Design and Prototype Conversational Agents for Research Data Collection

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ABSTRACT

Conversational agents have gained increasing interest from researchers as a tool to collect data and administer interventions. They provide a natural user interface through conversations and hence have the potential to reach a wide population in their homes and on the go. Several developer tools and commercial as well as open-source frameworks allow for the deployment of both text-based chatbots and voice assistants. In this 90 min tutorial, participants will learn how to choose an appropriate platform, how to design and deploy their conversational agents, and how to transform traditional surveys through conversation agents.

CCS CONCEPTS

• **Human-centered computing → Natural language interfaces**.

KEYWORDS

conversational user interface, conversational agents, chatbots, ESM

1 INTRODUCTION

With the growth of an ecosystem around voice applications and increasing deployments of chatbots, conversational user interfaces (CUIs) are becoming ubiquitous. Commercial platforms, such as Amazon Alexa, Apple Siri, or Microsoft's Cortana provide rich development platforms for voice applications to be deployed on and distributed through. Conversational Agents (CAs) can engage users using natural language and be deployed on a variety of platforms. Researchers have long taken advantage of using both text-based

chatbots or voice assistants to administer standard survey administration [5, 7], collect personal information through Experience Sampling Method (ESM) surveys [2, 10], stage interventions [8], and explore use cases in customer service [4], education [6], or digital health [3, 9].

There are several popular platforms that allow researchers to build and deploy CAs, including Google's **Dialogflow**[1], the open-source framework **Rasa**[2], and the recently emerged Large Language Model–**GPT-3**[3]. In this tutorial, we provide an overview of these different CA frameworks and offer guidance on how to choose a platform depending on deployment purpose, customization requirements, and programming abilities. The objective of this tutorial is to provide hands-on experience on building CAs for research data collection and turning standard surveys into conversations.

2 TARGET AUDIENCE

The tutorial is designed for anyone who is interested in collecting self-report data (e.g., survey responses, ESMs) from users using CAs or CUIs. We assume that most of our participants have little background in building CAs or chatbots. The goal is to show attendees available CA frameworks, how to select an appropriate platform, and how to design CAs for specific types of data collection. We can accommodate around 30 participants assuming half of these will participate in-person, and the other half remotely.

3 LEARNING OUTCOMES

Through completion of our tutorial, we expect our participants to achieve the following learning outcomes:

(1) Develop a basic understanding of two CA frameworks–Dialogflow and Rasa. Additionally, participants will also gain an outlook of how GPT-3 can be used to create dynamic CAs.
(2) Know how to choose a CA platform and design CA's conversation flows for data collection purposes for research.
(3) Build an survey chatbot using Dialogflow.

4 TUTORIAL ORGANIZATION

The tutorial will offer both in-person and online participation. It will be hosted in-person by at least one organizer together with

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[1] https://dialogflow.cloud.google.com/
[2] https://rasa.com/
[3] https://openai.com/api/

a facilitator while the other organizers will facilitate and manage remote participants.

The tutorial is organized as follows:

1. **Introduction to the tutorial** – 15 mins
The tutorial starts with an overview of CAs in research. We will introduce some recent implementations of CAs for various data collections: administer surveys, support ESMs, and deliver interventions.

2. **Dialogflow overview** – 10 mins
Dialogflow is a popular GUI-based CA platform powered by Google that can be used to deploy CAs on various delivery platforms. We will provide basic concepts for dialogue systems, such as user intent, context, and entities first. We then introduce different features of Dialogflow.

3. **Create a chatbot exercise** – 30 mins
In this practical part, participants will build their own chatbot that administers the System Usability Scale (SUS) [1] survey using Dialogflow. We will provide a step-by-step guide and some skeleton code using a Github repository.

4. **Rasa overview** – 10 min
Rasa is an open source tool for building chatbots that requires a bit more programming but provides greater flexibility in terms of conversation management. We will introduce the Playground of Rasa and discuss its flexibility and advantages in chatbot implementations.

5. **GPT-3 for CAs** – 10 mins
In this advanced part of the tutorial, we will introduce GPT-3 as one of the newest large language models. We will demonstrate how to design prompts to steer GPT-3 to power a chatbot that can conduct naturalistic conversations and effectively ask researcher defined questions.

6. **Designing voice surveys** – 5 mins
We will present guidelines on implementing surveys on voice assistants based on our recent research.

7. **Q&A** – 10 mins
We will close the tutorial with a general Q&A session that goes into application use cases and implementation details.

The tutorial is expected to run 90 minutes. A step-by-step guide will be provided for all attendees in advance and the remaining materials (source code and slides) will be made available during the tutorial.

5 ORGANIZERS

Jing Wei is a Ph.D. candidate in the School of Computing and Information Systems at the University of Melbourne, Australia. Her research focuses on smart speaker, conversational and voice user interfaces.

Young-Ho Kim is a research scientist at NAVER AI Lab, Republic of Korea. He investigates how to advance personal health and informatics systems by supporting flexible human-data interaction. He recently examined leveraging large language models to support flexible natural language interactions for personal data collection. Young-Ho was a postdoctoral scholar at the University of Maryland, College Park. He received his Ph.D. in Computer Science &

Engineering and BFA in Visual Communication Design from Seoul National University in 2019 and 2011, respectively.

Samantha Chan is a Postdoctoral Fellow at the Media Lab, Massachusetts Institute of Technology and an International Postdoctoral Scholar at Nanyang Technological University Singapore. She works on augmenting human memory and cognition through conversational and voice interfaces, wearables, and biosignals.

Tilman Dingler is a Computer Scientist and Senior Lecturer in the School of Computing and Information Systems at the University of Melbourne. Supported by an NHMRC Ideas Grant, Tilman investigates the use of conversational interfaces in the context of digital health.

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