Automating Algorithm Design through Genetic Programming Hyper-Heuristics

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Morris, MN

What does the title mean?

- Reducing the human component in algorithm design

https://scratch.mit.edu/discuss/m/topic/200574/

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- Reducing the human component in algorithm design
- More work at the beginning, more possibilities
- Genetic programming hyper-heuristics as a method to the madness

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Outline

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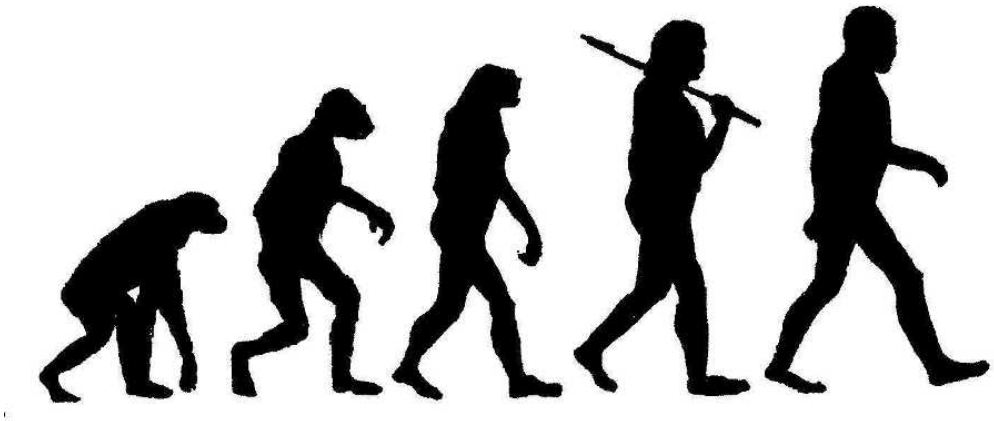
Evolutionary Computation



https://www.spigotmc.org/attachments/evolution-jpg.137048/

- Subfield of Artificial Intelligence

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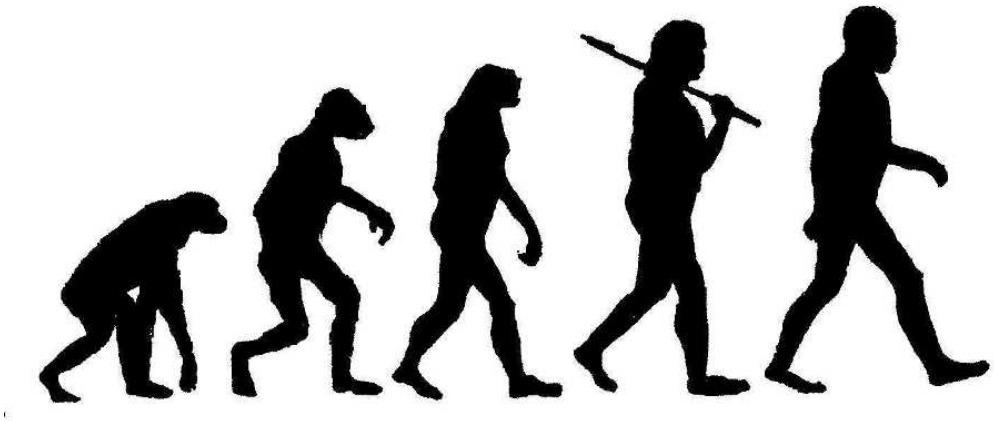

