



Experiences Building, Training, and Deploying a Chatbot in an Academic Library*

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* Last minute title-change, from 'Can Robots Replace Librarians? Experiences Using a Chat Bot to Respond to IM Questions'

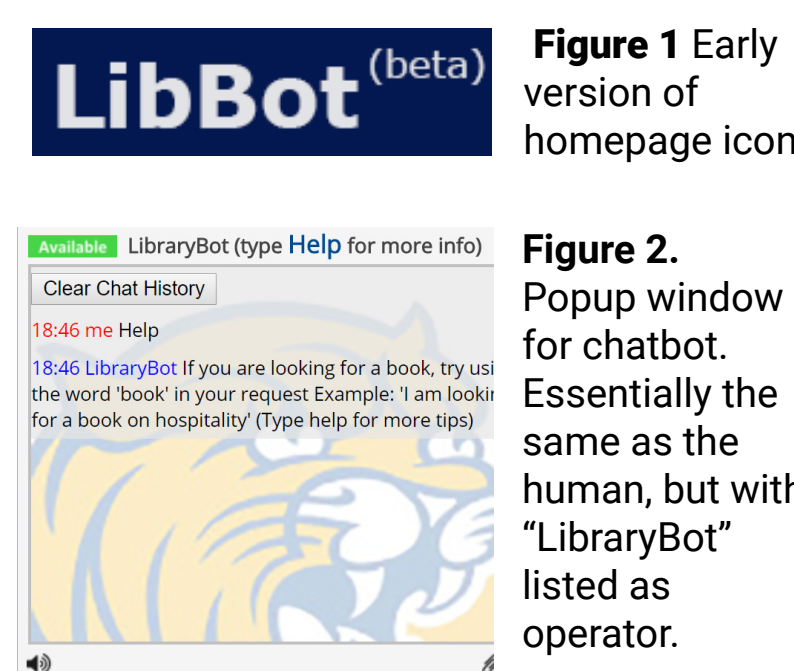
Introduction

In the Summer of 2016 we started experimenting with additional ways of extending library services (in the midst of discussions about adjustments to opening hours, staff coverage, and other issues that pertain to the breadth and quality of service we provide to our community).

We had experimented with chatbots before, but when library3lp showed an example of a functional 'echobot' (using Python and the sleekmpp python library), we decided to start experimenting with something more systematic. After a period of exploring, identifying the necessary features of a functional chatbot, and testing out free services we launched a working prototype in late Fall 2016. The chatbot was able to handle basic questions related to library hours, locating books and articles, providing basic library information (and even telling jokes).

Setting up a connection between a chatbot on a server and library3lp was not too difficult. The bot setup, maintenance was relatively simple (and continuing to train the bot through the v web interface is a quick, almost enjoyable task).

In October 2016 We released the chatbot with little fanfare, as a muted icon (see figure 1) on the homepage that would show up when all librarians were either busy or signed out of the main chat application. Curious users began using the bot, and over the course of the next 18 months usage was steady.



