Regenerating Neural Network

Growing Neural Cellular Automata

- Dr. Károly Zsolnai-Fehér - cellular automatons
- Automata are similar to games with a bunch of cells and simple rules
    - Simple rules determine when cell should be full and when should be empty
    - Best Example: John Horton Conway's Game of Life
        - Each cell represents little life form
- Too many neighbours will lead to overpopulation deaths, and too few leads to underpopulation deaths the right amount will thrive and reproduce
- Why is it interesting?
    - Shows that small set of simple rules can give rise to remarkably complex life forms including:
        - Gliders
        - Spaceships
        - John Von Neumann's universal conductor
- Cellular Automaton programmed to evolve single cell to grow into prescribed kind of life form
    - Two key differences from most works
        - Cell state is different
        - Mathematical formulation is similar to deep neural network
- Exception but why?
    - Gives rise to useful feature - teach it to grow prescribed organisms
    - Over time sometimes will decay and can't continue growing - but paper describes how to recover from undesirable states - which might mean that it can regenerate when damaged
- Amazing considering it wasn't even trained for it
    - Main objective of paper was to grow and maintain shape (regeneration is a subset of this)

Possible Applications?

- Possibly for jpeg manipulation as a filtering option - self regulating compression