Algorithms on Noisy Speech for Hearing-Aid Users

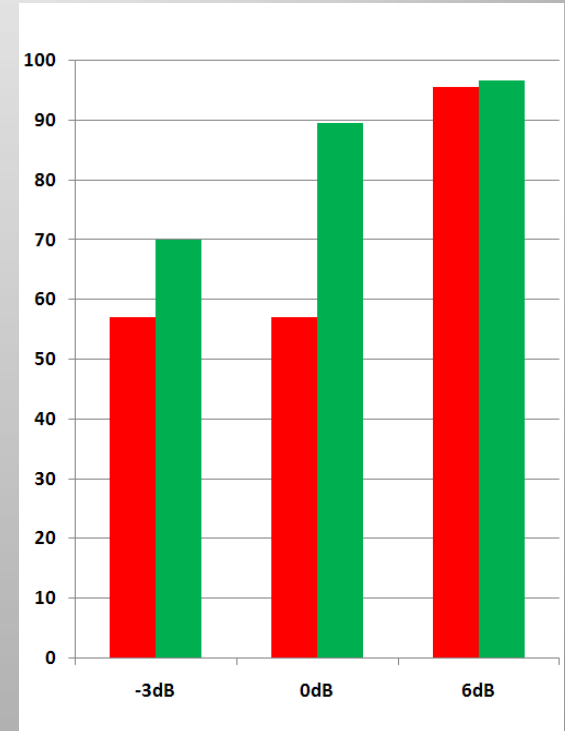**Nicholas Prior**

Srikanth Vishnubhotla

Carol Espy-Wilson
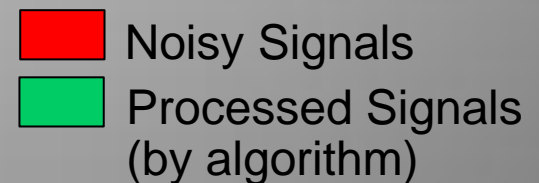
Project

Normal Hearing Listeners

- The Speech Communication Lab has developed an algorithm to remove noise from speech, even when the noise is the speech of a competing speaker.

- The study will test the effectiveness of the algorithm for hearing-aid users.

Sentence Type

Noisy Signals

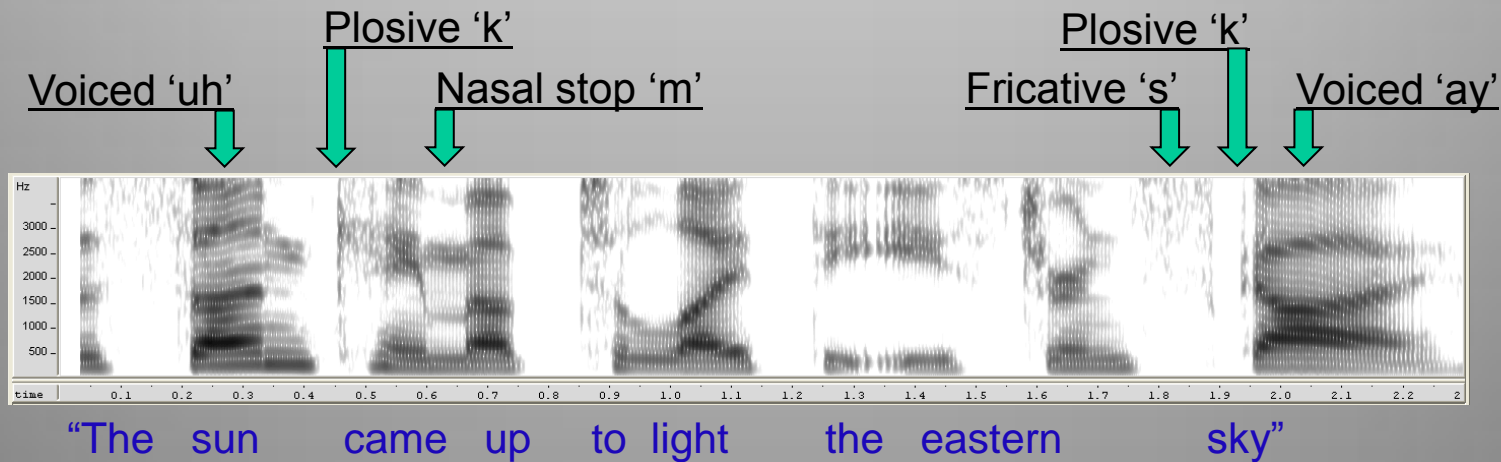Processed Signals (by algorithm)

