CUI@CHI: Mapping Grand Challenges for the Conversational User Interface Community

Heloisa Candello

IBM Research

hcandello@br.ibm.com

Cosmin Munteanu

University of Toronto

cosmin.munteanu@utoronto.ca

Leigh Clark

Swansea University

l.m.h.clark@swansea.ac.uk

Jaisie Sin

University of Toronto

js.sin@mail.utoronto.ca

María Inés Torres

Universidad del Pais Vasco

manes.torres@ehu.eus

Martin Porcheron

University of Nottingham

martin.porcheron@nottingham.ac.uk

Chelsea M. Myers

Drexel University

chelsea.m.myers@drexel.edu

Benjamin Cowan

University College Dublin

benjamin.cowan@ucd.ie

Joel Fischer

University of Nottingham

joel.fischer@nottingham.ac.uk

Stephan Schlögl

Management Center Innsbruck

stephan.schloegl@mci.edu

Christine Murad

University of Toronto

cmurad@taglab.ca

Stuart Reeves

University of Nottingham

stuart.reeves@nottingham.ac.uk

CCS Concepts

•**Human-centered computing** → **Human computer interaction (HCI)**; *Haptic devices;* User studies;

Abstract

The aim of this workshop is twofold. First, it aims to grow critical mass in Conversational User Interfaces (CUI) research by mapping the grand challenges in designing and researching these interactions. Second, this workshop is intended to further build the CUI community with these challenges in mind, whilst also growing CUI research presence at CHI. In particular, the workshop will survey and map topics such as: interaction design for text and voice-based CUI; the interplay between engineering efforts such as in Natural language Processing (NLP) and the design of CUI; practical CUI applications (e.g. human-robot interaction, public spaces, hands-free and wearables); and social, contextual, and cultural aspects of CUI design (e.g. ethics, privacy, trust, information exploration, persuasion, well-being, or decision-making, marginalized users). By drawing from the diverse interdisciplinary expertise that defines CHI, we are proposing this workshop as a platform on which to build a community that is better equipped to tackle an emerging field that is rapidly-evolving, yet is under-studied — especially as the commercial advances seem to outpace the scholarly research in this space.

Author Keywords

conversational user interface, CUI, speech interface, voice user interface, intelligent personal assistants

Background

Text and voice based Conversational User Interfaces (CUI) are becoming pervasive. These interfaces are commonplace in consumer-level devices such as Amazon Echo and Google Home as well as customer service enterprise systems. Although currently used for simple tasks, such as setting alarms, playing and controlling music, or requesting the weather, there is a significant drive to increase the complexity and capability of interaction with these systems to more closely resemble conversation. The interest in CUI interactions from the HCI community is growing and research in this domain is gathering pace. Key challenges are coming to the fore. These include the need to (1) understand and identify the parameters of appropriate CUI design [1,2,5,8,9,11,17]; (2) identify and develop tools and heuristics to support the design of CUIs [4, 15]; (3) map and address ethical, privacy and trust issues surrounding the use and development of CUIs [10, 18]; (4) develop core theoretical concepts to understand and predict user interaction behaviour with these types of interfaces [5, 7] and (5) identify appropriate design for multiple user contexts [16]. Yet the literature and research community in this domain is disparate, with the need to gather critical mass [5].

The proposed workshop looks to gather researchers, designers and practitioners from a wide range of communities to discuss the need to build this critical mass and develop a truly multi-disciplinary CUI community. To do this we aim bring together some of the leading researchers in these fields, with an interest in CUI based HCI questions to map the work needed to develop the thematic grand challenges identified by recent CUI work.

Organizers

This workshop is organized by leading researchers and practitioners from the CUI community, bringing together representatives from academia and industry to map and develop the grands challenges facing the field.

Heloisa Candello is an interaction designer and a researcher at the IBM Research laboratory in Brazil. She has experience in leading and conducting design research activities to understand people's contexts and motivations to use conversation technologies. She recently co-organized a related workshop at CSCW '17 and CHI '18, and previously published her research on UX with conversational systems at various HCI conferences.

