A brief survey of how leading companies develop AI related tools in the field of Games

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1 Introduction

In 2016, AlphaGO came out of nowhere to bring deep learning to the general public. For decades, games have been used as an important way to test and evaluate the performance of artificial intelligence systems. It was the first time a computer program was able to beat a world champion at Go. This was seen as a landmark achievement in Artificial Intelligence. AI-related technology then became widely used in the field of games by many leading companies, to compete with human players as well as to enhance user experience.

2 Companies and their AI programs

2.1 Deepmind

Deepmind, which is supported by Alphabet, is best known for its invention of the computer program AI AlphaGo. AlphaGo defeated the 18 world title winner Go player Mr Lee Sedol in March 2016 by a score of 4-1. In May 2017, Deepmind revealed AlphaGo Zero. They improve the program so that AlphaGo Zero can learn by playing against itself, starting from completely random play, instead of the learning-by-professional-players approach used in former AlphaGo. This powerful technology allows AlphaGo not to be limited by human knowledge. AlphaGo Zero has quickly outperformed all previous versions and has also discovered new knowledge, developed unconventional strategies and creative new moves, including those that defeated world Go champions Lee Sedol and Ke Jie.

In late 2017, AlphaZero was launched, a single system that taught itself how to master the games of chess, shogi, and go from scratch, beating a world champion computer program in each case. AlphaZero replaced hand-crafted heuristics with deep neural networks and algorithms that had nothing but the basic rules of the game. By teaching itself, AlphaZero developed its own unique and creative style of play in all three games.

In 2019, Deepmind launched the StarCraft II AI program AlphaStar, the first artificial intelligence to beat top professional players. Considered one of the most challenging real-time strategy games and one of the longest-playing eSports games ever, StarCraft has been unanimously recognized as a "huge challenge" for artificial intelligence research. The former best results had been achieved by handcrafting key elements of the system, imposing significant restrictions on the game rules, giving the system superhuman abilities, or playing on simplified maps. Even with these modifications, no system can match the skills of professional players. However, AlphaStar plays the full game of StarCraft II, using deep neural networks and reinforcement learning trained directly from the raw game data through supervised learning.

In 2020, the latest version of the Deepmid algorithm, called MuZero, took these ideas a step further. It matches AlphaZero's performance at Go, Chess and Shogi, while also mastering a series of visually complex Atari games, all without being told any of the game's rules.

It does this by learning its environment model and combining it with AlphaZero's powerful look-ahead tree search. This allows it to plan winning strategies in uncharted territory, a major leap forward in the capabilities of reinforcement learning algorithms and an important step toward building general-purpose learning systems.

2.2 OpenAI

OpenAI Five is the first AI to beat a world champion in an eSports tournament. In the April 2019 finals, OpenAI Five won two matches back-to-back against world champion Dota 2 team OG. Both OpenAI Five and DeepMind's AlphaStar had previously beaten great pros privately, but lost their live professional matches. The OpenAI Five won is the first time an AI has beaten an eSports pro group on live.

To build OpenAI Five, the OpenAI team created a system called Rapid, which was able to run PPO at an unprecedented scale. With its help, OpenAI Five became a world-class Dota bot without reaching any basic performance limits.

2.3 Microsoft

Scientists at Microsoft Research Asia have developed a mahjong artificial intelligence called Super Pheonix or simply Phoenix. It is based on deep reinforcement learning and a number of newly introduced techniques, including global reward prediction, prophecy machine guidance, and runtime policy adaptation.

The MSR Asia team designed Suphx to teach itself mahjong strategy, tactics and techniques through experience playing against thousands of people on Tenhou, a global online mahjong competition platform in Japan with over 300,000 members. With constant machine learning, Suphx went from novice to expert after playing over 5,000 games in four months. The more it plays, the more it learns at an increasingly rapid rate. It has now honed its playing style to balance attacking and defending moves, strategically weighing short-term losses against long-term gains, and making quick hand calculations and decisions in situations where information is unclear.

With more work, these may be applied to real situations to solve problems triggered by unknown factors and random events.

2.4 EA

In early 2019, new AI technology was introduced with the launch of Capital Supremacy. For the first time in Star Wars Battlefront II's online multiplayer games, players fight alongside and against the bots. The AI technology provides scale to the battle by increasing the sheer number of soldiers on the battlefront. But it also made it possible for players across the skill spectrum to have fun, as bots - if compared to seasoned veterans - were easier targets. Since then, as part of the cooperation update, AI has been front and center in no less than two new game modes: online co-op and offline instant action. The development team redoubled its efforts to use AI to make players feel heroic on the battlefront, allowing them to create their own, larger-than-life Star Wars moments - and have fun without the pressure of human competition.

2.5 Sony

Gran Turismo Sophy (GT Sophy) is a revolutionary racing Artificial Intelligence developed in partnership with Sony AI, Polyphony Digital (PDI) and Sony Interactive Entertainment (SIE). This AI is designed to compete with top Gran Turismo Sport drivers and enhance their gaming experience.

GT Sophy uses novel deep reinforcement learning techniques for training, including state-of-the-art learning algorithms and training scenarios developed by Sony AI, using a real driving simulator, Gran Turismo Sport, and using SIE's cloud gaming infrastructure for large-scale training.

GT Sophy takes gaming AI to a new level, tackling the challenges of hyper-realistic simulators by mastering real-time control of vehicles with complex dynamics, while operating within inches of the opponent.

2.6 Riot

A few years ago, the Riot team introduced a governance system called "courts" that would identify potential cases of abusive language and create interactive "case files" that would then be presented to the game's player community, who were invited to review in-game chat logs and vote on whether they think the behavior is acceptable.

Millions of cases were processed in this labor-intensive manner. Soon the team began to see patterns in the language used by toxic players. To help optimize the process, they decided to apply machine learning techniques to the data. The new version of the system is now supervised by technology rather than other players, making it more efficient to provide feedback and impose consequences for bad behavior in the game. It can now provide feedback to players in five minutes, whereas previously it could take up to a week.

One challenge for the system is identifying context. As with any team sport, players often build camaraderie by joking or being sarcastic, which in another context might be seen as unkind or aggressive. Machines usually fail to capture sarcasm. In fact, this may be the biggest obstacle to combating online abuse through machine learning.

Currently, the Riot team is trying to address this issue with additional checks and balances. Even if the system identifies that a player is exhibiting bad behavior, it will check other systems to reinforce or overrule the verdict. For example, it will attempt to verify every report a player submits to determine his or her historical "reporting accuracy".

To truly curb abusive behavior, Riot has designed penalties and disincentives to convince players to change their behavior. For example, it may limit chat resources for misbehaving players or require players to complete unranked games without incident before being able to play ranked games. The company also rewards respectful players with positive reinforcement.

2.7   Blizzard

The core tool Blizzard use to identify bad behavior is the player reporting system. Player report types are adjusted to make it easier to correctly select the reporting category that matches the reported misbehavior. To further improve these systems, Blizzard support team are doing a lot of exciting work to develop machine learning systems to help accurately identify chat abuse and game disruption. These technologies will be used in conjunction with player reports to empower the community to quickly bring attention to bad behavior so that appropriate measures can be taken to stop or prevent future bad behavior from ruining the experience of others playing Overwatch. These same systems will also protect players from false reports.

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