✕

Learn Git and GitHub without any code!

Using the Hello World guide, you'll start a branch, write comments, and open a pull request.

Read the guide

🗐 greerviau / **SnakeAI**

Train a Neural Network to play Snake using a Genetic Algorithm

⚖ MIT License

☆ **1.5k** stars   ⑂ **410** forks

★ Unstar	◉ Watch ▾

<> Code   ⊙ Issues 6   ⇡↓ Pull requests   ▶ Actions   ▥ Projects   📖 Wiki   ···

ᛘ master ▾   ···

🗐 **greerviau** Merge branch 'master' of https://github.com/greerviau/Sna... ···   on Mar 7, 2019   ⧖ **56**

View code

README.md

SnakeAI

Download and Run

To run the program you will need Processing

YouTube Video

Snake

Neural Network

Each snake contains a neural network. The neural network has an input layer of 24 neurons, 2 hidden layers of 16 neurons, and one output layer of 4 neurons. Note: Network can now be customized with the number of hidden layers as well as the number of neurons in the hidden layers.

Vision

The snake can see in 8 directions. In each of these directions the snake looks for 3 things:

- Distance to food
- Distance to its own body
- Distance to a wall

3 x 8 directions = 24 inputs. The 4 outputs are simply the directions the snake can move.
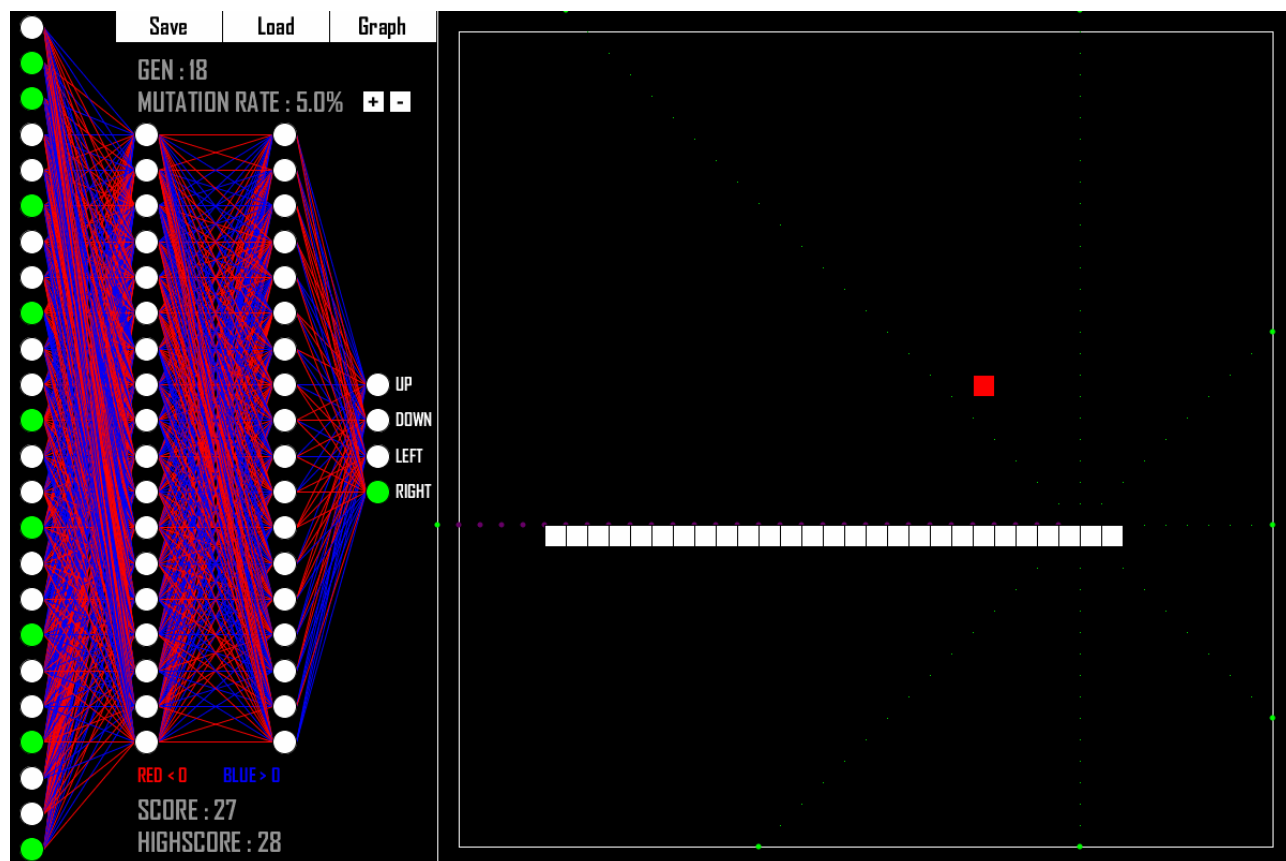

Evolution

Natural Selection

Each generation a population of 2000 snakes is created. For the first generation, all of the neural nets in each of the snakes are initialized randomly. Once the entire population is dead, a fitness score is calculated for each of the snakes. Using these fitness scores, some of the best snakes are selected to reproduce. In reproduction two snakes are selected and the neural nets of each are crossed and then the resulting child is mutated. This is repeated to create a new population of 2000 new snakes.