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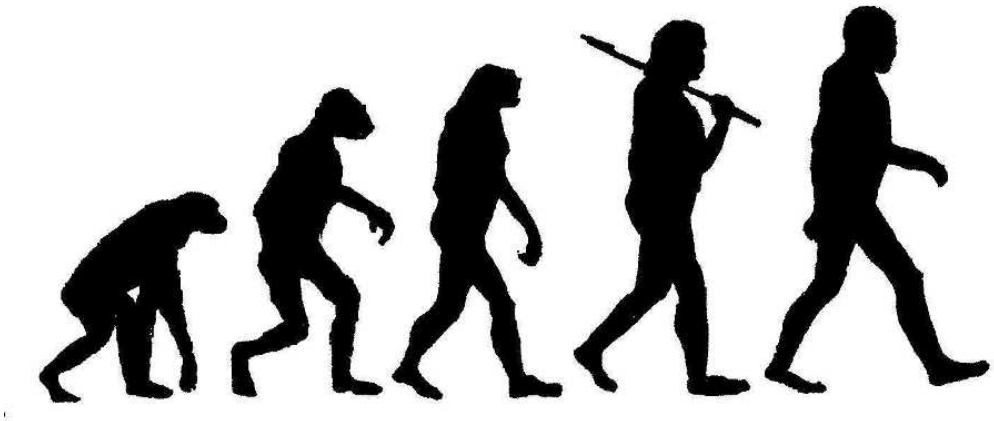

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- Subfield of Artificial Intelligence
- Algorithms based on biological evolution
- Uses lots of terminology from biology, doesn't always mean same thing as term means in biology.

Evolutionary Computation – Terminology

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- **Fitness Test** – a set of tests to determine how fit an individual is.

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- **Generation** – a population of individuals
- **Global optima** – best solution (or solutions) possible

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- **Parent** – Individual A

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If individual A experiences a mutation to create individual B, then:

- **Parent** – Individual A
- **Child** – Individual B

Genetic Programming

A family of algorithms in Evolutionary Computation that uses biological techniques to create programs to solve computational problems.

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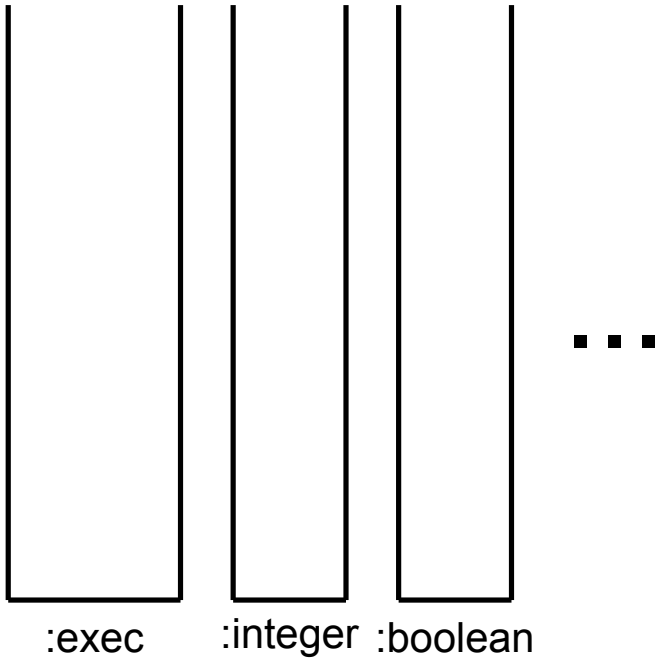

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Data-stacks are used for managing input and output of operations.

Programs are represented as linear sequences of literals and instructions. Below is an example of a simple Push program:

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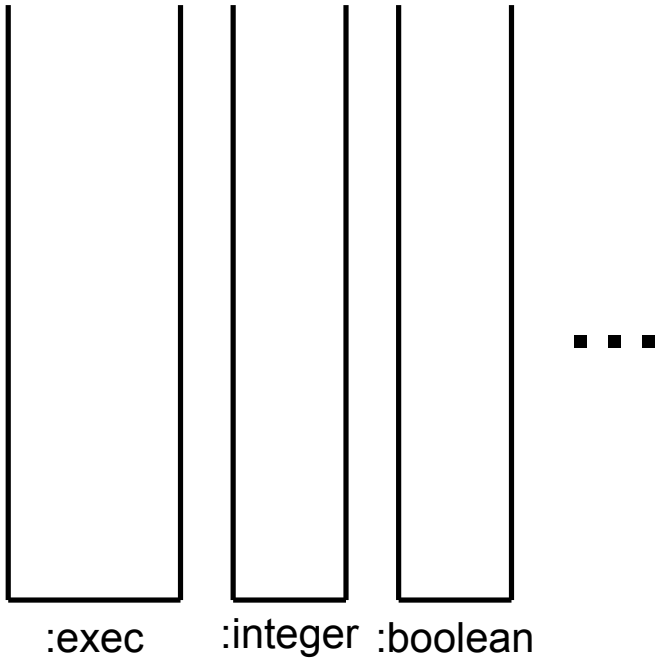

