



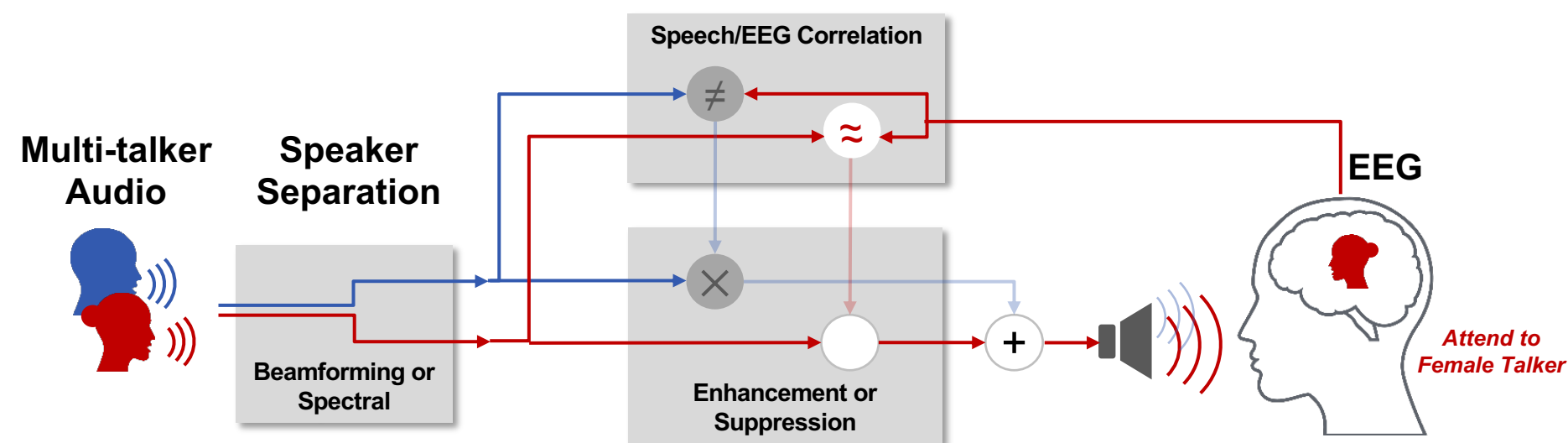
## Hearing is Critical to Operational Performance

- Nearly 1.1 million Veterans compensated for hearing loss in 2016
- Hearing in noisy environments is particularly challenging for current hearing aid technology and can be cognitively fatiguing
- We introduce a vision for cognitively aware “hearable” technology



Noise Protection — Health Monitoring — Hearing Enhancement

## System-Level Design for Cognitive Hearing Enhancement

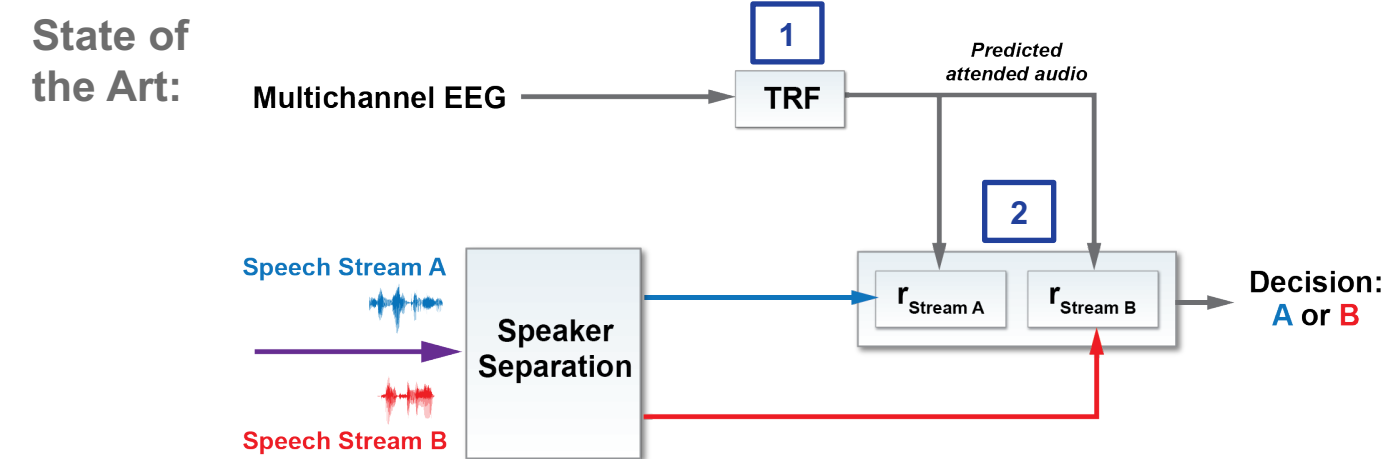


- Audio is separated into audio streams using spatial and spectral cues
- Separated audio streams are processed concurrently with recorded EEG to determine the listener’s desired audio stream

