Let's Talk About CUIs: Putting Conversational User Interface Design Into Practice

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ABSTRACT

As CUIs become more prevalent in both academic research and the commercial market, it becomes more essential to design usable and adoptable CUIs. Though research on the usability and design of CUIs has been growing greatly over the past decade, we see that many usability issues are still prevalent in current conversational voice interfaces, from issues in feedback and visibility, to learnability, to error correction, and more. These issues still exist in the most current conversational interfaces in the commercial market, like the Google Assistant, Amazon Alexa, and Siri. The aim of this workshop therefore is to bring both academics and industry practitioners together to bridge the gaps of knowledge in regards to the tools, practices, and methods used in the design of CUIs. This workshop will bring together both the research performed by academics in the field, and the practical experience and needs from industry practitioners, in order to have deeper discussions about the resources that require more research and development, in order to build better and more usable CUIs.

CCS CONCEPTS

• **Human-centered computing** → *Human computer interaction (HCI)*; HCI design and evaluation methods; *Interaction design*; Interaction design process and methods;

KEYWORDS

conversational user interface, voice user interface, design methods, design heuristics, speech interface, CUI, intelligent user interface, design methods

1 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 [1], 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 have been identified, including the need to: (1) understand and identify the parameters of appropriate CUI design [3, 4, 8, 12, 13, 15, 30] (2) identify and develop tools and heuristics to support the design of CUIs [7, 24]; (3) map and address ethical, privacy and trust issues surrounding the use and development of CUIs [14, 31]; (4) develop core theoretical concepts to understand user interaction

behaviour with these types of interfaces [8, 10] and (5) identify appropriate design for multiple user contexts [29].

At the same time, demand in the commercial market for voice-enabled devices and applications is growing. Current HCI research finds that there are still many key usability issues in even the most current voice-enabled devices, such as Google Home and Amazon Alexa. Some of these core issues consist of: difficulties with the amount of information that can be remembered, system feedback, learnability, and recognition errors [11, 16, 26, 27]. Yet there is currently a disconnect between the research being performed in academia and the practical application of CUI design in industry. Though some have been developed [17, 19, 26, 32, 33], there is a perceived lack of industry focused tools and heuristics to aid in CUI design. Current expert designers in industry are also often lacking the proper training and resources needed to know how to develop good CUIs [24, 25].

1.1 Workshop Aims

This workshop comes at a time where research on CUI usability, design, and development is at an exponential growth. We are also seeing a large commercial push and demand for usable CUIs - many of which we've already seen the likes of, such as Google Assistant, Amazon Alexa, and Siri. This workshop will be critical to the direction of the field, bringing together researchers, developers, designers, and industry practitioners to:

- Identify the gaps between academia and industry in terms of methods, tools, and practices used in CUI design and development
- Identify key design challenges in the development of CUI devices, and particularly, the tools and practices which are key to the space of developing CUIs which are not yet in existence and require more research

This workshop will build upon significant momentum in this area [5, 7, 9, 20–23, 28]. 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. At CHI '19, the community turned its attention to the deficit of theoretical and methodological perspectives [6]. At CHI '20, we began to move from this solid base, 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 [2]. As the need for good CUI design becomes essential in the commercial market, and as the CUI community looks to advance the research on CUI design performed within the last decade, we now aim bring together some of the leading researchers in these fields, with an interest in CUI-based HCI questions to bring these thematic grand challenges into practice. We aim to further these grand challenges into practical perspectives by discussing the gaps in design knowledge between industry and academia, and the practical resources that need to be developed to solve these challenges.

1.2 Bridging the Industry-Academia Gap in CUI Design

Participants will be invited to contribute to the discourse on methods, resources, and approaches to CUI design and development, bringing in both their experience either in academic research or industry experience. We are interested in attracting a broad range of perspectives in different areas of CUI research, including but not limited to:

- Approaches, methods, theories and techniques applied in CUI research
- The challenges of voice and speech in CUI interaction design
- Topics related to conversational flow, analysis, and psycholinguistics in regards to the design of CUI dialogue
- Domain-specific CUI challenges e.g. automotive interfaces, healthcare & wellbeing
- Designing for multimodality & multiparty challenges
- Designing for accessibility and inclusion e.g. underrepresented or marginalized users
- Ethics, privacy, explainability, trust and transparency

The proposed workshop looks to gather researchers, designers and practitioners from industry and academia to identify key gaps between industry and academia in current CUI design and development, and discuss the tools, methods, and practices that are needed in order to bridge these gaps. The workshop will focus on employing the unique capabilities of our community to bring perspectives from both industry and academia, in order to identify the real practical challenges in CUI design, and to connect academic research in CUI design and development with industry practitioners. Through this, we hope to identify the gaps which exist between the two fields.

