



CS 225

Data Structures

March 10 – Project Q&A

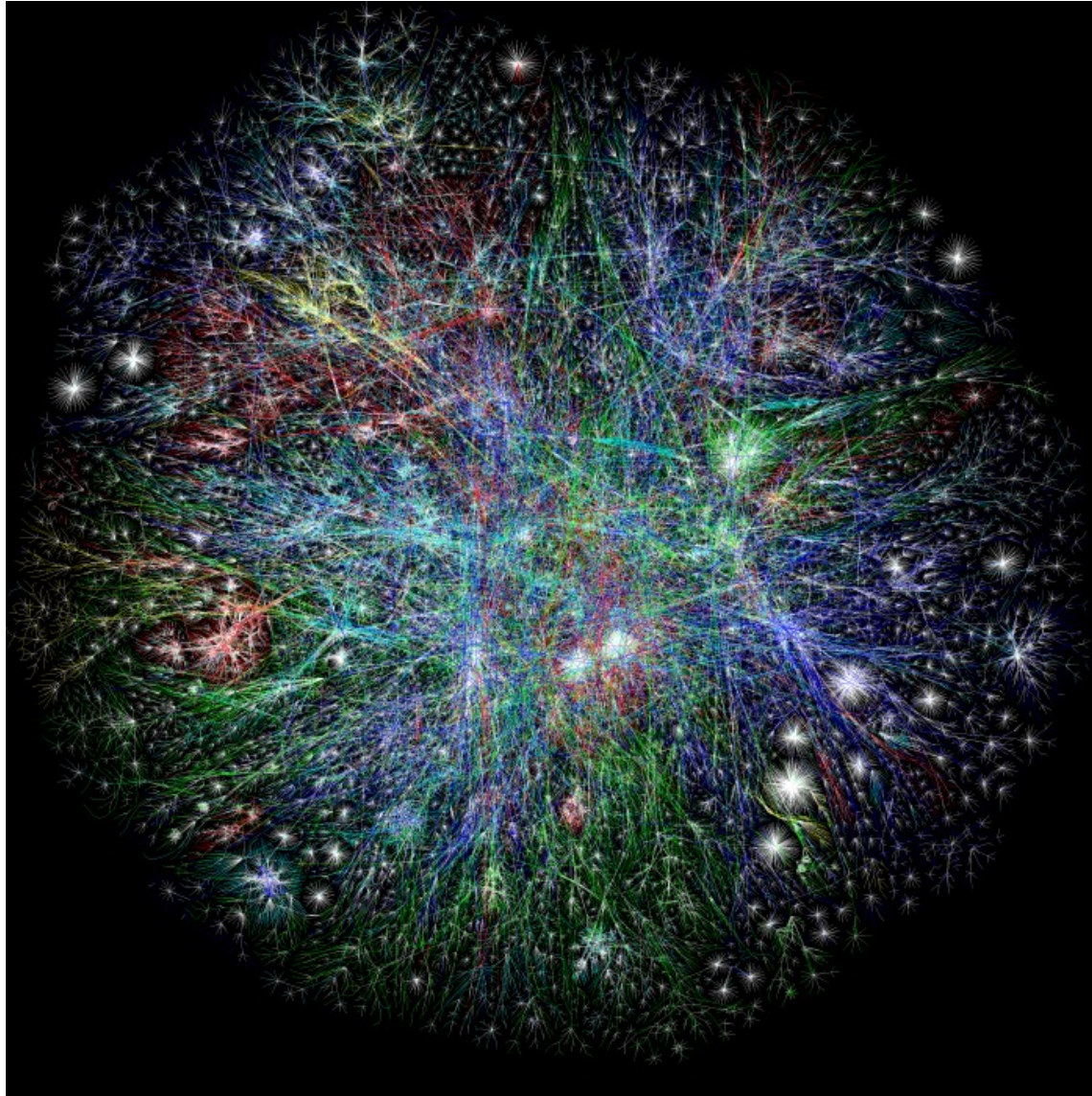
G Carl Evans



Project Key Points

- Must be a group of 3-5 people
- Must have one major deliverable per person
- Must have a leading question





The Internet 2003

The OPTE Project (2003)

Map of the entire internet; nodes are routers; edges are connections.