Fitness

A snakes fitness is dependant on how long the snake stays alive as well as its score. However they are not equally important, having a higher score is rewarded more than a snake who simply stays alive. There is the possibility however that a snake may evolve a strategy where it loops in a certain pattern and never dies. Even though having a high score is prioritized more, if a snake can stay alive forever then that is a clear problem. To avoid this each snake is giving 200 starting moves at the beginning of its life. Every time it eats a piece of food it gains 100 more moves, with a maximum of 500 moves. This means that snakes who evolve to go in loops will eventually die and snakes who go for the food will not only have a higher score, but stay alive longer.

Crossover & Mutation

When two snakes are selected for reproduction, what happens is that the snakes brains are crossed with each other. What this means is that part of one parents brain is mixed with part of the second parents and the resulting brain is assigned to the child. After the crossover the brain is also mutated according to a mutation rate. The mutation rate determines how much of the brain will be randomly altered.
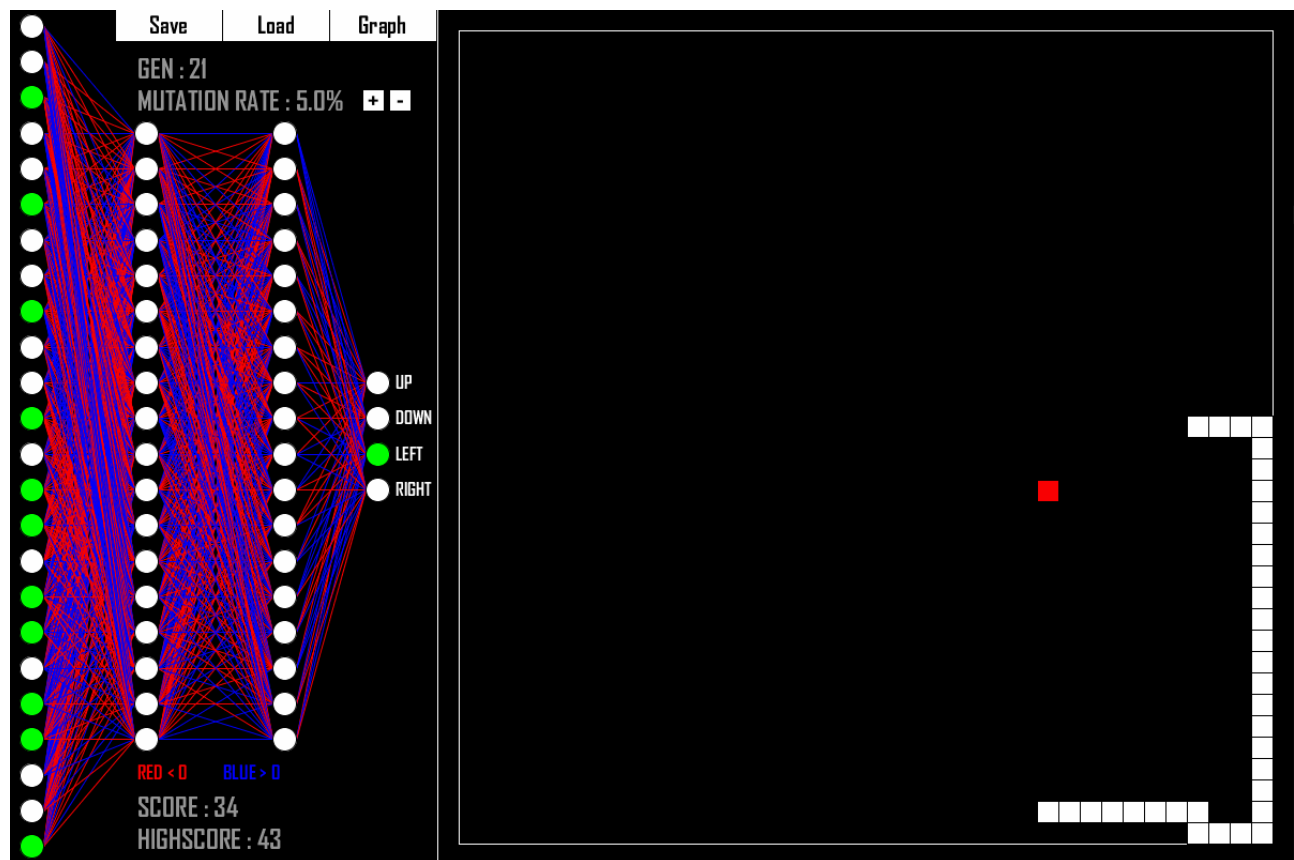
Data Collection