Speech Properties

➢ **Voiced speech** (e.g. vowels)

- Periodic waveform.
- Vocal cords open and close rapidly for the voiced periodic sounds including vowels, nasals, semivowels and voiced consonants.
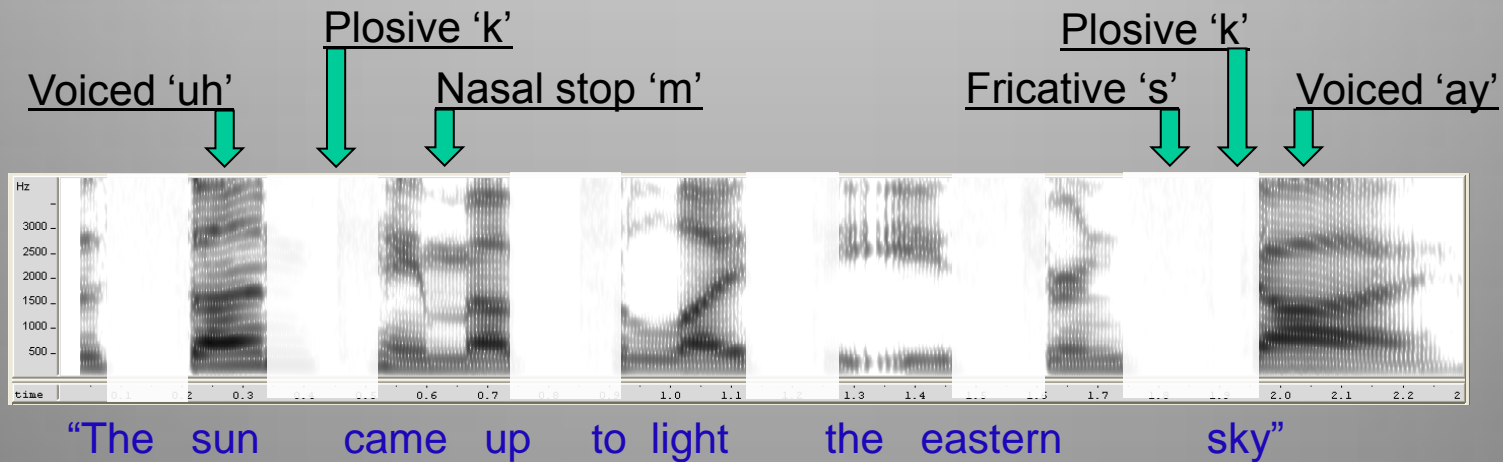
➢ **Unvoiced speech** (e.g. most consonants)

- Aperiodic waveform.
- Tongue, lips and teeth temporarily constrict or block air flow for consonant sounds generating frication noise and/or transients.

Plosive 'k'

Voiced 'uh'   Nasal stop 'm'

Plosive 'k'

Fricative 's'   Voiced 'ay'

