

Deep Chit-Chat: Deep Learning for Chatbots

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ABSTRACT

The tutorial is based on our long-term research on open domain conversation and rich hands-on experience on development of Microsoft XiaoIce. We will summarize the recent achievements made by both academia and industry on chatbots, and give a thorough and systematic introduction to state-of-the-art methods for open domain conversation modeling including both retrieval-based methods and generation-based methods. In addition to these, our tutorial will also cover some new trends of research of chatbots, such as how to design a reasonable evaluation metric for open domain dialogue generation, how to build conversation models with multiple modalities, and how to conduct dialogue management in open domain conversation systems.

CCS CONCEPTS

• **Computing methodologies** → **Discourse, dialogue and pragmatics.**

KEYWORDS

Human-machine conversation; deep learning; chatbot.

ACM Reference Format:

Wei Wu and Rui Yan. 2019. Deep Chit-Chat: Deep Learning for Chatbots. In *Companion Proceedings of the 2019 World Wide Web Conference (WWW'19 Companion)*, May 13–17, 2019, San Francisco, CA, USA. ACM, New York, NY, USA, 1 page. <https://doi.org/10.1145/3308560.3320084>

Starting from ELIZA in 1960s, non-goal-oriented conversational agents (a.k.a., chatbots) have never been so popular as in recent years. Take Microsoft XiaoIce as an example. The chatbot which was released by Microsoft to Chinese users first in 2014 now has attracted more than 245 million users in China, Japan, U.S., India, and Indonesia. Different from task-oriented dialogue systems, which are designed for helping people complete specific tasks such as ticket booking and restaurant reservation etc., chatbots aim to engage users in human-machine conversation in open domain for entertainment and/or emotional companionship. As a result, it is easier for chatbots to go viral among end users without specific purposes than task-oriented dialogue systems. For example, until June of 2018, users from the five countries have finished more than 30 billion conversations with XiaoIce; and on average, each

conversation lasts up to 20 turns. The promising user data indicate impressive popularity of the chatbot product.

Goal of the tutorial. In contrast to the prosperity of chatbots among end users, there are few systematic introductions to approaches about how to build the conversational engines behind chatbots in research communities. The reason might be that the conventional chatbots such as ELIZA are designed with hand-crafted rules which are difficult to achieve real open domain human-machine interactions. It is only until the recent two or three years that researchers (who benefit from the large scale social conversation data available on the public Internet and the rapid advancement of deep learning approaches) begin to develop principled and data-driven approaches to build open domain conversational systems. Therefore, we believe it could be useful and valuable to give a tutorial on recent progress of chatbots, particularly on applications of deep learning approaches to building open domain dialogue engines. The community would learn the insights behind chatbots in order to fulfill the gap between task-oriented dialogue systems and non-task-oriented ones. In summary, we expect that our audience can learn the following items from the tutorial: 1) new opportunities modern chatbots, such as Microsoft XiaoIce, bring to academia, industry, and the society; 2) how to build a state-of-the-art dialogue engine with deep learning methods for chatbots; and 3) what are likely to be the future solutions for making chatbots better.

Topic and relevance. Conversational AI is catching on fire: academic conferences especially add new research tracks for conversational studies and attract unexpected growth in the number of submissions to these tracks; companies from industry are making great efforts to develop conversational products. We are entering the AI era whereby large-scale big data become more easily available and learning techniques become more powerful. We may stand at the entrance of future success in more advanced conversational systems (social chatbots and/or virtual assistants). Although this research area still faces bottlenecks and obstacles, we have witnessed a rapid surge of conversational studies in the past few years, especially the chit-chat research in open domain.

The research topic “deep learning for chit-chat” is quite relevant to the Web research community in following ways: 1) the products powered by intelligent conversational techniques can be deployed online to serve users directly, by providing chat companionship services or assisting users to complete certain tasks, and 2) the conversational techniques are deeply connected with web technologies such as content analysis, text mining, semantic matching, and search & retrieval, which are main concerns of the Web conference. Please note that there is **NO** similar proposal included into the tutorial forums of the Web conferences in recent years, and thus we believe the topic of deep chit-chat is fresh to audience of the conference.

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WWW '19 Companion, May 13–17, 2019, San Francisco, CA, USA

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ACM ISBN 978-1-4503-6675-5/19/05.

<https://doi.org/10.1145/3308560.3320084>