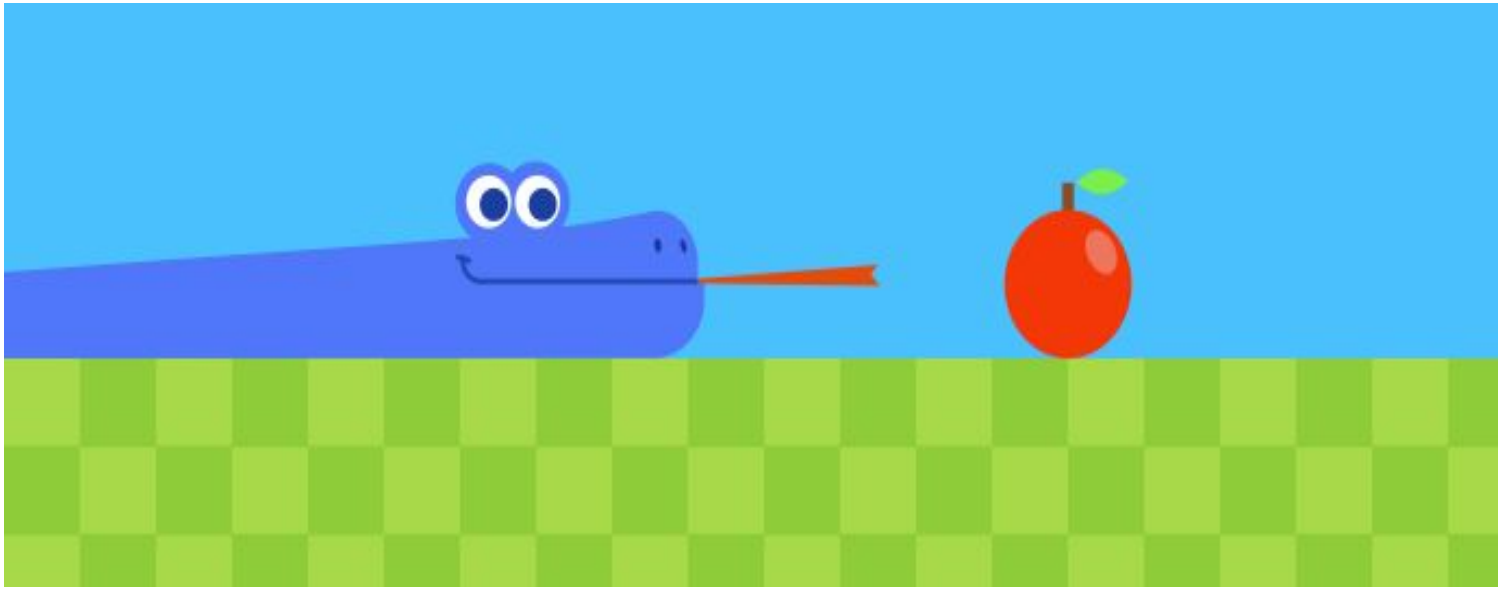
Deep Neural Network In Snake Game



Deep Learning Final Project

Students Team

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Problem Statement

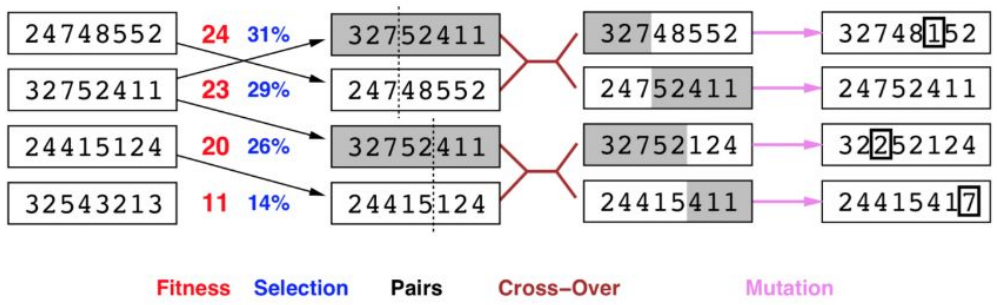
Learn our friendly snake how to navigate to eat apples and grow!

Our Approach: In Depth

The genetic algorithm is the key player here.

For the sake of time, we will not repeatedly be covering the general flow of the algorithm and how it works.

