Programming, Problem Solving, and Algorithms

CPSC203, 2023 W2

Announcements

- Test 4 is this week.

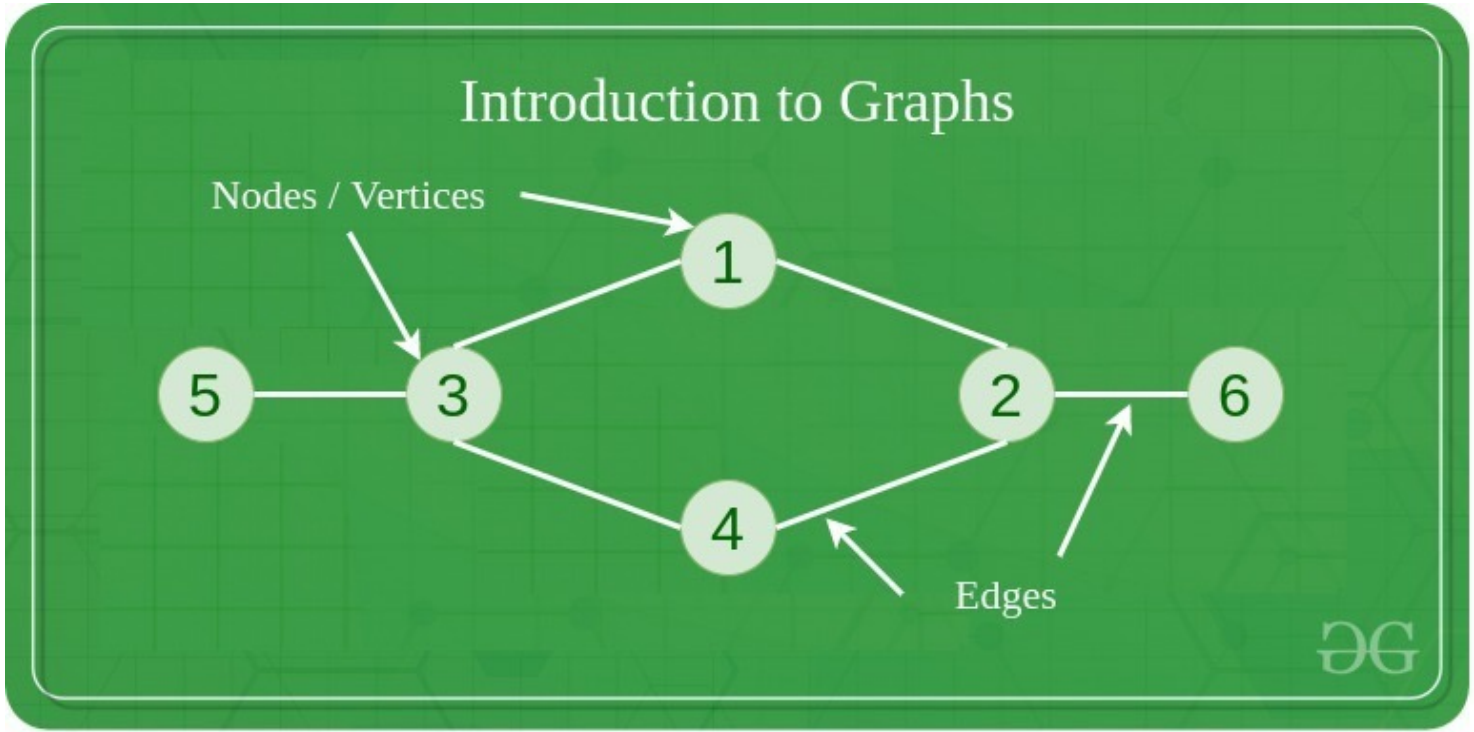
- Project 1 is done!
  - Many of you struggled with this.
  - Please do come to our student hours and labs to make sure you understand things
- Final Exam date has been released, but we will try self-serve between **Wed April 17th – Fri April 20th**
  - Seats will be released next week

Today's Plan...