How it works

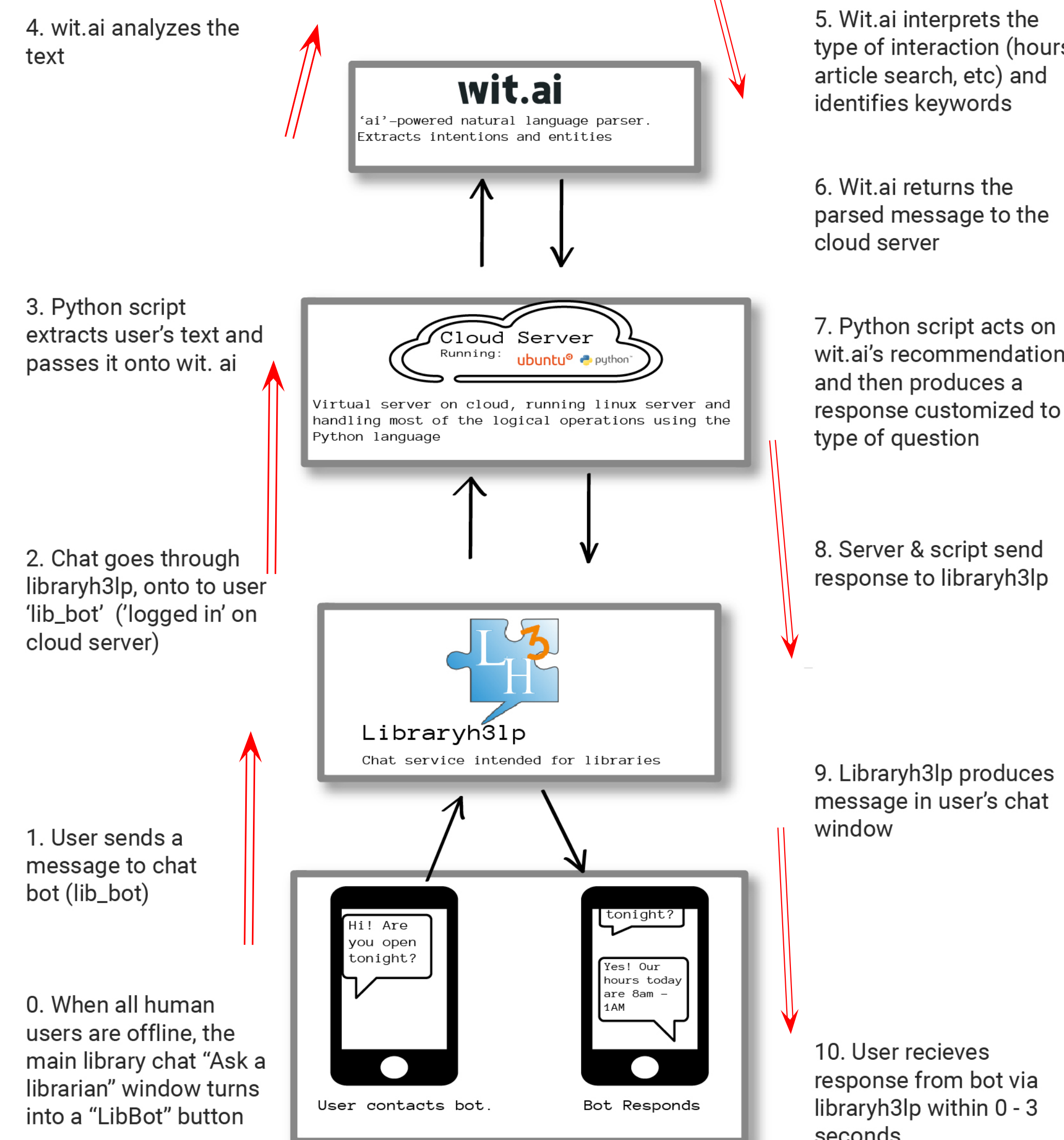


Figure 3. Processes and services involved when a user messages the bot

Software/Service Alternatives

There are alternatives to nearly every one of the specifically named services in the flowchart. Here are some:

Wit.ai: Amazon Lex; Microsoft Bot Platform, Dialogflow (Google), many others. You can also write your own intent-parser, but this could be tricky.

Library3lp: It is possible to run a chatbot on a webpage without connecting it to a 3rd party service.

Python: I'm pretty sure that you could easily write the main code in JavaScript, Ruby, PHP, etc. (you need a language that can handle REST requests as well as text parsing)

Cloud Server: you could run this on a laptop/desktop, but you would have to keep it on the whole time; you could also run it on an always-on raspberry pi

