General Learning Algorithms

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0.1 Context

This is a summary of the notes I've taken while listening to the presentation by Demis Hassabis available at https://www.youtube.com/watch?v=08Cl7ii6viY. It builds on the presentation Systems Neuroscience and AGI but can be watched on its own. This presentation covers most of the content in the presentation The Theory of Everything amd How Deep Learning Can Give Birth to General Artificial Intelligence as well.

0.2 Learned in this study

0.3 Things to explore

1 Overview

- DeepMind was founded in 2010
- Acquired by Google in 2014
- An Apollo Programme for AI (>100 scientists)
- A new way to organize science

1.1 General-Purpose Learning Machines

- Learn automatically from raw inputs - not pre-programmed
- General - same system can operate across a wide range of tasks

1.2 Reinforcement Learning Framework

- Build the best approximate model of the world
- Update the model every time a new observation comes in
- Use the model to make plans (simulations) toward a goal
- Reinforcement learning in the brain through the dopamine system called TD (temporal difference) learning

1.3 Atari Agents

- Agents just get the raw pixels as inputs (~30K)
- Goal is simply to maximize score
- Everything learnt from scratch
- One system to play all the different games

1.4 Transfer Learning

- The key to flexible general intelligence
  - Apply previously learnt knowledge to a new situation
- Identify the salient features in an environment

- Re-represent those features as an abstract concept
- Select and appropriately apply prior knowledge

1.5 Adding Memory to Neural Networks

- Classical Computer (leads to)
- Recurrent Neural Network + Memory Store (leads to)
- Neural Turing Machine

1.6 Why work on AGI and spend life/career on it

- Information overload and system complexity
- Solving AI is potentially the meta-solution to all these problems
- Empowering people through knowledge

2 See also

- Systems Neuroscience and AGI
- https://en.wikipedia.org/wiki/Temporal_difference_learning

3 References

- General Learning Algorithms
- The Theory of Everything (covered by this presentation)
- How Deep Learning Can Give Birth to General Artificial Intelligence (covered by this presentation)