HeapifyUp BasicBlock Graph

```
heapifyUp(int*, unsigned int):  
  push rbp  
  mov rbp, rsp  
  sub rsp, 16  
  mov qword ptr [rbp - 8], rdi  
  mov dword ptr [rbp - 12], esi  
  cmp dword ptr [rbp - 12], 1  
  jbe .LBB0_4
```

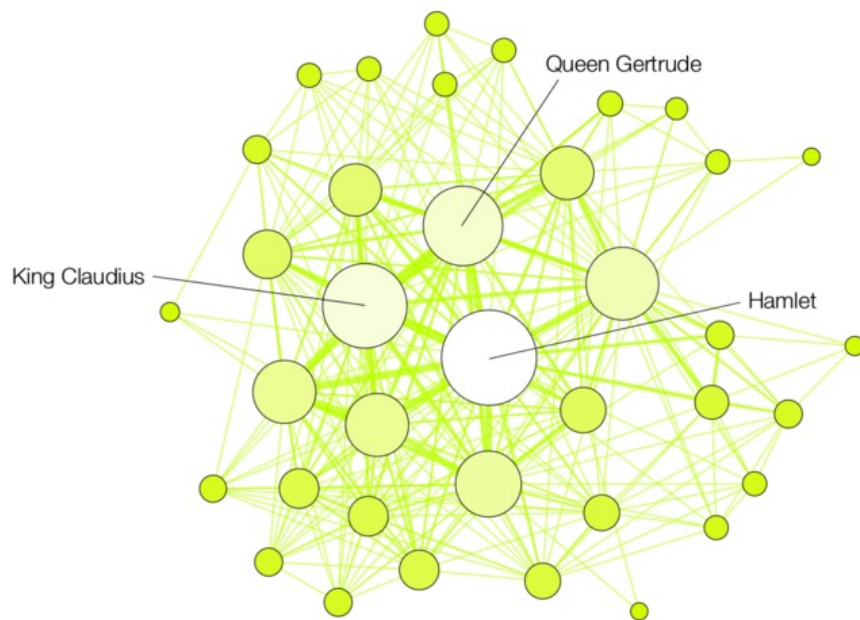
```
heapifyUp(int*, unsigned int):@@  
  mov rax, qword ptr [rbp - 8]  
  mov ecx, dword ptr [rbp - 12]  
  mov edx, ecx  
  mov ecx, dword ptr [rax + 4*rdx]  
  mov rax, qword ptr [rbp - 8]  
  mov esi, dword ptr [rbp - 12]  
  shr esi, 1  
  mov esi, esi  
  mov edx, esi  
  cmp ecx, dword ptr [rax + 4*rdx]  
  jge .LBB0_3
```

```
heapifyUp(int*, unsigned int):@19  
  mov rax, qword ptr [rbp - 8]  
  mov ecx, dword ptr [rbp - 12]  
  mov edx, ecx  
  mov ecx, dword ptr [rax + 4*rdx]  
  mov dword ptr [rbp - 16], ecx  
  mov rax, qword ptr [rbp - 8]  
  mov ecx, dword ptr [rbp - 12]  
  shr ecx, 1  
  mov ecx, ecx  
  mov edx, ecx  
  mov ecx, dword ptr [rax + 4*rdx]  
  mov rax, qword ptr [rbp - 8]  
  mov esi, dword ptr [rbp - 12]  
  mov edx, esi  
  mov dword ptr [rax + 4*rdx], ecx  
  mov ecx, dword ptr [rbp - 16]  
  mov rax, qword ptr [rbp - 8]  
  mov esi, dword ptr [rbp - 12]  
  shr esi, 1  
  mov esi, esi  
  mov edx, esi  
  mov dword ptr [rax + 4*rdx], ecx  
  mov rdi, qword ptr [rbp - 8]  
  mov ecx, dword ptr [rbp - 12]  
  shr ecx, 1  
  mov esi, ecx  
  call heapifyUp(int*, unsigned int)
```

