Bots in Libraries: They're coming for your jobs (or is it?)

Abstract

With advancements in Artificial Intelligence (AI) and Machine Learning (ML), we have seen a rise in the use of bots, specifically chatbots, to deliver information services. Motivated by the Smart Nation programme, these chatbots have sprung up in sectors as transport, healthcare, banking and education in Singapore. What are these chatbots? How do they work? Will they take our jobs?

SMU Libraries tries to answer these questions by delving into the mechanics of creating chatbots. The proof-of-concept aims to find out and understand use cases where these bots can be useful to delivering library information services to its campus community.

Introduction

The Smart Nation programme aims to transform Singapore through the use of technology with a vision of a leading economy powered by digital innovation, and a world-class city that gives citizens the best home possible and responds to their different and changing needs. The use of Artificial Intelligence (AI) has particularly been particularly key in driving this transformation (Teng 2018). Previously, AI could be only be harnessed with complex programming and massive computing power. With enablers like cloud and mobile computing, AI has seen pervasive use through the creation of chatbots to deliver information services in banks, hospitals and government agencies (Ramchandani 2018). While libraries and librarians have long been providing information services to patrons, we explore how chatbots can be used to enhance or even streamline library services.

Literature Review

Chatbots in libraries are not something new. They have existed for more than ten years in US libraries – "Emma the Catbot", Mentor Public Library, Ohio and "Pixel", University of Nebraska–Lincoln Libraries are a couple of prominent chatbots in libraries (McNeal and Newyear 2013). Their developments were influenced by the use of a programming language specifically for AI called Artificial Intelligence Mark-up Language (AIML) which uses pattern recognition to process inputs and pre-defined templates to generate outputs. (Pandorabots 2019). AIML also has learning features to enable the developers to train their chatbots to new and unknown concepts, gradually building up their knowledgebase.

While AIML is still being used to today to create chatbots, there are many tools, frameworks and development platforms to easily create chatbots (Dekhno 2015). Facebook provides Application Programming Interfaces (APIs) to develop chatbots on its Messenger platform. Popularity of virtual assistants such as Google Home and Amazon Echo drove the development of many 'skills' to not only find information but also fulfil requests without sitting in front of a computer. With a bit of effort,

chatbots can be created easily on various platforms, targeting a variety of users. The key difference between a good chatbot and an average one is the knowledgebase that the bot has 'learnt' through 'training', whether automatically or with human intervention.

Mechanics

Based on our exploration and understanding, we attempted to breakdown the different components of a chatbot service. A chatbot service consists of a user interface, usually a website or a messaging platform, that is able to receive textual input and pass it on a natural language processing (NLP) layer that attempts to break downs phrases into entities and intents of the query. Once the intent is identified, a respond is generated using the relevant knowledgebase and sometimes an external web service is called to fulfil more complex requests. Figure 1 below summarises the basic building blocks in creating a simple chatbot.
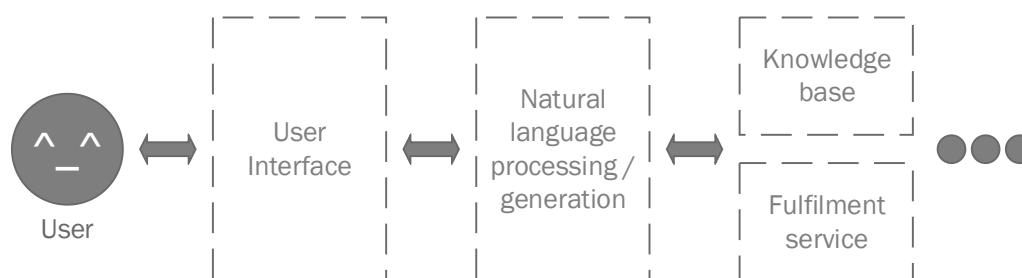

Figure 1. Basic building blocks of a simple chatbot

Examples of messaging platforms that are bot-friendly include, Telegram, Facebook, Skype, WeChat and Kik. Some notable chatbot services that simplifies NLP processing and AI knowledgebase generation include Microsoft Bot Framework, Google Dialogflow and Amazon Lex.

