

AI Snake Game

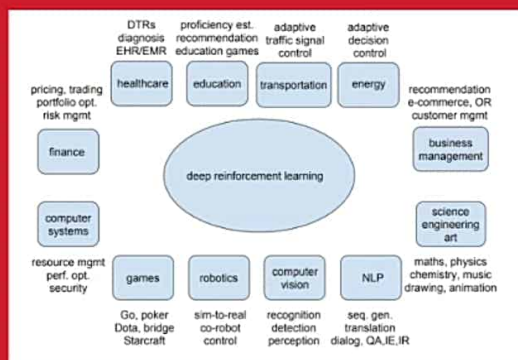


The single-player variant of Snake is a well-known and popular video game that requires a player to navigate a line-based representation of a snake through a two-dimensional playing area, while avoiding collisions with the walls of the playing area and the body of the snake itself.

A score and the snake length are increased whenever the snake is moved through items representing food.



Reinforcement Learning



Reinforcement learning (RL) is an area of machine learning concerned with how software agents ought to take actions in an environment in order to maximize the notion of cumulative reward.

Reinforcement learning is one of three basic machine learning paradigms, alongside supervised learning and unsupervised learning.



Shortest Path

Path Solver uses breadth-first search to find the shortest path.

Intuitively, we expect the path to be as straight as possible so there will be less scattered empty points on the map.

Longest Path

The longest path problem on the game map (i.e., a cyclic, undirected and unweighted graph) is NP-hard.

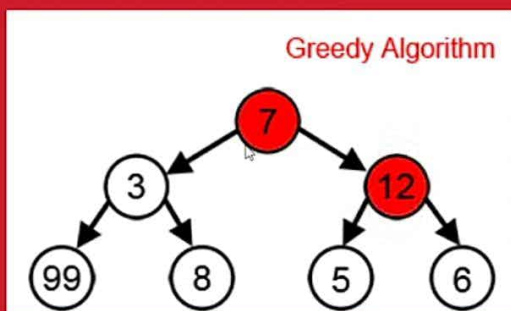
Path Solver uses a heuristic algorithm to find suboptimal solutions.

Suppose we want to find the longest path from point A to point B on a 4*4 game map.

The solver first finds the shortest path between the two points, then extends each pair of pieces until no extension is found.



Greedy Path - Path Solver



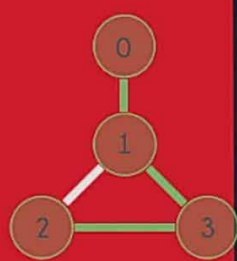
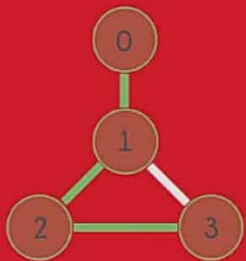
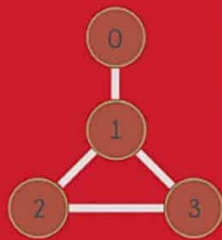
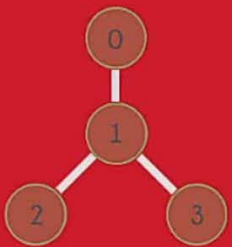
A greedy algorithm is a simple, intuitive algorithm that is used in optimization problems.

The algorithm makes the optimal choice at each step as it attempts to find the overall optimal way to solve the entire problem.

It will choose what appears to be the optimal immediate choice, so it will choose 12 instead of 3 at the second step and not reach the best solution, which contains 99.



Hamiltonian Path solver



Hamiltonian Path is a path in a directed or undirected graph that visits each vertex exactly once.

The problem to check whether a graph (directed or undirected) contains a Hamiltonian Path is NP-complete, so is the problem of finding all the Hamiltonian Paths in a graph.



Deep QLearning



Qlearning

Q-learning learns the action-value function $Q(s, a)$: how good to take an action at a particular state.

DQLN

A reinforcement learning algorithm that combines Q-Learning with deep neural networks to let reinforcement learning work for complex, high-dimensional environments, like video games, or robotics.