1. Announcements! (5 mins)
2. Finish up Voronoi Art with (10 mins)
3. Computing Voronoi Diagrams (45 mins)
4. Introduction to Graphs (20 mins)

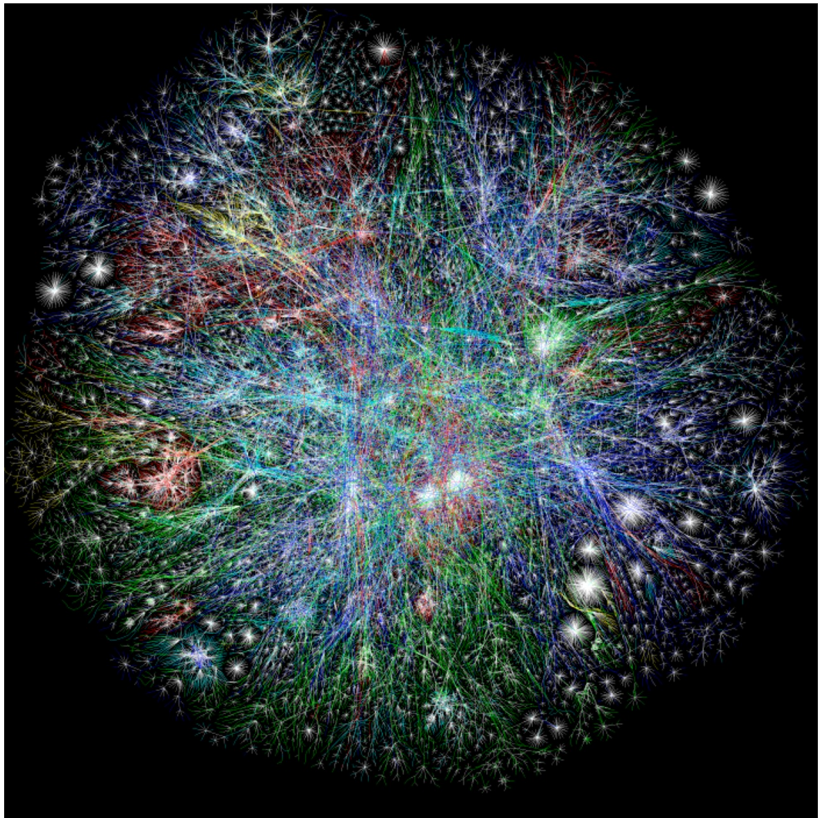
Slides from the Assigned Videos (N/A for today!)

