

# Intelligent Systems and a Language Transparent World

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## Abstract

After centuries of separation and misunderstandings, we are lucky to be living in *the* generation that can see an end to language/cultural barriers between the peoples of our planet. AI, specifically: automatic recognition, translation and understanding of language in all its forms (text, speech, images, tactile, body, emotion...) is now making it feasible to operate and communicate in any country, language, mode and situation. We began working on first *speech* translation systems in the late 80's on humble computing environments delivering modest performance, but have by now arrived at systems that are able to deliver real-time simultaneous interpretation capabilities for real-life situations that approach/exceed human performance. Key to success is a combination of 1.) better machine learning algorithms, 2.) exponential growth in available computing and data, and 3.) matching language systems with appropriate multimodal human-machine interfaces that make them usable.

In my talk, I will present different classes of systems that we have designed and deployed in different environments and for different requirements, including:

- Interpreting Smartphones for tourists, healthcare and relief workers
- Communicators on tablets in Humanitarian and Government Missions
- Road sign interpretation to translate international signing
- Multilingual subtitling and translation of TV broadcasts
- Automatic Interpretation of lectures for foreign students
- Symbiotic human & machine interpreters at the European Parliament
- Multimodal interpretation of human meta-communication (emotion, gaze...)
- Translation of silent speech

I will discuss the technology's progression and the lessons learned for each of these systems and show how language technology must meet user interface concerns. I will conclude with remarks on open challenges that need to be addressed to make language barriers truly transparent.

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## Biography

Alexander Waibel is Professor of Computer Science at Carnegie Mellon University (USA) and at the Karlsruhe Institute of Technology (Germany). He is director of the International Center for Advanced Communication Technologies. Waibel is internationally known for his work on AI, Machine Learning, Multimodal Interfaces and Speech Translation Systems. He and his team developed early Neural Network based Speech and Language systems, including the TDNN, the first shift-invariant "Convolutional" Network. Combining such advances in ML with work on better multimodal interfaces, Waibel devoted decades of his work to developing pioneering speech translation and simultaneous interpreting solutions in an effort to overcome language barriers. He published extensively in the field (>800 pubs, >30,000 citations, h-index 85), received numerous awards and founded more than 10 companies in an effort to transfer academic results to practical deployment.

Waibel is a member of the National Academy of Sciences of Germany and a Fellow of the IEEE. He received BS, MS and PhD degrees from MIT and CMU, respectively.