Natural Language Processing & Chatbots

What are they?

Chatbots are software programs designed to interact with humans in lieu of interactions with other humans. They are mostly used by companies to supplement online customer service capabilities and direct people to dedicated customer service agents, and as assistance apps on mobile phones and computers (eg. Siri, Cortana, Google Assistant) (En.wikipedia.org. *Chatbot*. 2020.). Natural Language Processing (NLP) is the name used for software processes which are designed to interpret human communication. Different chatbots will use different types of NLP depending on the environment they are implemented in and the level of technology available to the organisation which created the chatbot. (En.wikipedia.org. *Natural Language Processing*. 2020.)

Because chatbots rely on NLP to communicate with humans, the development of both has gone hand in hand. The first chatbot developed was call ELIZA and was developed primarily to evaluate the Turing Test. This test devised by Alan Turing was to assess a machines intelligence from a person’s ability to determine if they are communicating with another person or a machine. The NLP used in these early model chatbots was basically a database of phrases that were manually matched up to the input from the human. (En.wikipedia.org. *Turing Test*. 2020.)

Since then there have been two major shifts in NLP implementation. The first of these began early in the 1990’s when the increase in computational power made it possible for algorithms to be written which allowed software to “learn” by studying written text. The algorithms then used statistical models to infer further information about the language that they were processing and to formulate responses base on probabilities. This is called Statistical NLP. (En.wikipedia.org. *Natural Language Processing*. 2020.)

Skipping forward to current technology, NLP has progressed to understanding human speech, which is much harder for a computer to do than understanding written text. Peoples speech is very variable, for instance not only are there many different languages spoken, people speak different dialects and with different accents. Speech is also not as structured as text as people can mumble, slur, use slang and can use terms from other languages. (Sas.com. *What Is Natural Language Processing?*. 2020.)

This progress has been made possible by the second shift in NLP implementation, which has also been made possible because of the further increase in computation power. This latest implementation is termed as Neural NLP and is a subset of Artificial Intelligence research. Neural NLP uses Artificial Neural Networks (ANN) to “learn” in a more efficient way. ANN’s are, simply put, a collection of computational segments designed to mimic the structure of animal brains. There are “neurons” interconnected with “synapses” and the individual synapses are strengthened the more they are used (En.wikipedia.org. *Artificial Neural Network*. 2020.). The main processes the ANN’s use to learn are known as Deep Learning and Data Mining. Deep Learning is a process where the ANN’s repeatedly perform set tasks on different sets of data and alter their responses and methods according to the results they receive. This technique has been made possible by the massive amount of data available with the current ubiquitous use of the internet (Marr, B., *What Is Deep Learning AI? A Simple Guide With 8 Practical Examples*. 2020.). Data Mining is the method of analysing large amounts of data using statistical algorithms to extract predictions about other events and processes. This is similar to what was used with Statistical NLP, but with much larger amounts of data available and more efficient ANN’s to process it. (Sas.com. *What Is Data Mining?*. 2020.)

Current chatbot technology is widely used in customer service situations. While they are very efficient at simple tasks, they are generally programmed to transfer the customer to a human agent when more complex situations arise. It is also generally made obvious to the customer by the companies that use the chatbots that they are communicating with a bot (Chi, C., *7 Of The Best AI Chatbots For 2020*. 2020.). Although, at the moment there is a rapid increase in the level of Artificial Intelligence being implemented in public fields and Natural Language Processing is a part of this. It is quite feasible that in the near future all our phone and text interactions with companies will exclusively be with chatbots and we may not be able to tell the difference between them and a real person. Also, as technology becomes more complicated tech companies will need to find better user interfaces for their products and chatbots are the best option for this. If you can interact with your device the same way you would another person, it would be the easiest option for the user.

What are the likely impacts?

