# Let start with something good?!

The first paper, that I want to write an abstract about, is called [Grandmaster level in StarCraft II using multi-agent reinforcement learning](https://www.nature.com/articles/s41586-019-1724-z.epdf?author_access_token=lZH3nqPYtWJXfDA10W0CNNRgN0jAjWel9jnR3ZoTv0PSZcPzJFGNAZhOlk4deBCKzKm70KfinloafEF1bCCXL6IIHHgKaDkaTkBcTEv7aT-wqDoG1VeO9-wO3GEoAMF9bAOt7mJ0RWQnRVMbyfgH9A%3D%3D). The name looks too long, and we can call this paper, for short, AlphaStar. This incredible method (I don’t want to call it “algorithm” because it sounds less than the technique is, for me) mixes with mastery techniques as neural networks, imitation learning, reinforcement learning and multi-agent learning, and I call this method incredible because it won professional players in the game Starcraft 2, and with the same limitations that humans have, the method archive the grandmaster position in the official rank of players.

## Learning with humans

## The first step consists of learning with replays using supervised learning. In resume, the supervised learning tries to approximate how humans play the game using observations from the game’s replays. Those replays are free, public, and anonymous. After train with those replays, we have three different AI’s, one for each race, able to play the game at the same level as one human play in the rank gold of the game. It means, if we get those AI’s and put to play matches against humans in the official (and online) championship of Starcraft 2, they will get rank gold ( in order of difficulty, bronze, silver, gold, platinum, diamond, master and grandmaster).

I know, that it sounds incredible. Many of us don’t have skills enough to play the game at this level. Therefore, the group of researches, co-led by [David Silver](https://www.davidsilver.uk/), knows that the method would be more than a gold rank player.

## AlphaStar League: Where the greats rise!

A league is a place where the AlphaStar agents can play against copies of themselves exploring different strategies and variations, as humans do. The focus of the league consists of work as a multi-agent reinforcement learning, where agents learn, try, exploit, and explore different strategies, rising and improving unimaginable agents’ behavior. Each moment when a good strategy is discovered, the agent is frozen and put as a fixed part of the league. Agents like that help the league to keep a large number of strategies and variety in the learning process.

## Take-Away

I know that the post looks short, but I think that it is the idea. However, I will put here some links that I suggest everyone see, if you get yourself interested in the thematic.

* [DeepMind Demonstration](https://www.youtube.com/watch?v=cUTMhmVh1qs)
* [Lex Fridman and David Silver](https://www.youtube.com/watch?v=uPUEq8d73JI&t=280s)

In the paper, we can find more detailed concepts and the pseudocode of the method. I wrote my own AlphaStar League for a project that I’m doing, and it is a really good process! We can learn a lot about the concept that the DeepMind used in this project!  
  
Goodbye!