

Ghaida Alshiddi

CS 4395.001

April 8, 2023

ACL Paper Summary

A Summary on ProphetChat

- **Document Information**

- Title: ProphetChat: Enhancing Dialogue Generation with Simulation of Future Conversation
- Author list and affiliations:
 - Chang Liu, Wangxuan Institute of Computer Technology, Peking University, and Center for Data Science, Peking University
 - Xu Tan, Microsoft Research Asia
 - Chongyang Tao, Microsoft Corporation
 - Zhenxin Fu, Wangxuan Institute of Computer Technology, Peking University
 - Dongyan Zhao, Wangxuan Institute of Computer Technology, Peking University, Center for Data Science, Peking University, Artificial Intelligence Institute of Peking University, and State Key Laboratory of Media Convergence Production Technology and Systems
 - Tie-Yan Liu, Microsoft Research Asia

- Rui Yan, Gaoling School of Artificial Intelligence, Renmin University of China

- **A Summarization of the Problem Addressed by the Paper**

The ProphetChat paper aims to develop a chatbot that predicts conversation with the user. The chatbot could provide a good answer based on past and future dialogs.

The chatbot can analyze past and future dialogs using a dialog generator and selection models. The paper mentions that many chatbots use past and old dialogs to produce an answer, and the authors argued that only using old dialogs to produce a response will not provide a good response as the authors claim that a good chatbot should provide a complete and simple answer that would allow for future conversation with the user. The authors explain that a chatbot can provide such an answer by predicting future conversation from the user's answer, hence, the chatbot would provide an answer based on the previous dialog (user response) and future dialog (based on predicting future conversation). The authors also explain the technique they used that would allow the chatbot to predict future conversations by coming up with responses that would eventually lead to the recent user response (hence the chatbot would use a reverse process to come up with a future response by trying to come up with a response to the user that would lead to a conversation to the user current user response).

The authors explained the methods they used in ProphetChat to produce a good and complete response to users. First, the chatbot would provide a list of answers based on the current and past conversations with the user, and then the selector would select a certain number of the responses from the previous list to come up with future conversations with the user by using the reversal method explained earlier, where the

future responses based on previous dialogs would be used to try and predict the current conversation with the user. Then, the selector method would select a number of the best future responses and combine them with selected responses based on previous conversations to produce a number of complete answers based on past and future dialogs. Then next, the list of the responses (based on past and future dialogs) would go through an evaluation process, where every response would be ranked based on how accurate it is based on the past and future dialogs that were previously selected. Then the selector would select the response with the highest rank as a response to the user. Thus, the selector method is what the chatbot relies on to produce a complete and simple conversation that leads to future conversations with the user, and the selector method uses reinforcement learning to select responses.

- **A Summarization of Prior Work**

The paper explained that many AI dialog generators use reinforcement learning to develop dialog tools. The authors explained that most dialog generators depend on previous and old conversations with users to be able to provide an answer to users. Hence, the author's tool (ProphetChat) is unique as it depends on old conversations with users and tries to predict new conversations with them, which would ultimately provide a more accurate and concise response. Also, the authors explained that they used the techniques known to produce responses based on past dialogs, and they also used reinforcement learning to develop a better selector model. The authors said they were able to obtain dialogs based on the past conversation by using DialoGPT, which is a tool that provides responses based on previous dialogs with the user. The authors also used the DialoGPT-MMI tool to generate future conversations with the user by

using the reverse process to get the user's current response. The authors were able to develop their code on an open-source environment and transformer.

- **A Description of the Paper Contribution**

The authors explained that there are three major contributions: improving the AI response generator, developing the framework to deliver precise responses, and experimenting on large datasets to measure the accuracy of the chatbot and framework. The paper aims to improve chatbot or AI responses by implementing their ProphetChat on the chatbots or AIs as it was explained earlier, the purpose of ProphetChat is to provide complete answers that lead to a continuous conversation with the user by using future and past dialogs with the user and select the best response using the selector that uses reinforcement learning to make a better response selection. The authors of this paper claim that their invention of ProphetChat is one-of-a-kind, hence, none has suggested this tool before. Also, the authors explained that their ProphetChat tool provides the best responses than the other tools as their method of obtaining a future conversation with the user is unique, and their selector model is too. Moreover, the authors tested out their tool on two large datasets (DailyDialog and PersonaChat) to examine the response accuracy in comparison with other chatbots and AI dialog generator tools, and they have proven that their tool provides the most accurate answers that lead to future conversation. The author compared ProphetChat with other tools, such as Posterior-GAN, RegDG, and DialoGPT, on the datasets and proved that ProphetChat provided very accurate responses that led to future conversations with the user, unlike the other dialog tools.

- **A Description of Authors Evaluation**

The authors used a number of metrics to evaluate their tool, including BLEU, Distinct 1-4, Average, Extrema, and Greedy embedding metrics, and three random people to measure their tools. The authors used the BLEU measure to calculate word overlapping between human responses and AI responses by using n-gram functionalities to determine how accurate the tools' responses are. The authors also used Distinct 1-4 and Distinct n measures to examine how diverse the tools' answers are (also uses n-grams). The Average, Extrema, and Greedy embedding metrics are used to examine the responses grammatically and semantically. Lastly, the evaluation the authors received from people and educators was the most accurate measurement as the people were asked to rank the AI response based on readability (including grammar), sensibleness, and the details of the response. Based on these measurements, the authors were able to prove that their tool ProphetChat was able to pass the tests better than the other AI tools.

- **Citations on Google Scholar**

Bibliography:

Liu, Chang, et al. "*ProphetChat: Enhancing Dialogue Generation with Simulation of Future Conversation*." Proceedings of the 60th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers). 2022.

- Chang Liu has no citations on Google Scholars
- Xu Tan has 5842 citations on Google Scholar
- Chongyang Tao has 1309 citations on Google Scholar
- Zhenxin Fu has 559 citations on Google Scholar

- Dongyan Zhao has 8949 citations on Google Scholar
- Tie-Yan Liu has 45491 citations on Google Scholar
- Rui Yan has 9628 citations on Google Scholar

From the list, Tie-Yan Liu appears to have the highest number of citations on Google Scholars among the other authors.

In conclusion, I believe that this paper and the tools they developed (ProphetChat) a new idea that would help improve Natural Language Processing systems and applications as the tool is able to communicate with users and engage in more conversations with them. There are many developments in dialog generators, and I believe that the tool implemented by the authors would be helpful and beneficial in the field of education. For example, I believe that the tool or chatbot could be developed more and be used as an educational tool that engages with children to teach to make the learning experience more enjoyable.