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# Developing state-of-the-art defences for computer networks

**Every computer network is vulnerable to cyber criminals and hackers. Detecting attackers within a network is a complex task, and even skilled operators struggle to keep track of them all.** In 2020, for example, the average amount of time attackers spent inside compromised networks was an estimated 24 days. During this so-called ‘dwell time’, hackers can perform malicious activities such as stealing data, installing malware and disrupting services.

To bolster network defences and speed up response times, computer security organisations are increasingly looking to autonomous systems. Researchers led by the Turing’s [Vasilios Mavroudis](#) and [Chris Hicks](#) are exploring a technique called reinforcement learning (RL) – a field of artificial intelligence in which computer algorithms learn by solving problems through trial and error, with the goal of maximising a specified reward (in this case, maximising a network’s security).

In February 2022, the team won the first [Cyber Autonomy Gym for Experimentation \(CAGE\) challenge](#), run by The Technical Cooperation Program (TTCP) – an international organisation focused on defence science and technology. The challenge tasked teams with defending a network against two simulated ‘advanced persistent threat’ agents – attackers that typically remain undetected inside networks for weeks or even months. The Turing team [programmed three RL agents that work together](#) to defend the network by, for example, removing attackers, laying traps for attackers (by creating decoy network hosts), or terminating malicious processes.

The team has made its code publicly available so that others can benefit from and expand upon this work, and it plans to use its success to kick-start a deeper programme of research around RL and network defence.

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“Dstl is proud to have been part of this challenge with the Turing. Through cutting-edge reinforcement learning techniques, this research is taking us another step towards achieving autonomous cyber defence decision-making.”

**Josh C**

UK CAGE representative and Principal Data Scientist, Defence Science and Technology Laboratory (Dstl)