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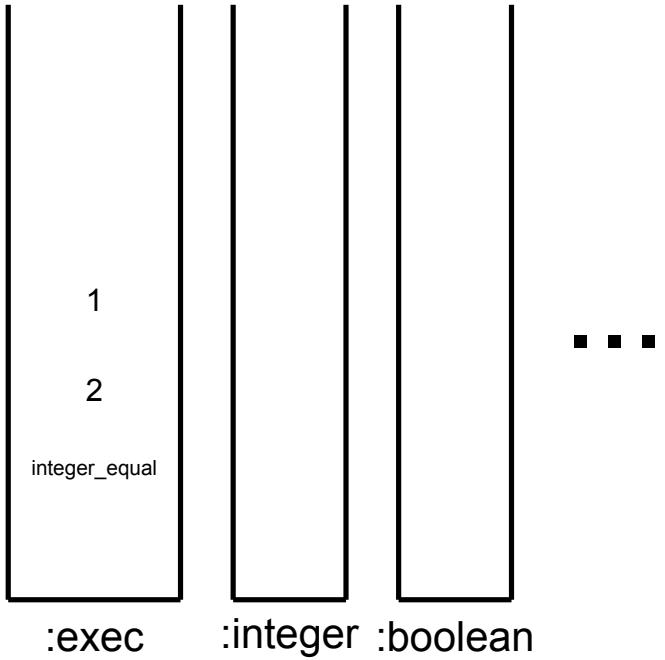

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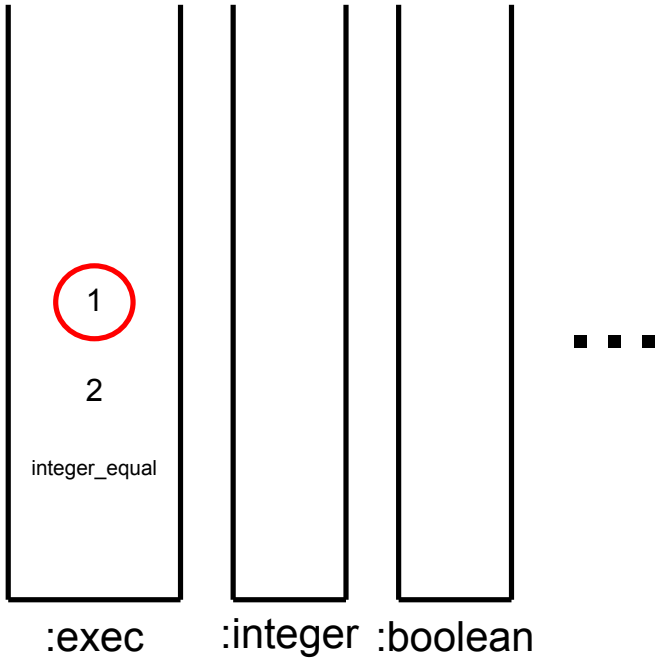