The biggest impact that chatbots will have in society is the improvement in the general public’s access to services and technology. The use of technology such as accessing the internet and mobile phone use has become an essential part of life, and people who are not IT literate are in danger of being left behind. Chatbots can give people easier access to technology by allowing them to simply talk to an interface that can assist them to use a device or navigate websites. They can communicate with the chatbot just like they were talking to another person, so they would not need to learn anything new. People can also get greater access to essential services such as legal help, medical advice, education, news and community information (Zilkha, G., *What Chatbots Are Doing For Social Good.* 2020.). Many of these services are under resourced or expensive so people can wait long periods of time for access or not be able to get access at all. Chatbots are a very cost-effective solution to this problem, because for instance if a person is employed as a customer service assistant to answer phone calls, they can only answer one call at a time. Whereas the chatbot can answer as many calls as there are phone connections. When implemented online the chatbot can also communicate and assist an almost unlimited number of people simultaneously.

Like any technology there are also possible negative impacts of chatbots and NLP as well. For example, chatbots could be used to conduct phishing scams on a large scale. Chatbots could be programmed to communicate with people online through social media platforms, pretending that they are real people. They could then use this interaction to elicit personal details (bank account details, date of birth etc.) from their targets. There is also the impact to employment. Currently most chatbots can only help with basic enquiries, so there has not been a great impact on customer service jobs. However, as NLP improves chatbots will be able to engage in more and more complex interactions with people, so online and phone customer service roles will begin to be supplanted by this technology.

How will they affect me?

Currently when I come across a chatbot online I tend to avoid them, because my past interactions have been that the chatbot wasn’t much more useful than a search bar. Simply directing you to another webpage or regurgitating information that is from the website. As chatbots become more sophisticated I am sure they will become the main way that we interact with customer service departments and even our devices, so I will have no choice but to interact with them more and more. Especially if digital assistants become the main way we interact with our devices, everybody will quickly get used to talking and giving instructions verbally to their phone, fridge, oven, media player, TV, etc.

The main negative impacts to my family would be diminished job prospects. Chatbots are most likely to replace entry-level remote customer service roles. These roles are often a way young people can enter the job market and gain experience as they are beginning their career. Without jobs like this available it makes it even harder for young people to enter the job market, and gain experience to move on to other roles.

References:

Chi, C., 2020. *7 Of The Best AI Chatbots For 2020*. [online] Blog.hubspot.com. Available at: <https://blog.hubspot.com/marketing/best-ai-chatbot> [Accessed 15 October 2020].

En.wikipedia.org. 2020. *Chatbot*. [online] Available at: <https://en.wikipedia.org/wiki/Chatbot> [Accessed 15 October 2020].

En.wikipedia.org. 2020. *Turing Test*. [online] Available at: <https://en.wikipedia.org/wiki/Turing\_test> [Accessed 15 October 2020].

En.wikipedia.org. 2020. *Artificial Neural Network*. [online] Available at: <https://en.wikipedia.org/wiki/Artificial\_neural\_network> [Accessed 15 October 2020].

En.wikipedia.org. 2020. *Natural Language Processing*. [online] Available at: <https://en.wikipedia.org/wiki/Natural\_language\_processing> [Accessed 15 October 2020].

Sas.com. 2020. *What Is Natural Language Processing?*. [online] Available at: <https://www.sas.com/en\_au/insights/analytics/what-is-natural-language-processing-nlp.html#world> [Accessed 15 October 2020].

Marr, B., 2020. *What Is Deep Learning AI? A Simple Guide With 8 Practical Examples*. [online] Forbes. Available at: <https://www.forbes.com/sites/bernardmarr/2018/10/01/what-is-deep-learning-ai-a-simple-guide-with-8-practical-examples/#b0ad9ff8d4ba> [Accessed 15 October 2020].

Sas.com. 2020. *What Is Data Mining?*. [online] Available at: <https://www.sas.com/en\_au/insights/analytics/data-mining.html> [Accessed 15 October 2020].

Zilkha, G., 2020. *What Chatbots Are Doing For Social Good | SAP Conversational AI Blog*. [online] SAP Conversational AI Blog. Available at: <https://cai.tools.sap/blog/what-chatbots-are-doing-for-social-good/> [Accessed 15 October 2020].