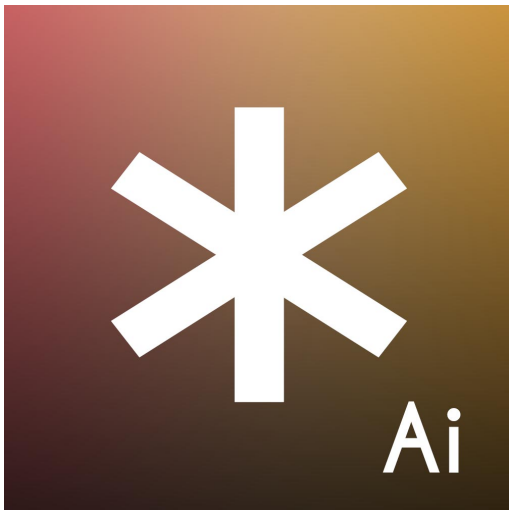
Ai

The way to the Future.

StarAi



We believe that Artificial Intelligence is the way to the future, and is the most transformative technology of the 21st century.

We are a community for talented researchers and hobbyists alike, working to create the next generation of artificial intelligence algorithms.

StarAi is an ***Artificial Intelligence competition*** to rapidly improve the current state of the art in Machine Learning, by pitting teams of developers Ai algorithms against one another in competitive play- using Starcraft II.

Details of the competition

Why Starcraft?

AlphaGo solved the ancient game of Go & there is need for a new Artificial Intelligence challenge.

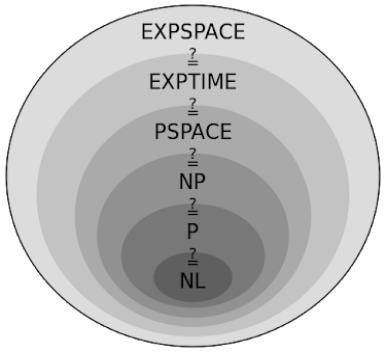
Just like the ImageNet competition pushed the boundaries of Machine Vision [1], a new challenge is required to push the boundaries of "applied" general purpose artificial intelligence systems.

There are massive problems facing modern general purpose machine learning algorithms however. Partial observability, Very Large Action Spaces, Hierarchical Learning & Multi Agent Problems are currently some of the largest active areas of research in the applied machine learning community [2].

Relative to previous Ai milestones like Chess or Go, complex video games like Starcraft start to capture the ***messiness*** and ***continuous nature*** of **the real world.**

General Purpose Artificial Intelligence systems which solve complex video games like Starcraft will be **highly general,** with **applications outside of games** & will be one of the most powerful technologies ever developed by humanity [3].

Because of this, we believe that Starcraft is the next "Grand Challenge" for Ai and requires resources, tools & incentives to do so.



Starcraft 2 is an example of a ExpTime problem – the most complex type of computation problems in Computer Science.

Why incentivize competitions?

We believe that a financial prize is the best way to incentivize people to solve the "Starcraft problem".

The Ansari X Prize (1996-2004) was a space competition in which the X Prize Foundation offered a US$10,000,000 prize for the first non-government organization to launch a reusable manned spacecraft into space twice within two weeks. It was modeled after early 20th-century aviation prizes, and aimed to spur development of low-cost spaceflight. Surprisingly, the Xprize was won

SpaceShipOne, the winning entrant to the Xprize ascending to space.

During its existence, The Xprize sparked renewed interest in Spaceflight with more than US$100,000,000 invested in new technologies in pursuit of the Xprize. At the time, the renewed interest in manned spaceflight also directly lead to the founding of companies & organizations including Virgin Galactic, SpaceX & BlueOrigin. . [4]

Even though the Xprize was a remarkable technological accelerator, what was even more remarkable was the way the Xprize was funded.

Instead of having a US$10,000,000 purse "on hand" to be gifted out to a potential winning team, the prize was funded by "an insurance policy that guaranteed that the $10 million was in place on the day that the prize is won."

Previous Ai competitions have had small cash payouts. StarAi aims to stand in stark contrast to this & be the first of its kind by being a "Grand Prize" of the Ai community. We believe that having a larger prize is the "missing ingredient" required to incentivize massive amounts of time being invested by groups to do research from all over the world.

Instead of just having a cash pool, purchasing an insurance policy acts as a "financial amplifier", allowing the prize to be far greater than it would have been otherwise.

Similarly to the Ansari Xprize, StarAi is actively in talks with many major partners to discuss funding just such an insurance policy for a significant artificial intelligence prize.

We hope that such a prize would act as *the* incentive to solve the Starcraft problem & in the process create the next generation of Ai algorithms.

Goal of the competition

Create an Artificial Intelligent agent to beat a Grand Master human player at the game of Starcraft 2.

Prize Purse

The StarAi competition shall offer a prize purse of US$ 1 000 000 upon the defeat of our nominated Grand Master player.

Period of the competition

The prize shall be offered for a maximum of 4 years.

Competition Participants

The competition is open to both groups or individuals, including the broad spectrum of hobbyists through to professional researchers.