Graphs

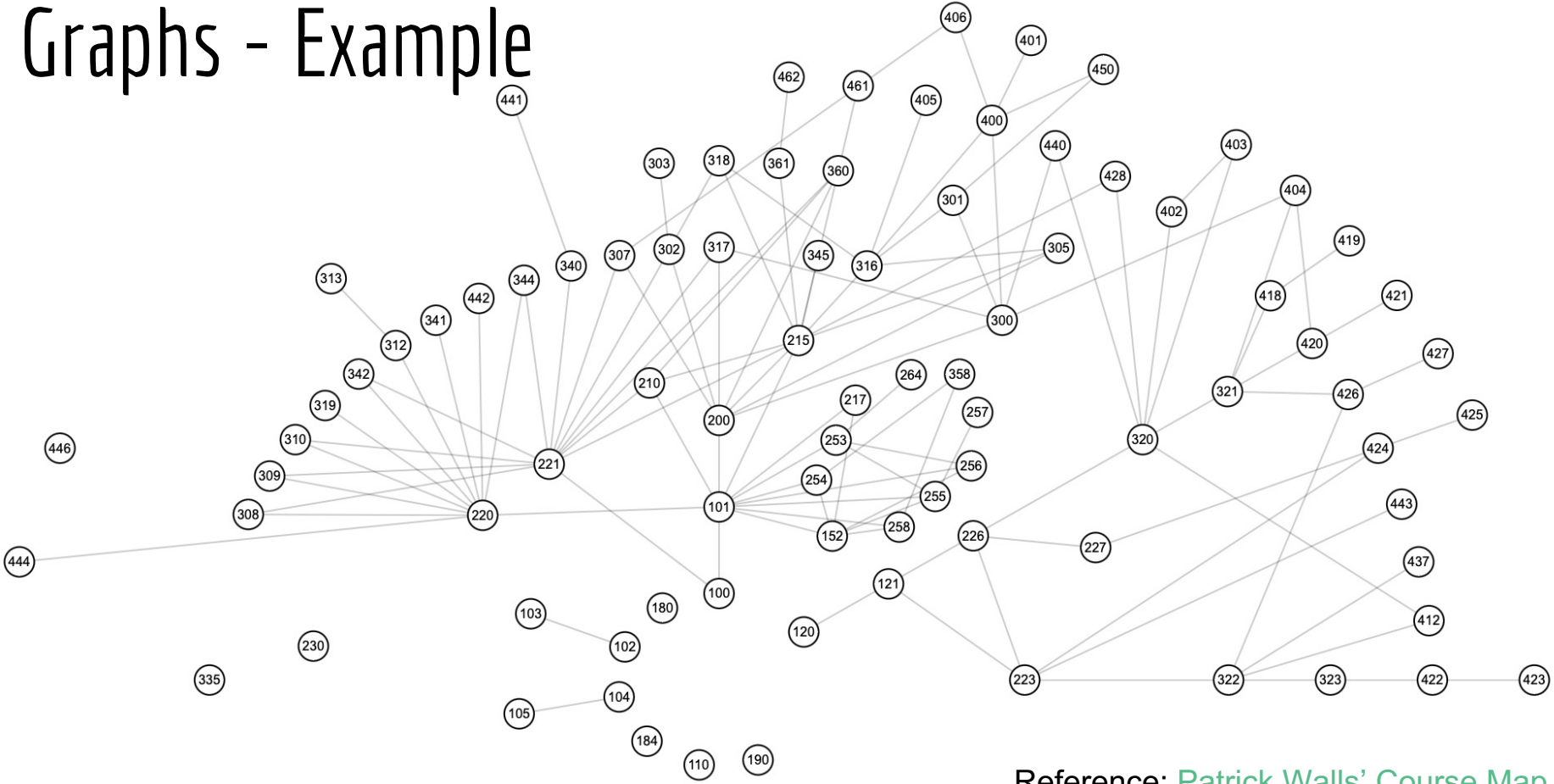


Reference: Geeks for Geeks

Introduction to Graphs:



Graphs - Example



Reference: [Patrick Walls' Course Map]

Graphs: A new model for representing images

00	10	20	30	40	50	60	70	80	90
01	11	21	31	41	51	61	71	81	91
02	12	22	32	42	52	62	72	82	92
03	13	23	33	43	53	63	73	83	93
04	14	24	34	44	54	64	74	84	94
05	15	25	35	45	55	65	75	85	95

A *Graph* is a collection of *vertices,* and *edges* between them. They're used as a general model for many problems.

In our images every **pixel** is a vertex, and every **neighbour** is an edge. How many edges are there in the graph representing the image on the left?

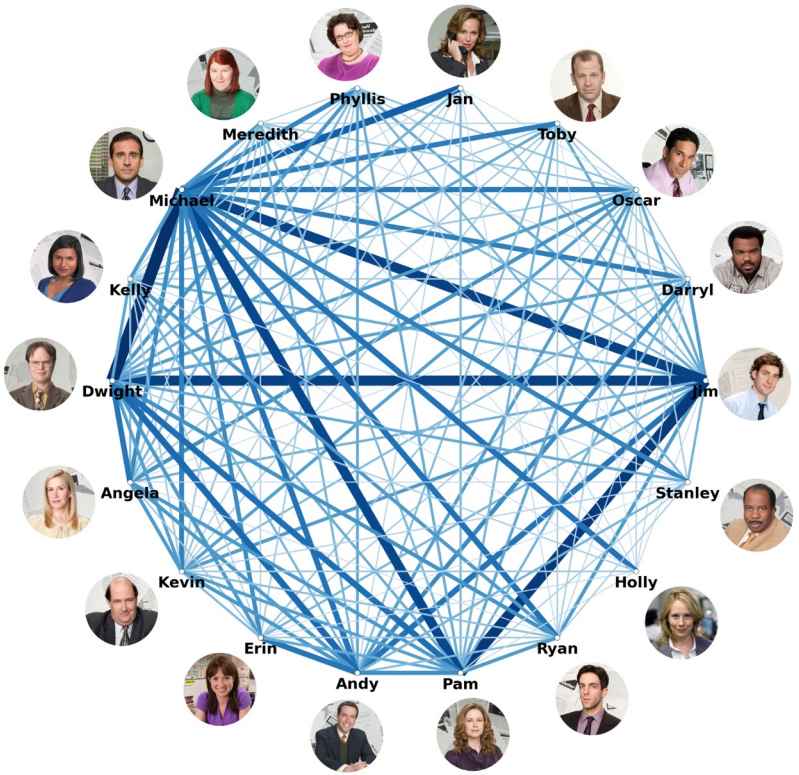
Our fast algorithm for Voronoi Art mirrors a classic algorithm on graphs called Breadth First Search.

