

First assignment

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1 What is intelligence?

Intelligence is the ability to learn and apply knowledge

In AI, this can also include:

- + Causal reasoning: The ability to derive a cause from a result
- + Planning: the ability to make plans
- + Creativity: the ability to come up with novel solutions for problems
- + Intuition: the ability to perceive things without coming into direct contact
- + Imagination: the ability to imagine
- + Commonsense: the ability to perceive what is common

According to Howard Gardner, there are 8 types of intelligence:

- + Linguistic Intelligence: how well you can use language
- + Logical Mathematical Intelligence: the ability to reason logically, do math proofs
- + Musical Intelligence: how well you can understand (and create) music
- + Spatial Intelligence: the ability to work in specific space (chess player on a chess board, surgeon on a patient...) or the ability to navigate (like a pilot)
- + Bodily Kinesthetic Intelligence: the ability to use your body to do things or make things (athletes, craftspeople...)
- + Interpersonal Intelligence: the ability to connect with other people (understand them, interact with them...)
- + Intrapersonal Intelligence: the ability to connect with yourself
- + Naturalist Intelligence: the ability to discern things naturally (pick a better shirt over another...)
- + Teaching (or Pedagogical) Intelligence: the ability to teach successfully to other people
- + Existential Intelligence: the intelligence of Big Questions (Why do we exist? Why do we love?...)

2 What is Artificial Intelligence? What led to the Artificial Intelligence Revolution?

AI is a computer that is able to learn and apply knowledge.

The invention of the computer brought about the possibility of a world run by machines, and that world is being slowly realized by the improvement of AIs. We are able to come up with more and more efficient algorithms, and are able to process faster and more data with the use of AIs. AIs are slowly becoming more intelligent because of this and we are constantly improving the technology as well. The economy also helps this, and because there are more and more investment into the field, we are seeing new innovations all the time. All of these factors, plus the application of AI into pretty much every fields there are, brought about the AI revolution.

3 What is learning? What is machine learning? Where does machine learning stand in AI? How do knowledge and skills take shape in a computer?

Learning is the process of acquiring new knowledge, through experience or through education.

Machine learning is said process but applied to computers. But unlike a human's process of learning, it mainly focuses on the practical parts (experimenting, processing data...); the machine does not generate its own goal or hypothesis, a human does this instead.

Machine learning is the idea to have AI teach themselves; before, we had to teach them ourselves.

Knowledge (or in this case data) is fed into the computer, and through some algorithm (like some functions), it spits out a result.

4 What are the basic elements needed for an AI to teach itself?

An AI must be given a task first, then a dataset for it to experience, a learning algorithm for it to process the dataset, a rating system to rate its performance and a function space for it to find the optimized function. The necessary elements can be summarized as TEFPA (Task, Experience, Function Space, Performance Measure, (Seach) algorithm)

Example: Color restoration in photos

- + The AI is given the task of restoring color to a black and white photo.
- + It is given examples of sets of colored and black&white photos, both are the same except for the color.
- + It is told to look at all of the photos and replicate them as close to the original as possible (through some complicated algorithm).

+ Finally, it will compare its results to the original and repeat the process until it reaches a satisfactory result.

5 Describe some processes

5.1 low resolution photos to high resolution ones

Input: low resolution image.

Output: high resolution image.

Experience: First, compress a large ammount of high quality images (e.g., from Google Image) to low quality ones (e.g., 1080p -> 360p). Give the computer the dataset of both the high quality images and the compressed ones so it can learn the appropriate amount of pixels, sharpness of a high quality image compared to a low one. Then let it recreate the compressed images to higher quality ones. Performance: compare the original high quality images to the computer-created images.

5.2 Process X-ray images and diagnose the patient

Input: X-ray image

Output: diagnosis

Experience: feed the computer a lot of x-ray images with accurate diagnosis. The x-ray images can be obtained from a hospital or a doctor (maybe). Then have it test out its diagnoses on past records (from doctors).

Performance: compare a doctor's diagnosis to the computer's diagnosis (either live or records of diagnoses)

5.3 Read an email, then send it to the appropriate sections like "questions", "feedbacks"...

Input: an email

Output: sort into the appropriate category

Experience: Have the computer read millions of emails (from internet sources) including spams with already determined categories. Test it by writing a typical email to it.

Performance: compare its sortation to a human one.

6 explain the claim: A computer "learn" by searching for functions in a function space

A function space is like a bunch of programs that human made, and so the computer's task is to find the best one in the space. That means that we are essentially teaching it to code itself (to find the optimized function) and so it is "learning".

7 What are the two main problems about the function space?

Two important problems we must address about the function space is its representation and the process of search/train/learn/optimize.

8 What did you find particularly interesting about the lecture?

As an introduction, it doesn't touch upon the practical stuff of machine learning yet, but it is enjoyable in that anyone can watch and understand it fully. A particular interesting part to me was the discussion about intelligence. I never knew that intelligence could be defined in so many ways and so was pleasantly surprised to learn how varied it really is. Thus, I believe that others would enjoy that aspect as well.

REFERENCES:

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