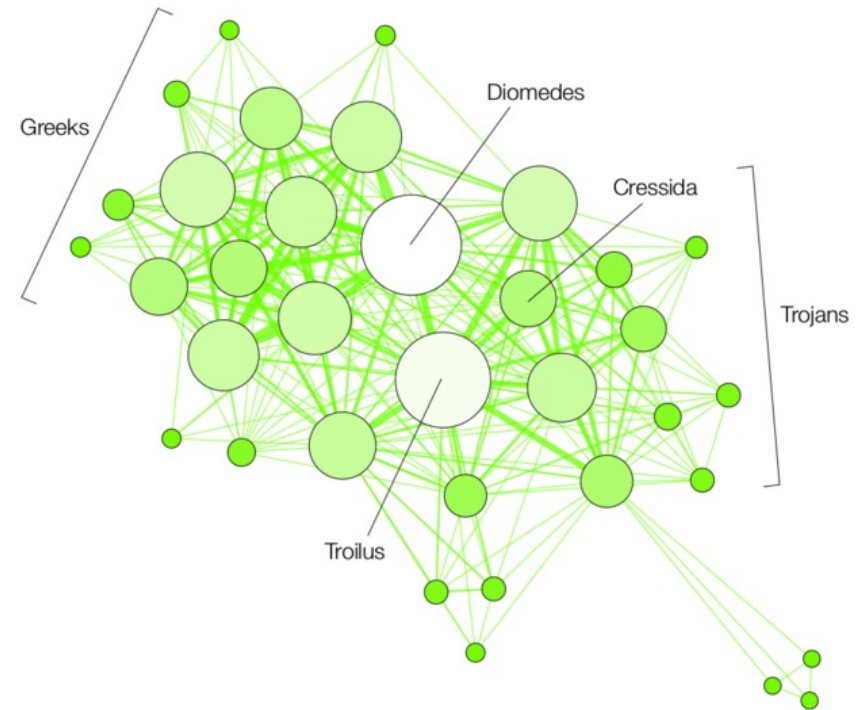
```
.LBB0_3:  
  jmp .LBB0_4
```

```
.LBB0_4:  
  add rsp, 16  
  pop rbp  
  ret
```

