Chapter 5
Study of Neural Machine Translation With Long Short-Term Memory Techniques

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ABSTRACT

The growing demand for having a conversation amongst people who come from different areas, across the globe, resulting from globalization, has led to the development of systems like machine translations. There are techniques like statistical models, Bayesian models, etc. that were used earlier for machine translations. However, with growing expectations towards better accuracies, neural networks aided systems for translations termed as neural machine translations (NMT) have come up. Models have been proposed by several organizations like Google NMT (G-NMT) that are widely accepted and implemented. Several machine translations are also based on RNN models. This work studies neural machine translations with respect to long short-term memory (LSTM) network and compares them on the basis of several widely accepted accuracy metrics like BLEU score, precision, recall, and F1 score. Further, a combination of two LSTM models is implemented for better accuracy. This work analyzes the various LSTM models on the basis of these metrics.

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INTRODUCTION

Evolution has always been a constant change over time. The ability to communicate amongst humans is one such evolution that changed the world for the better. As the ability to communicate developed, so did the way to communicate. Now communication can be anything ranging from simple sign language to a telephonic conversation from miles away. But speech, speech is the most efficient and the most used for this activity. Using eleven thousand to around twenty-five thousand words per day, it is evident that for any human being this is the go-to method to facilitate any kind of communication amongst them. A meeting, a discussion, an event, or any such activities require the ability to speak. Now, these speeches may not be comprehensible by all the participants. With evolution, humans have managed to develop different languages and different dialects. Each is similar to the others as they are different. So, how does the world continue the constant exchange of words, of dialects when the involved participants are unable to understand each other? That's when Speech-to-Speech translation comes into play. In this information-driven world, intercommunal exchanges of information are unavoidable. Thus, breaking this language barrier by a digitized medium is very important and necessary using a framework or machine. The innovation that was observed in the Speech Translation machinery is the onset of one speech dialect getting converted naturally to another speech dialect. The difficulty of learning a new language or even remotely understanding the countless languages all around the globe will always be a tedious task for humans, thus, a Speech Translation framework might just be the way out of this difficulty.

Speech Translation can be described in layman's terms by specifying that it takes the voice of the user as an input and provides the output with the same semantic meaning in the language required by the end-user. Google has a framework called the Google Neural Machine Translation (GNMT) that has its algorithm using the Artificial Neural Network (ANN), An improvement over this will be the use of the Recursive Neural Network (RNN) framework. Now, RNN is an architecture that works on the set of a data sequence, assumed to be like a time series, and each of the current samples is dependent on the one before it. RNN has also shown application with an amalgam with the Convolutional layers used in image processing. Machine translation is one of the benchmark use cases of NLP (Natural Language processing). Machine translation (MT) has been complemented with various categories of techniques in the past decades. The ability to communicate amongst humans is one such evolution that changed the world for the better. Machine translation is the automation of converting the textual information in one human language to another human language. While solving the translation problem the Human and the computer both have their inherent challenge. Two human translators can produce matching translations of the same given text in the same language possibly to a certain good extent. The machine needs to face e greater challenge, compared to a human translator. The difficulty of learning a new language or even remotely understanding the countless languages all around the globe will always be a tedious task for humans, thus, a precise Machine Translation framework might just be the way out of this difficulty. The first category of technical approaches to the machine translation problem is the rule-based approach (were to convert a piece of textual information the needs need a lexicon for all the morpheme's morphological, syntactic, and semantic information in both source and target language. Steps to implement RBMT (rule-based machine translation) can be found in Huang et al (2020), and Alvarez et al (2020), and also the authors, discuss the pros and cons of the same. Another category of technique to accomplish Machine Translation is using statistical models. Statistical Machine Translation was presented by Warren Weaver in 1947. Model parameters of SMT are obtained from the analysis of bilingual text corpora. Such type of translation activity is heavily dependent on corpus features, especially the size of the corpus. Decoder