CS 103000
Prof. Madeline Blount

Week 14:
ALGORITHMS part 2

attendance link:

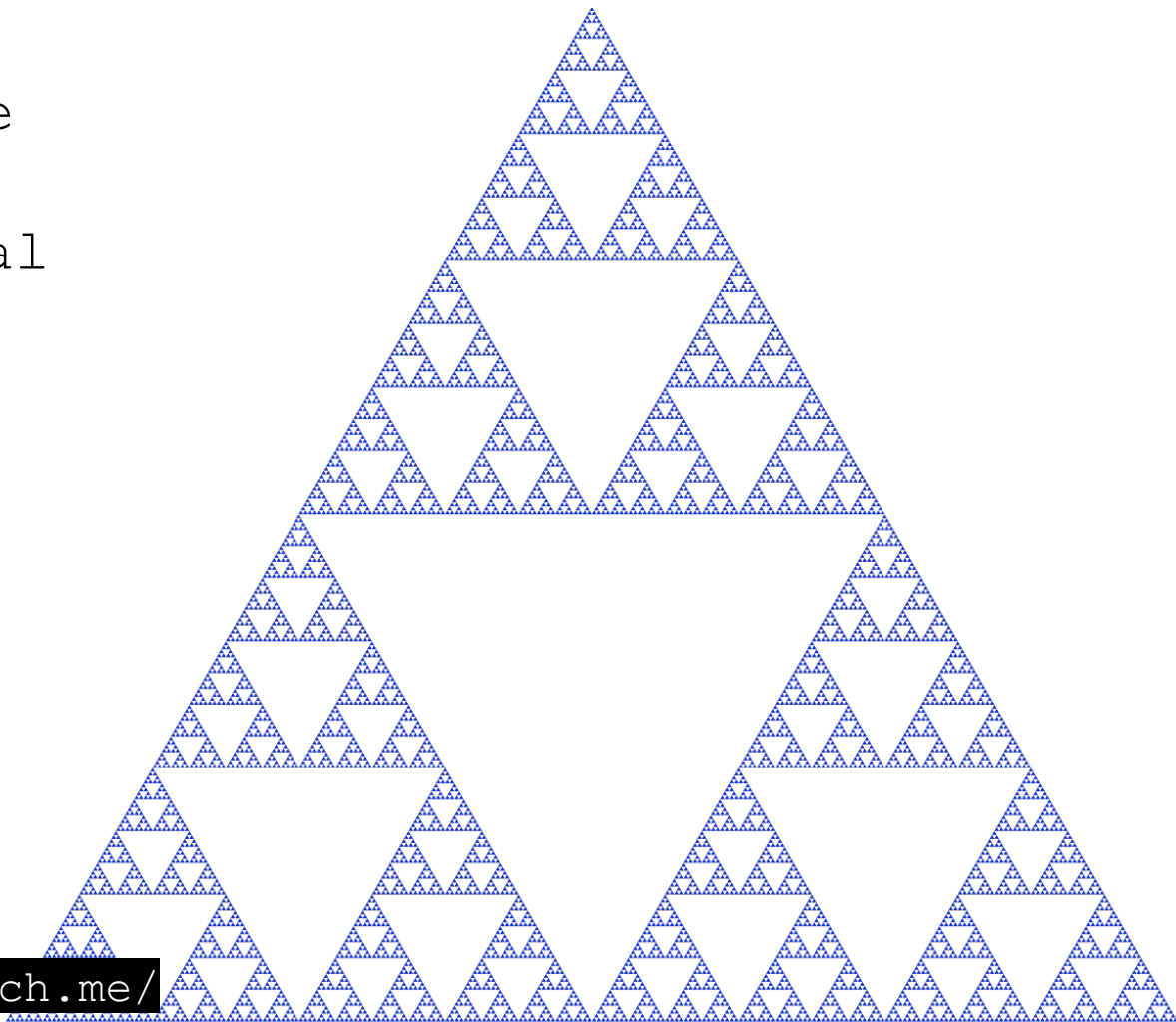https://cs103-proton.glitch.me/

Dall-E 2: cats learning C++ in the forest on '90's technology

Sierpinski triangle

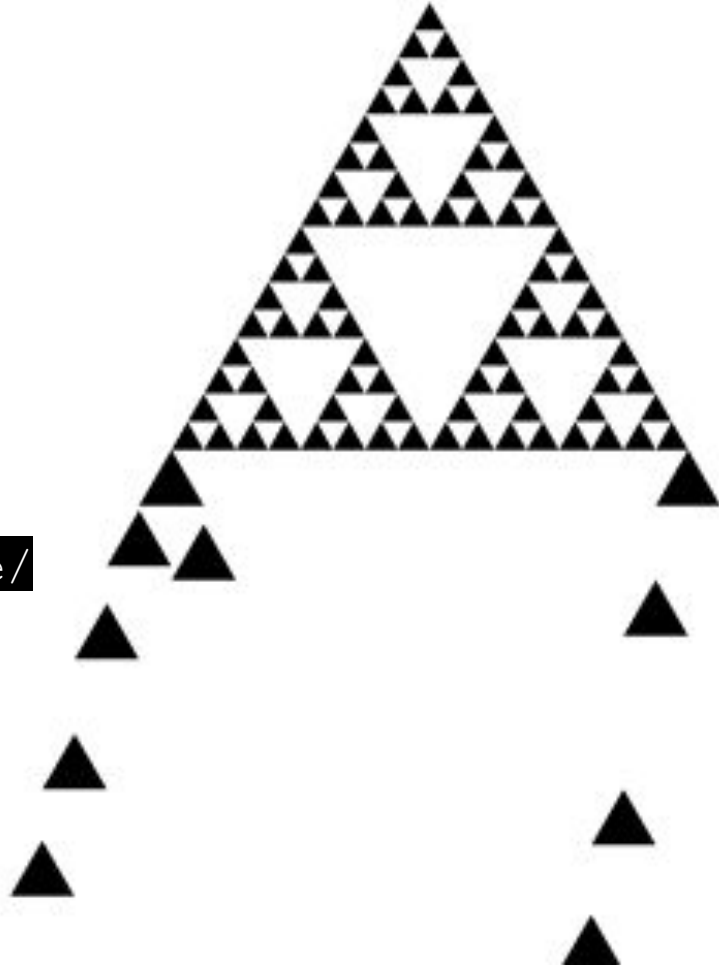self-similar fractal

RECURSION!

