P06 – The ARC Challenge

1. Background

The ZHAW Centre for Artificial Intelligence collaborates with the Mindfire Foundation and its Lab42 on furthering AI towards more general applicability. One joint activity, in collaboration with machine learning pioneer and holder of the global Swiss AI Award, François Chollet, revolves around the ARC Abstraction and Reasoning Challenge, which comprises a set of tasks that are hard for any current AI method, particularly also for (deep) learning.

This year, we invite selected ZHAW students to take part in this new generation AI competition (see sections 3 & 4 below). As an incentive for this extra-curricular activity, these selected students can make their participation count as 2 graded labs for their AI1 course.

2. Terms and conditions

The replacement of the 2 graded AI1-labs by one of the following two options is open to students of the AI1 module in fall term 2022 under the following conditions (outside of this grading incentive, students are of course free to participate in the ARCathon on their own without any restrictions, and without any connections to AI1):

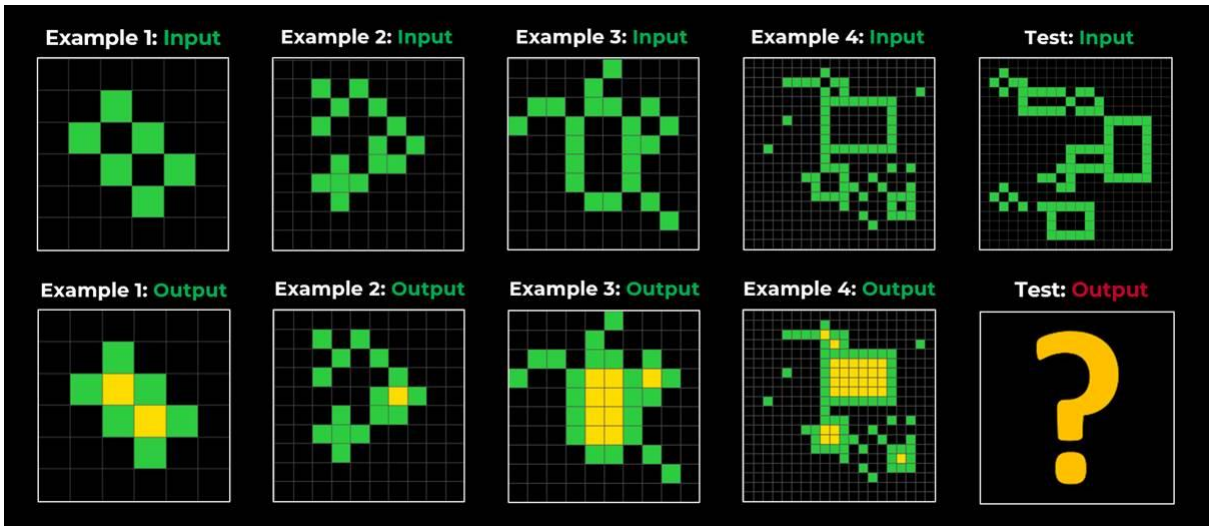
- Application: We intend to have ca. one team of 2-5 AI1 students for each option. Students that want to take a particular option are asked to form a team prior to applying together (as a team) with T. Stadelmann (contact to Mindfire/Lab42) and their lab supervisor not later than the 2nd lab (Sep. 30, 2022).
- Selection: Teams are selected based on an informal interview during the 2nd lab which will touch upon (a) their idea for approaching their chosen option; (b) their track record in the previous course of study (transcript of records, average grade); (c) their willingness to continue work in ARC in a Bachelor thesis, MSE studies etc. Selected teams will be informed after the lab supervisors synchronized their impressions.
- Grading: Selected teams can choose to hand in their team result (differs per chosen option) and get it graded instead of 2 of the other AI1-labs, i.e., they can get 20 points for their work on ARC. Grading follows the same pattern as with the other labs: The team result is presented in one of the December labs of AI1 within an informal interview during the lab time, and graded as either failed (0 points), ok (12 points) or extraordinary (20 points) without intermediate values.

- Logistics and supervision: It is understood that participating in any of the two options below will take more effort than the usual lab work (which shouldn't also fully be neglected as AI1 labs train important skills for the final exam). Especially, participating involves certain logistics (e.g., liaising with Lab42, collaborating with students of a different university) which needs to be undertaken independently by the team. AI1 lecturers and lab supervisors guarantee supervision during the lab hours of the course.

3. Option one: Compete in the ARCathon

The development of AI is one of the most important challenges of our time. With a solution for ARC, the next step towards AI could take place in Switzerland and possibly by a team of ZHAW. Competing in the ARCathon means to connect with pioneers in the AI community and become part of a new movement that can and ideally should go on beyond this year's ARCathon.

In this friendly competition, teams of AI-enthusiasts aim at solving the "ARC Challenge", a global intelligence test for a new generation of AI algorithms. The competition is about displaying creativity in programming a solution for a challenge which cannot be solved with any of today's machine learning models. Referring to a secret test set using only a small sample of training data, challenges like the one outlined below are in focus. If a team breaks the current world record of 29%, it will be honored at the Swiss AI Awards, and prizes such as a team weekend in Davos and a lot of prestige are awarded. More details are found in the attached PDF description by Lab42, and the conditions mentioned there apply.



Particularly, students are kindly requested to register their team at https://lab42.global/arcathon/. All team members are cordially invited to an introductory briefing by Lab42 staff. For questions or a personal meeting, don't hesitate to get in touch with oliver.schmid@lab42.global, community head at Lab42.

4. Option two: Build towards an ARC-world

Trying to solve the ARC challenge in one semester is to some extent like hoping for a lucky punch in sports: It is not impossible, but many consider it important to prepare longer and first build an environment in which a totally novel solution may grow. Amongst the subscribers to the latter idea are our collaborators from the ETH/UZH Institute for Neuroinformatics, Prof. Grewe's Neural Learning and Intelligent Systems Group.

Together, we would like to plan towards a simulation environment that could generate arbitrary individual ARC challenges (by analysing the existing examples and implementing a respective generator) and thus serve as a training environment for a novel future machine learning solution (similar in spirit to what MuJoCo is for robotic learning, or what simulating go games was for training AlphaZero).

A team that choses this option will:

- Find a common goal and a mode of collaboration with MSc students of ETH that work towards the same goal (could be anything between a merged team or loose exchange, depending, amongst other factors, on the number of students on each side)
- Contribute to a requirements document for an ARCworld simulator that spells out principles and concepts that need to be generatable.
- Possibly implement a first proof of concept than can be extended in follow-up work.