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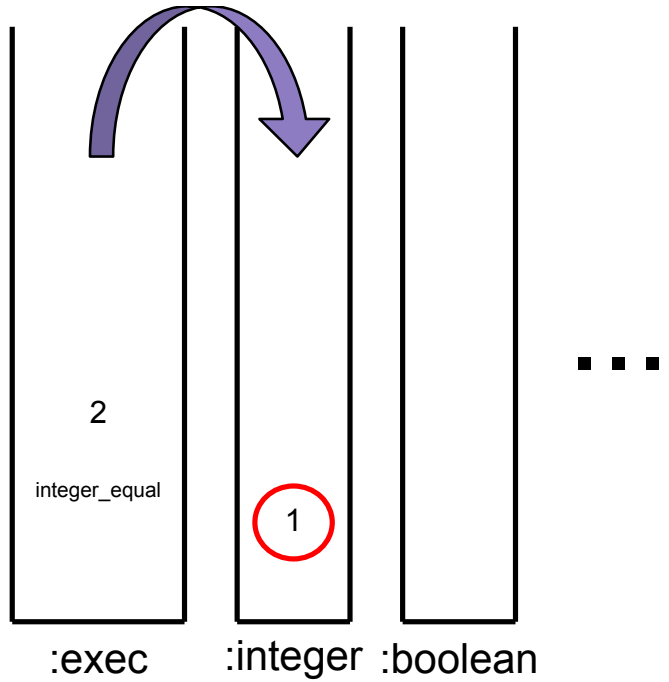

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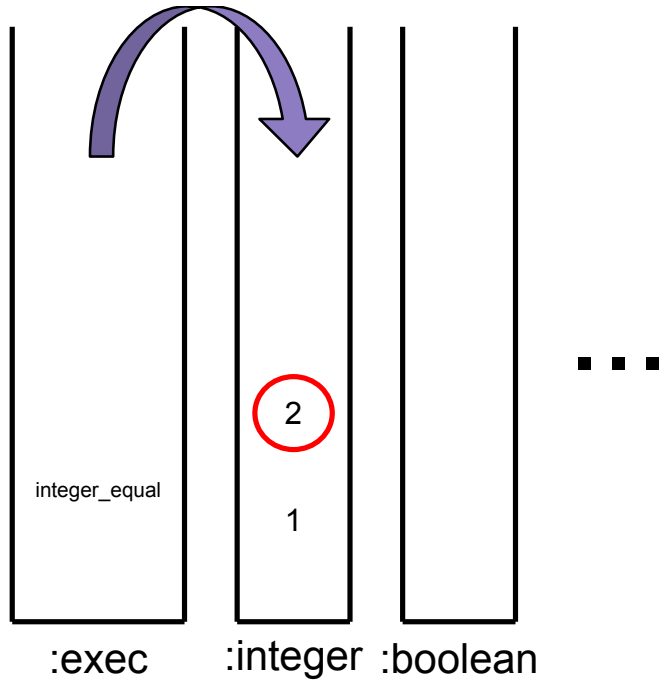

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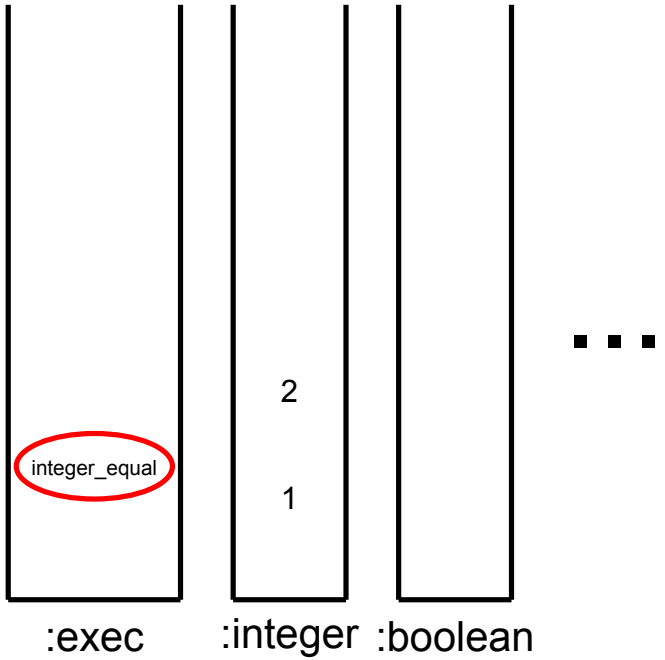