Breadth First Search

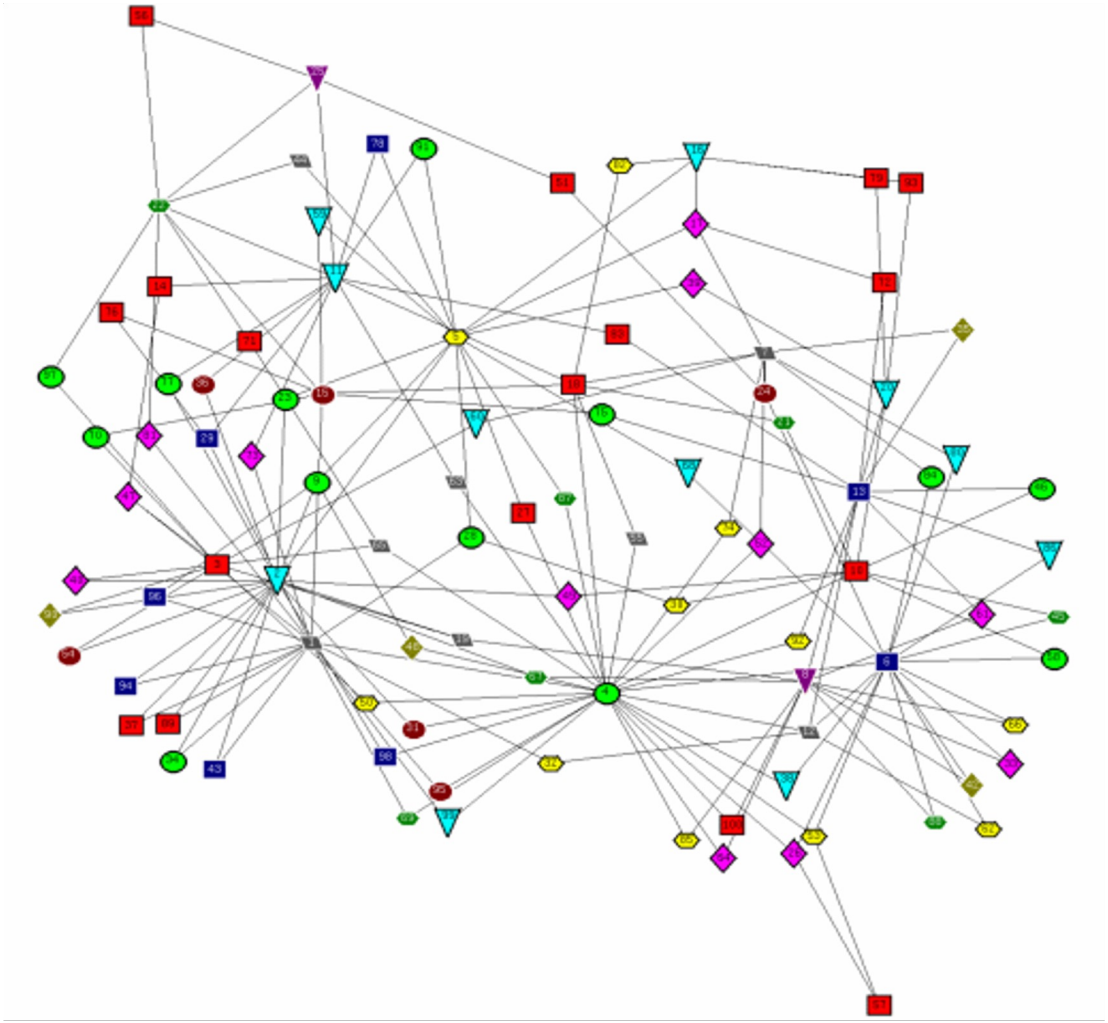
Breadth-first search (**BFS**) is an algorithm for traversing or searching tree or graph data structures. It starts at the tree root (or some arbitrary node of a graph, …), and explores all of the neighbor nodes at the present depth prior to moving on to the nodes at the next depth level. (--Wikipedia)

