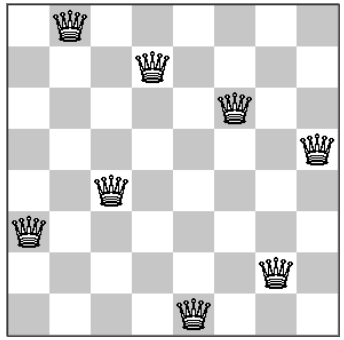
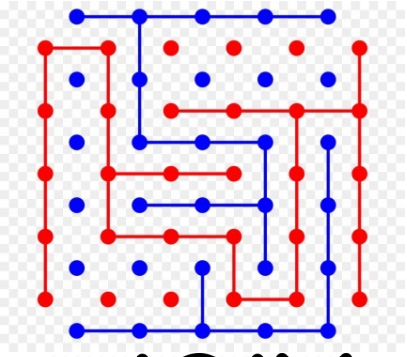
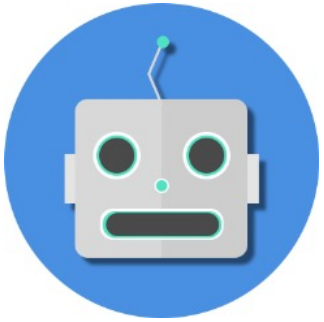
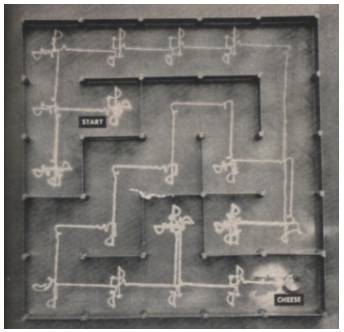
Artificial Intelligence:

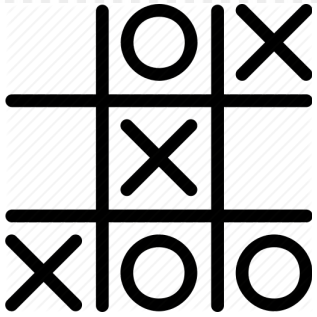
Past, Present and Future





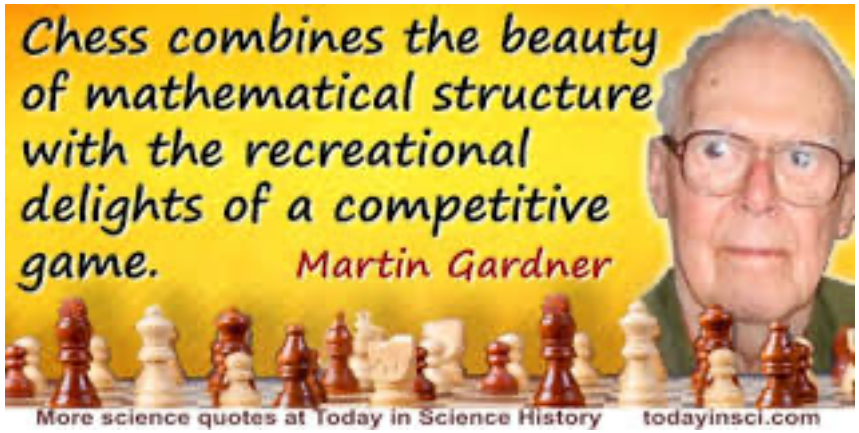






Chee Wei Tan

Hexapawn: The Drosophila of Machine Learning



Hexapawn Game

- Know just the rules. Do NOT try to analyze it first!

Start with a Beginner's mind!