"The   sun   came   up   to light   the   eastern   sky"
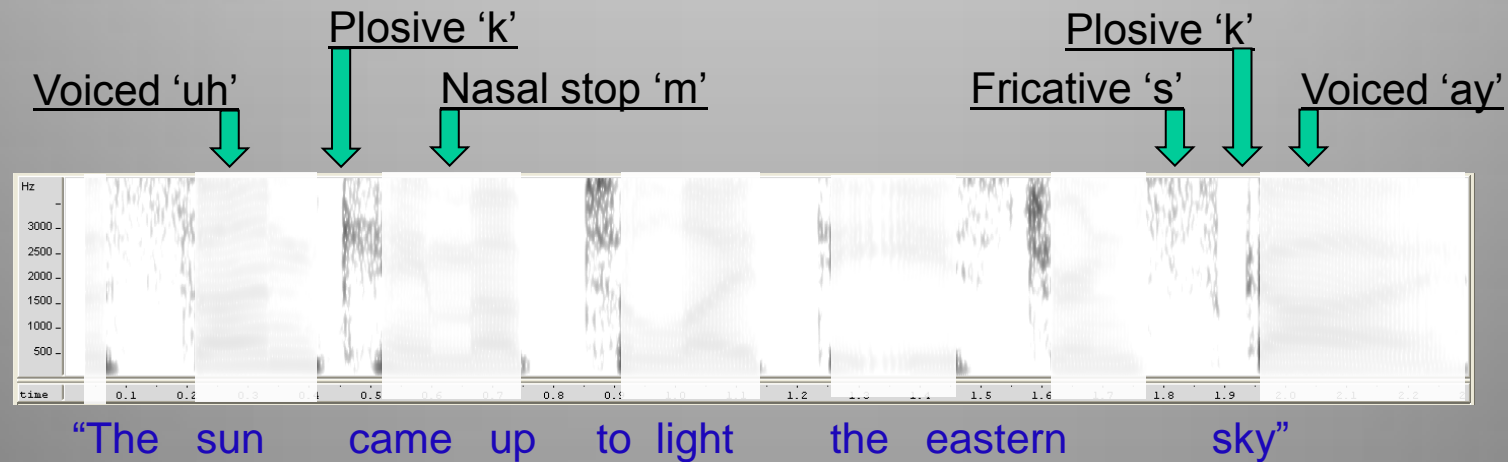
- **The algorithm first identifies the voiced regions of the signal from their periodic properties.**
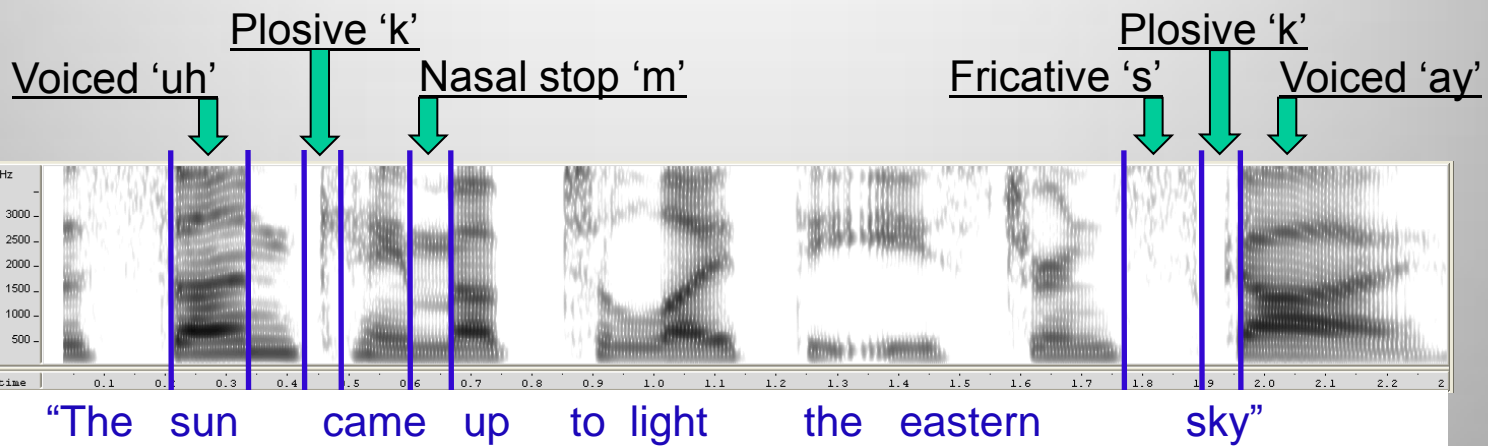
Algorithm

- The algorithm first identifies the voiced regions of the signal from their periodic properties.

