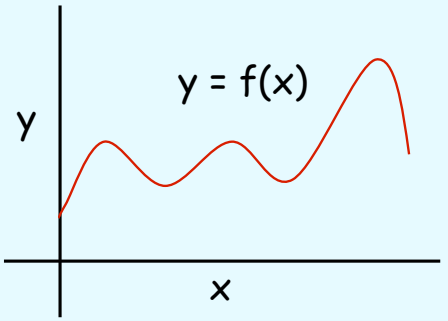
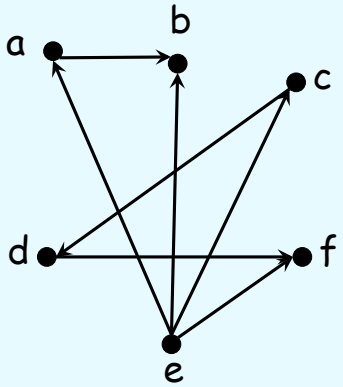
Mathematics for Computer Science
MIT 6.042J/18.062J

Directed Graphs (Digraphs)

Normal Person's Graph



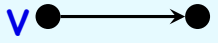
Computer Scientist's Graph



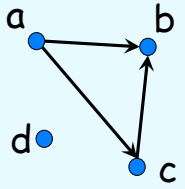
Digraphs

- a set, V, of vertices
- a set, $E \subseteq V \times V$ of directed edges

$(v,w) \in E$ notation: $v \rightarrow w$



Relations and Graphs



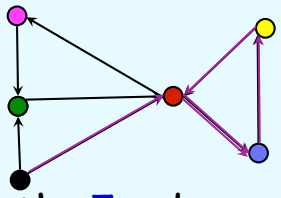
V= {a,b,c,d}
E = {(a,b), (a,c), (c,b)}

Digraphs

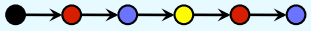
Formally, a digraph with vertices V is *the same* as a binary relation on V.

Walks & Paths

Walk: follow successive edges



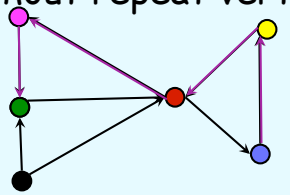
length: 5 edges



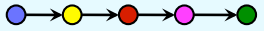
(not the 6 vertices)

Walks & Paths

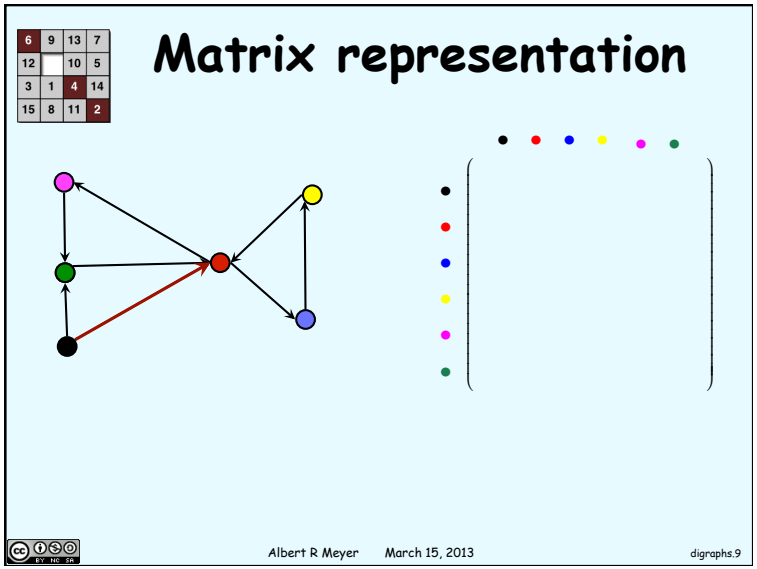
Path: walk thru vertices without repeat vertex

