It takes a team. Multiple mechanisms for real-time speech processing:

Evidence from computational modeling, eye-tracking, electro-corticography, event related potentials.

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Abstract:

Two fundamental problems in speech perception are the problem of acoustic variability and the problem of temporary ambiguity. With respect to acoustic variability, factors like talker differences, speaking rate and coarticulation create significant variation in the signal. However, even if the acoustic signal were perfectly ambiguous listeners would still be left with temporary ambiguities created by the fact that words unfold over time. For example, at the onset of a word like *cantata*, the input (*ca*-) is temporarily consistent with a variety of candidates like *Canada, capital*, and *canteen).* This talk examines two general purpose mechanisms that may work together to solve both problems. I first present data from eye-tracking and electro-corticography showing how a simple process of graded, dynamic competition and partially activated competitors can help listeners track acoustic uncertainty and to integrate material over time. I next present computational models working off of a large corpora of phonetic measurement that argue that if competition is buttressed with a form of data explanation, predictive coding, or hypothesis testing, they fully account for much of the variability in speech. Several behavioral experiments validate these models and show how data explanation may also participate in anticipatory processing to help with the problem of time. These studies suggest a combination of these mechanisms may be sufficient to explain speech perception without more radical theoretical notions. However, I end with two recent studies from my lab that challenge this simple framing, suggesting that there may be auditory organization processes below the level of speech that play a critical role in perception, even if we do not yet understand their role.