Two Ways of Looking at a Bot Interaction

How the Bot sees it

Other Functions (not shown): Textbooks, Video, Help

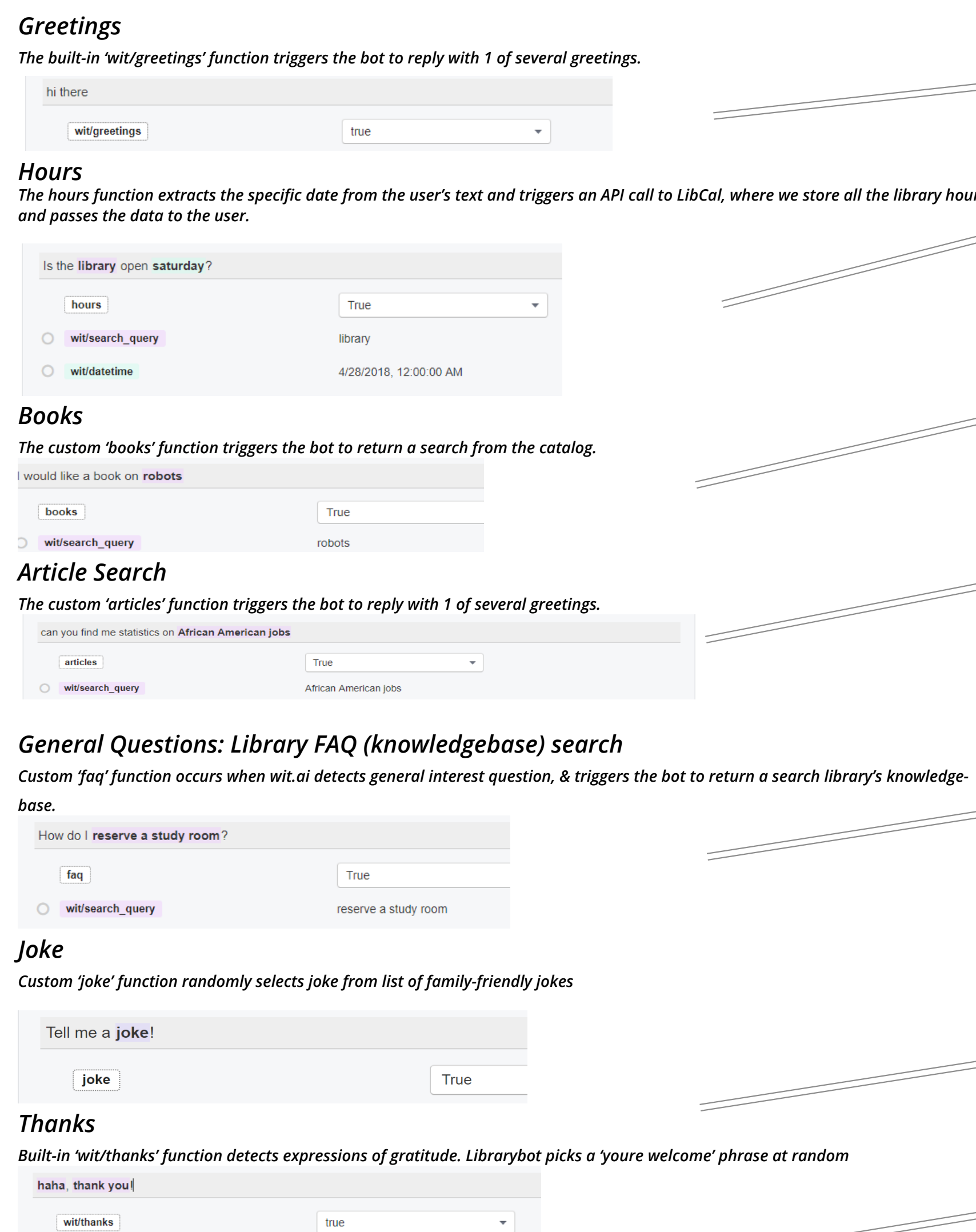


Figure 4. How bot interprets incoming text. Images show the user's phrase and category and search term/keyphrase if applicable