Generated using tools at
<https://godbolt.org>



HAMLET

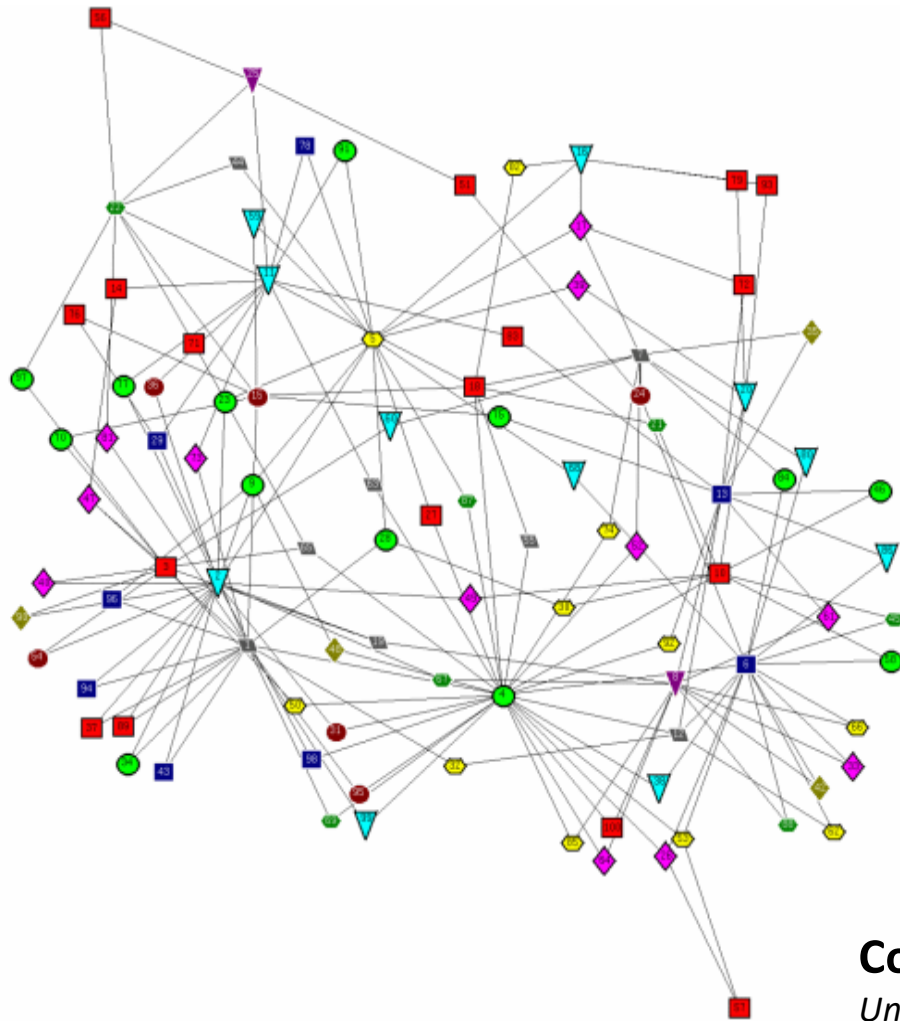


TROILUS AND CRESSIDA

Who's the real main character in Shakespearean tragedies?

Martin Grandjean (2016)