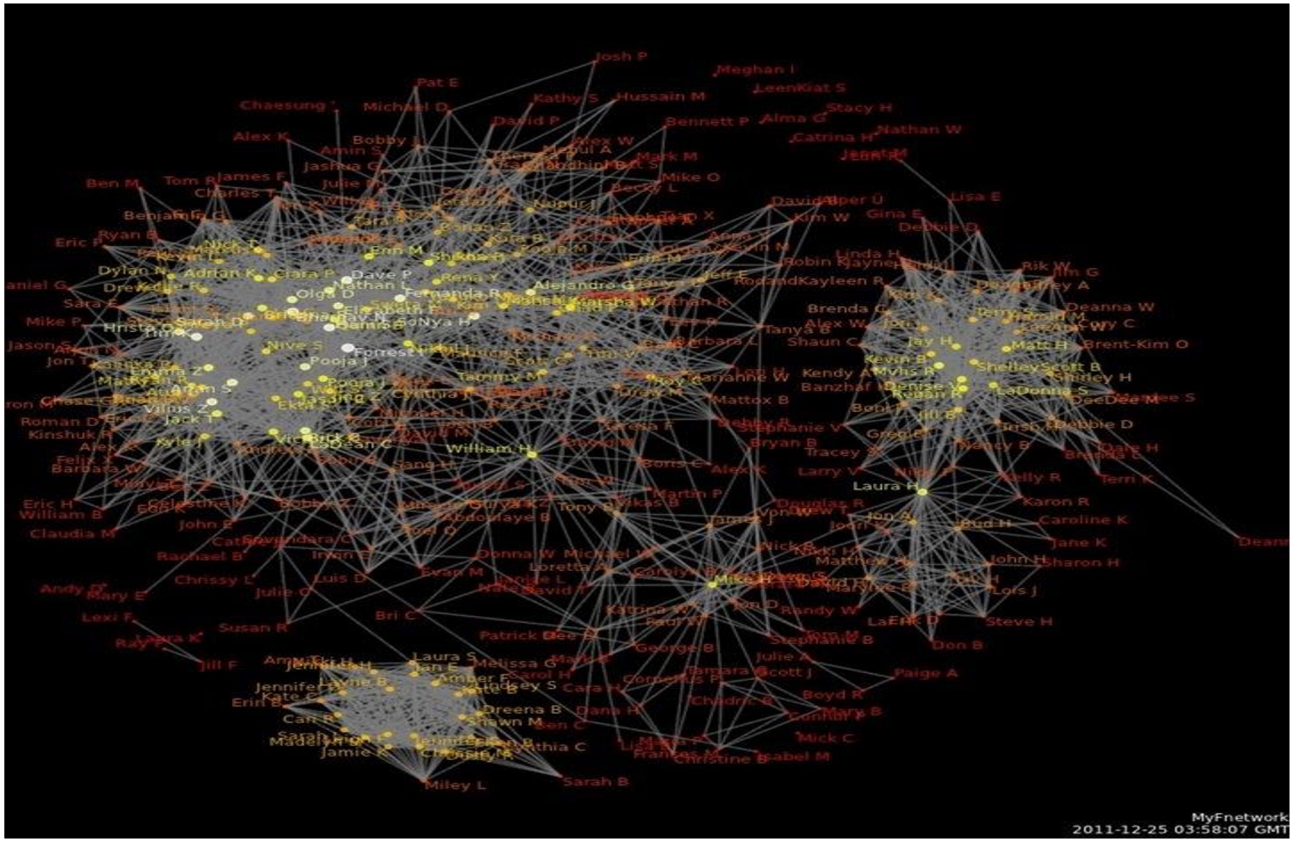
The Office

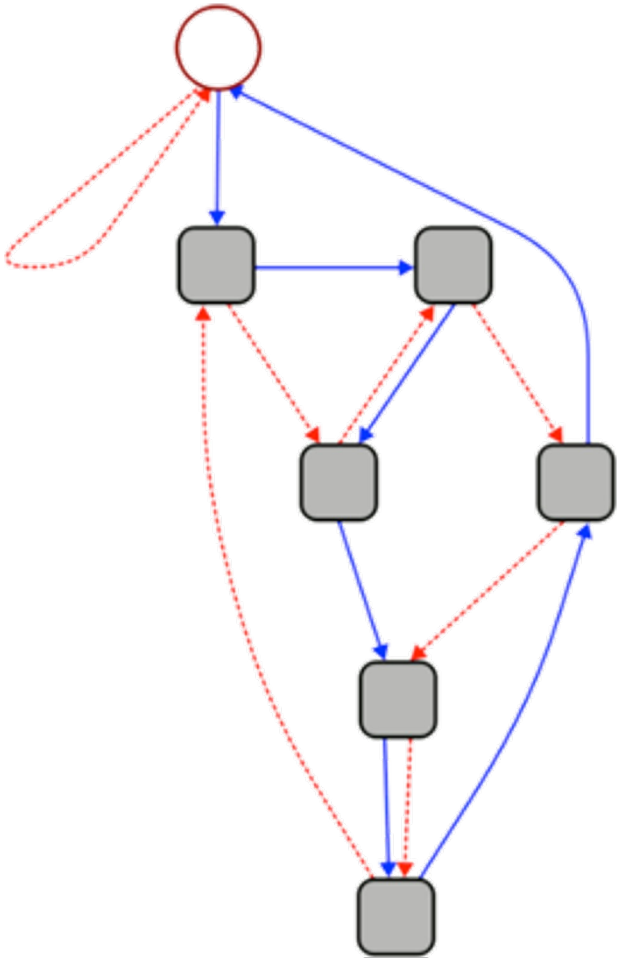
Interaction graph of 18 main characters



data: Kaggle
source code: https://github.com/duongnosu/The_Office_interactiongraph
created by: u/if__name__
