

Applications of Artificial Intelligence in Neural Machine Translation

Nihar Sukhadia

B. Tech Student, Computer Science and Engineering, Malla Reddy Engineering College, Hyderabad, Telangana, India

Abstract - Artificial intelligence is important in our routine life. We are making use of artificial intelligence products in our daily routines. This paper tells about some information regarding neural machine translation which is working based on the terminologies of artificial intelligence. This paper is also giving brief information about artificial intelligence and neural machine translation. In which way artificial intelligence is working, content of artificial intelligence, different types of models implemented for neural machine translation, methodologies of neural machine translation. It also finds an efficiency between previous approaches and approaches which are implemented in 2000s when we are giving any set of words and statements to convert into another language then which approach is working in which way and the drawbacks of that approach and the comparison of it.

Key Words: Terminologies of Artificial Intelligence (AI), Deep Neural Machine Translation, encoder-decoder interface model, machine translation system, recurrent neural network model

1. INTRODUCTION TO ARTIFICIAL INTELLIGENCE

The word Artificial Intelligence can also be defined as Intelligence of Machine is intelligence described by machines in contrast of neural intelligence. A device which observes its environment and successfully acquires its layouts. Newly invented capabilities of a machine include excellent understanding of human voice, autonomous cars and military limitations[1]. Basically, it is invented for academic purpose followed by new methods. AI has been classified in sub-categories that frequently fail for communication. Methods involve statistical approaches, computations and original remarkable AI. There are plenty of protocols applied in AI which include search and utilization and approaches based on probabilities, etc. Now a days techniques of AI have come with resurgence and have become an important part of technological industry by contributing to solve important problems in the field of computers and research.

There are many terms which are available in AI but Machine Learning, Deep Learning, Data Science, IoT are the major terms.

AGI is generally used in the development of the machine which can be able to think autonomously. ANI is available for face recognition technique and language translation. ASI is a type of intelligence which is smarter than normal human brains. Neural networks are a collection of algorithms which is an approach to solve important problems by applying the neural identification process and also applies biological evolution. Machine learning is a

subtype of AI which involves algorithms to perform an allotted task properly[2].

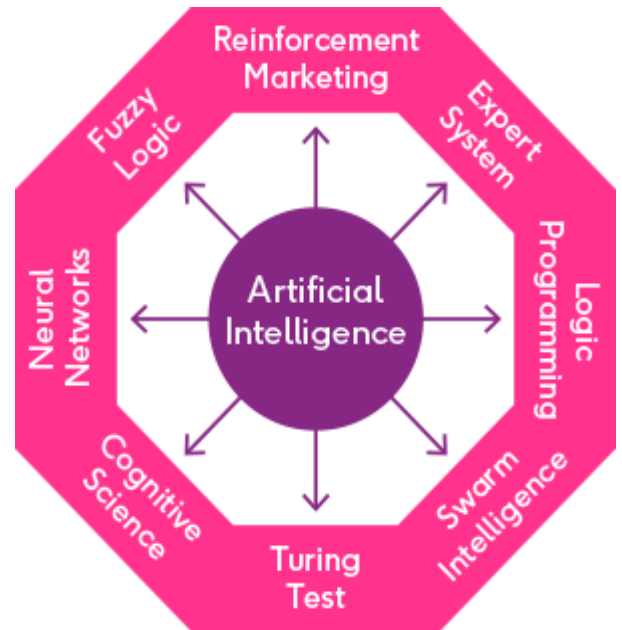


Fig-1: Some Parts of AI

2. INTRODUCTION TO TRANSLATION OF NEURAL MACHINE

Neural Machine Translation (NMT) is a term for the conversion of machine which uses big Neural Networks to predict a block of words which are given. Since 1960s, researchers tried to build this system depending on rules of grammar and structure of languages. When they came out with new term Machine Learning at that time NMT got success. All the products related to machine translation had been invented through implementing the statistical approach of algorithms and it is known as Statistical Neural Translation (SNT)[3]. There is a drawback in SNT, it translates only some lines of words and remaining lines of words will be ignored i.e. it translates limited words. In that too if you are giving big statements of words then the computation time will be more where as for small statements SNT works in a faster way. During the end of 2000s, new approach had been invented for the conversion of machine known as Deep Neural Networks which is more accurate than previous approach. Because it is directly related to the working of the brain of human being and it tries to receive information from human brains with minimum partially.

There are two levels of NMT. First way could be based on the given words for translation. For suppose, if we

are passing a word 'cat' and we are asking for the translation of word in French, for that it will take the word and internally based on the given word it will create its image internally and base on the image which is generated internally it will find the word in the language in which it asked to translate. So, here the French word 'chat' will be the resultant for the given English word 'cat'.

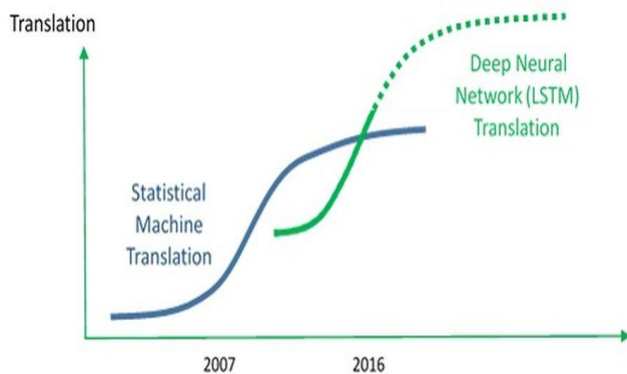
This methods provides better result compare to other method, the reason behind this is that, it take few sentence for the translation process rather than only words.

