Neural architecture of human speech comprehension

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Humans understand speech with such speed and accuracy, it belies the complexity of transforming sound into meaning. The goal of my research is to develop a theoretically grounded, biologically constrained and computationally explicit account of how the human brain achieves this feat. In my talk, I will present a series of studies that examine neural responses at different spatial scales: From population ensembles using magnetoencephalography and electrocorticography, to the encoding of speech properties in individual neurons across the cortical depth using Neuropixels probes in humans. The results provide insight into (i) what auditory and linguistic representations serve to bridge between sound and meaning; (ii) what operations reconcile auditory input speed with neural processing time; (iii) how information at different timescales is nested, in time and in space, to allow information exchange across hierarchical structures. My work showcases the utility of combining linguistic theory, machine-learning and neuroscience for developing neurally-constrained computational models of spoken language understanding.