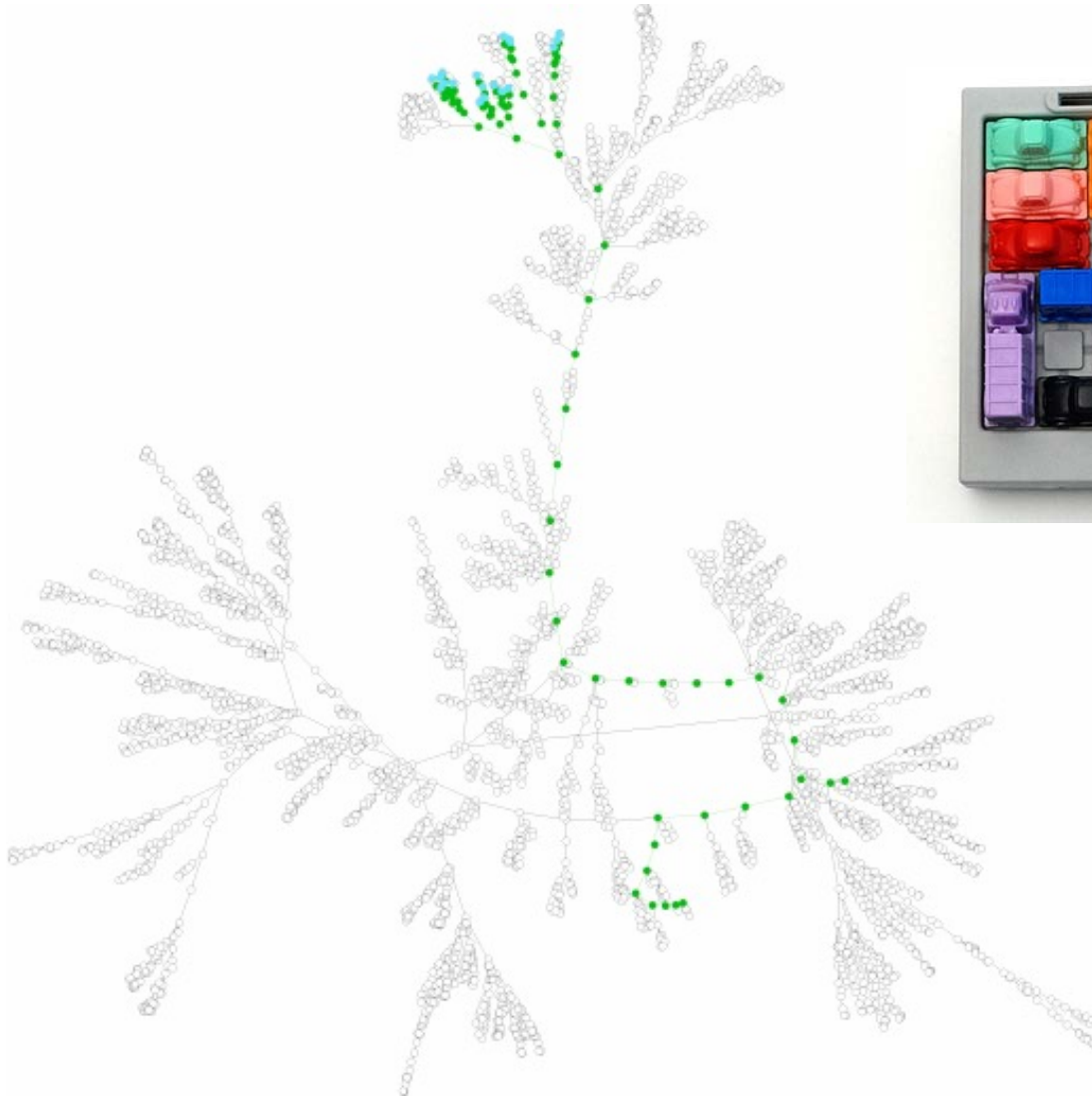
<https://www.pbs.org/newshour/arts/whos-the-real-main-character-in-shakespearean-tragedies-heres-what-the-data-say>