Benjamin Cowan is an Assistant Professor at University College Dublin's School of Information & Communication Studies. His research lies at the juncture between psychology, HCI and computer science in investigating how theoretical perspectives in human communication can be applied to understand phenomena in speech based human-machine communication. He is the co-founder of the International Conference on Conversation User Interfaces (CUI) conference series and has run a number of workshops at CHI and Mobile HCI on designing speech and language technologies.

Cosmin Munteanu is an Assistant Professor at the Institute for Communication, Culture, Information, and Technology, University of Toronto at Mississauga), and Associate Director of the Technologies for Ageing Gracefully lab. His area of expertise is at the intersection of Human-Computer Interaction, Automatic Speech Recognition, Natural Language Processing, Mobile Computing, and Assistive Technologies. He has extensively studied the human factors of using imperfect speech recognition systems, and has designed and evaluated systems that improve humans' access to and

interaction with information-rich media and technologies through natural language. Cosmin has organized speech interaction workshops and panels at SIGCHI conferences such CHI, MobileHCI, and IUI for almost a decade, and has frequently delivered courses on designing voice interactions at these venues.

Joel E. Fischer is an Associate Professor at the School of Computer Science and member of the Mixed Reality Lab at the University of Nottingham. His practice-focused research in voice interaction has been published at CUI, CHI, and CSCW, and he has previously co-organised related workshops at CHI and CSCW.

Leigh Clark is a Lecturer in the Computational Foundry at Swansea University. His research examines the effects of voice and language design on speech interface interactions and how linguistic theories can be implemented and redefined in speech-based HCI. He is co-founder of the CUI conference series and led a CHI 2019 workshop on mapping methods and theoretical approaches for CUI research.

Stephan Schlögl is Associate Professor in the Dept. Management, Communication & IT at the MCI Management Center Innsbruck. His main research interest lies in human-computer interaction, particularly focusing on conversational user interfaces and other types of AI supported interaction modalities. He is one of the general chairs for the CUI 2020 conference.

Jaisie Sin is a graduate student at the Technologies for Aging Gracefully Lab and the Faculty of Information at the University of Toronto, in Toronto, Canada. Her research focuses on older adults' use of technology, in particular of speech-based interfaces, and inclusive design from the perspective of preventing digital marginalization.

Christine Murad is a graduate student at the Technologies for Aging Gracefully lab in the Department of Computer Science at the University of Toronto. Her research looks at the usability and design of conversational voice interfaces, and exploring the development of different tools and resources to aid in intuitive and user-friendly conversational voice interaction. She recently co-organized a related workshop at CHI '19.

María Inés Torres is Full Professor at UPV/EHU Univeridad del Pais Vasco and director of the SPIN RG Speech Interactive Research Group. Her research focuses on statistical approaches to deal with spoken dialog systems, aiming to learn from human interaction to generate artificial interaction. Furthermore, she and her group look at methods to identify emotions in speech. She is one of the general chairs for the CUI 2020 conference.

Stuart Reeves is Assistant Professor in Computer Science at the University of Nottingham, and is a member of the Mixed Reality Lab and Horizon. He recently held an EPSRC Fellowship investigating the connections between academic HCI research communities and the work of practitioners in UX/IxD/IA and other design professions (EP/K025848/1). He is also Co-I on EPSRC grant "From Human Data to Personal Experience" (EP/M02315X/1).

Martin Porcheron is a Research Fellow in the Mixed Reality Lab at the University of Nottingham. His work examines the use of new technologies such as conversational systems and the autonomous Internet of Things in multi-party settings like pubs and the home. He has recently co-organised workshops at MobileHCI '16, CHI '16 and '18, CSCW '16 and '17 on topics such as collocated interaction and conversational interfaces and served as a Full Papers Chair for the inaugural CUI conference.

Chelsea M. Myers is a Digital Media PhD Candidate at Drexel University. Her research focuses on multimodal interaction, with a particular focus on voice user experience and adaptive techniques in CUI based interaction.

Workshop Aims

The workshop comes at a critical juncture, whereby research in the field of HCI on CUIs has intensified, but is in need of grand challenges to focus the research domain more effectively. This workshop will be critical to the direction of the field, bring together researchers, developers, designers, and industry practitioners to:

- Identify key themes and areas of potential overlap in current literature and practice which can form the basis for CUI grand challenges

- Discuss the strategies, methods and approaches that are appropriate to tackle these grand challenges

- Explore the potential impact of addressing these challenges

Crucially, we wish this workshop to include reflection and exchange of experiences, insights, directions and, methodologies so as to illuminate the true nature and scope of the challenges to be addressed. When identifying these challenges, this workshop will also consider broader questions such as:

- Can current interaction design approaches be adapted to support CUI design?

