

Review: Computing Machinery and Intelligence

COMP110 - Research Journal

1703170

November 15, 2017

1 Learning Machines

When Turing wrote "Computing Machinery and Intelligence" [1], no Artificial Intelligence programs existed, indeed the phrase Artificial Intelligence wasn't used until 1956, just 2 years after his untimely death. General purpose computers were rare enough that the article was mostly theoretical in nature.

Within a few years of the article, more computers were being created and the musings of Turing were finally able to be put to the test, albeit with limitations. Turing's idea of Learning Machines for example [2]. Turing argued that a Learning Machine was the likely the only realistic way of producing human-like intelligence in computers, hand coding every conceivable eventuality in advance to simulate a human brain was unlikely to be possible.

In Daniel Dennett's book, *Darwin's Dangerous Idea: Evolution and the Meanings of Life* [3]ch8sec5, Dennett references Turing's "prophetic essay" and goes on to talk about Arthur Samuel's experiments in creating perhaps one of the first candidates that

could be called Artificial Intelligence [4]. In Samuels paper, he describes the learning schemes he was able to program into the computer to play checkers and learn from previous games with itself to improve. Samuels learning version of the checkers program was finished in 1955, just 5 years after Turing's paper. Although by no means perfect, the program was sufficient enough that it surpassed Samuel's proficiency at checkers. It may be less complicated a game compared with chess, nonetheless, this shows the foresight of Turing when in his paper he concludes by suggesting that machines should be taught abstract tasks, such as chess, in order to eventually progress to a time when machines can compete with humans on an intellectual level.

Dennett also notes in his book that this ability to learn is classically Darwinian [5]. One might infer that Turing's paper can be interpreted as a prelude to the idea of Artificial Evolution.

2 The Imitation Game

Arguably the most influential aspect of the paper, widely viewed as it's most controversial, is the Imitation Game. Influenced perhaps by Descartes [6], now known as the Turing test [7]. Initially a parlour game in which an interrogator attempted to distinguish a man from a woman using only the worded responses they both returned from questions put to them by the interrogator. Turing re-purposed this to accept a man and a machine instead. The theory being, that if the interrogator was unable to distinguish the man from the machine then this would be sufficient evidence for machine intelligence.

A simple form of the Turing test was said to have been beaten using a computer program in 1966 called ELIZA [8], using a version of the program called DOCTOR. The program essentially accepted input data from the user in text form and output responses related to certain key words from the perspective of a therapist. This helped the machine assume a sense of distance from the user and allowed for vague responses, which in turn made the realization that it was a machine more unlikely.

Although this clearly doesn't pass the Turing test if any amount of rigour is injected into the interrogation, it is nevertheless a large leap towards the possibility of a machine one day passing the test. What once was merely theoretical, suddenly seems within the bounds of reality. Clearly, this shows how ahead of his time Turing was.

"We can only see a short distance ahead, but we can see plenty there that needs to be done."

References

- [1] A. M. Turing, "Computing machinery and intelligence," *Mind*, vol. 59, no. 236, pp. 433–460, 1950.
- [2] M. Ramscar, "Computing machinery and understanding," *Cognitive science*, vol. 34, no. 6, pp. 966–971, 2010.
- [3] D. C. Dennett and U. Mittwoch, "Darwin's dangerous idea: Evolution and the meanings of life," *Annals of Human Genetics*, vol. 60, no. 3, pp. 267–267, 1996.
- [4] A. L. Samuel, "Some studies in machine learning using the game of checkers," *IBM Journal of research and development*, vol. 44, no. 1.2, pp. 206–226, 2000.
- [5] C. Darwin and W. F. Bynum, *The origin of species by means of natural selection: or, the preservation of favored races in the struggle for life.* AL Burt, 2009.
- [6] R. Descartes, *Discourse on the method: And, meditations on first philosophy.* Yale University Press, 1996.
- [7] L. A. Suchman, *Plans and situated actions: The problem of human-machine communication.* Cambridge university press, 1987.
- [8] J. Weizenbaum, "Elizaa computer program for the study of natural language

communication between man and machine,” *Communications of the ACM*, vol. 9,
no. 1, pp. 36–45, 1966.