Conflict-Free Final Exam Scheduling Graph

Unknown Source

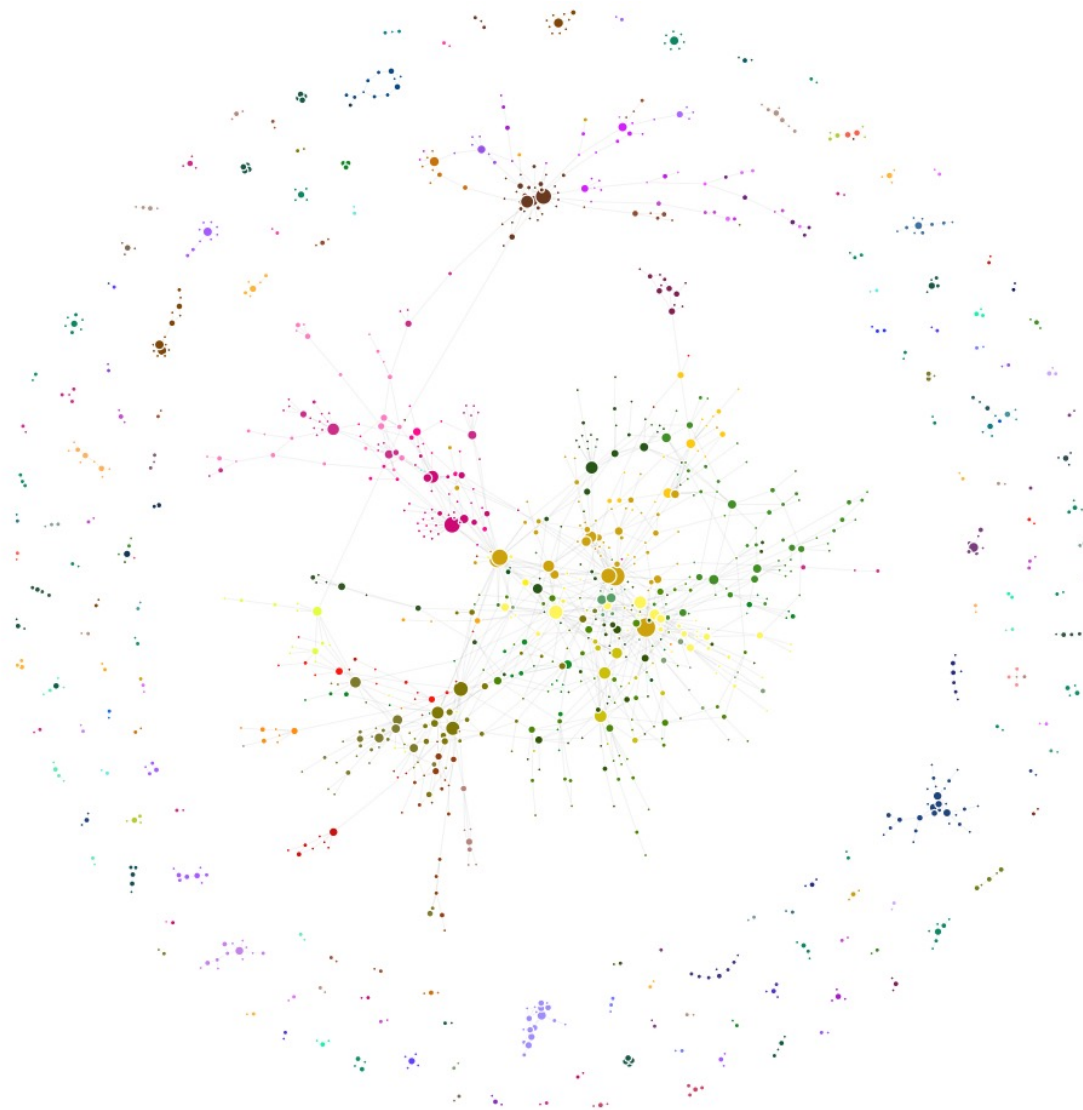
Presented by Cinda Heeren, 2016



“Rush Hour” Solution

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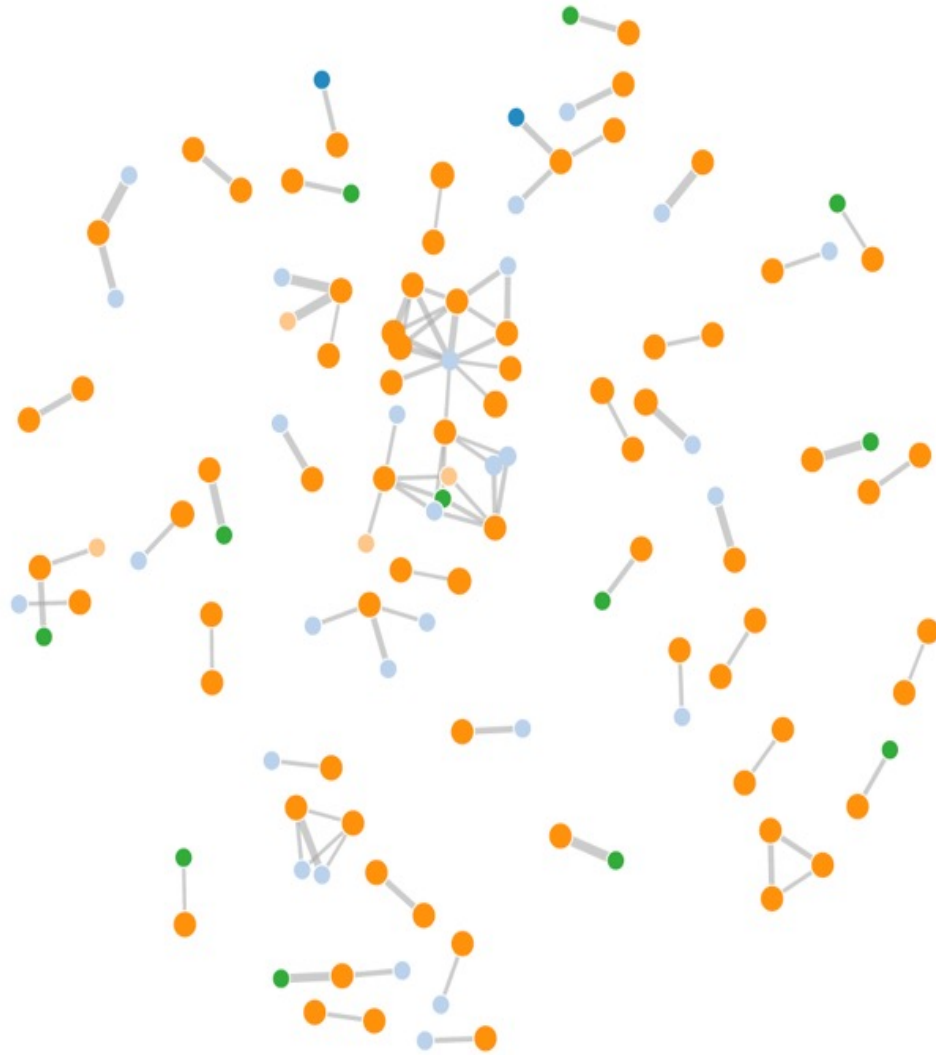


Class Hierarchy At University of Illinois Urbana-Champaign

A. Mori, W. Fagen-Ulmschneider, C. Heeren