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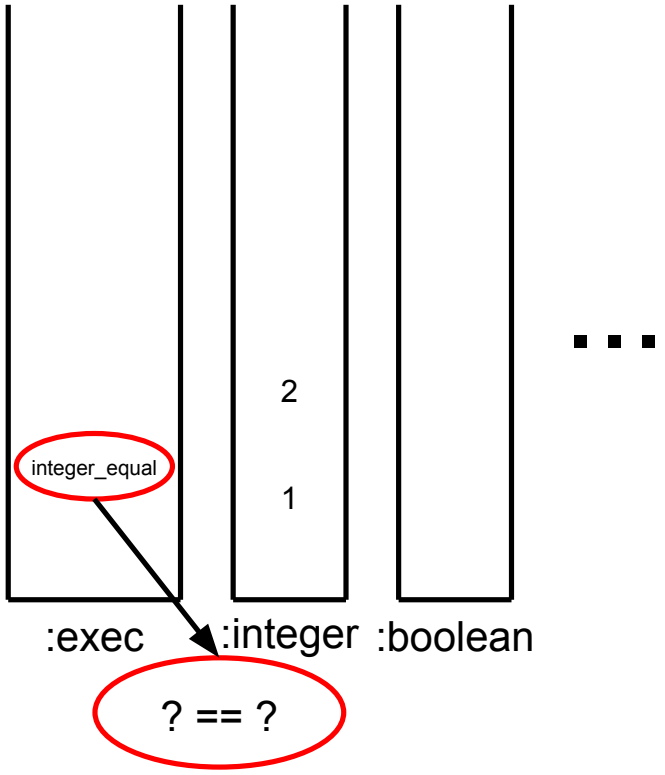

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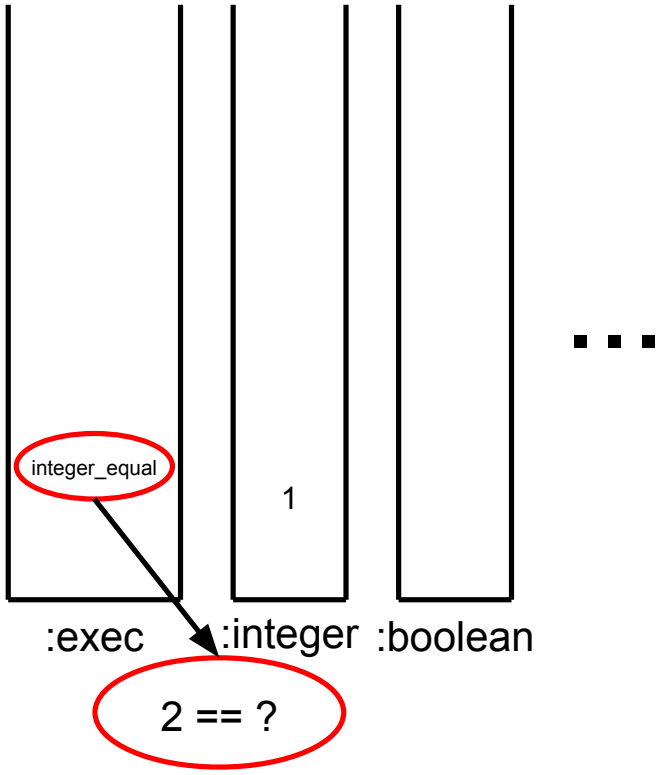

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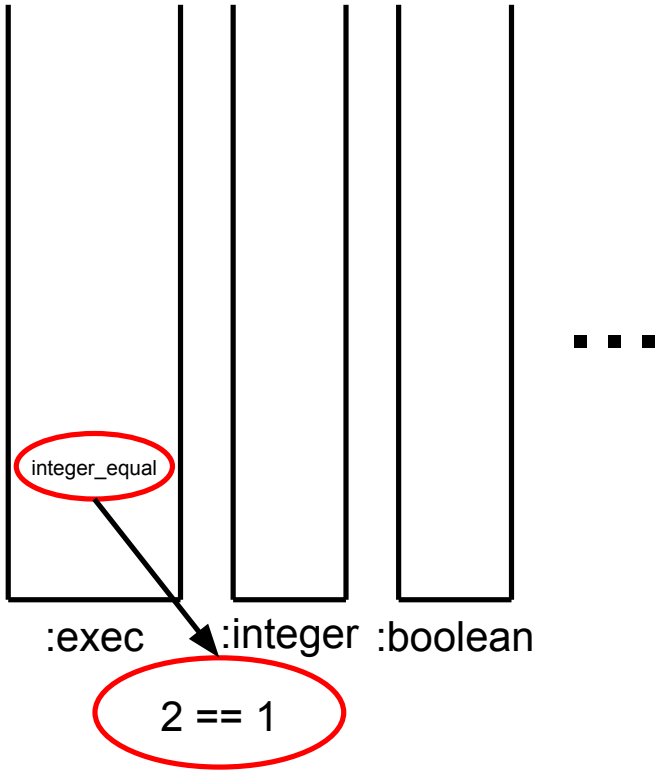

