Specialization Project

Dynamic Memory Network Applied To Retrieval-Based Dialogue Systems

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1 Intro

2 Motivation

In the domain of Natural Language Processing, training open-domain conversational systems that emulate human conversation is a goal that has been attempted to reach for the last few years. Although it can seem quite elusive, recent increase in the quantities of conversational exchanges provided by social networks, as well as the development of new architectures based on deep neural networks, have given the idea of building data-driven models that can start to communicate conversationally. [2]

Amongst the challenges of such a task, the incorporation of context into the responses generated by the dialogue system remains a difficult but crucial task that has often been omitted. [3]

3 State Of The Art

The state of the art studies for the development of context-sensitive dialogue systems attempt to accomplish dialogue management and response generation jointly, based on a deep architecture allowing a data-driven process.

Amongst them, the most successful have been the use of RNNs to develop a Recurrent Language Model providing a dynamic context for the generation of responses [3], the building of a Latent Semantic Model to learn a low-dimensional representation of the context semantic [6], as well as the training of a Convolutional Deep Structured Semantic Model to find semantic relevance between text query and document. [1]

The latest approach is particularly interesting since its trigrams model outperforms previously existing systems in terms of incorporation of context and relevance of responses retrieved.

It particular, it could be used for Question Answering, by combining it with a framework that currently achieves state of the art results in that domain, namely the Dynamic Memory Network. By using a GRU/LTSM structure and an Episodic Module Component that focuses on the right part of the input, the model is able to answer questions with relevance. [4]

4 Challenges

Amongst the challenges of working with context-sensitive dialogue based systems, we can mention the difficulty of having the right focus when looking for the relevant information to retrieve. In particular, most context-sensitive systems tend to have issues detecting switch of context, although some work on semantic similarities through Context Capturing Features have given some successful results [1]

Of course, curse of dimensionality remains an important challenge, as in any NLP task, and it is crucial to get a proper semantic representation that avoid sparsity issues and manage to lower the space dimension.

In addition, much attention must be paid on the evaluation process. In order to get a data-driven system, it is useful to draw away from human evaluation and make use of automatic evaluation tools such as BLEU. [5]

5 Ideas

The idea of the project is to combine Dynamic Memory Network and DSSM to develop a context-sensitive dialogue systems, that could be used for Question Answering and/or Response Generation. This would allow the building of a system that can find the right focus in the given input while using the context provided by previous exchanges.

6 Experimentation

Experimentation would be made on the **bAbI dataset** for question answering (20 tasks having 2000 questions each), or on the **Twitter FireHose dataset** for response generation in case of longer exchanges (10M tweets)

The idea would be to implement a system that can reach good relevance in the responses or even achieve state of the art results.

7 Analysis Of Results

8 Conclusion

9 Further Work

References

[1] Chris Brockett Abhay Prakash and Puneet Agrawal. Emulating human conversations using convolutional neural network-based ir.

[2] Colin Cherry Alan Ritter and William B. Dolan. Data-driven response generation in social media.

[3] Alessandro Sordoni et al. A neural network approach to context-sensitive generation of conversational responses.

[4] Ankit Kumar et al. Ask me anything: Dynamic memory networks for natural language processing.

[5] Kishore Papineni et al. Bleu: a method for automatic evaluation of machine translation.

[6] Yelong Shen et al. A latent semantic model with convolutional-pooling structure for information retrieval.