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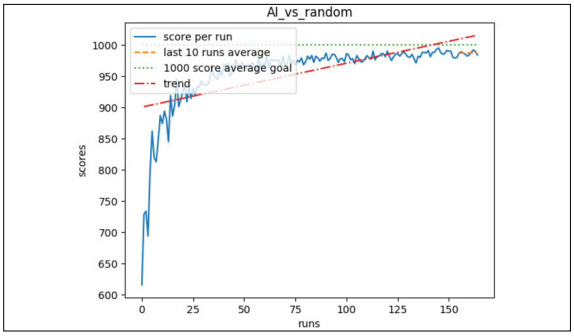
Reinforcement Learning from Scratch

Teach an AI to play board games without prior knowledge

DeepMinds trained Reinforcement Learning model plying Atari Breakout

A screenshot made during the training of the Connect4 Reinforcement Learning model



Score of a trained model. In the end, the AI won almost 1000 out of 1000 games per evaluation cycle.

Introduction: Self-driving cars and computer programs that can beat world champions in games like Chess and GO have become quite common in recent years. The technology behind all these applications is Reinforcement Learning. Researchers are making tremendous progress and are achieving ever more amazing results. The goal of this thesis is to enable a developer to make his own Reinforcement Learning application from scratch. It shall be shown how a Reinforcement Learning model is designed and trained on a self-made
training environment. This process shall be demonstrated by the development of an artificial intelligence for the game Connect4.

Objective: In a first step all necessary background information and current researches gets explained. Findings, difficulties and differences to more common fields like supervised learning shall be pointed out. The second part examines the practical aspects of the development process. First, the necessary tools such as a training environment and evaluation functions were created. Further, the training on high-performance servers and the use of Docker containers in Machine Learning will be explained. Finally various reinforcement learning
model with different network architectures were created.

Result: The resulting Connect4 artificial intelligence is able to beat amateur players several times. Its development shows the complete process to develop a Reinforcement Learning model from beginning to the end. The collected experiences can be used for other Reinforcement Learning applications. Further improvements on the Connect4 model could make it theoretically an unbeatable opponent.