

Bidirectional links are blue. Unidirectional link is black as it leaves page c, red when it arrives at page r.

Outline

- 1. Get coordinates of points on circle
- 2. Iterate over all links
 - 1. Determine color to draw
 - 2. Draw line(s) between points





Transpose—like switching row and column indices Triangular traversal [nr, nc] = size(M); for $\underline{A} = \underline{B}:\underline{C}$ for $\underline{D} = \underline{E}:\underline{F}$ disp(M(r,c)) end end