- **From these voiced regions it then tries to implicitly estimate the unvoiced regions for each speaker.**
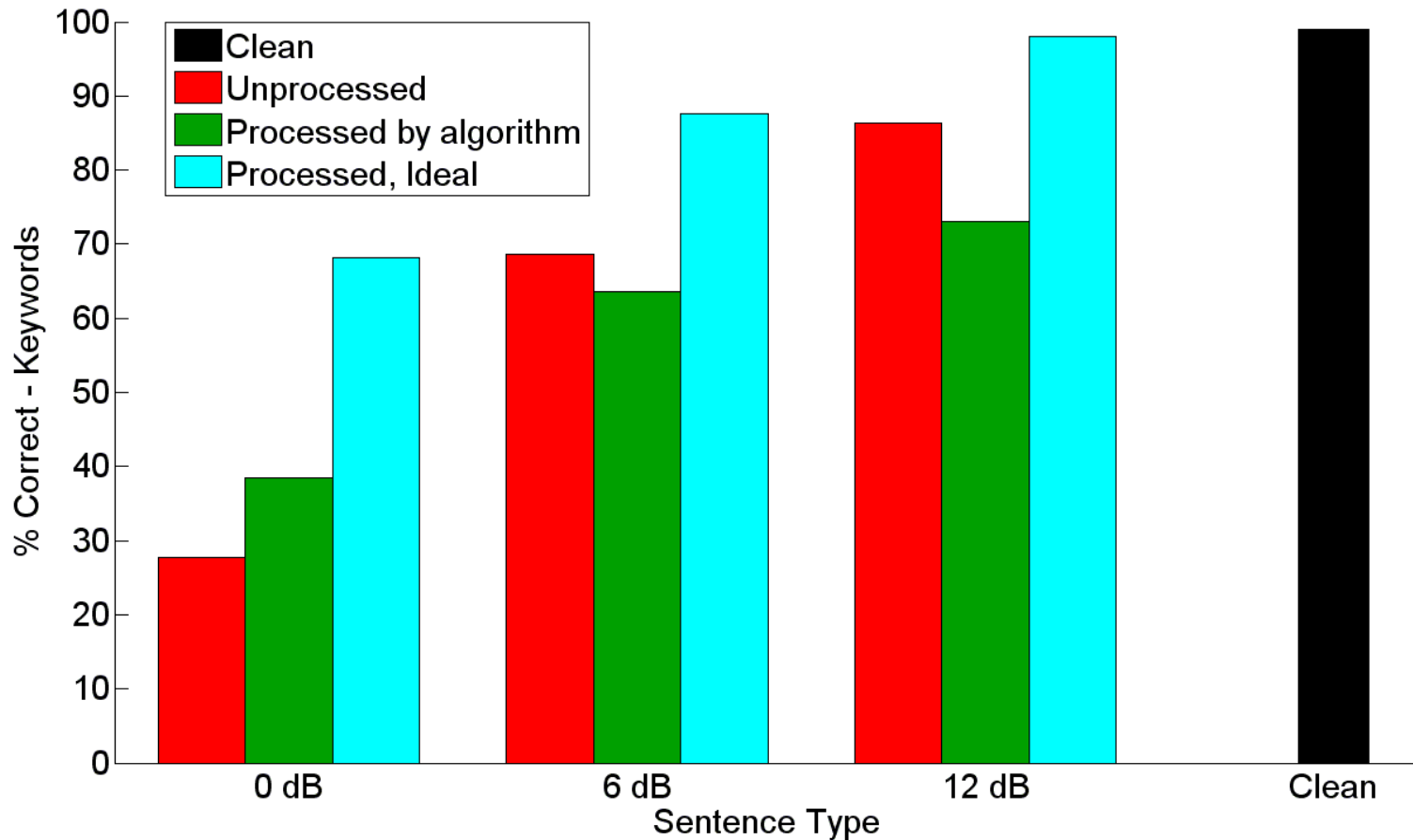

"The sun   came up   to light   the eastern   sky"

Speech Signals

"The sun came up to light the eastern sky"