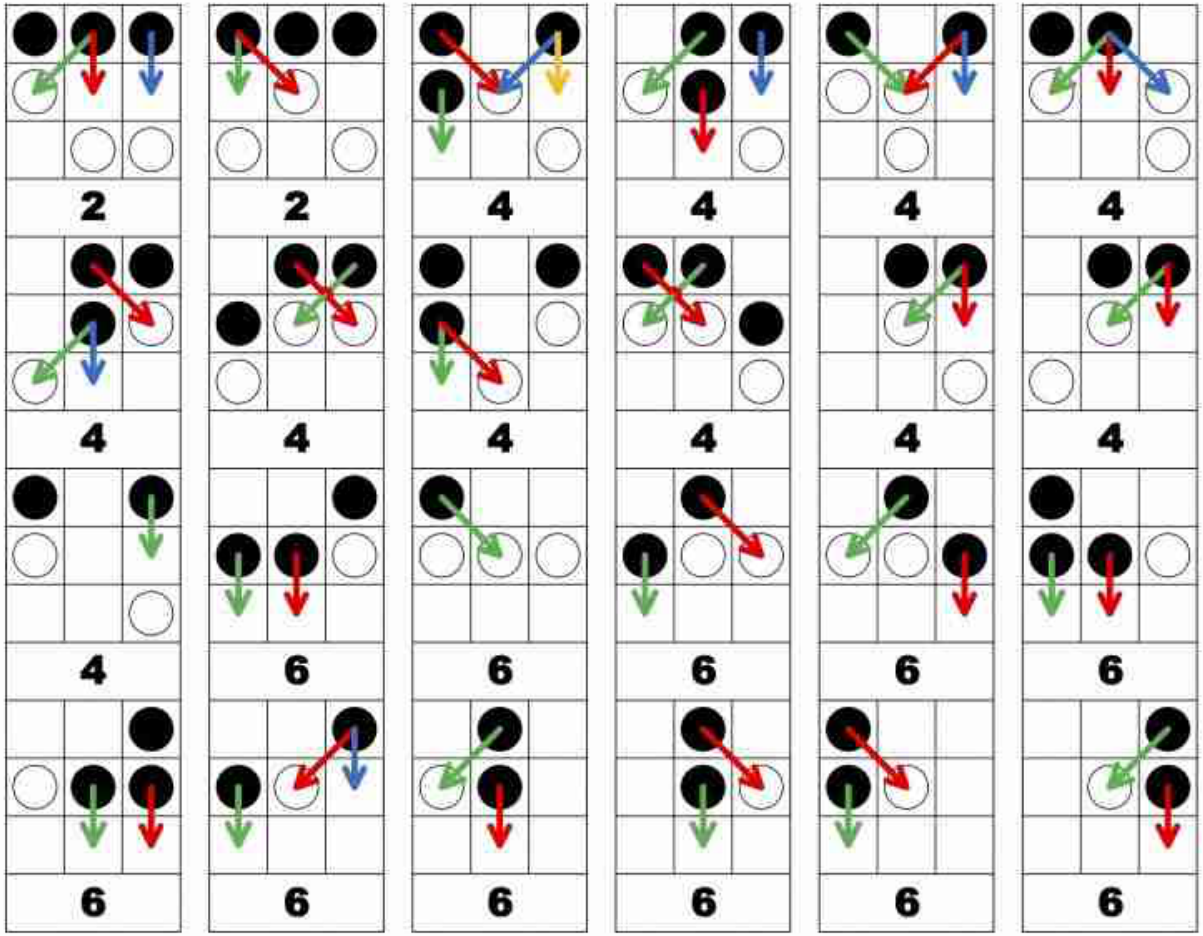
Feasible Moves

- Pawns can move one square forward into an empty square.
- Pawns can capture an opponent's pawn by moving forward diagonally.

When A Player Wins (Checkmate!)

- Get one of your pawns to the other side of the board or;
- Prevent the opponent from moving (e.g., no more pawn left)

Activity: Teach the Machine to play Hexapawn!



How many games to train the machine into a skillful player?

Are there ways to train it faster?

Machine Learning in AI Games

- Alan Turing in his 1948 paper “Intelligent machinery” (https://weightagnostic.github.io/papers/turing1948.pdf) introduces the idea of rewarding and penalizing strategy through experience – early form of Reinforcement Learning
- Is it true that a more complex game requires more training (i.e., a bigger training data set)?
- But is a *bigger* training data set always better?
- Will the learning be slower for more complex game, e.g., checker, chess, Go?
- From Codebreaking to Computing: Remembrances of Bletchley Park 50 Years Later

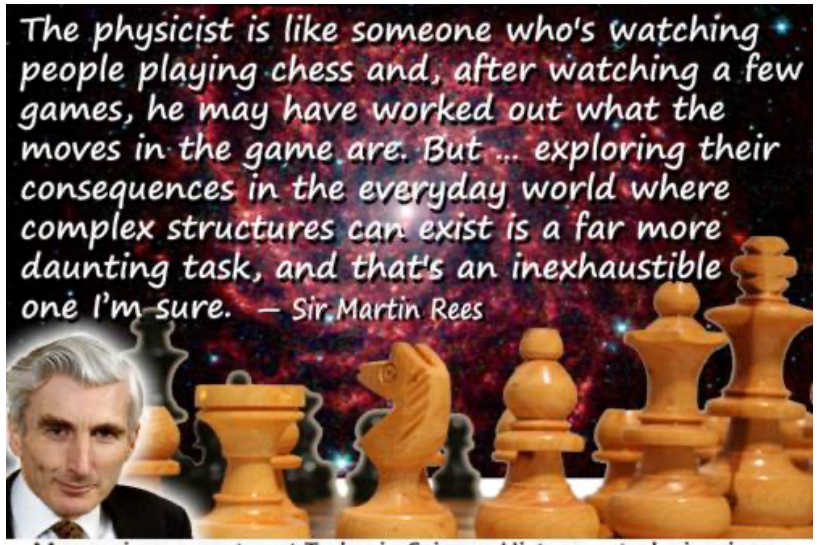
https://www.computer.org/csdl/magazine/an/1995/01/man1995010032/13rRUxYIN6g

Summary of Machine Learning

- Game-learning machines playing Hexapawn, Nim and Tic-Tac-Toe serve as the ideal *drosophila* of machine learning in AI
- Machine learning ideas:
  - Supervised Learning
  - Training
  - Trial-and-Error Strategy
  - Reinforcement Learning by Reward and Penalization
  - Backpropagation

"When you ask what are electrons and protons I ought to answer that this question is not a profitable one to ask and does not really have a meaning. The important thing about electrons and protons is not what they are but how they behave, how they move. I can describe the situation by comparing it to the game of chess. In chess, we have various chessmen, kings, knights, pawns and so on. If you ask what chessman is, the answer would be that it is a piece of wood, or a piece of ivory, or perhaps just a sign written on paper, or anything whatever. It does not matter. Each chessman has a characteristic way of moving and this is all that matters about it. The whole game os chess follows from this way of moving the various chessmen."

– Paul A.M. Dirac



https://www.quantamagazine.org/martin-rees-on-the-future-of-science-and-humanity-20181205