Proof-of-Concept

For our proof-of-concept (PoC), we explored the existing library service touchpoints where we could embed the chatbot service user interface. We explored our existing Springshare LibChat virtual chat service but it was impossible to build a chatbot on top of LibChat as Springshare did not provide any APIs to extend the virtual chat service. Through consultation with our library student assistants we found out that the Telegram messaging app was popular among SMU students and decided to make use of the Telegram Bot API service for our chatbot (Telegram 2019). Next, we explored the various chatbot services available stated in the section above. We found that Dialogflow offered a well design and intuitive interface for creation of chatbots (Google 2019). Dialogflow has pre-built agents that is able to answer simple conversational queries and offers ready-made connectors to messaging platforms such as Telegram, Facebook and Skype. To extend the functionality of our chatbot, we attempted to generate book search results through API calls with our library management system, Alma and its discovery layer,

Primo. Figure 2 below summarises the steps and pieces of our PoC chatbot based on Telegram and Dialogflow.
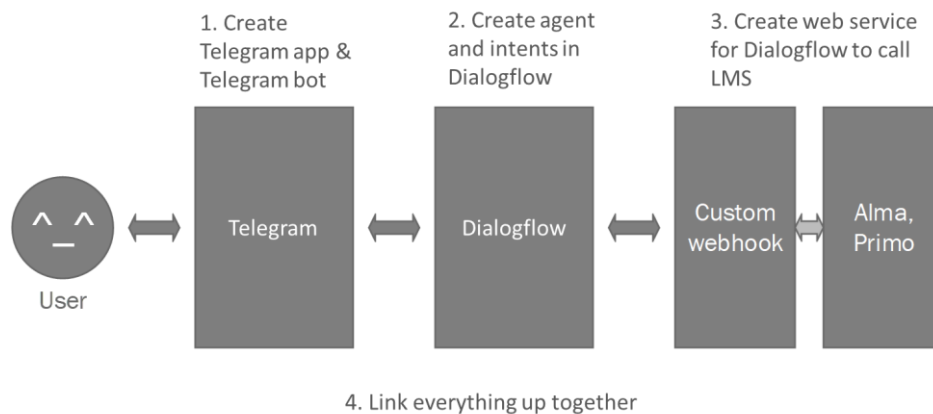

Figure 2. Assembling the chatbot building blocks

Introducing the chatbot was a challenge and it was not a perfect product from the start. There were a lot of queries that it could not answer. Training the chatbot requires time and effort to organise the concepts that were not understood by the chatbot and this may take considerable amount of time during the chatbot's infancy. While the mechanics and putting together a chatbot may be relatively simple, maintaining and training it proved otherwise.

Towards the end of our chatbot PoC, the SMU Student Services Hub had organised a campus-wide initiative to collaborate with various campus departments to develop another chatbot to answer administrative queries pertaining to student life in SMU. This led to AskSmooSmoo, based on the campus mascot SmooSmoo, being the figurehead of this collaborative information service (SMU 2019).
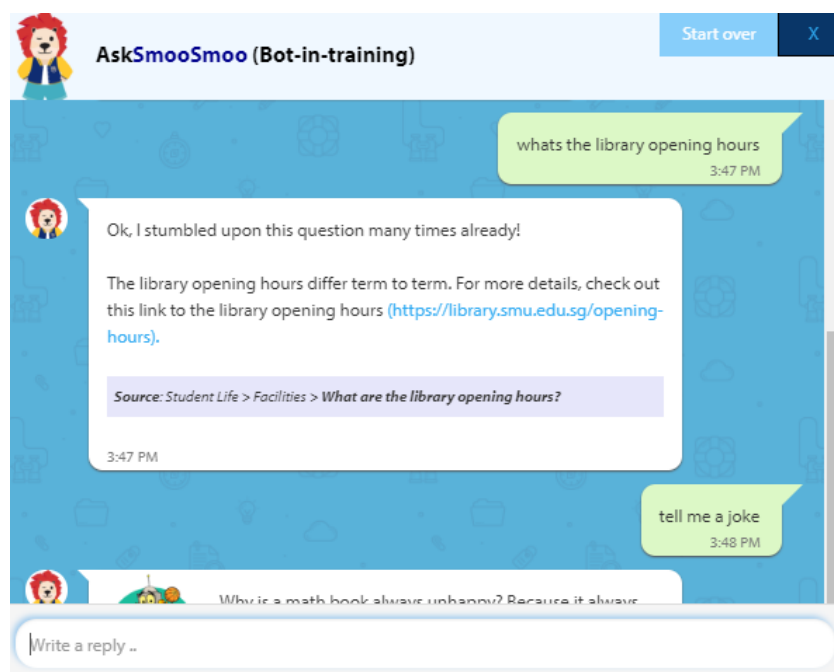