How the user sees it

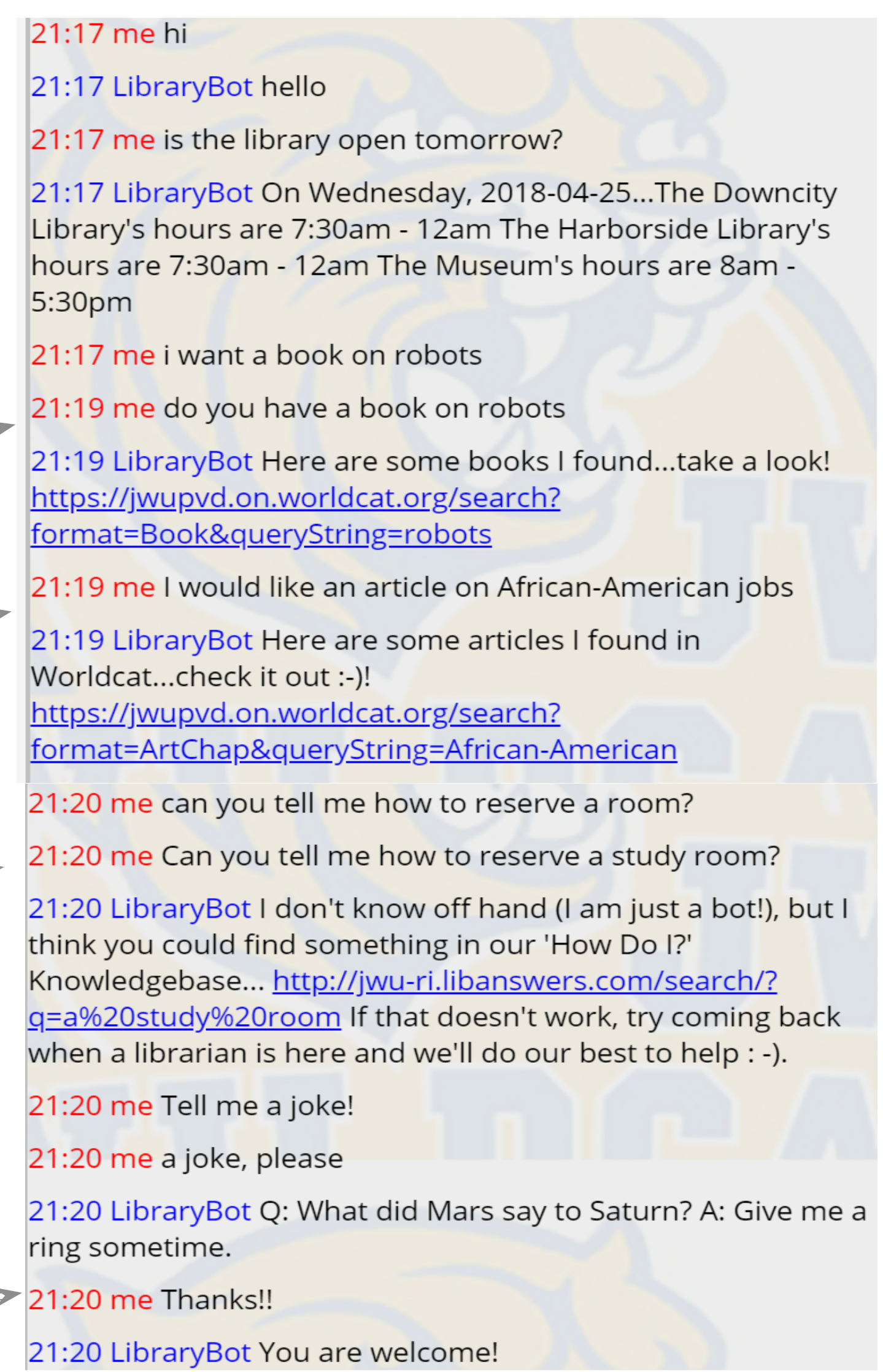


Figure 5. How bot interprets incoming text. Images show the user's phrase and category and search term/keyphrase

Effective at:

General Questions (via knowledgebase)

User: Why do I need to cite my sources in my paper?
lib_bot: I think you could find something in our 'How Do I?' Knowledgebase... <http://jwu-ri.libanswers.com/search/?q=cite%20my%20sources>

Providing library hours

User: "Hi, is the library open tomorrow?"
lib_bot: "Yes on, tomorrow, Sat, May 5, the library will be open 10AM to 5PM"

Providing a text-based interface to books, articles, and library information

This was the original aim of the project, and we look forward to adding new features going forward (especially as more library software companies are trying to open up their APIs)

Convenient for mobile usage

The text-based interface made finding information easier when on-the-go (as opposed to using a not-entirely-mobile-optimized web site for basic queries).

Great for quick answers.

I found that I was using it as an alternative to the graphical web interface for certain things I needed to look up (textbooks, FAQs)

Issues & fixes

Bot sometimes has issues with unfamiliar topics and phrases

User: I would like to complain about the noise
lib_bot: Hmm, I'm confused. Try typing Help--to help me help you!

