Internship Proposition:
Advanced Search Algorithms for Program Synthesis

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Location : LaBRI (Bordeaux)

Internship topic : Constructing search algorithms for program synthesis

Themes : program synthesis, algorithms, machine learning

Program synthesis is one of the oldest dream of Artificial Intelligence: it automates problem solving by generating a program meeting a given specification [GPS17, CEP+21]. A very classical scenario for user-based program synthesis, known as programming by example (PBE), uses input output examples as specification. For PBE, combinatorial search has been an especially popular technique [BGB+17, EWN+21, OSB+21, FLM+22, AL23].

Despite huge progress, the existing tools are far from solving the Abstraction Reasoning Corpus (ARC), a dataset proposed a few years ago by François Chollet from Google, and endowed with a 1.000.000 $ prize (see https://arcprize.org/). See below for an example task from ARC.

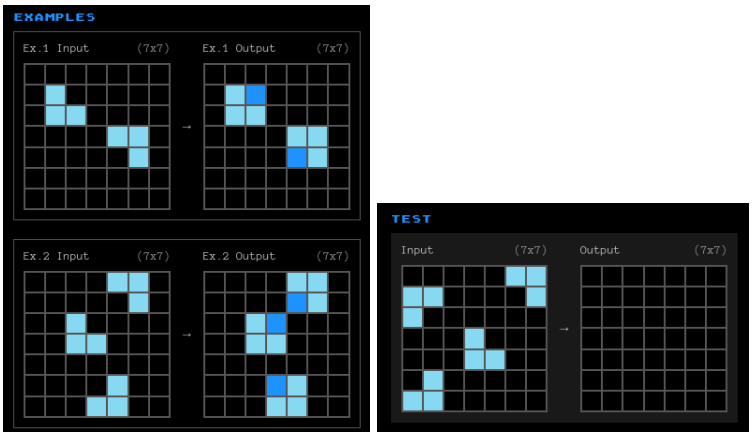

Figure 1: A task from the Abstraction Reasoning Corpus (ARC).

Internship objectives

The objective of this internship is to construct efficient search algorithms for program synthesis, to tackle the ARC challenge and related easier datasets. Specifically, our starting point is that although it is hard to find program solutions for a task, it is relatively easier to find sequences of actions for solving each example. The open question we will work on during the internship is whether this can help for the search of program solutions.

The internship will combine theoretical understanding and algorithm design with practical implementation and experiments. A continuation towards a PhD is possible after the internship.

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