Listener Tests - Results

Hearing-Aid Users

Listener Tests - Comparison
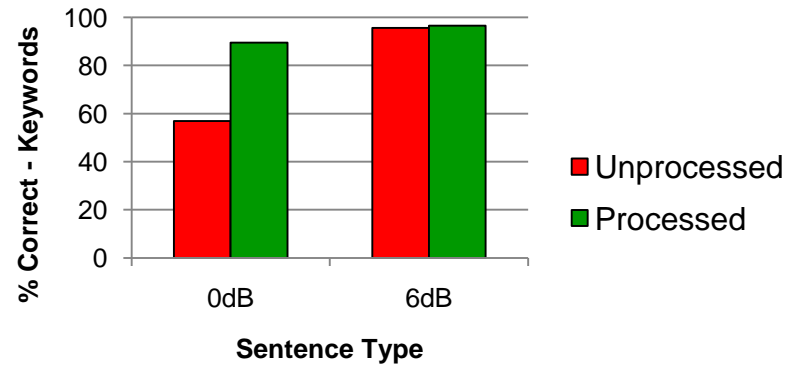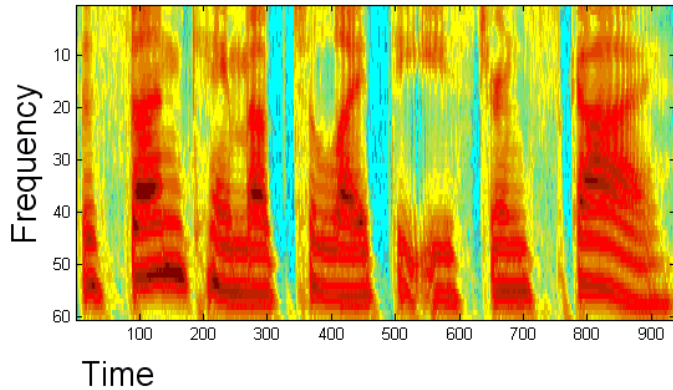
Hearing-Aid Users
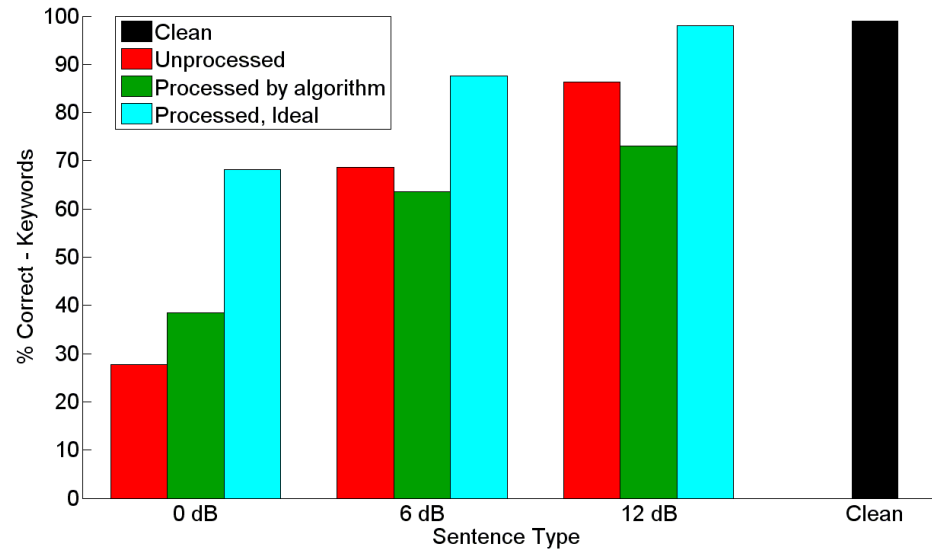
Normal Hearing Listeners

Analysis

Energy distributions for the different sentence types
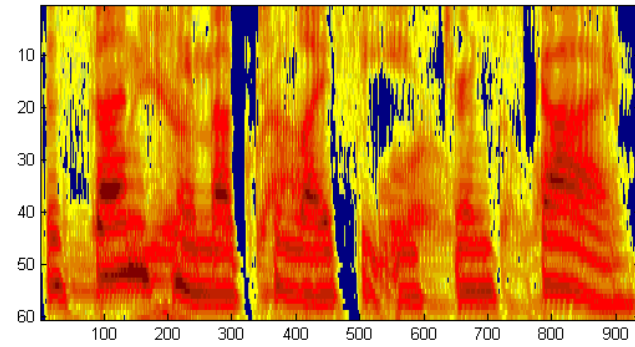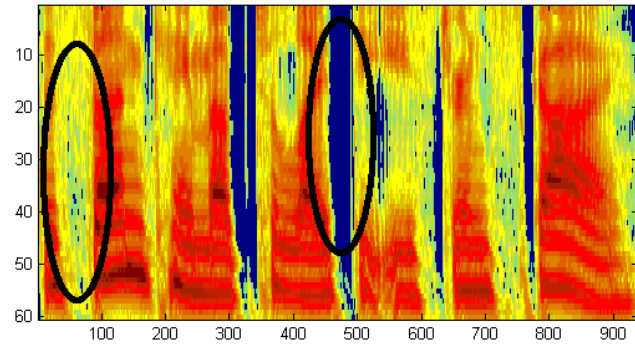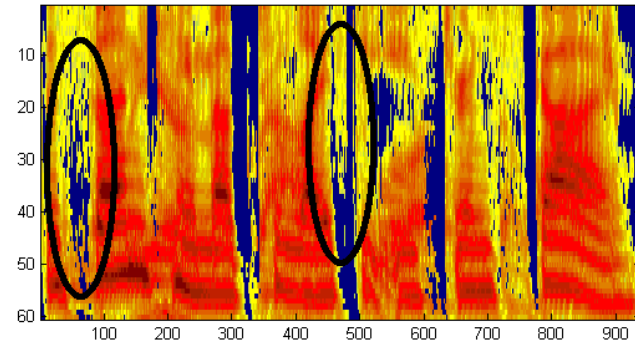
Acknowledgments

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