



A Neural Conversational Model

CS671A: Introduction to Natural Language Processing
Course Instructor: Prof. Amitabha Mukherjee

INTRODUCTION

Conversational modelling is one of the most exciting problems in the field of Natural Language Processing. Since Eliza, many attempts have been made to improve the conversation model. But, most of these attempts were restricted to specific domains and required hand-crafted rules. The Neural Conversation Model^[1] tries to model our agent using just previous sentence or sentences. It is trained end-to-end and hence, require less hand crafted rules. Our agent can have simple conversations if trained with large enough dataset even if it is as generic and noisy as a movie subtitle dataset.

PAST WORK

- Most ChatBots use special handcrafted rules
- It is tedious to build such a ChatBot
- DNNs not used due to variable dimensions of input and output
- But, a new Seq2Seq model allows to read input and produce output without knowing their dimensions a-priori

SEQ2SEQ

- Seq2Seq uses two LSTMs – one each for input and output
- It increases the model parameters at negligible computational cost.
- LSTMs with four layers were used.
- Order of the words in the input sequence was reversed to improve the performance of the LSTM.
- This makes it easy for SGD to "establish communication" between input and output.
- Seq2Seq Learning model makes it easy to map two sentences of different lengths.
- It also makes it easy to train the model with different input and output languages.
- This features make it easier to train for translation or cross-lingual chat.
- Ability of LSTMs to solve long range temporal dependencies makes it ideal for machine translations and context based replies to user's input.

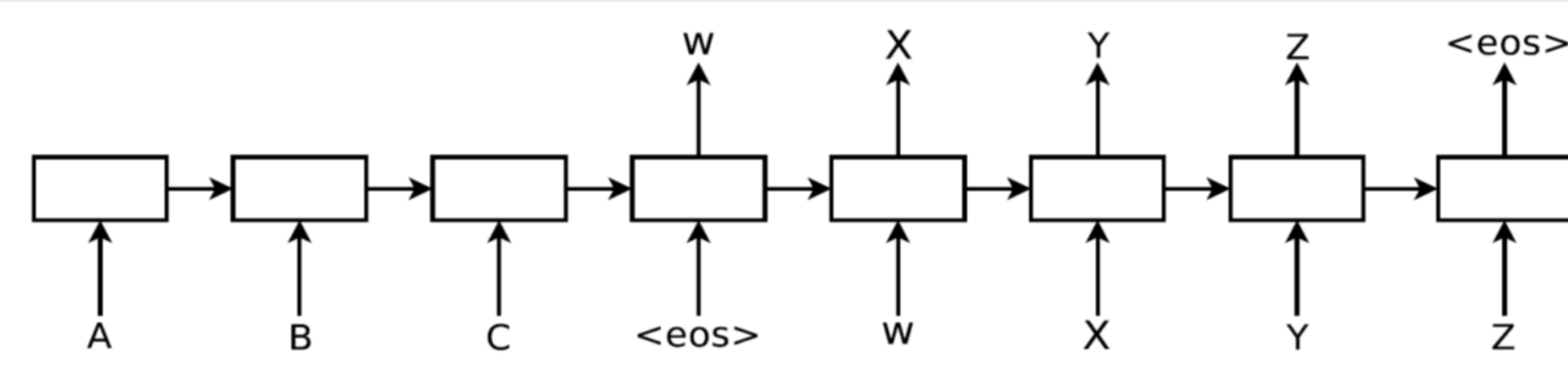


Figure 2. Seq2Seq framework for machine translations

APPROACH

- A Translation Model using Seq2Seq will be easier than a conversational model due to no context required.
- Input sequence is the concatenation of what has been conversed so far.
- Lack of general world knowledge is another limitation of the purely unsupervised model.

Suppose, first person says "ABC", and the second person replies "WXYZ". We can use an RNN to train a map from "ABC" to "WXYZ" as shown in the figure below.