Graphing

The graph represents the score of the best snake from each generations. In some generations the graph may dip bellow the previous, this is because even though the score may have been worse, some trait allowed the snake to live longer and gain a higher overall fitness.
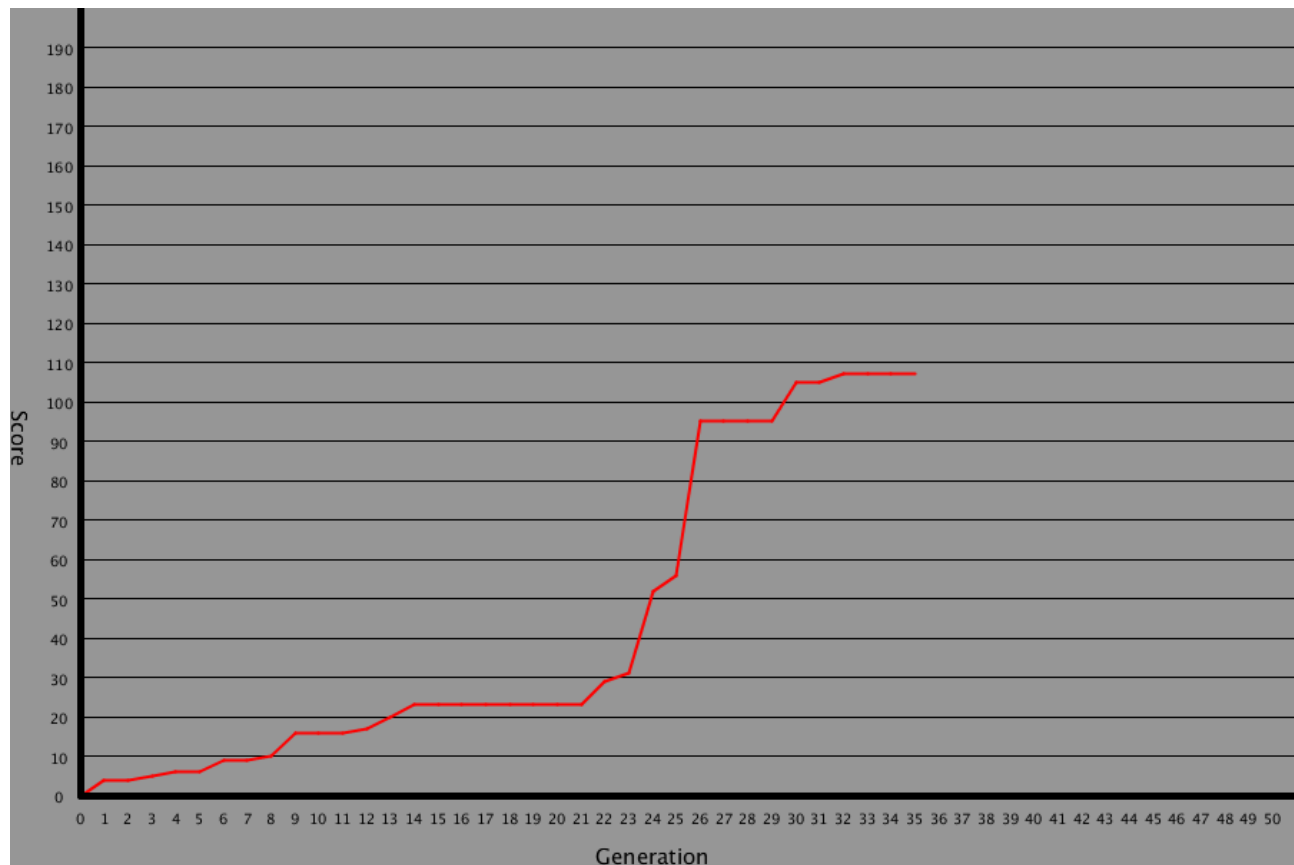
Save & Load

Models can be saved and loaded in order to test a model in new situations. The weights
for each connection are saved in a CSV file. The evolution graph is also saved in order to
view the evolution progress of the model.

Releases

No releases published

Packages

No packages published

Languages

● **Processing** 100.0%