Title: ***Empowering Libraries with Conversational AI***

Project Justification

This project responds to *Strengthen Community Engagement*, one of the goals of the Laura Bush 21st Century Librarian Program, to *promote inclusive engagement across diverse audiences*. For this project, the School of Information Sciences at University of Illinois at Urbana-Champaign (UIUC) is partnering with a diverse collection of libraries, including the Champaign Public Library, Cortland Free Library, Mahomet Public Library, Parkland Community College Library, and Urbana Free Library, to propose a three-year *Early Career Research Development* project, requesting total $445,502 to **explore the potential for library-focused conversational AI**.

This research is driven by the necessity to adapt public library services to cater to diverse needs and dynamic changes in local community populations, which has heightened as a result of the COVID-19 pandemic; specific communities and groups of people, especially, have been disproportionately impacted by this human, economic, and social crisis. Libraries, as vibrant community hubs, are well-positioned to help communities confront these challenges. *However, being able to respond to changes in local communities requires scalable solutions, which is often 'mission impossible' for public libraries that are under-staffed.* Conversational AI can help meet this challenge, though, by supporting a chat conversation with a user in natural language, either through text or audio. It is promising technology that has quickly gained traction across a wide variety of application domains, e.g., ecommerce, education, and IT support, etc. The benefits of applying conversational AI in other fields manifested in: 1) providing 24/7 service to address low-level questions when humans are not available; 2) enabling broader accessibility of services to a wide range of age-groups, including those who have accessibility issues; 3) collecting and analyzing diverse input from people to help prioritize emerging challenges and needs for new services; and 4) building stronger relationships between different stakeholders. Some academic libraries have also adopted conversational AI in their practice; however, *little is known about what factors would impact the adoption and effective design of conversational AI at public libraries*. ***The proposed research contributes to both professional knowledge and practice, strengthening inclusive engagement between libraries and diverse audiences by exploiting conversational AI, with immediate and lasting impacts***.

Project Work Plan

The PI's team will work closely with advisory board members and partner libraries for the proposed research. This project will focus on three major research questions. **RQ1**: *Under what situations would community members use a conversational agent to support their interaction with libraries?* Because interactions between the two stakeholder groups can happen both online (e.g., chats on library websites or through Facebook Messenger, or via mobile apps) and offline (e.g., at the reference desks), these settings may involve privacy concerns at varying levels (e.g., Facebook may reveal identifiable information; face-to-face interactions may inform the librarians if they are patron members with kids or not, etc). The types of member requests and expectations on receiving answers in real-time may differ. Thus, we will conduct interviews by recruiting community members and then release online surveys to identify factors that impact members' adoption of conversational AI in libraries. **RQ2**: *When/How do librarians leverage the conversational AI to interact with community members*? Several libraries have applied conversational AI for online Q&As. However, their successes and lessons learned may not be applicable to other libraries. Much of current interaction mode is designed to support answering members' questions in *real-time*; however, technological barriers (e.g., failing to recognize the requests correctly) may temper members' trust. Librarians may need to update the conversational AI design to improve the quality of *real-time* answers. After collecting needs from community members (RQ1 findings), we plan to host workshops and conduct

participatory design activities to elicit input from librarians in different communities to identify impacting factors (e.g., library size, community type, staff skills, etc) on potential design and effective deployment. **RQ3**: *How can we democratize conversational AI for libraries to improve community engagement?* It is very likely that libraries are short of technological support, and librarians may not have the technological background to deploy and manage a conversational agent. We have been working with the creator of UC Irvine's ANTswers (a text-based conversational AI) and conducting data analyses of its 6-year chat logs to examine ways of improving the chatbot execution. In this project, building on the findings of RQ1 and RQ2, we will draw insights from more existing chatbots' experiences and create tools that can lower the barriers of deploying conversational AI for other libraries with resource constraints (people/skill/computing). Research findings will be presented at conferences, and both software and training materials will be released for public use.

Diversity Plan

This project addresses diversity from several perspectives. **First**, the highly interdisciplinary team contributes complementary expertise to this research from varying backgrounds. PI Yun Huang has worked with several public and academic libraries in her prior IMLS projects. The advisory board members include both scholars (e.g., Lisa Janicke Hinchliffe from UIUC, and Danielle A Kane from UC-Irvine) and practitioners, including five library directors with extensive and diverse experience in providing library services. **Second**, this research aims to promote inclusive engagement by involving diverse communities and members. The participating libraries will be drawn from local and remote libraries that differ in size, type of communities served, staff skills, IT support, etc.. Because text-based chatbots enable accessibility for users with hearing loss, and chats in multiple languages facilitate non-native speakers. The research will recruit subjects with accessibility challenges to broaden the impacts of the research. The PI has been conducting accessibility research for diverse populations (e.g., her DHHS project and recent NSF projects on improving online learning for deaf students and on AI ethics for young adults and children). **Third**, dissemination of the research will reach across multiple sectors. The PI's research on human-AI interaction is sponsored by both industry and federal agencies, e.g., Google, IBM Research, NSF, IMLS, and DHHS. Findings of this project will be shared with the PI's industrial collaborators and academic communities.

Project Results

The PI will contribute her extensive expertise in social computing systems research, and will work closely with participating libraries and an advisory board of leading academics and practitioners. The research aims to provide solutions for libraries to engage their communities in a timely, scalable and proactive fashion, and for the communities to have an efficient and additional outlet for receiving support at different times (normal and crisis). **The project is expected to 1) yield empirical understandings** of the factors that may impact the adoption and effective design of such technologies for community engagement, pros and cons of applying conversational AI in public libraries, and potential pitfalls to avoid in this human-AI engagement; 2) design novel approaches to **democratizing** conversational AI to provide improved services to library communities with individuals of diverse backgrounds, and 3) **produce first-hand materials** that can be used for skill training and innovating library services.

Budget Summary

The estimated 3-year project budget is $445,502, including PI summer support (total $28,732); PhD stipend ($151,788); personnel benefits ($26,225); other costs, including human subject payments, workshop expenses, renumeration for advisory board members and consultants, and tuition remission ($110,044); and indirect costs ($128,713).