2 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.

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's co-organized several related workshops at CHI '19 - '20, IUI '20 and CSCW '20. She is on the CUI 2020/2021 steering committee.

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.

Benjamin R. 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 CUI conference series and has run a number of workshops at CHI and Mobile HCI on designing speech and language technologies.

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, how linguistic theories can be implemented in this space, and how users with diverse speech patterns like stammering can improve their interactions with CUIs. He is co-founder of the international CUI conference series.

Martin Porcheron is a Lecturer in the Computational Foundry at Swansea University. His work examines the use of technologies such as conversational interfaces in multi-party settings like pubs and the home. He has recently co-organised workshops at CHI '18–'20 and CSCW '16, '17, and '20 on topics including collocated interaction with technologies and conversational user interfaces. He is a member of the CUI conference series steering committee.

Heloisa Candello is research scientist 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 related workshop at CHI '18–'20 and CSCW '16, '17, and '20. and previously published her research on UX with conversational systems at various HCI conferences. She was also a full paper co-chair for CUI'20.

Stephan Schlögl is an Associate Professor in the Dept. Management, Communication & IT at theMCI 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 was one of the general chairs for the CUI 2020 conference.

Matthew P. Aylett has been working for over two decades in speech synthesis both in a commercial and academic role. He has published widely on the theme of putting character and emotion into speech synthesis and he has significant media engagement experience in the areas of voice cloning and expressive speech synthesis. He has worked on high profile projects such as recreating JFKs voice to give his last speech. He is a trustee for the Scott Morgan Foundation which aims to encourage technological innovation and design for severe disabilities.

Jaisie Sin is a graduate student at the Technologies for Aging Gracefully Lab and the Faculty of Information at the University of Toronto. Her research focuses on the design of emerging technologies like CUIs from the perspective of preventing the marginalization of underrepresented users like older adults through design. She has co-organized related workshops at CHI '19-'20, IUI '20, and CSCW '20.

Robert J. Moore is a scientist at IBM Research, Almaden, where he works to bridge the gap between user interface design and conversation science. He has adapted research findings from the field of Conversation Analysis, in which he is trained, to the emerging discipline of conversational UX design. The result is the Natural Conversation Framework [17, 19] and the Alma Design System [18], which provide designers with basic concepts, principles, interaction patterns and software components. He has co-organized past workshops on the topic at CHI'17, '18 and '20.

Grace Hughes is a Content Design Lead for Fjord at The Dock, Accenture's innovation hub in Dublin, Ireland. She's passionate about a human-centred approach to language, and the role of content at the heart of the design process. In the Dock, she's worked to embed content design in projects, exploring emerging technology across a range of industries. Grace is also exploring conversational design and technology, while leading a project of research and experimentation in this area. Grace has a background in the Humanities, journalism, copywriting, and UX Design. She also lectures in copy and content for the MSc. in Advertising and Digital Comms. at the Technological University of Dublin.

Andrew Ku is a Designer at Google, San Francisco Bay Area. He leads conversation design on cross-auto and cross-home Google Assistant projects. He focuses on building system frameworks to help scale conversational patterns and capabilities across different surfaces. As a strong believer that effective conversations are fundamentally multi-modal, he also evangelizes the multi-modal framework to ensure visual channels are ingrained in the consideration and coordination of conversation design. Prior to Google, he was one of the original designers at Amazon, who designed and shipped Amazon Echo and Alexa.

3 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 & statements will be available on the website dedicated for the workshop (www.speech-interaction.org/CHI2021).

4 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/CHI2021). All accepted workshop papers will also be invited to submit to the CUI '21 conference taking place July, 2021 in Bilbao, Spain. The organizers will issue a call for positional papers in the ACM SIGCHI Extended Abstract template.

Participants will be asked to contribute either a position paper (academia) or a position statement (industry) that illustrates or speaks to a research project or practice that reflects on methods, resources, and approaches to CUI design and development. Papers and statements will be reviewed by the organizing committee, and participants will be selected based on their ability to add to the discussion in light of bringing a diverse and representative set of presenters to foster a two-way conversation between industry and academia, and bringing light to the gaps in

methods, tools, and practices in CUI design. Papers should be submitted to christine.murad@mail.utoronto.ca, and selected papers will be available online on the website dedicated to the workshop, http://www.speechinteraction.org/ CHI2021/. At least one author of each accepted paper/statement must attend the workshop.