Graph of every course at UIUC; nodes are courses, edges are prerequisites

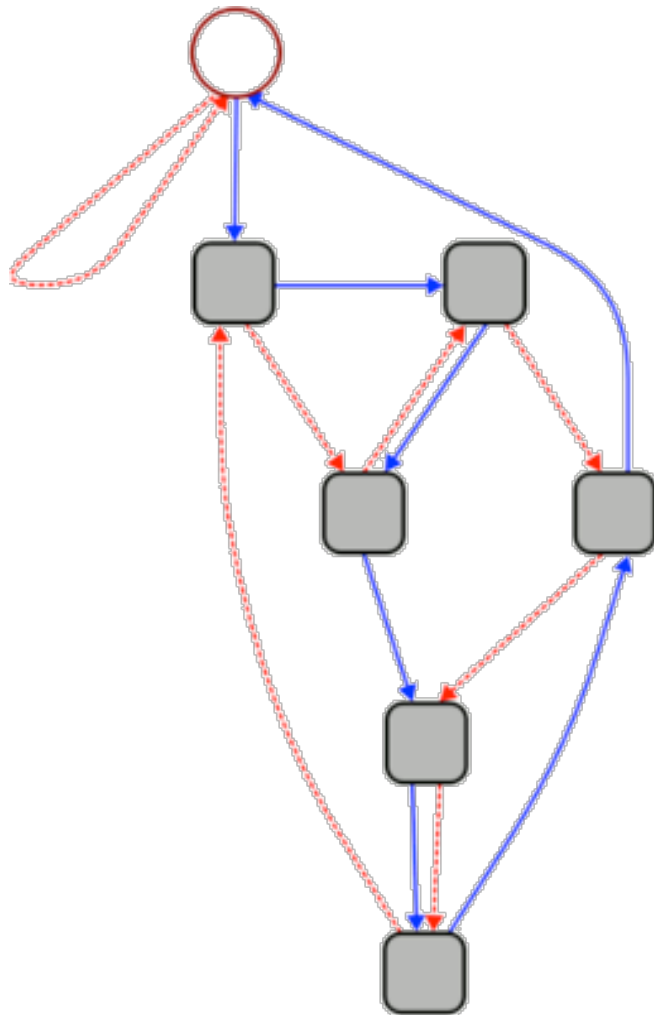
http://waf.cs.illinois.edu/discovery/class_hierarchy_at_illinois/



MP Collaborations in CS 225

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This graph can be used to quickly calculate whether a given number is divisible by 7.