Individuals or groups shall have to name their “team” & apply to be a successful applicant for StarAi.

Rules of the competition

Submission Rules

The competition will comprise of two distinct phases spanning a maximum of 4 years, upon which the StarAi competition shall expire.

Training Phase

During the training phase, entrants will be allowed to battle their bots against one another in competitive leader board play, to improve & test overall performance of their Ai Systems.

Entrants will be allowed to submit 1 update of their bot per day up until the closing date. During this part of the competition source code will not be required.

Each year, an annual event shall be held in Sydney, Australia - gathering the community together with the best applicants bots battling each other out.

Evaluation Phase

Six months prior to the end date of the competition, the “evaluation phase” begins.

In order to avoid any conflict of interest or collusion between entries, only one entry per institution / author is allowed in this final phase of the competition.

Final submissions will require inclusion of source code in order to manually check for cheating.

Once approved, Ai systems will then be battled against our nominated Grand Master Starcraft 2 player.

Bot types

Traditionally expert computer systems have been "hard coded" to handle situations whereby a rule will be manually coded into the system - for if situation X happens, respond by taking action Y.

These are known as "If-then" systems.

End to end machine learning systems are defined in stark contrast to existing expert computer systems that are a series of simple "rule based" if-then statements by being able to autonomously determine on their own, what action to take in a given a certain situation ***without*** an " if-then rule book".

Only "end-to-end" machine learning bot systems will be allowed in to compete in the final tournament.

Game Type

The only game type for the competition will be 1 vs. 1 full game StarCraft 2 with fog of war enabled.

Time Limit

Games will have a 'frame limit' of 86400 frames, to simulate one hour of gameplay. If a game goes this long, it will be stopped and the in-game score will be used to determine the winner.

Bot Time-Out

Make sure that each onframe call does not run longer than 42ms. Entries that slow down games by repeatedly exceeding this time limit will lose games on time. In particular a bot will be given a game loss if one of the following occurs:

>= 1 frames exceed 10 seconds, or
>= 10 frames exceed 1 second, or
>= 320 frames exceed 55ms

Open-Source

All entries submission folders, including source code, will be published on the competition website once the competition has finished.

Probability of Winning StarAi.

Past Prizes

Ai researchers have been using the original Starcraft as a test bed for machine learning research for 15 years starting around 2004. This is because Starcraft is a multi agent control problem, with imperfect information (given the fog of war) and a large state space given the number of possible actions and world configurations.

The first true Starcraft Ai competition was held in 2010 at the Artificial Intelligence and Interactive Digital Entertainment conference (AIIDE) and was a huge success. 26 teams from Universities all around the world entered. This competition has continued to be held annually with the current registration open for the 2018 season. Other than the chance to competition, prizes for the AIIDE competition have been scarce to non-existent. [5]

We believe that providing an incentive would significantly increase the amount of teams likely to compete and hence the amount of research being performed in the area.

For more information on past Starcraft competitions, please refer to this article by Tommy Thompson [6].

Other Research Analogues

It is extremely hard to predict when a research project will bear fruit. However, we can use analogues to other research efforts currently underway to get a feel for the rate of progress as of writing this document in June 2018.

Dota 2, a very similar game to Starcraft - in the sense that it has extremely complex dynamics that arise from a set of basic game rules - is currently being tackled as their "problem of choice" by OpenAi.

In 2017, OpenAi released an Ai End-to-end machine learning system Dota2 bot [7], the key take away from this bot was that is was able to achieve *superhuman* performance in Dota2, outperforming human Grand Master players.

The game is usually played in a 5 vs. 5 player setting, with 115 character options available to be chosen at the start of the game. Furthermore there are items that the characters can wear that give them additional "Abilities" & also modify the statistics of the characters.

In the 2017 OpenAi Dota 2 bot, the environment was limited to ***only one character type, no items & only 1 vs 1 (of the same character type!).*** By doing this, OpenAi ***significantly reduced*** the complexity of the game.

However in late June this year 2018, OpenAi released a new version of their bot, titled "OpenAi Five" [8]. Whilst all 115 characters are still not all being used, they have now opened it up to 5 vs 5. This is a significant milestone as it significantly increases the complexity of the game.

Even though the OpenAi Five bot siginificantly moved the bar forward in terms of what End-to-end ML systems are capable of, there is still massive amonts of work to be done before true Machine Learning systems are able to conquer the full game of Dota.

For a more indepth analysis of why OpenAi's recent research achievement still has a long way to go, please refer to this article "Good Luck, Have Fun" by Michael Cook [9].

Size of the Machine Learning Community.

Artificial Intelligence & Machine Learning is being applied everywhere & it goes without saying that the Machine Learning community is growing- with freely available high quality courses available online to meet the demand for talent in this area.

The best metric to measure the size of this community is in fact Reddit.

As of writing (June 2018), the reddit/r/machinelearning community has 355 000 subscribers [10].

StarAi Team

Founder of the Sydney Machine Learning Group & Machine Learning Engineer, Paul Conyngham

Software Engineer & Digital Delivery Lead at IAG, William Xu

Software Engineer, Hivery, Artem Golubev

Referances.

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