- How do we grow the multidisciplinary nature of CUI research, bringing together those addressing engineering challenges (e.g. NLP) with those working on HCI challenges in a fruitful way?

- Is HCI (and CHI) currently methodologically and scientifically well-equipped to address the identified challenges?

Rather than starting from a blank canvas, the workshop will build upon significant momentum in this area [3, 4, 6, 12–14]. That is, it will emphasize the progression of existing grand challenges identified in the literature (and mentioned in the introduction above). Over the past 5 years Our small, yet growing CUI community, has successfully brought together researchers and industry practitioners from speech, dialogue, computational linguistics, human-machine interaction, speech interface design and voice UX research. In the past few years we have tackled topics such as designing speech interactions, conversational analysis, and conversational design. More recently at CHI '19, the community turned its attention to the deficit of theoretical and methodological perspectives. From this solid base, it is thus timely to now move towards a more holistic perspective on this space, by inviting the broad CHI community to help define the grand challenges that this community needs to address along with appropriate methods, theories, application, and approaches for such challenges.

CUI Grand Challenges

Participants are invited to contribute to the discourse on CUI grand challenges. We will invite researchers and industry practitioners to share their experiences, methods, designs, case studies, approaches, or theories as relevant to various aspects of CUI research and design. We are interested in attracting a broad range of perspectives, with the aim to create a space that is inclusive of the diverse research directions that are relevant to CUIs, with topics including but not limited to:

- Approaches, methods, theories and techniques applied in CUI research
- The role of voice and language in CUI design and interaction
- Personalisation, grounding and topcis related to conversation flow
- Domain-specific CUI challenges e.g. automotive, healthcare
- Multimodality & multiparty challenges
- Accessibility and inclusion e.g. underrepresented or marginalized users
- Ethics, privacy, explainability, trust and transparency

The workshop will focus on employing the unique capabilities of our community to enlighten the discussion of these related areas, identify key challenges, how to address them, and explore possible technical, human, and societal outcomes.

Pre-Workshop Plans

The website will provide the call for participation; workshop aims; agenda and outcomes; workshop date; organizer's short-bio and contact. The selected papers will be available on the website dedicated for the workshop (www.speech-interaction.org/CHI2020). All accepted workshop papers will also be invited to submit to the CUI '20 conference taking place July 9–10 2020 in Bilbao, Spain. The organizers will issue a call for positional papers in the ACM SIGCHI Extended Abstract template. Submissions should be 3 to 6 pages long, including references, and describe work related to the workshop, and how this showcases a grand challenge that authors feel should be addressed by the community. Presenters will be selected based not only on the overall quality and novelty of their submission, but also in light of bringing a diverse and representative set of pre-

senters to foster a multi-faceted view of the research and challenges in the field. Papers should be submitted to hcandello@br.ibm.com by February 11th 2020 and selected papers will be available online on the website dedicated to the workshop, http://www.speechinteraction.org/CHI2020/. At least one author of each accepted paper must attend the workshop.

Workshop Structure

We propose a one-day workshop structured in a series of presentations, activities, and structured discussions to exchange lessons learned on addressing critical challenges of interaction and conversational systems design. We expect a maximum of 20 registered participants.

1. **Introductions**. Brief introductions from organizers and participants on workshop structure, goals and interest in CUI research.
2. **Presentations**. Short presentations from accepted submissions.
3. **Breakout Session 1: Identifying CUI Grand Challenges**. Participants will be divided into groups. Each group will map the challenges, experiences and possible outcomes to improving CUIs. Groups will also identify key research opportunities and possible directions to improving CUI interactions within the domains they have chosen.
4. **Breakout Session 2: Challenges In Practice-Scenario & Role-play**. Participant groups will choose one challenge from the morning activities and explore the directions proposed by creating a collaborative, conversational system dialogue in a fictional role-playing scenario. Each group will present their scenarios and rationale. The strategies and directions adopted will be discussed by all workshop participants.