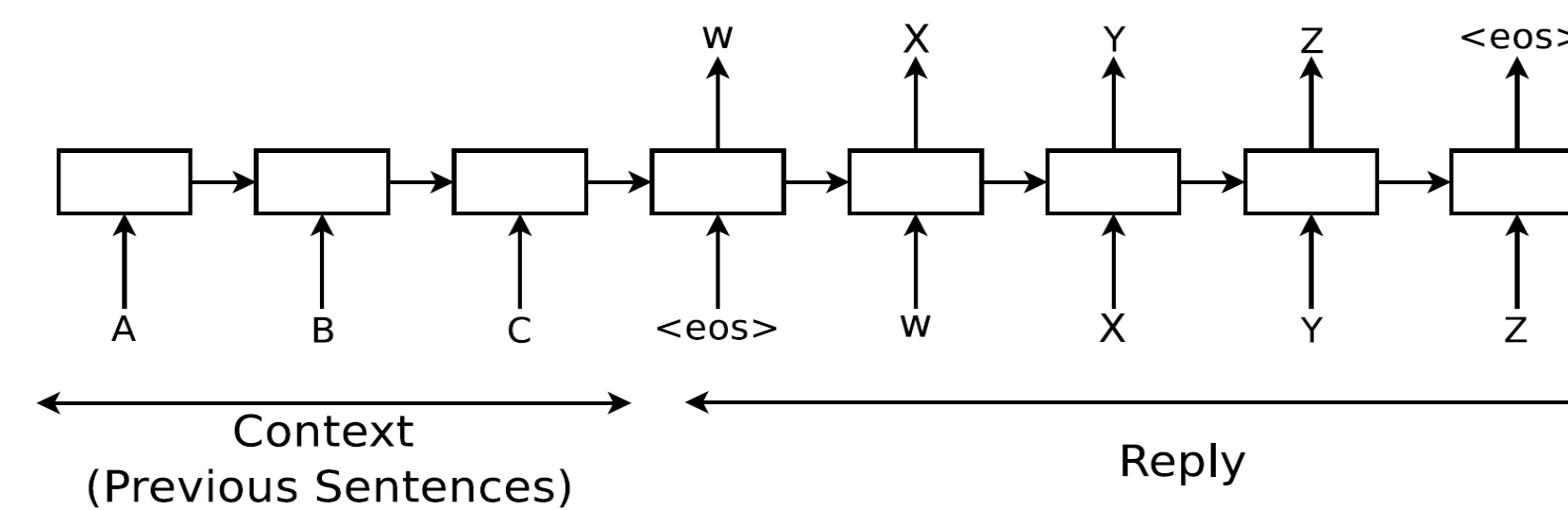


Figure 2. Seq2Seq framework for modelling conversations

RESULTS

CleverBot

Human: What do you think about tesla ?

CleverBot: I am tesla.

Human: What do you think about cleopatra ?

CleverBot: Cool is cool.

Human: What do you think about england during the reign of elizabeth ?

CleverBot: I like him. Do you ?

Human: What do you think about bill gates ?

CleverBot: Lets talk about Link.

Neural Conversational Model

Human: what do you think about tesla ?

NCM: he 's a good conductor .

Human: what do you think about bill gates ?

NCM: he 's a good man .

Human: What do you think about messi ?

NCM: he 's a great player .

Human: what do you think about cleopatra ?

NCM: oh , she 's very regal .

Human: what do you think about england during the reign of elizabeth ?

NCM: it was a great place .

DATASET

- OpenSubtitles dataset Tiedemann 2009.
- Movie conversations in XML format.
- Training Dataset : 62M sentences (923M tokens)
- Validation Dataset : 26M sentences (395 tokens)
- Quite large but noisy
- This is an open-domain conversation dataset so expected results are quite fascinating.

CONCLUSIONS

- Completely data driven, No separate rules
- Simple conversation possible when trained with large, noisy and open-domain dataset
- No coherent personality
- Many modifications required to pass Turing Test
- Tested against CleverBot, which uses handcrafted rules to answer the questions.
- Yet CleverBot is outperformed in most cases

REFERENCES

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3. Tiedemann, J. News from OPUS - A collection of multilingual parallel corpora with tools and interfaces. In Nicolov, N., Bontcheva, K., Angelova, G., and Mitkov, R. (eds.), Recent Advances in Natural Language Processing, volume V, pp. 237–248. John Benjamins, Amsterdam/Philadelphia, Borovets, Bulgaria, 2009. ISBN 978 90 272 4825 1.

Aadil Hayat

Roll No.: 13002

Email: aadilh@iitk.ac.in

Masare Akshay Sunil

Roll No.: 12403

Email: amasare@iitk.ac.in