

DECI

The 2nd Tutorial on Designing Effective Conversational Interfaces

Gadiraju, Ujwal; Yadav, Kuldeep

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DECI: The 2nd Tutorial on Designing Effective Conversational Interfaces

Ujwal Gadiraju*
Delft University of Technology
Delft, The Netherlands
u.k.gadiraju@tudelft.nl

Kuldeep Yadav
SHL Labs
Gurgaon, India
kuldeep.yadav@shl.com

ABSTRACT

Conversational User Interfaces (CUIs) have been argued to have advantages over traditional GUIs due to having a more human-like interaction. The growing popularity of conversational agents has enabled humans to interact with machines more naturally. People are increasingly familiar with conversational interactions mediated by technology due to the widespread use of mobile devices and messaging services and a hungry market for conversational agents. Based on the recent advances in conversational AI, due to the proliferation of large language models, there are clear signs that the future of human-computer interaction will have a significant conversational component. Today, over two-thirds of the population on our planet has access to the Internet, with ever-lowering barriers to accessibility. This tutorial will showcase the benefits of employing novel conversational interfaces for *crowd computing*, *human-AI decision making*, *health and well-being*, and *information retrieval*. Given the widespread adoption of AI systems across several domains, we will discuss the potential of conversational interfaces in facilitating and mediating people’s interactions with AI systems and the opportunities and challenges that lie at this intersection from the user modeling and personalization standpoint. The tutorial will include interactive elements and discussions and provide participants with practical insights to inform the design of effective conversational interfaces.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; **Interaction paradigms**; *Interaction techniques*; *Empirical studies in HCI*;

KEYWORDS

conversational user interfaces, conversational crowdsourcing, human-AI interaction, human-AI decision making, conversational AI

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*Corresponding author.



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1 RELEVANCE TO ACM UMAP 2024

Virtual companions, intelligent assistants, and task-focused chatbots have become prevalent in our daily lives [11], serving various purposes, from customer service to automation in smart environments. The rise of conversational user interfaces (CUIs) can be attributed to several factors, including the increased use of messaging apps, the growing popularity of voice assistants, and the need for more efficient and personalized communication [15]. In addition, the advancements in artificial intelligence and natural language processing have made conversational interfaces more intelligent and responsive, allowing them to understand user intents better and respond effectively to natural language queries [21]. With the increasing demand for seamless and efficient communication, conversational interfaces are poised to become even more commonplace. They offer a convenient and accessible way to interact with technology, making them a valuable tool in numerous industries, from healthcare [1, 20, 22] to finance [13, 27, 30] to retail [17]. Overall, the ease of use and potential for personalization make conversational interfaces attractive for many consumers [16, 28], increasing their popularity and widespread adoption.

This tutorial is fundamentally relevant to the UMAP community owing to its relation to intelligent conversational interfaces. More recently, researchers in the UMAP and IUI communities have been drawn to investigate CUIs for a variety of application domains, including learning a second language [29], sexual harassment prevention [8], qualitative interviews [4], and music production [5], among others. Furthermore, this tutorial will emphasize the distinctive characteristics of CUIs, ushering the UMAP community to redefine and expand the scope of CUIs. For instance, we will provide detailed insights and hands-on training on employing conversational interfaces to improve worker engagement and satisfaction across the microtask crowdsourcing landscape. In addition, we will expand on the possibilities of allowing people to learn new affective support skills through CUIs and how these affective support tasks can be delivered in near real-time through embodied conversational agents by leveraging real-time human computation. We will also demonstrate how CUIs can better support individuals in information retrieval (IR) tasks.

Although text modality remains a dominant method to implement CUIs today, foundational AI models enable the implementation of multimodal CUIs using voice and visual modality [6]. Adopting visual and auditory cues in addition to text-based responses provides an engaging user experience, specifically in complex scenarios like health guidance [7], job interviewing [18], among others.

This tutorial will present a review of state-of-the-art research and best practices on building and deploying multimodal CUIs and synthesize the open research challenges in supporting such CUIs.

Furthermore, this tutorial will discuss opportunities to build conversation-based Explainable AI (XAI) methods that can facilitate interactive two-way communication between AI systems and users to increase the intelligibility of AI systems and foster *appropriate trust* and *reliance* [2]. Recent works in HCI and AI suggest that human interaction with AI systems can be enhanced by leveraging conversational interfaces to improve engagement and build trust [10]. This tutorial will synthesize design concepts and recommendations for developing more effective conversational interfaces based on many creative application domains of CUIs that have not been thoroughly investigated.

Learning Objectives. To summarize, attendees of this tutorial will be able to achieve the following:

- **LO1** – Understand how CUIs can be designed to solve real-world problems across different domains.
- **LO2** – Understand the complex design choices that shape the effectiveness of CUIs in different contexts.
- **LO3** – Identify the challenges and opportunities that entail domain-specific CUIs from the standpoint of user modeling, adaptation, and personalization.

2 TUTORIAL DESCRIPTION AND STRUCTURE

Targeted Audience and Pre-requisite Knowledge. This tutorial introduces CUIs across different domains, drawing practical insights for designing effective conversational interfaces. It is suitable for UMAP attendees with different levels of experience and expertise. We hope all attendees – graduate students, Ph.D. students, post-doctoral researchers, faculty members, and industry practitioners – will walk away with valuable learnings.