Sierpinski triangle

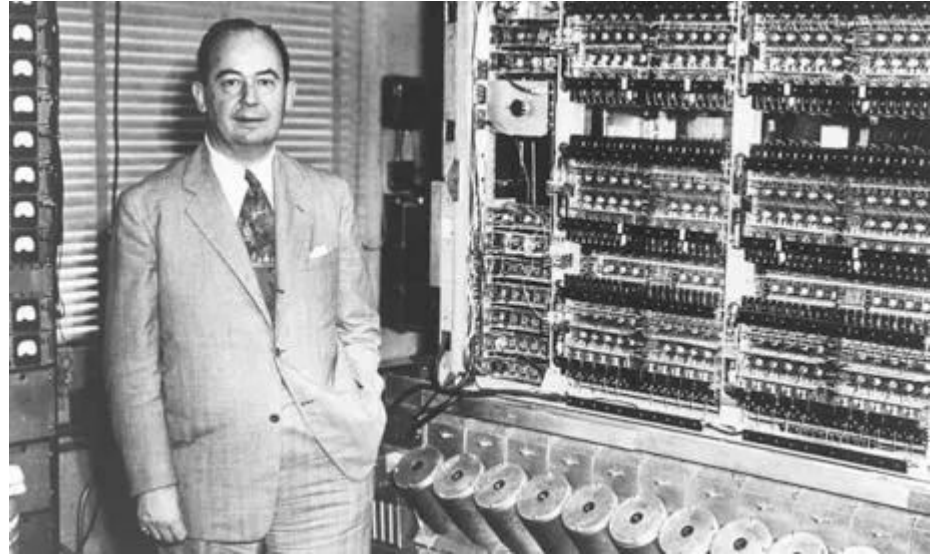self-similar fractal

RECURSION!

cellular automata

algorithms: how can complex behavior be modeled from simple steps?

"What kind of logical organization
is sufficient for an automaton to be able to reproduce itself?" How does nature reproduce itself?