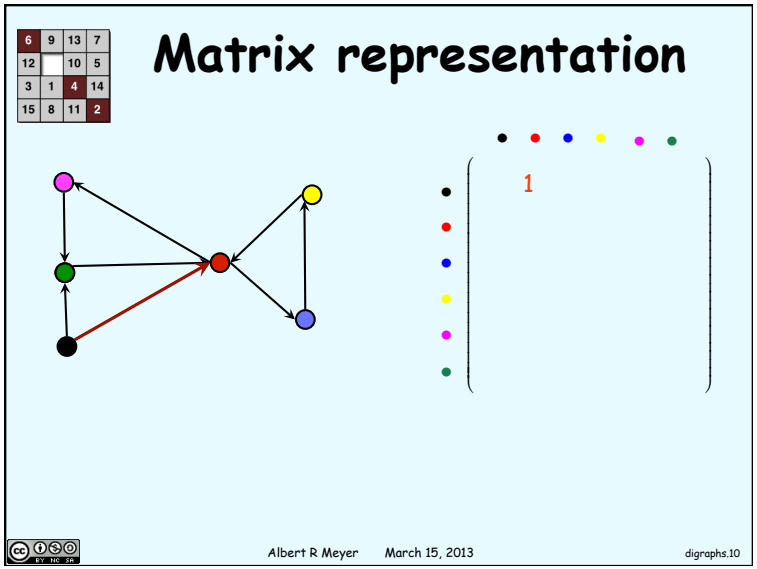


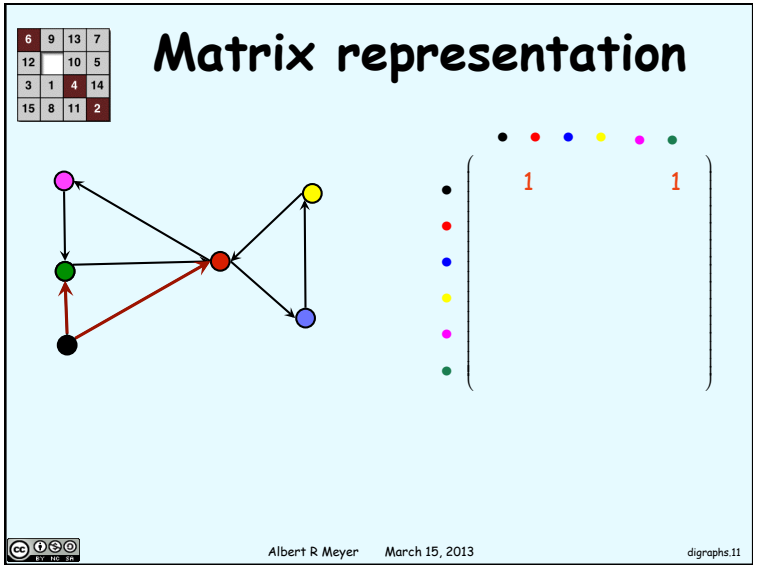
length: 4 edges

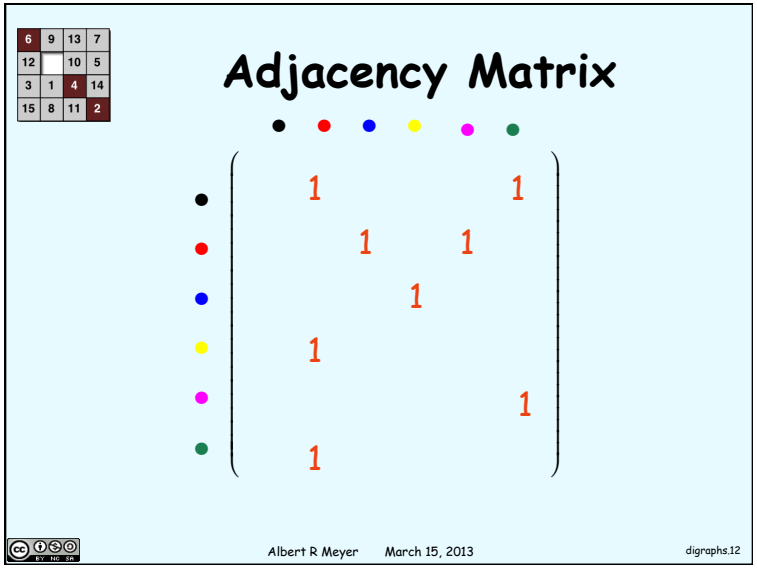


stuck!


Matrix representation
6 9 13 7
12 10 5
3 1 4 14
15 8 11 2
Albert R Meyer March 15, 2013
digraphs.9


Matrix representation
6 9 13 7
12 10 5
3 1 4 14
15 8 11 2
1
Albert R Meyer March 15, 2013
digraphs.10


Matrix representation
6 9 13 7
12 10 5
3 1 4 14
15 8 11 2
1 1
Albert R Meyer March 15, 2013
digraphs.11


Adjacency Matrix
6 9 13 7
12 10 5
3 1 4 14
15 8 11 2
1 1
1 1
1
1
1
1
Albert R Meyer March 15, 2013
digraphs.12

Adjacency Matrix

●	0	1	0	0	0	1
●	0	0	1	0	1	0
●	0	0	0	1	0	0
●	0	1	0	0	0	0
●	0	0	0	0	0	1
●	0	1	0	0	0	0