

# Invited Talk: Advancing Technological Equity in Speech and Language Processing

**Helen Meng**

The Chinese University of Hong Kong (CUHK)

**Abstract:** Accelerating advances in AI and deep neural networks have powered the proliferation of speech and language technologies in applications such as virtual assistants, smart speakers, reading machines, etc. The technologies have performed impressively well, achieving human parity in speech recognition accuracies and speech synthesis naturalness. As these technologies continue to permeate our daily lives, they need to support diverse users and usage contexts with inputs that deviate from the mainstream. Examples include non-native speakers, code-switching, speech carrying myriad emotions and styles, and speakers with impairments and disorders. Under such contexts, existing technologies often suffer performance degradations and fail to fulfill the needs of the users. The crux of the problem lies in data scarcity and data sparsity, which are exacerbated by high data variability.

This talk presents an overview of some of the approaches we have used to address the challenges of data shortage, positioned at various stages along the processing pipeline. They include: data augmentation based on speech signal perturbations, use of pre-trained representations, learning speech representation disentanglement, knowledge distillation architectures, meta-learned model re-initialization, as well as adversarially trained models. The effectiveness of these approaches are demonstrated through a variety of applications, including accented speech recognition, dysarthric speech recognition, code-switched speech synthesis, disordered speech reconstruction, one-shot voice conversion and exemplar-based emotive speech synthesis. These efforts strive to develop speech and language technologies that can gracefully adapt and accommodate a diversity of user needs and usage contexts, in order to achieve technological equity in our society.

**Bio:** Helen Meng is Patrick Huen Wing Ming Professor of Systems Engineering and Engineering Management at The Chinese University of Hong Kong (CUHK). Her research interests include speech and language technologies to support multilingual and multimodal human-computer interactions, eLearning and assistive technologies, as well as big data decision analytics using AI. She leads the interdisciplinary research team that received the first Theme-based Research Scheme Project in Artificial Intelligence in 2019 from the Hong Kong SAR Governments Research Grants Council. She is Chair of the Curriculum Development in the CUHK-JC AI4Future Project, which has developed the courseware for pre-tertiary AI education being taught in a growing number of participating secondary schools across Hong Kong.

Helen received all her degrees from MIT. She is the Founding Director of the CUHK Ministry of Education (MoE)-Microsoft Key Laboratory for Human-Centric Computing and Interface Technologies (since 2005), Tsinghua-CUHK Joint Research Center for Media Sciences, Technologies and Systems (since 2006), and Stanley Ho Big Data Decision Analytics Research Center (since 2013). Previously, she has served as CUHK Faculty of Engineering's Associate Dean (Research), Chairman of the Department of Systems Engineering and Engineering Management, Editor-in-Chief of the IEEE Transactions on Audio, Speech and Language Processing, Member of the IEEE Signal Processing Society Board of Governors, ISCA Board Member and presently member of the IEEE SPS Awards Board and ISCA International Advisory Council. She was elected APSIPAs inaugural Distinguished Lecturer 2012-2013 and ISCA Distinguished Lecturer 2015-2016. Her awards include the Ministry of Education Higher Education Outstanding Scientific Research Output Award 2009, Microsoft Research Outstanding Collaborator Award 2016 (1 in 32 worldwide), IBM Faculty Award 2016, HKPWE Outstanding Women Professionals and Entrepreneurs Award 2017 (1 in 20 since 1999), Hong Kong ICT Silver Award 2018 in Smart Inclusion, 2019 IEEE SPS Leo L. Beranek Meritorious Service Award and various best paper

awards. Helen has served in a number of government appointments, which include memberships in the Steering Committee of Hong Kongs Electronic Health Record Sharing, Social Welfare Departments Joint Committee on Information Technology for the Social Welfare Sector and Advisory Committee on financing social welfare services. She is also a member of the AI4SDGs AI for Children Working Group. Helen is a Fellow of IEEE, ISCA, HKIE and HKCS.