Tutorial Length and Prior Edition. This tutorial will last for 1.5 hours and self-study material will be shared with the attendees. The first edition of this tutorial was successfully delivered at the ACM IUI 2023 conference (with approximately 50 attendees). This edition includes a new component on multimodal CUIs and a new organizer from the industry (SHL Labs) to enhance the practitioners' perspective of the tutorial.

The tutorial will begin with a primer on conversational interfaces in different domains. During this session, we will give participants an overview of conversational user interfaces (CUIs), along with a comparison with traditional interfaces, vet the context and scope for CUIs, and briefly discuss what makes good conversational interfaces. Additionally, we will provide an overview of multimodal CUIs with examples to demonstrate how they differ across modalities, i.e., text, voice, and visual. Each of the following parts of the tutorial will explicitly appeal to the facets of user modeling and personalization in the corresponding domain.

2.1 CUIs for Crowd Computing

In the second part of this tutorial, we will introduce the logic and workflow of conversational agent design for quickly deploying crowdsourcing tasks in customizable conversational interfaces.

We will compare conversational crowdsourcing with traditional web-based microtask crowdsourcing to explain the advantages of conversational crowdsourcing in terms of increasing user satisfaction, improving user engagement, and decreasing perceived workload [19, 24]. Next, we will explain the effect of using different conversational styles [31, 32], and share empirical insights into how we can define a conversational style, how to estimate the conversational style, and how to exploit the conversational style to facilitate an effective task design [23]. Finally, we will showcase conversational crowdsourcing in various domains, such as supporting microtask execution and aiding informational web search [26]. In this session, we will also provide a step-by-step breakdown of implementing a conversational crowdsourcing interface using TickTalkTurk [25] for different crowdsourcing task types [9] and reflect on the metaphorical representation of conversational agents [14].

2.2 CUIs for Affective Crowdsourcing, Applications in Mental Health, and Human-AI Decision Making

In this part of the tutorial, we will first present the Trainbot CUI and discuss how effectively it can teach non-experts motivational interviewing skills essential for providing mental health support [1]. We will then showcase some different ways conversational agents have been proposed to tackle various challenges in healthcare. We will also review the opportunities and concomitant challenges of using CUIs for human-AI decision-making (for example, job interviewing) and the potential that CUIs offer to foster appropriate trust and reliance in AI systems, in comparison to traditional interfaces [12, 33, 34].

2.3 Multimodal CUIs

CUIs based on generative AIU are heralded to be multimodal and will be expressive across different dimensions of modalities, i.e., voice and visual. Therefore, several key research directions are emerging to address pivotal challenges in these realms. These include 1) Ability to support synchronous conversation with automatic turn taking,¹ 2) Human-like AI avatars,² 3) Demonstrating appropriate non-verbal cues/feedback (i.e. nodding, smiling, facial expressions) and emotions [35], and 4) Accommodating different domain [3] or cultural nuances. The tutorial will cover state-of-the-art work in these realms to help attendees obtain a broad overview and identify opportunities and challenges for further research.

3 ORGANIZERS

Dr. ir. Ujwal Gadiraju is a tenured Assistant professor in the Software Technology Department of the EEMCS Faculty, Delft University of Technology. He co-directs the TU Delft “Design@Scale” AI Lab and is a member of the program management team of the TU Delft AI Labs. In addition, Ujwal co-leads a research line on Human-Centered AI and Crowd Computing at the Web Information Systems group. His research interests lie at the intersection of Human-Computer Interaction (HCI), Artificial Intelligence (AI),

¹<https://www.soulmachines.com/>

²<https://www.synthesia.io/>

and Information Retrieval (IR). Ujwal has published over 150 peer-reviewed articles, including at premier venues such as ACM CHI, ACM CSCW, ACM TOCHI, AAAI HCOMP, ACM TheWebConf, ACM SIGIR, ACM UBICOMP, ACM CIKM, ACM WSDM, ACM HT, ACM UMAP, ACM IUI, among others. His work has been recognized with honors, including best paper awards at top-tier HCI and AI conferences. Ujwal's prior work has explored user modeling and personalization to improve the effectiveness of the crowdsourcing paradigm, running large-scale human-centered experiments to understand the interaction between humans and machines and the societal impact of algorithmic decision-making. His current research focuses on creating novel methods, interfaces, systems, and tools to overcome existing challenges on our path toward building trustworthy AI systems and facilitating better reliance of humans on AI systems. Ujwal has co-led and co-organized several workshops and tutorials at relevant academic venues over the last decade.

Dr. Kuldeep Yadav is the Senior Vice President of AI and head of SHL Labs. He leads a team of AI researchers and engineers to build cutting-edge talent assessment/management tools and platforms. His team's work impacts over 10 million pre-employment screening assessments annually. Before this, he was the CTO and founding member of VideoKen, an EdTech startup. He also worked as a researcher in research labs including Xerox Research, and Microsoft Research. He has over 30+ research publications in major conferences including, ACM IUI, ACM Multimedia, AAAI, and Interspeech. Additionally, he has 10+ patents granted/applications. He also won many awards including the Nasscom AI Game Changer Awards and Microsoft Research PhD Fellowship. His current research interests are in building multi-modal conversational systems, better interfaces for human-AI collaboration, and building robust systems for decision-making in talent hiring.

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