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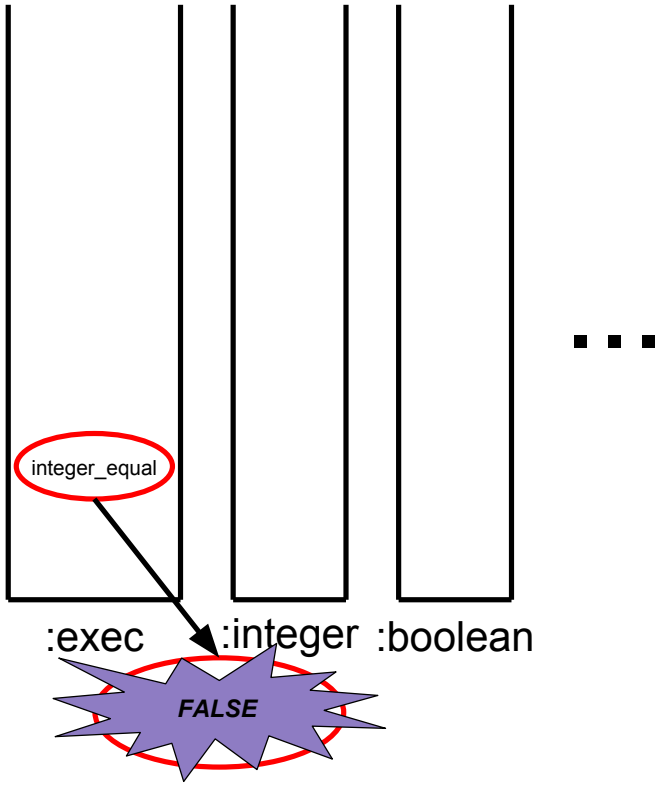

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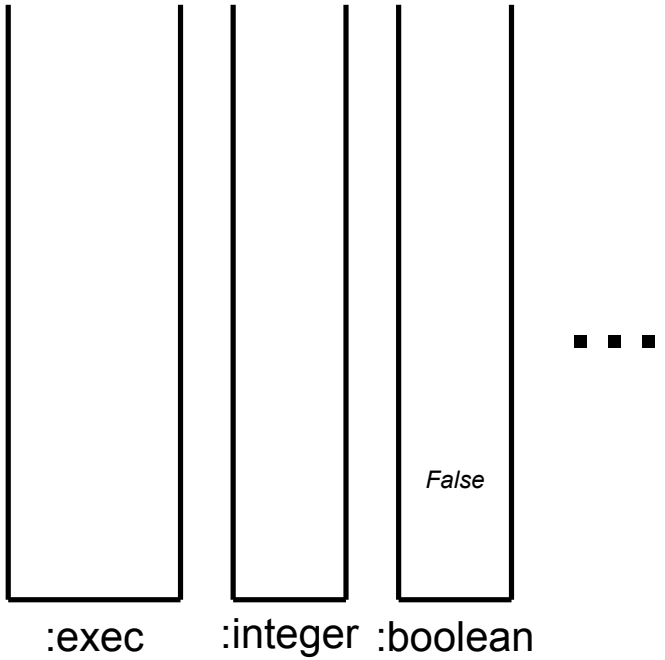

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This means programs in autoconstruction are responsible for evolving solutions *and* responsible for evolving their offspring.

The system called AutoDoG

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