5 WORKSHOP STRUCTURE

We propose a day-long 4-hour co-creation workshop consisting of short presentations, followed by co-creation group sessions that will involve brainstorming between academics and industry practitioners. We expect a maximum of 20-25 registered participants, in order to promote discussion and to pair/group participants for relevant breakout sessions appropriately.

(1) **Introductions (30 minutes)**. Brief introductions from organizers and participants on workshop structure, goals and interest in CUI research.
(2) **Opening Statements (60-90 minutes, depending on number of participants)**. Brief opening statements from participants in a half pechakucha format (3 mins 40 secs each). This will involve showing 10-11 slides for 20 seconds each, promoting an alternative style of brief presentations, and more showing of participant's personal work and interests to the workshop.
(3) **Break (10 minutes)**
(4) **Breakout Session 1: Industry-Academia Speed-Dating (45 minutes)**. Participants will be split into pairs of academia - industry. Each pair will be asked capture at least one main unresolved challenge in CUI design/development from their partner.
(5) **Break (15 minutes)**
(6) **Breakout Session 2: Putting CUI Grand Challenges Into Practice (45 minutes)**. Participants will be brought back together and split into small groups, with a mix of academia/industry in each. Participant groups will take the challenges they have garnered from the first session, and use the Disney method (outsiders, dreamers, realizers, and critics) to discuss these challenges, and particularly, how to develop practical methods, tools, or practices that can help solve these challenges.
(7) **Break (10 minutes)**
(8) **Plenary Co-Creation Session (60 minutes)**. Participants will come together after to discuss the different tools, methods, and practices that were brainstormed, and debate the positives and negatives. Organizers will synthesize the discussions from the prior session to develop a key list of tools that the CUI community identifies as necessary to be developed in order to advance CUI design with the participants, and how the CUI community can start working forward to develop these. Potential projects for post-workshop will be discussed to begin addressing these.

5.1 Virtual Workshop Delivery

All the activities will be delivered through Zoom, with Breakout sessions being held in Breakout rooms, and all other sessions being held in a main communal Zoom room. The organizers have access to international Zoom accounts that can be used to run the workshop. We will use either Mural (https://www.mural.co/) or Miro

(https://miro.com/) to facilitate the many co-creation activities that will take place within the workshop.

We will use Microsoft Powerpoint's live captioning feature to provide live captioning for the duration of the workshop, by routing Zoom audio to Microsoft Powerpoint and letting subtitles show on a blank slide. This is a method that we have used in previous virtual workshops which have worked very well. If possible, we will also recruit a live captioner for the duration of the workshop, making use of Zoom's live captioning capabilities where one person can type in captions to the meeting live.

6 POST-WORKSHOP PLANS

The expected workshop outcomes include:

- Identification of key gaps in CUI design knowledge between academia & industry that need to be addressed
- A proposal for a post-workshop report of the tools, methods and practices that were identified as necessary to develop to advance practical CUI design
- Reconnecting, sustaining and extending the existing CUI community of researchers.
- Invite selected papers to be fast-tracked for review at the upcoming CUI 2021 conference.

7 CALL FOR PARTICIPATION

Researchers and industry practitioners working in the field of Conversational User Interfaces (CUIs) are invited to submit to our workshop. The aim of this workshop is to bridge the academia / industry gap in conversational user interface design, and to discuss the development of different tools, methods, and practices for the design and development of CUIs. Those interested are asked to submit either a position paper (academia) or a position statement (industry) that illustrates or speaks to a research project or practice that reflects on methods, resources, and approaches to CUI design and development. We are looking for perspectives from all different areas of CUI research, from conversation analysis, psycholinguistics, interaction design, voice & speech research, etc.

Position paper submissions should be between 3 to 6 pages including references, and position statements should be about one page. The submission should describe authors' work related to the workshop goals and also their interest to participate. Papers and statements will be reviewed by the organizing committee, and participants will be selected based on their ability to add to the discussion in light of bringing a diverse and representative set of presenters to foster a two-way conversation between industry and academia, and bringing light to the gaps in methods, tools, and practices in CUI design. Papers and statements should be submitted to christine.murad@mail.utoronto.ca. Further details can be found on the workshop website: www.speechinteraction.org/CHI2021.

8 ACKNOWLEDGMENTS

REFERENCES

[1] Tawfiq Ammari, Jofish Kaye, Janice Y Tsai, and Frank Bentley. 2019. Music, search, and IoT: How people (really) use voice assistants. *ACM Transactions on Computer-Human Interaction (TOCHI)* 26, 3 (2019), 1–28.