## One-Stage vs. Two-Stage Decoding Architecture

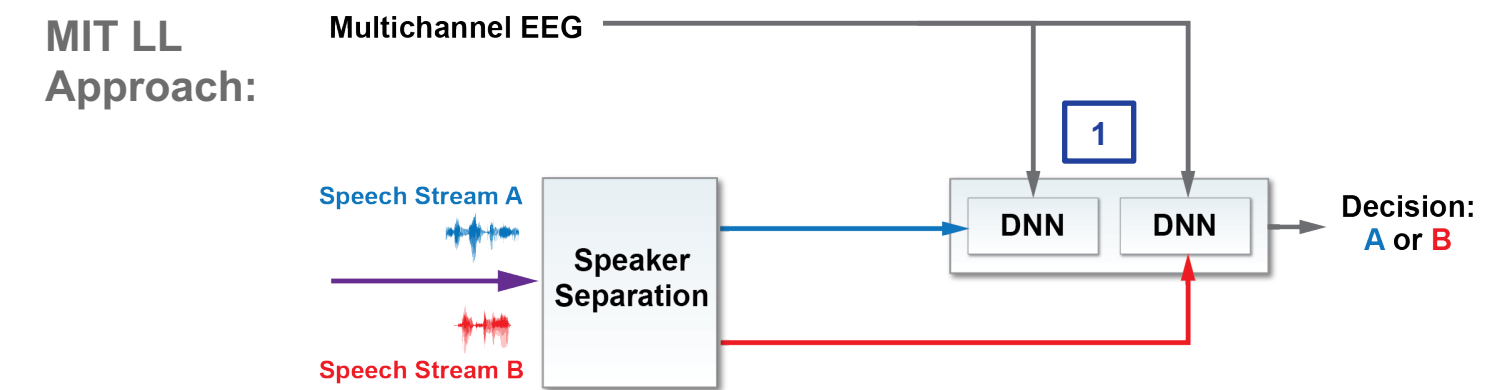
### Two-Stage Architecture

- Stimulus reconstruction (NN or least squares)
- Explicit correlation with actual audio

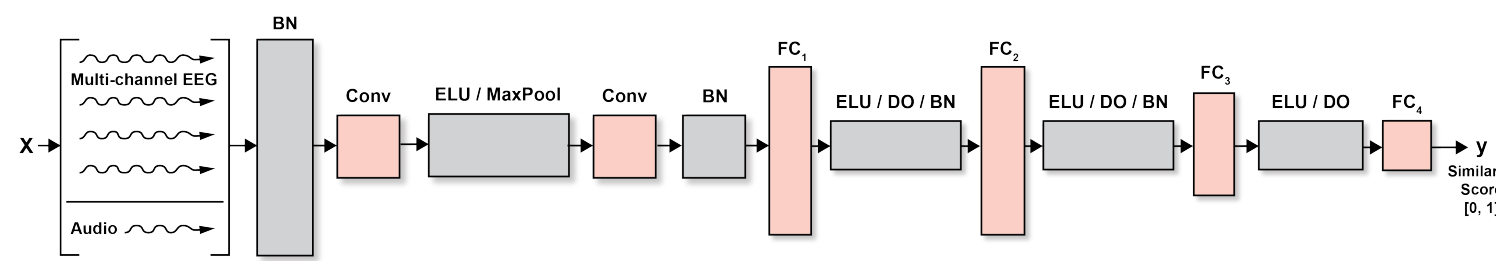


### One-Stage Architecture

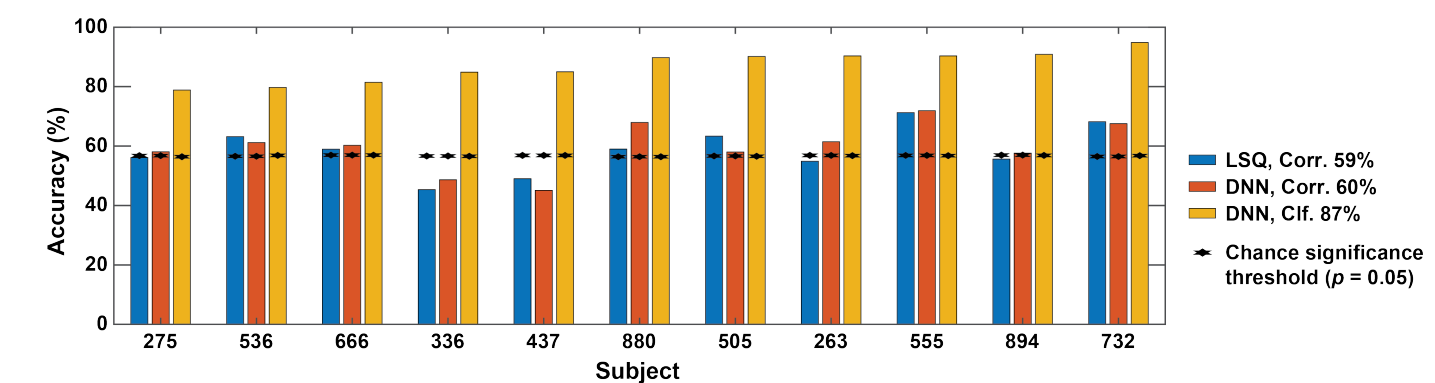
- DNN implicitly computes similarity



## One-Stage Attention-Decoding with a DNN



## Attention Decoding Performance



## Cognitively Controlled Hearing Aid Prototype