inspired by: u/Gandagorn




MyFnetwork
2011-12-25 03:58:07 GMT



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.

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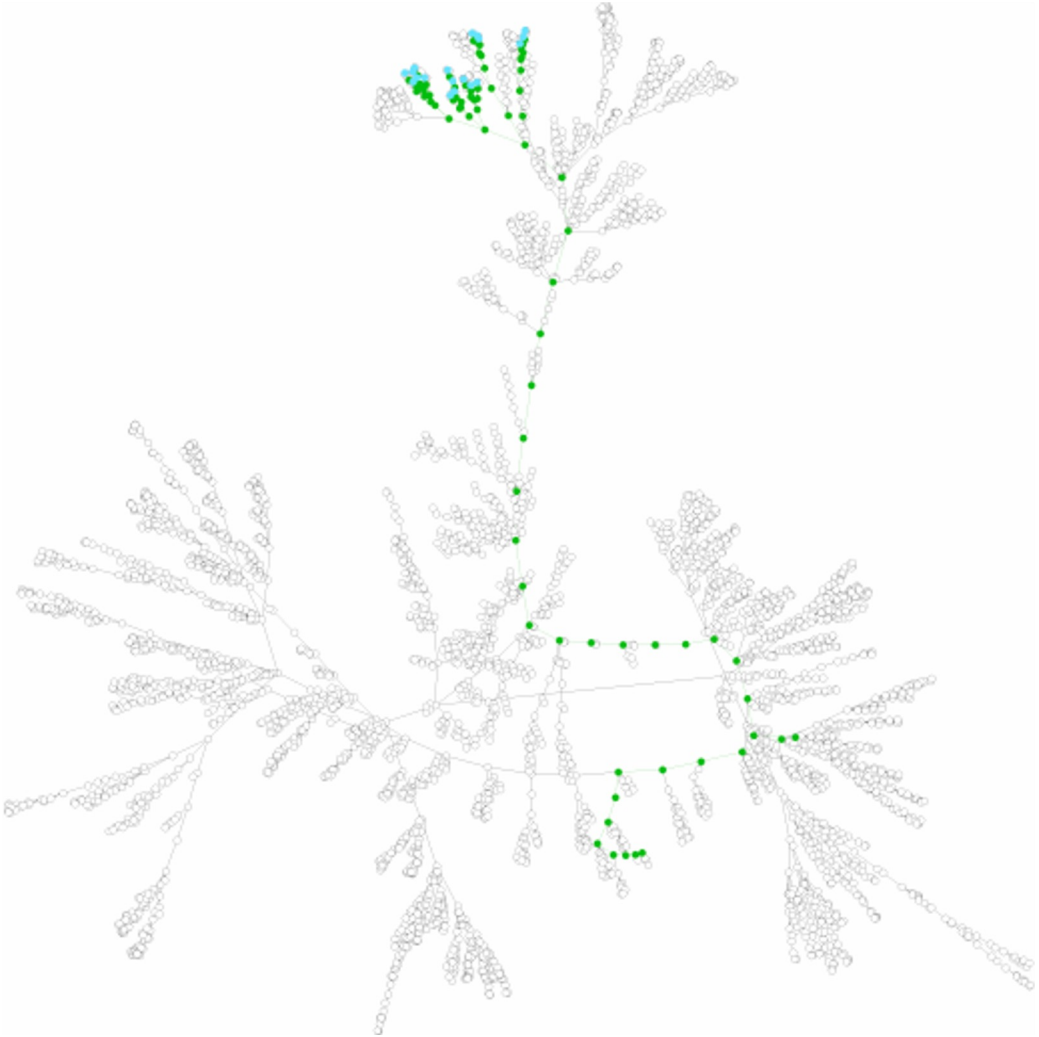


ThinkFun