Natural Language Processing - 585

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Project Report

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**Abstract**

Machine Comprehension (MC) has always been a challenging task from a Natural Language Processing perspective. It can be defined as answering a query about a given passage of text. To be able to answer questions from a given text, the Reading Comprehension system needs to model complex interactions between question and the passage text. Various techniques and models are proposed to solve this problem of Machine Comprehension and in this project we study the famous Bi-Directional Attention Flow Model (BiDAF). We retrained the BiDAF model and were able to reproduce results of the original model. We present some interesting visualizations for these results. Also, this model is very large and it takes quite long time to train. To make the training faster, we made some changes in the sizes of various layers in the model by carefully looking at training dataset. We present our results and compare these results with the original Bi-Directional Attention Flow Model on the Stanford Question Answering Dataset (SQuAD).

1. **INTRODUCTION**

The task of Machine Comprehension have gained a lot of popularity in recent years. Applications such as Google Now, Amazon Alexa, Apple Siri etc. focus on answering queries of users based on some context. Core requirement to solve these problems is to be able to understand the context text, understand the query, study the correlation between context and the query, and get the answer correctly. To be able to answer questions from a given text, the Reading Comprehension system needs to model complex interactions between question and the passage text. Also it should have many complex skills such as coreference resolution, analogy detection, understanding spatiotemporal relations etc. Consider an example passage of text from SQuAD dataset:

“*The Black Death is thought to have originated in the arid plains of Central Asia, where it then travelled along the Silk Road, reaching Crimea by 1343. From there, it was most likely carried by Oriental rat fleas living on the black rats that were regular passengers on merchant ships. Spreading throughout the Mediterranean and Europe, the Black Death is estimated to have killed 30–60% of Europe's total population. In total, the plague reduced the world population from an estimated 450 million down to 350–375 million in the 14th century. The world population as a whole did not recover to pre-plague levels until the 17th century. The plague recurred occasionally in Europe until the 19th century.*”

**Question:** “*When did the world's population finally recover from the black death?*”

**Possible Answers:** “*the 17th century, 17th century*”

**Question:** “*For how long did the plague stick around?”*

**Possible Answers:** *“until the 19th century, 19th century*”

The scope of Machine Comprehension has been a core research topic in the Artificial Intelligence and Natural Language Processing community is very broad and is very hard to give any Christopher J.C. Burges defines the task of Machine Comprehension as, *"A machine comprehends a passage of text if, for any question regarding that text that can be answered correctly by a majority of native speakers, that machine can provide a string which those speakers would agree both answers that question, and does not contain information irrelevant to that question.”* [<https://www.microsoft.com/en-us/research/wp-content/uploads/2016/02/mct.pdf>] This generalizes the definition of Machine Comprehension task.

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1. **Result:**