Fixes:
- Add more robust help function so that the user wouldn't be left stranded,
- Log in to the wit.ai interface periodically and train the bot how to respond to unfamiliar questions and concepts.

Natural conversation can be stilted/aimless

User: Do you have a name?
lib_bot: Hmm, I'm confused. Try typing Help--to help me help you!

Fixes:
- Write custom functions for frequent types of interactions (such as 'what is your name').
- Introduce a kind of 'free-talk' mode for when the bot has absolutely no idea what to do (or if the user input is clearly meant to be trivial conversation).

Bugs

User: Hi!
User: Hello?
User: Are you there?

Fixes:
- Further testing and debug log analysis

Next Steps

Branding and Access Points: If you check out the caption to Figure 8 to the left you will see that usage was low when the button was hidden (when library staff were online). It is likely that if the chatbot were given a dedicated, always-on public access point then the usage would increase. I'm not quite ready to give this button its own 24/7 frontpage space, but I'm close. After we run a few rounds of usability testing we will launch a rebranded LibBot button on homepage (see Figure 9.) in Fall 2018.



Figure 9. Redesigned LibBot button concept

Testing and Fixing
We have a series of usability tests and bug fixing (log analysis, unit tests, create an issue reporter)

New Features

Features in the works include an improved textbook search, paragraph summarizer

Recommendations for a Successful Launch

Messaging: Prompt text, FAQ, video, etc.
Feedback: Aside from in-chat transcripts it was tough to gather feedback.
Usability Testing: This would have been useful.

Questions, Observations, Comments

- Is this really an artificial intelligence? Or just a 'conversational interface'?
- How satisfied were the students? How satisfied are you with bots in general?
- Text has been described as "incredibly comfortable medium. Text-based interaction is fast, fun, funny, flexible, intimate, descriptive and even consistent in ways that voice and user interface often are not" (Libov). Does this work in practice?
- What does this experience teach about possible futures for librarian-ship?
- More interfaces to library services (connect catalog, articles, knowledgebase, other things in natural-language speaking bot)
- This won't replace reference librarians...but it could augment their abilities
- Perhaps as a front-line? referring to librarian when confidence level is too low (or when user asks for 'librarian').
- Something along the lines of what is described as "tools that help people, facilitate their work, and their interaction with computers using natural language; but not to replace the human role totally, or imitate human conversation perfectly" (Shawarr and Atwell)

How/when was it used?

Unless otherwise indicated, all data is from October 2016 to May 2018

Quick Stats:

- Average response time: <1 second
- Average chat length: 4.5 minutes (human: 10 minutes)
- Questions answered by Bot: 596 (Human: 5487)
- Busiest hours: 8PM-11PM (177 Questions, or 30% of all Questions asked)
- Average number of messages sent by user in a transaction: 4.5
- Average number of words sent by user in a transaction: 21

Commonly Used Words & Phrases (by Patrons, to Chatbot)

"glass ceiling cracked?"
"6th ed., wiley"
"calculus - '1011 (marketing strategy)"
"3rd edition, freeman(macmillan)."
"9780393629736 copyright year:"
"advc 1011 (marketing)"
"aplegate; carole carlson"
"popular bottled waters"
"fascist body politics"
"frame stories including"
"freeman(macmillan). isbn 978-1464193774"
"gordon ramsay's educational"
"professions listed mean"
"properties, medicinal uses,"
"author: bullock edition:"
"packaged facts"
"peer reviewed"
"workplace communication"
"study room "
"good morning"
"right here"
"business ethics"
"check out"
"bio 1022 class."
"traditional cork closures"
"transcendentals, 3rd edition,"
"ventureline? sekaran, uma"

Figure 6. Selected commonly used or interesting bigrams (two words) and trigrams (three word) phrases from real-life transcripts. Note how many textbooks were requested, as well as inquiries into specific books and research topics. Stopwords (common, non-specific words such as 'the') are removed.

