Dialogue Interactions Critical Analysis

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December 10, 2019

Learning Through Dialogue interactions by asking questions [1], is a paper which aims to research ways in which dialogue interactions between a conversational agent (referred to as student/bot) and a user (referred to as teacher) can improve. Its main focus is looking at ways in which the student can develop its methods of dialogue via asking questions. By asking questions, the bot will be able to store data which it previously did not have access to or could not retrieve, in order to successfully answer future conversations. This is very applicable to the real life scenario of a student in a classroom obtaining further information through asking their teacher for hints and tips.

The article aims to address this topic by tackling three main areas where it feels the bot could struggle during dialogue. These include scenarios where the bot cannot understand the dialogue (i.e. misspellings), they have the necessary information to answer the question however they fail to connect and retrieve the answer and where the student simply does not have the data/answer to the question.

I. Related Work and Scientific Contribution

Learning and improving language dialogues through continuous interactions is an area that has been widely researched since the early 1950's. This article applied these theories into a deep learning model context between a bot and a user. In the field of deep learning this idea has also been widely researched.

One article that relates quite closely to this one is that by *Bordes and Weston* [2]. In this paper the authors focused on how the bot tries to improve its language dialogues by copying responses from an expert student, only imitating the responses of those which it deems to be correct and predicting a teachers feedback during an interaction.

The paper in question goes further by looking at how a bot can learn and develop by asking questions to the user and learning off of their responses. It also incorporates an interesting element of the cost at which a question is asked. If the bot asks a question then it will receive a cost associated with asking that question. This is to reflect user dissatisfaction with continuous questions within a dialogue. The bot will then have to adjust for this cost and determine the best way to proceed once presented with a question.

II. Strengths

The overall hypothesis of this paper is that the dialogue agent will improve its interactions with the user if it asks questions and interacts with user. This was tested by asking the bot questions based on WikiMovies Dataset and seeing if its answers were accurate based on various scenarios.

This paper does well to produce as many varying scenarios as possible in order to test the hypothesis. There were in total three training sets and three test sets which were each tested against each other. They also conducted their

experiments offline through simulations and online with Mechanical Turks. This ensured that their findings were applicable in both environments. Through their findings they found that asking questions in both the training and test environment yielded the best results. This reinforces the strength of their overall hypothesis.

On top of this, the authors do well to formulate and explain the cost of asking a question during a dialogue. This is very applicable in the real world and it is a very important element for user satisfaction.

One of this papers strongest points is how it can relate to nearly every human that has gone through an education system. It is a simple idea that asking questions will result in you improving in that area and yet this has such resounding results when applied in a deep learning context. It allows the reader to contextualise the concepts more clearly given that it is applicable to them.

III. Areas for Improvement

Given that their results were convincing, the authors did not mention any further areas in which this research could go and the potential it has in a real world context. An idea for further research into this field could be if the user decides to give false information to the bot and whether or not the user is compliant when asked a question.

The authors also failed to fully explain that if the bot has all required information to answer a question, then why could it not perform necessary reasoning operations on the data.

For their simulated tests they also state that there were "irrelevant conversations" between the user and the bot prior to the recorded interactions that took place. It would be interesting to see what these conversations were and why they were not deemed to be useful.

IV. Structure

The structure throughout the paper is very clear and concise. It allows the reader to easily follow the process from when the idea is presented to when the results are produced. Whenever a new idea is presented within the corpus there is a clear effort to give as much background knowledge as possible.

On top of this they help the reader understand their simulations more thoroughly by producing easy to follow figures (Figure 1).
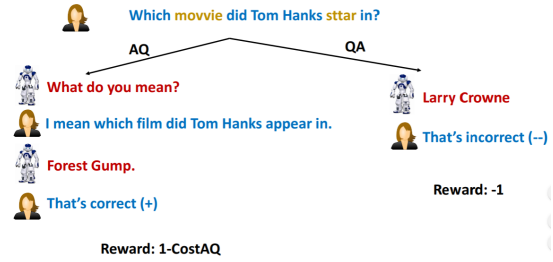

Figure 1: *Interaction between user and bot.*

Although most of their figures are extremely helpful, some of their visualised results are not very clear and concise due to multiple data points (Figure 2).
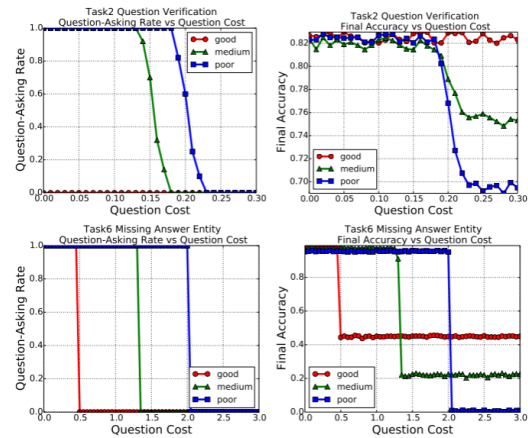

Figure 2: *Graphs of question-asking rate against cost of asking.*

Finally the authors produce plenty of further insight into the models they used for their experiments and mathematical explanations within the Appendix. This allows readers to go more in depth into the topics without having to do further research afield.

V. Conclusion

The paper does well to engage the reader with multiple real life applications and combine that with numerous numerical explanations to support a strong hypothesis. They also ensure to mention several other articles in order to facilitate further reading into the field.

References

[1] Jiwei Li, Alexander H. Miller, Sumit Chorpa, Marc' Aurelio Ranzato, Jason Weston (2017). Learning Through Dialogue interactions by asking questions *Conference paper*, ICLR.

[2] Antoine Bordes and Jason Weston (2016). Leanring end-to-end goal orientated dialog.