[2] Heloisa Candello, Cosmin Munteanu, Leigh Clark, Jaisie Sin, María Inés Torres, Martin Porcheron, Chelsea M. Myers, Benjamin Cowan, Joel Fischer, Stephan Schlögl, Christine Murad, and Stuart Reeves. 2020. CUI@CHI: Mapping Grand Challenges for the Conversational User Interface Community. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI EA '20)*. ACM, New York, NY, USA, 1–8. https://doi.org/10.1145/3334480.3375152

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

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

[5] Leigh Clark, Benjamin R Cowan, Justin Edwards, Cosmin Munteanu, Christine Murad, Matthew Aylett, Roger K Moore, Jens Edlund, Eva Szekely, Patrick Healey, et al. 2019. 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, New York, NY, USA, W20.

[6] Leigh Clark, Benjamin R. Cowan, Justin Edwards, Cosmin Munteanu, Christine Murad, Matthew Aylett, Roger K. Moore, Jens Edlund, Eva Szekely, Patrick Healey, Naomi Harte, Ilaria Torre, and Philip Doyle. 2019. Mapping Theoretical and Methodological Perspectives for Understanding Speech Interface Interactions. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI EA '19)*. ACM, New York, NY, USA, 1–8. https://doi.org/10.1145/3290607.3299009

[7] Leigh Clark, Philip Doyle, Diego Garaialde, Emer Gilmartin, Stephan Schlögl, Jens Edlund, Matthew Aylett, João Cabral, Cosmin Munteanu, Justin Edwards, and Benjamin R Cowan. 2019. The State of Speech in HCI: Trends, Themes and Challenges. *Interacting with Computers* 31, 4 (09 2019), 349–371. https://doi.org/10.1093/iwc/iwz016 arXiv:http://oup.prod.sis.lan/iwc/advance-article-pdf/doi/10.1093/iwc/iwz016/29961050/iwz016.pdf iwz016.

[8] 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. 2019. 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. https://doi.org/10.1145/3290605.3300705

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

[10] 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* (Dublin, Ireland) *(CUI '19)*. ACM, New York, NY, USA, Article 23, 8 pages. https://doi.org/10.1145/3342775.3342786

[11] Benjamin R. Cowan, Nadia Pantidi, David Coyle, Kellie Morrissey, Peter Clarke, Sara Al-Shehri, David Earley, and Natasha Bandeira. 2017. "What Can i Help You with?": Infrequent Users' Experiences of Intelligent Personal Assistants. In *Proceedings of the 19th International Conference on Human-Computer Interaction with Mobile Devices and Services* (Vienna, Austria) *(MobileHCI '17)*. ACM, New York, NY, USA, Article 43, 12 pages. https://doi.org/10.1145/3098279.3098539

[12] 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.

[13] 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* (Dublin, Ireland) *(CUI '19)*. ACM, New York, NY, USA, Article 26, 8 pages. https://doi.org/10.1145/3342775.3342788

[14] 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* (Dublin, Ireland) *(CUI '19)*. ACM, New York, NY, USA, Article 22, 7 pages. https://doi.org/10.1145/3342775.3342789

[15] Q. Vera Liao, Muhammed Mas-ud Hussain, Praveen Chandar, Matthew Davis, Yasaman Khazaeni, Marco Patricio Crasso, Dakuo Wang, Michael Muller, N. Sadat Shami, and Werner Geyer. 2018. All Work and No Play?. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. ACM, New York, NY, USA, 1–13. https://doi.org/10.1145/3173574.3173577

[16] Ewa Luger and Abigail Sellen. 2016. Like having a really bad PA: the gulf between user expectation and experience of conversational agents. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. ACM, New York, NY, USA, 5286–5297.

[17] Robert J Moore and Raphael Arar. 2019. *Conversational UX Design: A Practitioner's Guide to the Natural Conversation Framework*. ACM, New York, NY, USA. https://doi.org/10.1145/3304087

[18] Robert J Moore, Eric Young Liu, Saurabh Mishra, and Guang-Jie Ren. 2020. Design Systems for Conversational UX. In *Proceedings of ACM CUI Conference (CUI'20)*. ACM, New York, NY, USA, 4 pages. https://doi.org/10.1145/3405755.3406150

[19] Robert J Moore, Margaret H Szymanski, Raphael Arar, and Guang-Jie Ren. 2018. *Studies in Conversational UX Design*. Springer, Cham, Switzerland. https://doi.org/10.1007/978-3-319-95579-7