Chats Claimed by Humans/Bots over Time

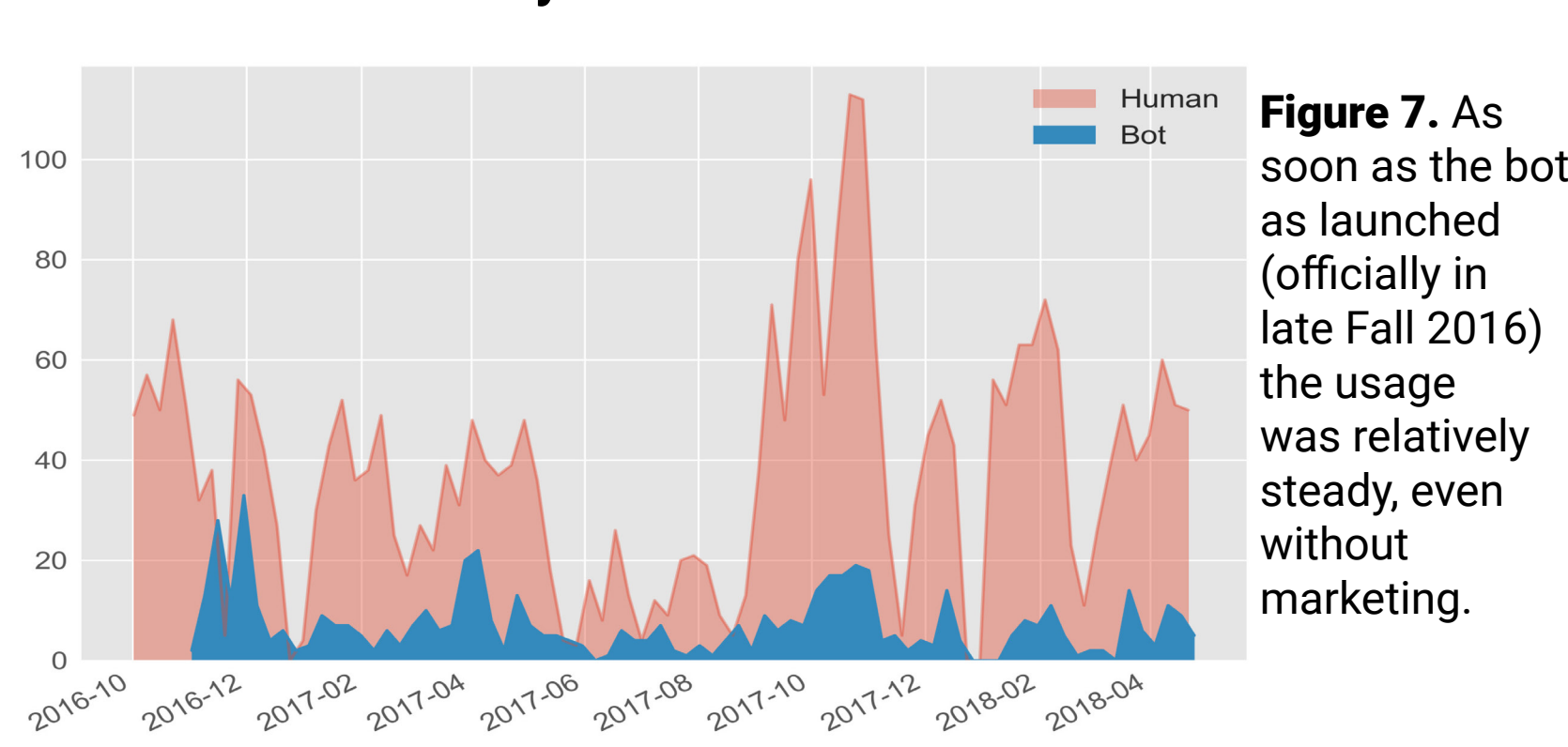


Figure 7. As soon as the bot as launched (officially in late Fall 2016) the usage was relatively steady, even without marketing.

