WKEXP 902 Work Term Report

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Work term 2

Computer Engineering Software Co-op

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1 Introduction

The purpose of this report is to develop a profile of an industry which is of interest to me. By exploring different aspects of the industry of Artificial Intelligence, or AI. It can be noted that "Machine Learning" is a subfield of AI **sasAIvsML** , such as its history, We wil also cover the projected economic status

2 Brief History of the Industry

Contrary to what one might think, the idea of a machine being able to reason is nothing new. Early Philosophers, such as René Descartes (∼1600s C.E.) have used the idea of a "mechanical man" to define what it is to be human.**briefhistorysep-descartes** Another philosopher, named Etienne Bonnot, de Condillac**briefhistory** (∼1700s C.E.) thought about "an originally inanimate and insentient human being"**sep-condillac** and how much information it would need to acquire by exposing it to different sensations before it would become intelligent. However, an example more familiar to us nowadays might be this quote from the *Wizard of Oz***wizardofoz**:

> "Scarecrow: I haven't got a brain... only straw.
> Dorothy: How can you talk if you haven't got a brain?
> Scarecrow: I don't know... But some people without brains do an awful lot of talking... don't they?

Before the Wizard of Oz, however, people were already attempting to make physical machines appear intelligent. So-called 'automatons', or self-operating machines have existed for a very long time. One of the first humanoid automatons (∼800 C.E.) actually played the flute, and was programmable.**automaton** Other automatons have been created to write letters, draw

art, and a lot more.

Automatons though, are not intelligent. They must be programmed to do a pre-defined task, and their actions were usually defined by a clock system. Today, the game of chess is sometimes used as a measure of intelligence. In the 1700s, an "automaton" called "The Turk" was made, which appeared to play chess against human players autonomously**turk**. The Turk was not a true automaton, since it was actually a hoax, controlled by a human. In 1912, however, the "El Ajedrecista" was made by Leonardo Torres **actualchessmachine**. It was not made to play chess from the very beginning with a human, rather, it implemented an algorithim for a specific end-game scenario. That is, the scenario when the human player has only a King, and the automaton has only a Rook and a King. Although it did not checkmate the human player in the minimum number of moves possible, it would eventually do it. This automaton is considered by some, the first computer game ever. It was not until the 1960s that a computer was able to fully play chess against a human player.**computerchess** On May 11, 1997, the man considered to be the "world's best chess player" officially lost to Deep Blue, a chess AI owned by IBM.**computerchess**

The notion that an artificial creation can be made smarter than humans is a scary one to some, and with no doubt, there exists a plethora of dystopian stories about machines being a threat to humans. A popular example is Blade Runner, where the artificial creations rival humans at almost everything, except for feeling and displaying emotions. (However, there is one so-called 'replicant' who does feel emotions)**bladerunner**. Another famous example is from HAL 9000 in *A Space Odyssey* where the sentient AI detects that the humans want to shut it off, and says the famous quote: **HAL**

> I know that you and Frank were planning to disconnect me. And I'm afraid that's something I cannot allow to happen.

From these fictional stories, however, comes the inspiration for AI-powered things we interact with today, such as virtual assistants (Google, Siri, Alexa...)

3 Recent Technological Advances

In the "brief history" section above, a common theme was making machines which appear human. A modern example today, is Sophia, a humanoid robot who is the first one to recieve citizenship from any country. Although not a true general intelligence**sopiaAI**, Sophia uses various technologies like Google's natural language APIs.

Although beating the world's chess champion was considered a major victory for the advancement of AI, a game which is much more complex is Go. Go is a game which originates from Ancient China, which has relatively simple rules, yet the amount of legal moves each turn is vastly larger. While chess is estimated to have about 10^{120} possible games, In 2017, Google Deepmind's AlphaGo program was the first program which beat the world's best Go player. Not only is this facinating in and of itself, but the way the program worked was fundamentally different compared to previous programs which played Go, and even chess. Normally, these programs use algorithms and evaluate different outcomes of future moves in a 'tree'. However, Alphago used a neural network which was trained using machine learning.**alphagopaper**. The program was never told how to actually play the game, nor did it learn by watching a human play. [1] It still evaluates future moves, but the evaluation of the trees are 'learned', and not pre-defined by a human.

NVIDIA uses DLSS (Deep Learning Super Sampling) in their consumer hardware to upscale the resolution of real-time rendered 3-D graphics.**dlss**

[1] Actually, AlphaGo initially trained on datasets with humans playing, and some heuristics were hand crafted. However, AlphaGo Zero, and AlhpaZero were made afterwards based on no human data, and are significantly better than their predecessors.

It is widely known that Google uses AI to synthesize and recognize human speech, among many other things.

Though it isn't the first company to do so, Tesla uses AI to in their self-driving cars.**teslaautopilot**

Amazon uses AI to suggest new products to you.**aznai**

4 Economic Factors Influencing the Industry

https://www.newsmax.com/finance/richardagu/factors-artificial-intelligence-job/2018/04/24/id/856267/

pretty much just demand for the technology and whether or not certain companies prefer the human touch over machines...

5 Geographic locations of industry concentration

hey Edmonton actually has some pretty cool machine learning research stuff going on

Fun fact, "The University of Alberta, located in Edmonton, is ranked #2 in the world for AI and ML research." obviously there's Silicon Valley as well...

ATB alpha beta also partnered with the U of A

The Alberta Machine Intelligence Institute (Amii)

https://medium.com/syncedreview/2017-in-review-10-leading-ai-hubs-e6f4d8a247ee https://www.cbc.ca/n
intelligence-deepmind-edmonton-google-research-1.4195026

6 Major employers

fuck don't forget to cite this lol https://thenextweb.com/artificial-intelligence/2018/07/05/companies-work-ai-technology/

The obvious major employers that first come to mind when one thinks of AI are: Google, Tesla, IBM, NVIDIA, Intel, AMD, Facebook, Microsoft, Phillips (for healthcare technology), Panasonic (computer vision),

Other major companies which don't immediately come to mind, but totally make sense when you think about it are: GM, Volkswagen (really, any major auto manufacturer)

Some may be surprised to know that , , and even banks are also investing in AI technologies. JPMorgan Chase for example, and actually, here in Edmonton, there's ATB Financial and RBC

A thing to be wary of, is a lot of startups and other companies claim to be "AI-based" but in reality, they don't use any AI at all.

7 Projected Economic Status

todo **forbesprojected** https://www.forbes.com/sites/louiscolumbus/2018/02/18/roundup-of-machine-learning-forecasts-and-market-estimates-2018/

8 Current hiring trends and long term prospects

AI absolutely is a fad word as of the time of writing. However, given that continuous improvements have been made on it since the 1900s, and it is still relevant, in my opinion

already says something. Even though AI already pervades our lives today, it is still a field of active research**uofaAI**, meaning that new discoveries are yet to be made and applied in the real world. Humans have certain limits, and so do computers. But, we can overcome many challenges by leveraging this technology, even those that we haven't thought of yet. As mentioned earlier, AI is being used to advance progress in a vast majority of fields such as manufacturing automation, medicine, transport, and more.

9 Conclusion

AI has always been a field of interest for me. It's always interesting to see the things that people are creating using the technology. I actually plan to take relevant courses (ECE 449 and CMPUT 466) to understand the math and logic that goes on behind the scenes which makes the technology work.