The key decision maker in the genetic algorithm, which profoundly has to do with the scope of the problem we are tackling, is the **fitness function**.



Our Fitness Function

How do we consider a chromosome to be doing bad or well?

- The game score (the number of apples taken).
  - Basic scoring and game progression element.
- Penalty for dying.
- Survival time.
  - Enhances the ability to survive and avoid collisions.
- Spinning around itself in loops.
  - Regularizing prioritization of survival over taking risk in moving around to pursue apples.

Input Features Attempted

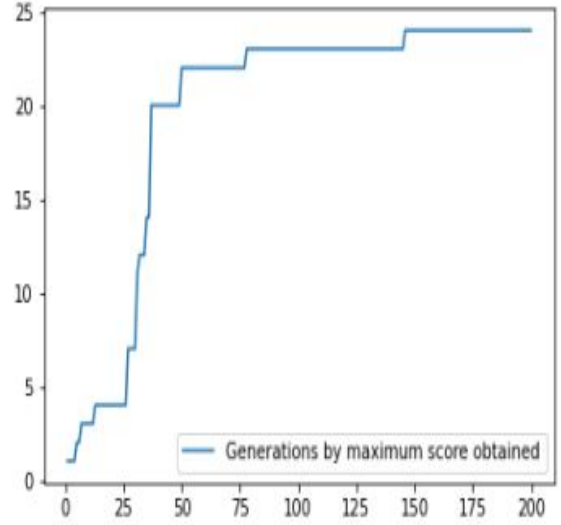
- Is the right direction blocked
- Is the left direction blocked
- Is the front direction blocked
- Snake length
- The direction of the head of the snake

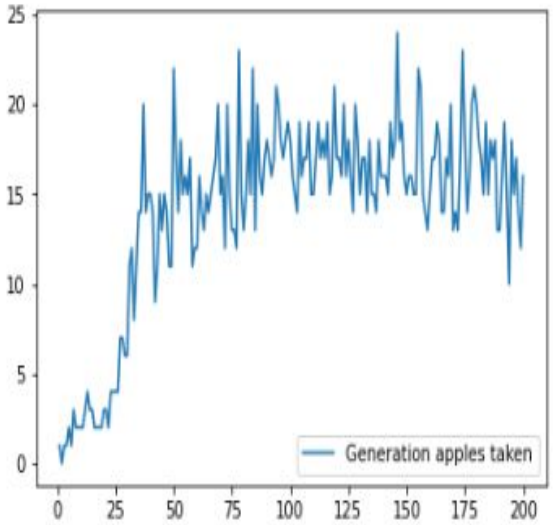
Another Approach:

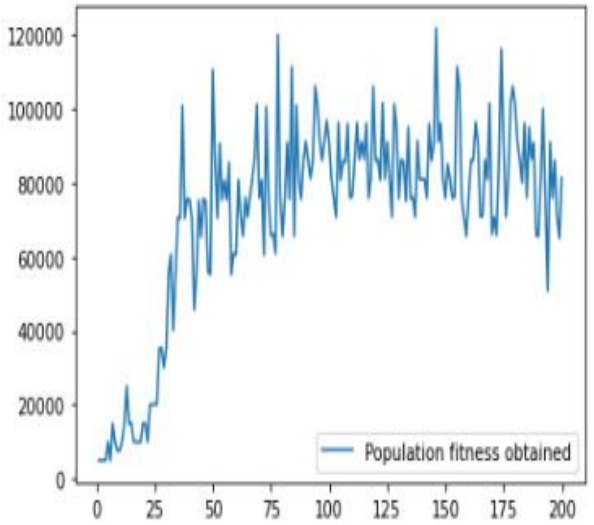
We tried to enter only all the index of the grid which is occupied by the snake and apple to the neural network but we don't get significant results due to the complexity of learning deriving observations off the grid.

Results

The following graphs show the progress of the model in learning through 200 generations with a maximum obtained score of 24 apples eaten!







Progress

As promised and more!

- Engine implementation with the input features. 
- Connected game frontend with backend engine. 
- Achieved positive learning according to the current set hyperparameters with some tuning, just enough to observe positive learning, for now. 

Next Step

- Hyperparameter tuning.

- Probably applying optimization techniques, possibly against randomization which was observed to be a force pulling in the opposite direction of learning.

- Might add more features.