Exploring methods of quantifying intelligence using theories in Machine Learning

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Intelligence has been defined as many different things, and each of these definitions have allowed us to quantify or understand intelligence in a different way. The simple act of telling people how intelligent she is, is the most basic act of quantifying intelligence that we do day-to-day. By stating that a particular individual is intelligent we could mean a couple things. For example, we could be commenting on the ability to gain knowledge at speed, their accomplishments, the ability to understand other individuals, their community/society, their an ability to reason, and much more. These are certain characteristics that we think about when making a judgement about an individual's intelligence, and the majority of society does this. The most intelligent individuals part-take in this as well by accepting awards that claim they have a high IQ such as high IQ societies or genius grants, and less intelligent individuals part-take in this by observing this phenomenon. Therefore, there is an inherit part of our society and the way we perceive of the world that needs to compare or judge intelligence.

The idea of trying to quantify intelligence or measuring intelligence was first introduced by the field of Phrenology, and Franz Joseph Gall who is known to be the founder of the field. Franz Joseph Gall wanted to try study the localization of the mental functions in the brain by observing skull sizes, and facial features of people. Even though the field of

Phrenology wasn't ultimately success, some of the concepts such as attempting to quantify intelligence intrigued the scientific community. Moreover, another individual we studied in class that tried to attempt to define intellectual ability was Samuel George Morton. Morton, similarly, in his work Crania Americana claimed in his paper that you could measure the intellectual ability of a race by their skull capacity.

How people have quantified intelligence in the past - IQ tests. Done by powerful individuals for gains (help recruitment for military).

Moreover, since the development of computers there has been a vision of creating an intelligent agent, and the community of individuals studying Artificial Intelligence have had a vision and different approaches to solving this problem. In 2007 Włodzisław published a paper on computational intelligence, and wrote "Artificial Intelligence (AI) was the first large scientific community, established already in the mid 1950s, working on problems that require intelligence to be solved" (Włodzisław, 1). Most of the Artificial Intelligence community is still debating on ways to solve this problem as building an intelligent agent inherently requires a mathematical or computational definition of intelligence. It's required in order for the intelligent agent to learn, and be able to make intelligent decisions on its own.

Given the limitations in terms of computational power in pre-2000, research in building an intelligent agent branched of into two perspectives. The first was looking at this problem from a mathematical perspective, and the second was exploring neuroscience and the human anatomy to apply the principles of our intelligence to building an intelligent agent. Building an intelligent agent from a mathematical perspective is looking at features, or aspects of intelligence and trying to model them mathematical in order to bring them together into one coherent model. The latter looks at how our cerebral cortex was formed and borrows the architecture and the way neurons make connections between things we

learn to apply the same methodology to learning as our brain does.

During the next decade individuals worked on advancing these fields theoretically until they reached a point where processing power would catch up with their research. The decade gave both the branches time to grow their communities and to improve traction around their work, and this created a separation in ideology and the way individuals dealt with the aspects of quantifying intelligence.

Intelligence and why create a framework for intelligence?

Quantifying and defining intelligence and frameworks around it became important when

Hawkins is an electrical engineer, and hasn't had any professional experience in neuroscience. His framework approaches the problem from an engineer's perspective as well as his personal study of the research done on the cerebral cortex to formulate his framework.

Jeff Hawkin's Intelligence

Intelligence in the Machine Learning community with just a mathematical training

References

[1] Hawkins, Jeff, and Sandra Blakeslee, *On Intelligence*. New York: Henry Holt, 2005. Print.

[2] Duch, Włodzisław. "What Is Computational Intelligence and What Could It Become?" Challenges for Computational Intelligence. 2007: n. pag. Print.