3. ROLE OF ARTIFICIAL INTELLIGENCE IN TRANSLATION OF NEURAL MACHINE

Neural Machine Translation is working on the terminologies of AI. Among these all terminologies pf AI we are making use of Deep Learning and Machine Learning majorly.

3.1 Role of Deep Learning in Neural Machine Translation:

Deep Neural Machine Translation(DNMT) is an extension of NMT which is invented based on the concepts of Machine Leaning and Deep Learning. After DNMT, many layers can be process instead of only one. Due to that compare to before the best quality of NMT experienced ever. It also has customized unique needs.



Graph-1: Role of Deep Learning

Given Graph-2 states the difference between the translation efficiency of statistical machine translation and deep neural machine translation year wise. It is clearly concluding that the deep neural machine translation is more efficient than statistical machine translation. The reason is DNMT is processing statements where as statistical machine translation gets proceed word by word so it requires more amount of time and due to that its efficiency is also decreasing[4].

3.2 Role of Machine Learning in Neural Machine Translation:

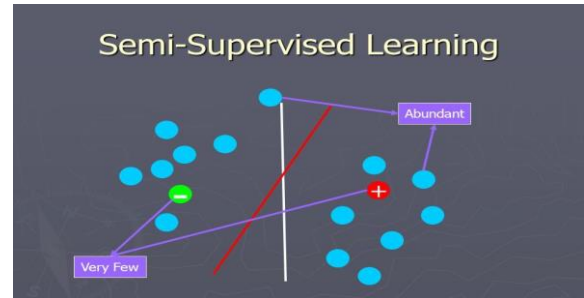


Fig-2:Semi-Supervised Learning

NMT also works on machine learning algorithms. Machine learning gets implemented using semi-supervised learning. It is implementing using end-to-end process in which it is directly converting the sentence from source language to destination language. Most of the present methods of NMT are suffering from the drawback: they relays on the corpora to train the translation model because they directly focus on the targeted language[5].

4. NEURAL MACHINE TRANSLATION MODELS

Neural machine translation is implemented through many models. In this, we are considering two models, 1. Recurrent Neural Network, 2. Encoder-Decoder Interface.

4.1 Recurrent Neural Network(RNN) Model:

This model can be called as artificial neural network which is available for time sequence. RNN takes sequences as an input inside RNN the sequences recognition starts processing and for that it is making use of internal memory(storage)[6]. For clarity, whenever you are watching a song and after some period of time you are understanding a song so, from that point you will remember that song it will not be forgettable for you. Similar to that, RNN remembers each and everything it shows that inputs are not independent. Now from one word suppose you want to search for the next word which is given in the input RNN will be trained for that to make it easy and RNN takes input and it will help to fetch(retrieve) the word. Coming to NMT, RNN will perform read operation for the given inputs to the machine which is connected with the neural network. It also plays wider role in searching next or precious word in the sequences[7].

4.2 Encoder-Decoder Interface Model:

This model is coming under recurrent neural network of NMT. This model is majorly used in the machine translation of Google's Neural Networks. This model has long procedure to follow moreover, it requires large dataset. It can not work on small dataset. As it has long procedure, it takes more time to execute the process of the translation[8].

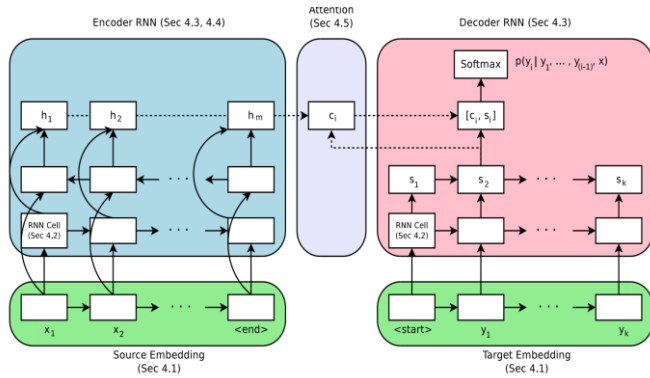


Fig-3: Architecture of Encoder-Decoder Interfacing

[7]. <https://medium.com/mindorks/understanding-the-recurrent-neural-network-44d593f112a2>

[8]. <https://machinelearningmastery.com/configure-encoder-decoder-model-neural-machine-translation/>

[9]. https://medium.com/@umerfarooq_26378/neural-Machine-translation-with-code-68c425044bbd

In this model there will be an interface between encoder and decoder. Encoder will take the input statements given by the user. Here, the input given by user is not understandable for the machine. As it is not understandable for the machine, encoder will encode the input in the system understandable format then it starts the process of translation.

Once translation is completed, it will give the output which is not understandable for the user. So, the decoder will decode it and makes it understandable for the user. Decoder is following few approaches of the RNN model.

5. CONCLUSION

This paper helps to gather contents about the working procedure of NMT and different type of models on what NMT is working. It also clarifies the difference between previous approaches and latest approaches with the proper reason. NMT is working on AI so that what are the terms used in it also identified with brief introduction about AI. Moreover, it also give a glance on the two latest approaches with their process of converting from one language to another language with the limits of a particular approach.

REFERENCES

[1]. https://en.wikipedia.org/wiki/Artificial_intelligence

[2]. <https://medium.com/machine-learning-world/Artificial-intelligence-terminologies-260f1d6d299f>

[3]. <https://translator.microsoft.com/help/articles/neural/>

[4]. <https://omniscien.com/deep-neural-machine-Translation/>

[5]. <https://www.groundai.com/project/semi-supervised-Learning-for-neural-machine-translation/>

[6]. https://en.wikipedia.org/wiki/Recurrent_neural_Network/