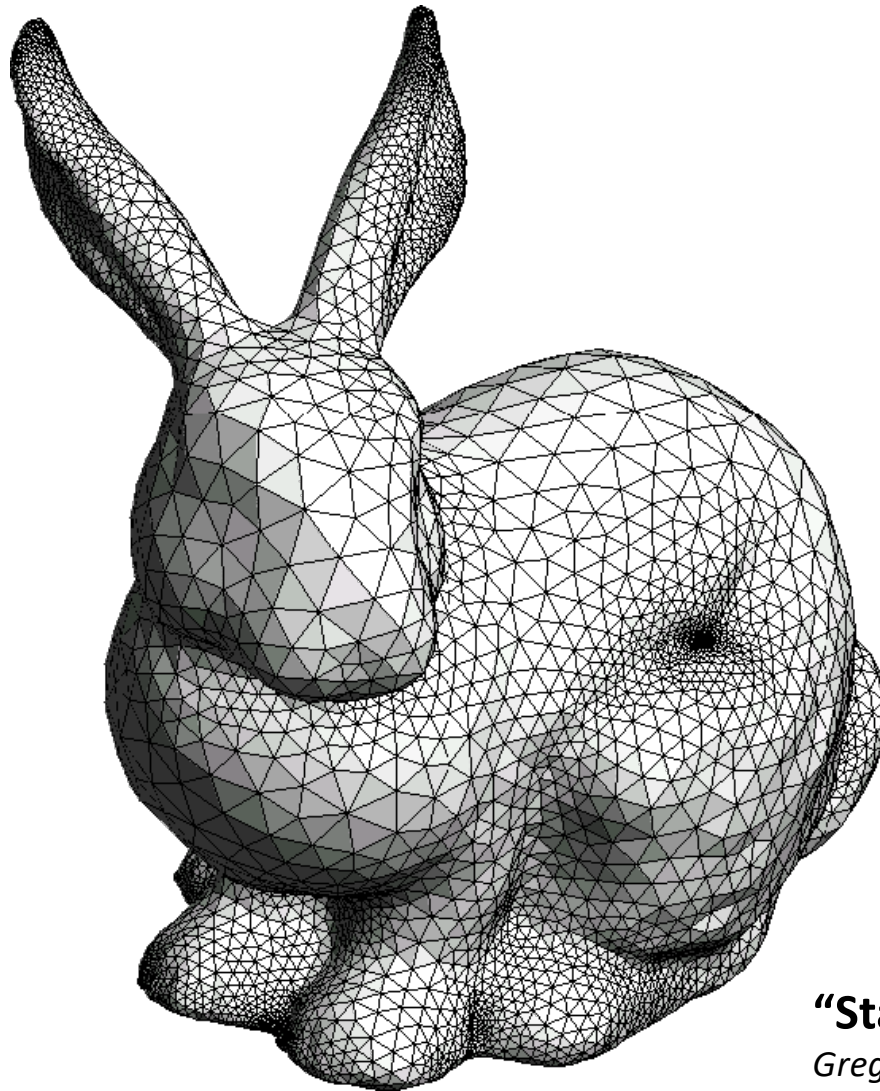
1. Start at the circle node at the top.
2. For each digit **d** in the given number, follow **d blue (solid) edges** in succession. As you move from one digit to the next, follow **1 red (dashed) edge**.
3. If you end up back at the circle node, your number is divisible by 7.

3703

“Rule of 7”

Unknown Source

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“Stanford Bunny”
Greg Turk and Mark Levoy (1994)