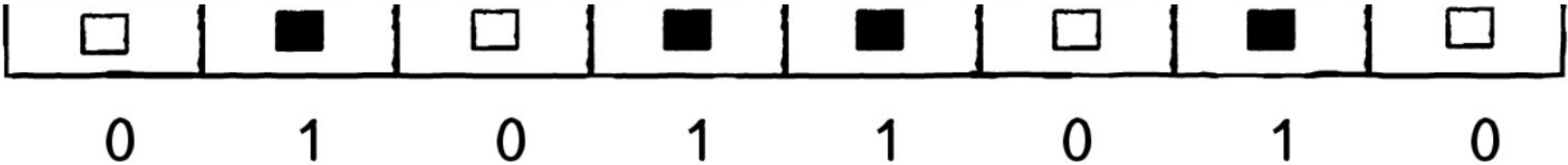John van Neumann, 1940's
(Stanislaw Ulam, Stephen Wolfram)

https://cs103-proton.glitch.me/

IF...

(7)	(6)	(5)	(4)	(3)	(2)	(1)	(0)
111	110	101	100	011	010	001	000

THEN...

0	1	0	1	1	0	1	0

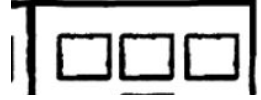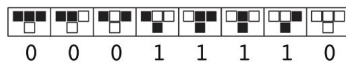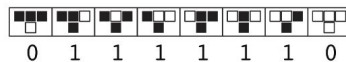**algorithm:**

- For every cell, take a look @ **neighbors** (left and right), find 3-pattern

- Look up pattern in the ruleset, find new state

- Set next generation cell to new state

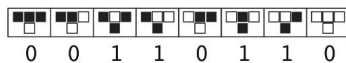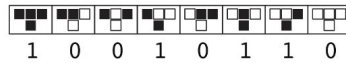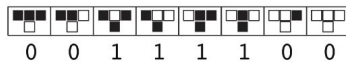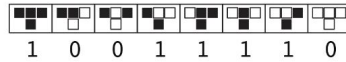- Repeat, iterate over generations (time)

rule 30
0 0 0 1 1 1 1 0
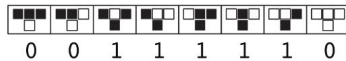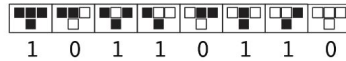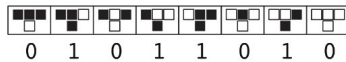
rule 126
0 1 1 1 1 1 1 0

rule 54
0 0 1 1 0 1 1 0

rule 150
1 0 0 1 0 1 1 0

rule 60
0 0 1 1 1 1 0 0

rule 158
1 0 0 1 1 1 1 0

rule 62
0 0 1 1 1 1 1 0

rule 182
1 0 1 1 0 1 1 0

rule 90
0 1 0 1 1 0 1 0

rule 188
1 0 1 1 1 1 0 0

rule 94
0 1 0 1 1 1 1 0

rule 190
1 0 1 1 1 1 1 0

rule 102
0 1 1 0 0 1 1 0

rule 220
1 1 0 1 1 1 0 0
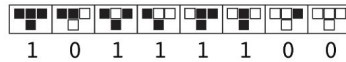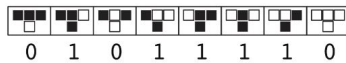
rule 110
0 1 1 0 1 1 1 0
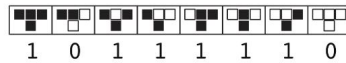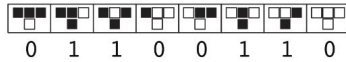
rule 222
1 1 0 1 1 1 1 0
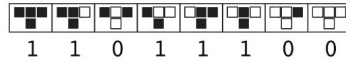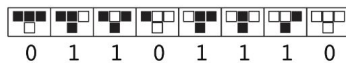
rule 122
0 1 1 1 1 0 1 0

rule 250
1 1 1 1 1 0 1 0

cellular automata:

- How can chaos, irregularity emerge from deterministic steps?

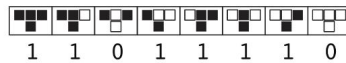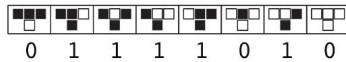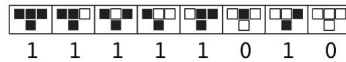- Can the complexity, randomness, and unpredictability of life (or, intelligence) be generated from simple underlying rules?

- ALSO, can order arise from disorder? (entropy)

Pattern found in Rule 30 …

cellular automata:

- Randomness in some CA (Rule 30) used in cryptography, as the cipher text or rand()

- Conceptually very similar to image processing: change neighboring pixels

- Model life-life behavior: sociology, political systems, fluid dynamics

- Adaptive, learning: you can change the rules based on conditions; closer to neural networks, AI

- Can evolve to do computation, solve problems