[20] Cosmin Munteanu, Leigh Clark, Benjamin Cowan, Stephan Schlögl, María Inés Torres, Justin Edwards, Christine Murad, Matthew Aylett, Martin Porcheron, Heloisa Candello, Philip Doyle, and Jaisie Sin. 2020. CUI: Conversational User Interfaces: A Workshop on New Theoretical and Methodological Perspectives for Researching Speech-based Conversational Interactions. In *Proceedings of the 25th International Conference on Intelligent User Interfaces Companion (IUI '20)*. ACM, New York, NY, USA, 15–16. https://doi.org/10.1145/3379336.3379358

[21] Cosmin Munteanu, Pourang Irani, Sharon Oviatt, Matthew Aylett, Gerald Penn, Shimei Pan, Nikhil Sharma, Frank Rudzicz, Randy Gomez, Ben Cowan, and Keisuke Nakamura. 2017. Designing Speech, Acoustic and Multimodal Interactions. In *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (Denver, Colorado, USA) *(CHI EA '17)*. ACM, New York, NY, USA, 601–608. https://doi.org/10.1145/3027063.3027086

[22] 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* (Toronto, Ontario, Canada) *(CHI EA '14)*. ACM, New York, NY, USA, 75–78. https://doi.org/10.1145/2559206.2559228

[23] Cosmin Munteanu and Gerald Penn. 2016. Speech-Based Interaction: Myths, Challenges, and Opportunities. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (San Jose, California, USA) *(CHI EA '16)*. ACM, New York, NY, USA, 992–995. https://doi.org/10.1145/2851581.2856689

[24] 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. https://doi.org/10.1145/3342775.3342795

[25] Christine Murad and Cosmin Munteanu. 2020. Designing Voice Interfaces: Back to the (Curriculum) Basics. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI '20)*. ACM, New York, NY, USA, 1–12. https://doi.org/10.1145/3313831.3376522

[26] Christine Murad, Cosmin Munteanu, Leigh Clark, and Benjamin R. Cowan. 2018. Design guidelines for hands-free speech interaction. In *MobileHCI 2018 - Beyond Mobile: The Next 20 Years - 20th International Conference on Human-Computer Interaction with Mobile Devices and Services, Conference Proceedings Adjunct*. ACM Press, New York, New York, USA, 269–276. https://doi.org/10.1145/3236112.3236149

[27] Chelsea M. Myers, Anushay Furqan, and Jichen Zhu. 2019. The Impact of User Characteristics and Preferences on Performance with an Unfamiliar Voice User Interface. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI '19)*. ACM, New York, NY, USA, 1–9. https://doi.org/10.1145/3290605.3300277

[28] Martin Porcheron, Leigh Clark, Matt Jones, Heloisa Candello, Benjamin R Cowan, Christine Murad, Jaisie Sin, Matthew P Aylett, Minha Lee, Cosmin Munteanu, Joel E Fischer, Philip R Doyle, and Jofish Kaye. 2020. CUI@CSCW: Collaborating through Conversational User Interfaces. In *Companion Publication of the 2020 Conference on Computer Supported Cooperative Work and Social Computing* (Virtual Event, USA) *(CSCW '20 Companion)*. ACM, New York, NY, USA, 10. https://doi.org/10.1145/3406865.3418587

[29] Martin Porcheron, Joel E Fischer, and Sarah Sharples. 2017. "Do Animals Have Accents?": Talking with Agents in Multi-Party Conversation. In *Proceedings of the 20th ACM Conference on Computer-Supported Cooperative Work & Social Computing (CSCW '17)*. ACM, New York, NY, USA, 207–219. https://doi.org/10.1145/2998181.2998298

[30] Stuart Reeves, Martin Porcheron, Joel E. Fischer, Heloisa Candello, Donald McMillan, Moira McGregor, Robert J. Moore, Rein Sikveland, Alex S. Taylor, Julia Velkovska, and Moustafa Zouinar. 2018. Voice-based Conversational UX Studies and Design. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (CHI EA '18)*. ACM, New York, NY, USA, Article W38, 8 pages. https://doi.org/10.1145/3170427.3170619

[31] 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* (Dublin, Ireland) *(CUI '19)*. ACM, New York, NY, USA, Article 20, 3 pages. https://doi.org/10.1145/3342775.3342808

[32] Bernhard Suhm. 2003. Towards Best Practices for Speech User Interface Design. In *Proceedings of the 8th European Conference on Speech Communication and Technology* (Geneva, Switzerland) *(EUROSPEECH 2003)*. ISCA, Baixas, France, 2217–2220.

[33] Zhuxiaona Wei and James A Landay. 2018. Evaluating Speech-Based Smart Devices Using New Usability Heuristics. *IEEE Pervasive Computing* 17, June (2018), 84–96. https://doi.org/10.1109/MPRV.2018.022511249