5. **Summary and Future of CUI Research & Community**. Organizers will synthesize the discussions from the prior session to develop tangible future research topics and potential outcomes for CUI research with the participants. This will help map out the future direction of the CUI community, its relationship with CHI and other HCI and non-HCI venues and future iterations of the CUI conference series and related workshops.

Post-Workshop plans

The expected workshop outcomes include:

- Reconnecting, sustaining and extending the existing CUI community of researchers.

- Identification of specific concrete challenge themes to improve the cohesiveness of the CUI community

- A proposal for a special issue of the ACM interactions magazine that will highlight the key grand challenges and themes related to CUI research and design as emerging from this workshop (with the aim to further energize CHI research in this space)

- Consider proposing joint publications or/and special issue of a journal.

- Invite selected papers to be fast-tracked for review at the upcoming CUI 2020 conference.

Website

The website will provide the call for participation; workshop aims; agenda and outcomes, workshop date; organizer's short-bio and contact. The selected papers will be available on the website dedicated for the workshop (www.speech-interaction.org/CHI2020).

Call for Participation

Researchers and practitioners working in the field of conversational user interfaces are invited to submit position papers to the CUI@CHI workshop. The aim of this workshop is twofold. First, it aims to explore and define the grand challenges in designing and studying the interaction with conversational and collaborative machines using natural language. Second, this workshop is intended to further grow the Conversational User Interfaces (CUIs) community and scaffold this area at CHI. In particular, the workshop will look into interaction and design (for) CUIs; Natural language Processing (NLP) understanding; CUIs and robotics; CUIs in public spaces; CUIs in hands-free environments and challenges and engineering limitations in voice-based interfaces. We will also explore the underlying contextual and social mechanisms in the context of typical scenarios of conversational systems such as decision-making, information exploration, and persuasion, and the related issues of trust, privacy, and adoption of conversational systems. Submissions should be between 3 to 6 pages including references. The submission should describe authors' work related to the workshop goals and also their interest to participate. Presenters will be selected based not only on the quality and novelty of the work but also on aiming to bring a diverse and representative set of presenters which can foster a multi-faceted view of the research and challenges in the field. Papers should be submitted to hcandello@br.ibm.com.

Important Dates: [11th December 2019] Call for participants released. [February 11th 2020] Submissions due. [February 28th 2020] Notification of acceptance. Selected papers will appear on http://www.speechinteraction.org/CHI2020/.

REFERENCES

[1] Heloisa Candello, Claudio Pinhanez, and Flavio Figueiredo. 2017a. Typefaces and the Perception of Humanness in Natural Language Chatbots. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*. ACM, 3476–3487.

[2] Heloisa Candello, Claudio Pinhanez, David Millen, and Bruna Daniele Andrade. 2017b. Shaping the Experience of a Cognitive Investment Adviser. In *International Conference of Design, User Experience, and Usability*. Springer, 594–613.

[3] Leigh Clark, Benjamin R Cowan, Justin Edwards, Cosmin Munteanu, Christine Murad, Matthew Aylett, Roger K Moore, Jens Edlund, Eva Szekely, Patrick Healey, and others. 2019a. Mapping Theoretical and Methodological Perspectives for Understanding Speech Interface Interactions. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems*. ACM, W20.

[4] Leigh Clark, Philip Doyle, Diego Garaialde, Emer Gilmartin, Stephan Schlögl, Jens Edlund, Matthew Aylett, João Cabral, Cosmin Munteanu, Justin Edwards, and Benjamin R Cowan. 2019b. The State of Speech in HCI: Trends, Themes and Challenges. *Interacting with Computers* (09 2019). DOI: http://dx.doi.org/10.1093/iwc/iwz016 iwz016.

[5] Leigh Clark, Cosmin Munteanu, Vincent Wade, Benjamin R. Cowan, Nadia Pantidi, Orla Cooney, Philip Doyle, Diego Garaialde, Justin Edwards, Brendan Spillane, Emer Gilmartin, and Christine Murad. 2019c. What Makes a Good Conversation?. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems - CHI '19*. ACM Press, New York, New York, USA, 1–12. DOI: http://dx.doi.org/10.1145/3290605.3300705

[6] Benjamin R. Cowan and Leigh Clark. 2019. CUI '19: Proceedings of the 1st International Conference on Conversational User Interfaces. ACM, New York, NY, USA.

