Computational Applications to Policy and Strategy (CAPS)

Overview

Computational Applications to Policy and Strategy (CAPS) explores ways in which computational methods can advance the applications of policy and strategy research. The workshop focuses on the potential of video games – and intelligent agents programmed to play these games – to study strategic behaviour in complex, simulated environments.

The workshop uses Python to build bots that play the real-time strategy game StarCraft II. StarCraft II is currently at the frontier of commercial AI research as its strategic depth continues to defy algorithms that led to super-human performance in games such as Go and Chess.

We will enter the race by building scripted and learning-based bots using the python-sc2 and pysc2 libraries that compete against StarCraft II's internal AI. We will analyse our bots' performance using a range of game data mining tools.

Following a discussion of the intersection of AI and international relations, we will compile the code and analysis of our Star Craft II bots into a short project. We will conclude the workshop by creating and hosting a free, personal websites through GitHub, where participants are encouraged to feature their project, as well as other SAIS coursework.

No previous knowledge of Python, AI or StarCraft II required.

Logistics

> Six session workshop of 60-90 minutes per week
> Starts October. Details and room TBA
> Workload – low. Just attend the sessions. Possibly some light workload on the project
> Contact: team@saiss2stechnology.com

Syllabus

The syllabus will be updated continuously, find the newest version here: https://git.io/fAaJn

1st Session – Introduction to CAPS

> Covers how games are studied within AI research and outlines the intersection of AI and IR in such as fields as AI Strategy and AI Policy. We also install the required software.
> Optional readings
    a. DeepMind on StarCraft II (blog post) https://deepmind.com/blog/deepmind-and-blizzard-open-starcraft-ii-ai-research-environment/

b. StarCraft II's Twitch channel with live streams from international pro gamer tournaments (videos) https://www.twitch.tv/starcraft
c. Detailed career guide on AI Policy and AI Strategy by 80,000 Hours (article) https://80000hours.org/articles/ai-policy-guide/

2nd Session – Python Primer

> Covers programming in Python from the ground up. Introduces object-oriented and asynchronous programming.
> Optional readings
  a. Eric Matthes *Python Beginner's Cheat Sheet* (learning resource) https://github.com/ehmatthes/pcc/releases/download/v1.0.0/beginners_python_cheat_sheet_pcc.pdf
  b. Brian Heinold *A Practical Introduction to Python Programming* (book) https://www.brianheinold.net/python/A_Practical_Introduction_to_Python_Programming_Heinold.pdf

3d Session – Building a Scripted StarCraft II bot

> Covers the python-sc2 library that enables building scripted bots for StarCraft II. We explore the StarCraft II gameplay and build our bot through a set of iterations to defeat the StarCraft II game AI on 'hard' difficulty.
> Optional readings
  a. Comprehensive overview of StarCraft II on its wiki (documentation) https://liquipedia.net/starcraft2/StarCraft
  b. Overview of bot APIs for StarCraft II on the SC2 AI wiki (documentation) http://wiki.sc2ai.net/Main_Page
  c. The GitHub repo of python-sc2 (documentation) https://github.com/Dentosal/python-sc2

4th Session – Building an Intelligent StarCraft II bot

> Introduces basic AI techniques. Covers the expansion of our bot so that it centres on a learning-based model, which we will train on StarCraft II replay data. We also explore the more advanced pysc2 library.
> Optional readings
  a. Georgios N. Yannakakis and Julian Toeglius *Artificial Intelligence and Games* chp. 2.5 on supervised learning and chp 2.6 on reinforcement learning (book) http://gameaibook.org/book.pdf
  b. Oriol Vinyas et al. *StarCraft II: A New Challenge for Reinforcement Learning* (paper) https://arxiv.org/pdf/1708.04782.pdf
  c. The GitHub repo of DeepMind's pysc2 library (documentation) https://github.com/deepmind/pysc2

5th Session – Replay Analysis and the Intersection of AI and IR

> Covers two topics, game data mining and the intersection of AI and IR on issues such as AI interpretability. We start by analysing the performance of our bot through a set of tailored data mining tools. We conclude by discussing the potential of real-time strategy games for IR research and how AI and IR can interact.

Optional readings

a. Henry Kissinger *How the Enlightenment Ends* (article) https://www.theatlantic.com/magazine/archive/2018/06/henry-kissinger-ai-could-mean-the-end-of-human-history/559124/
b. Miles Brundage et al. *The Malicious Uses of Artificial Intelligence: Forecasting, Prevention and Mitigation* (report) https://arxiv.org/ftp/arxiv/papers/1802/1802.07228.pdf
c. Mick Ryan *Intellectual Preparation for the Future of War: How Artificial Intelligence will Change Professional Military Education* (article) https://warontherocks.com/2018/07/intellectual-preparation-for-future-war-how-artificial-intelligence-will-change-professional-military-education/

6th Session – Building and Hosting a Website through GitHub

> Covers how to create and host a free personal website through GitHub. Afterwards we conclude with drinks and pizza.

The Project

The project is meant to work as a technical writing sample that can augment your SAIS portfolio. The project can be based on the code and performance analysis of the StarCraft II bot we write throughout the workshop. You can expand this into a short memo by adding a discussion of how such bots can be used for strategy research. Or you can write a blog post on some of the issues at the intersection of IR and AI that we will discuss. The idea is that you obtain something that interests you and that remains of value to you.

We will further discuss the project in sessions 4 and 5.

Additional Resources

We provide a list with additional relevant readings and learning resources that we will update on a rolling basis. The readings cover a range of technical topics that relate to CAPS.

You can find the up-to-date list here: https://git.io/fAaJn

How to enrol

If you want to enrol in the CAPS workshop, just contact us by email and we will keep you in the loop. Contact: team@saiss2stechnology.com

Please reach out for questions and comments. We greatly appreciate your interest.

Visit our website on GitHub: github.com/SAIS-S2S-Technology