# Invited Talk: Learning and Processing Language from Wearables: Opportunities and Challenges

**Alejandrina Cristia**

Laboratoire de Sciences Cognitives et de Psycholinguistique,  
Département études cognitives, ENS, EHESS, CNRS, PSL University

**Abstract:** Recent years have seen tremendous improvement in the ease with which we can collect naturalistic language samples via devices worn over long periods of time. These allow unprecedented access to ego-centered experiences in language perceived and produced, including by young children. For example, in a newly-formed consortium, we pulled together over 40k hours of audio, collected from 1,001 children growing up in industrialized or hunter-horticulturalist populations, located in one of 12 countries. Such data are interesting for many purposes, including as 1. fodder for unsupervised language learning models aimed at mimicking what the child does; 2. indices of early language development that can be used to assess the impact of behavioral and pharmacological interventions; and 3. samples of the natural use of language(s) in low-resource and multilingual settings. The technology allowing to carve out interesting information from these large datasets, however, is lagging behind – but this may not be such a bad thing after all, since the ethical, technical, and legal handling of such data also need some work to increase the chances that the net impact of research based on this technique is positive. In this talk, I draw from cutting-edge research building on long-form recordings from wearables and a framework for doing the most good we can (effective altruism) to highlight surprising findings in early language acquisition, and delineate key priorities for future work.

**Bio:** Alejandrina Cristia is a senior researcher at the Centre National de la Recherche Scientifique (CNRS), leader of the Language Acquisition Across Cultures team, and director of the Laboratoire de Sciences Cognitives et Psycholinguistique (LSCP) cohosted by the Ecole Normale Supérieure, EHESS, and PSL. In 2021, she is an invited researcher in the Foundations of Learning Program of the Abdul Latif Jameel Poverty Action Lab (J-PAL), and a guest researcher at the Max Planck Institute for Evolutionary Anthropology. Her long-term aim is to answer the following questions: What are the linguistic representations that infants and adults have? Why and how are they formed? How may learnability biases shape the world's languages? To answer these questions, she combines multiple methodologies including spoken corpora analyses, behavioral studies, neuroimaging (NIRS), and computational modeling. This interdisciplinary approach has resulted in over 100 publications in psychology, linguistics, and development journals as well as IEEE and similar conferences. With an interest in cumulative, collaborative, and transparent science, she contributed to the creation of the first meta-meta-analysis platform ([metalab.stanford.edu](http://metalab.stanford.edu)) and several international networks, including saliently the LangVIEW consortium that is leading /L+/, the First truly global summer/winter school on language acquisition.<sup>1</sup> She received the 2017 John S. McDonnell Scholar Award in Understanding Human Cognition, the 2020 Médaille de Bronze CNRS Section Linguistique, and an ERC Consolidator Award (2021-2026) for the ExELang<sup>2</sup> project.

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<sup>1</sup><https://www.dpss.unipd.it/summer-school-2021/home>

<sup>2</sup>[exelang.fr](http://exelang.fr)

# Invited Talk: Reliable Characterizations of NLP Systems as a Social Responsibility

**Christopher Potts**  
Stanford University

**Abstract:** This is an incredible moment for NLP. We all routinely work with models whose capabilities would have seemed like science fiction just two decades ago, powerful organizations eagerly await our latest results, and NLP technologies are playing an increasingly large role in shaping our society. As a result, all of us in the NLP community are likely to participate in research that will contribute (to varying degrees and perhaps only indirectly) to technologies that will impact many people's lives, with both positive and negative consequences for example, technologies that broaden accessibility, enhance creative self-expression, heighten surveillance, and create propaganda. What can we do to fulfill the social responsibility that this brings? As a (very) partial answer to this question, I will review a number of important recent developments, spanning many research groups, concerning dataset creation, model introspection, and system assessment. Taken together, these ideas can help us more reliably characterize how NLP systems will behave, and more reliably communicate this information to a wider range of potential users. In this way, they can help us meet our obligations to the people whose lives are impacted by the results of our research.

**Bio:** Christopher Potts is Professor and Chair of Linguistics and Professor (by courtesy) of Computer Science at Stanford, and a faculty member in the Stanford NLP Group and the Stanford AI Lab. His group uses computational methods to explore how emotion is expressed in language and how linguistic production and interpretation are influenced by the context of utterance. This research combines methods from linguistics, cognitive psychology, and computer science, in the service of both scientific discovery and technology development. He was previously Chief Scientist at Roam Analytics, a start-up focused on applying NLP in healthcare and the life sciences (now Parexel AI Labs). He is a long-time Action Editor at TACL, a frequent Area Chair at ACL conferences, and currently an Ethics Committee co-chair for EMNLP 2021.