Chatbot Usage Frequency (weekday/hour)

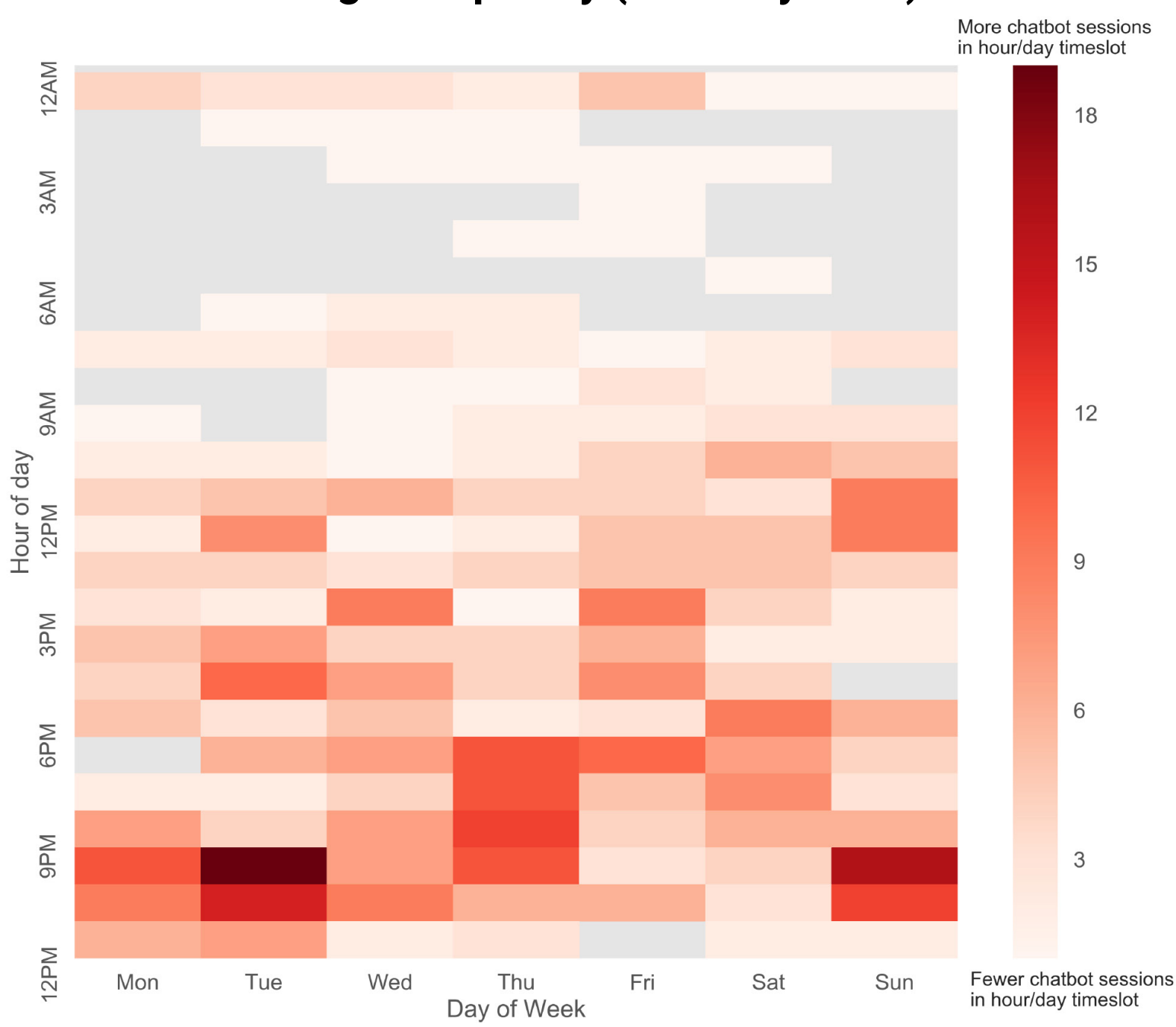


Figure 8. Most of the chatbot activity occurred when the library was open and no librarians were staffing chat reference (usually between 9PM and midnight). The lesser usage of the bot during opening hours is likely due to the lack of a prominent "LibraryBot" button or widget (when librarians are currently into chat the LibBot button is hidden, and accessible only in a hard to reach location).

Citations

Libov, J. (2015). "Futures of text." *Whoops*. <http://whoop.ps/2015/02/23/futures-of-text>.
Shawar, B.A., & Atwell, E. (2007). Chatbots: Are they Really Useful? *LDV Forum*, 22, 29-49.

Acknowledgements

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