[7] Benjamin R. Cowan, Philip Doyle, Justin Edwards, Diego Garaialde, Ali Hayes-Brady, Holly P. Branigan, João Cabral, and Leigh Clark. 2019. What's in an Accent?: The Impact of Accented Synthetic Speech on Lexical Choice in Human-machine Dialogue. In *Proceedings of the 1st International Conference on Conversational User Interfaces (CUI '19)*. ACM, New York, NY, USA, Article 23, 8 pages. DOI: http://dx.doi.org/10.1145/3342775.3342786

[8] Joel E Fischer, Stuart Reeves, Barry Brown, and Andrés Lucero. 2018. Beyond "Same Time, Same Place": Introduction to the Special Issue on Collocated Interaction. *Human–Computer Interaction* 33, 5-6 (2018), 305–310.

[9] Joel E. Fischer, Stuart Reeves, Martin Porcheron, and Rein Ove Sikveland. 2019. Progressivity for voice interface design. In *Proceedings of the 1st International Conference on Conversational User Interfaces - CUI '19*. ACM Press, New York, New York, USA, 1–8. DOI: http://dx.doi.org/10.1145/3342775.3342788

[10] David R. Large, Leigh Clark, Gary Burnett, Kyle Harrington, Jacob Luton, Peter Thomas, and Pete Bennett. 2019. "It's Small Talk, Jim, but Not As We Know It.": Engendering Trust Through Human-agent Conversation in an Autonomous, Self-driving Car. In *Proceedings of the 1st International Conference on Conversational User Interfaces (CUI '19)*. ACM, New York, NY, USA. DOI: http://dx.doi.org/10.1145/3342775.3342789

[11] Vera Q Liao, Muhammed Masud Hussain, Praveen Chandar, Matthew Davis, Marco Crasso, Dakuo Wang, Michael Muller, Sadat N Shami, and Werner Geyer. 2018. All Work and no Play? Conversations with a Question-and-Answer Chatbot in the Wild. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI'18). ACM, New York, NY, USA*, Vol. 13.

[12] Cosmin Munteanu, Pourang Irani, Sharon Oviatt, Matthew Aylett, Gerald Penn, Shimei Pan, Nikhil Sharma, Frank Rudzicz, Randy Gomez, Ben Cowan, and others. 2017. Designing speech, acoustic and multimodal interactions. In *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems*. ACM, 601–608.

[13] Cosmin Munteanu, Matt Jones, Steve Whittaker, Sharon Oviatt, Matthew Aylett, Gerald Penn, Stephen Brewster, and Nicolas d'Alessandro. 2014. Designing speech and language interactions. In *CHI'14 Extended Abstracts on Human Factors in Computing Systems*. ACM, 75–78.

[14] Cosmin Munteanu and Gerald Penn. 2015. Speech-based interaction: Myths, challenges, and opportunities. In *Proceedings of the 20th International Conference on Intelligent User Interfaces*. ACM, 437–438.

[15] Christine Murad and Cosmin Munteanu. 2019. "I don't know what you're talking about, HALexa". In *Proceedings of the 1st International Conference on Conversational User Interfaces - CUI '19*. ACM Press, New York, New York, USA, 1–3. DOI: http://dx.doi.org/10.1145/3342775.3342795

[16] Martin Porcheron, Joel E Fischer, and Sarah Sharples. 2017. Do animals have accents?: talking with agents in multi-party conversation. In *Proceedings of the 2017 ACM conference on computer supported cooperative work and social computing*. ACM, 207–219.

[17] Stuart Reeves, Martin Porcheron, Joel E Fischer, Heloisa Candello, Donald McMillan, Moira McGregor, Robert J Moore, Rein Sikveland, Alex S Taylor, Julia Velkovska, and others. 2018. Voice-based Conversational UX Studies and Design. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*. ACM, W38.

[18] Brendan Spillane, Emer Gilmartin, Christian Saam, and Vincent Wade. 2019. Issues Relating to Trust in Care Agents for the Elderly. In *Proceedings of the 1st International Conference on Conversational User Interfaces (CUI '19)*. ACM, New York, NY, USA, Article 20, 3 pages. DOI: http://dx.doi.org/10.1145/3342775.3342808