Figure 3. AskSmooSmoo the campus-wide chatbot

Reflecting on our experiences developing the PoC and AskSmooSmoo chatbots, we came up with several learning points:

User experience – It was key to identify students' learning spaces, be it physical or virtual. The insight of pervasive use of Telegram by SMU students made it easier to provide library services on platforms where students were already comfortable with.

Collaboration – After understanding the effort needed to maintain a chatbot, it was worthwhile to collaborate and invest in a campus-wide chatbot that meant students only needed a single touchpoint for administrative queries. Furthermore, the maintenance of chatbot was centrally managed by the campus IT department.

Talent Management – For library staff to be able to develop and manage new services like chatbots, they have to be equipped with the necessary skills and knowledge. Library management have to consider investing and upgrading library staff or acquire the relevant talent outside the library industry.

Beyond Chatbots

During a visit to SMU Libraries, we were fortunate to have Amanda Marcos, IE Library Director, share her experiences introducing Pepper, a semi-humanoid robot, in her library (IE Library 2019). Pepper was programmed to conduct library tours and conduct introductory library workshops. What was fascinating was that the AI knowledgebase was based on the same Dialogflow that we used for our chatbot. They had similar challenges training the robot but interestingly had bibliographic cataloguers staff doing the routine task of robot training. The skillsets to organise knowledge for bot consumption was similar to catalogue and classify bibliographic materials, and required staff who are meticulous and detailed.

Given how ubiquitous chatbots are in the online world, there is real concern that they can be deployed to mine users' data or manipulate public opinion. These malicious bots have been known to behave like humans and infiltrate social media networks. It is crucial that any user of the Internet is able to identify such bots and report them accordingly. Librarians may have a part in teaching bot literacy as part of information literacy to our stakeholders (Burkhardt 2018).

References

BURKHARDT J. M., 2018. Social Media Bots. [online]. American Libraries Magazine. Available from: https://americanlibrariesmagazine.org/2018/03/01/social-media-bots/ [Accessed 26 Jan 2019].

DEKHNO, Y., 2015. The Rise of Chat Bots: Useful Links, Articles, Libraries and Platforms. Intellectsoft Blog [online]. Available from: https://www.intellectsoft.net/blog/the-rise-of-chat-bots-useful-links-articles-libraries-and-platforms/ [Accessed 26 Jan 2019].

GOOGLE, 2019. Dialogflow. [online]. Dialogflow. Available from: https://dialogflow.com/ [Accessed 26 Jan 2019].

MCNEAL, M.L. and NEWYEAR, D., 2013. Introducing Chatbots in Libraries. Library Technology Reports, 49(8), pp. 5–10.

PANDORABOTS, 2019. AIML Documentation. [online]. Available from: https://pandorabots.com/docs/aiml-fundamentals/ [Accessed 26 Jan 2019].

RAMCHANDANI, N., 2018. The rise and rise of chatbots, Technology - THE BUSINESS TIMES. [online]. Available from: https://www.businesstimes.com.sg/technology/the-rise-and-rise-of-chatbots [Accessed 7 May 2018].

SMU, 2019. Student Service Hub (Beta). [online]. Available from: https://studentservices.smu.edu.sg/ [Accessed 26 Jan 2019].

TELEGRAM, 2019. Bots: An Introduction. [online]. Available from: https://core.telegram.org/bots [Accessed 26 Jan 2019].

TENG, A., 2018. The Big Read: The rise of AI, and how lives will be forever changed. [online]. TODAYonline. Available from: https://www.todayonline.com/big-read/big-read-the-rise-of-AI [Accessed 7 May 2018].

Acknowledgements