Newcastle IIP

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Auditory Cognition Lab

The Auditory Cognition Lab, summer 2015

Work goals

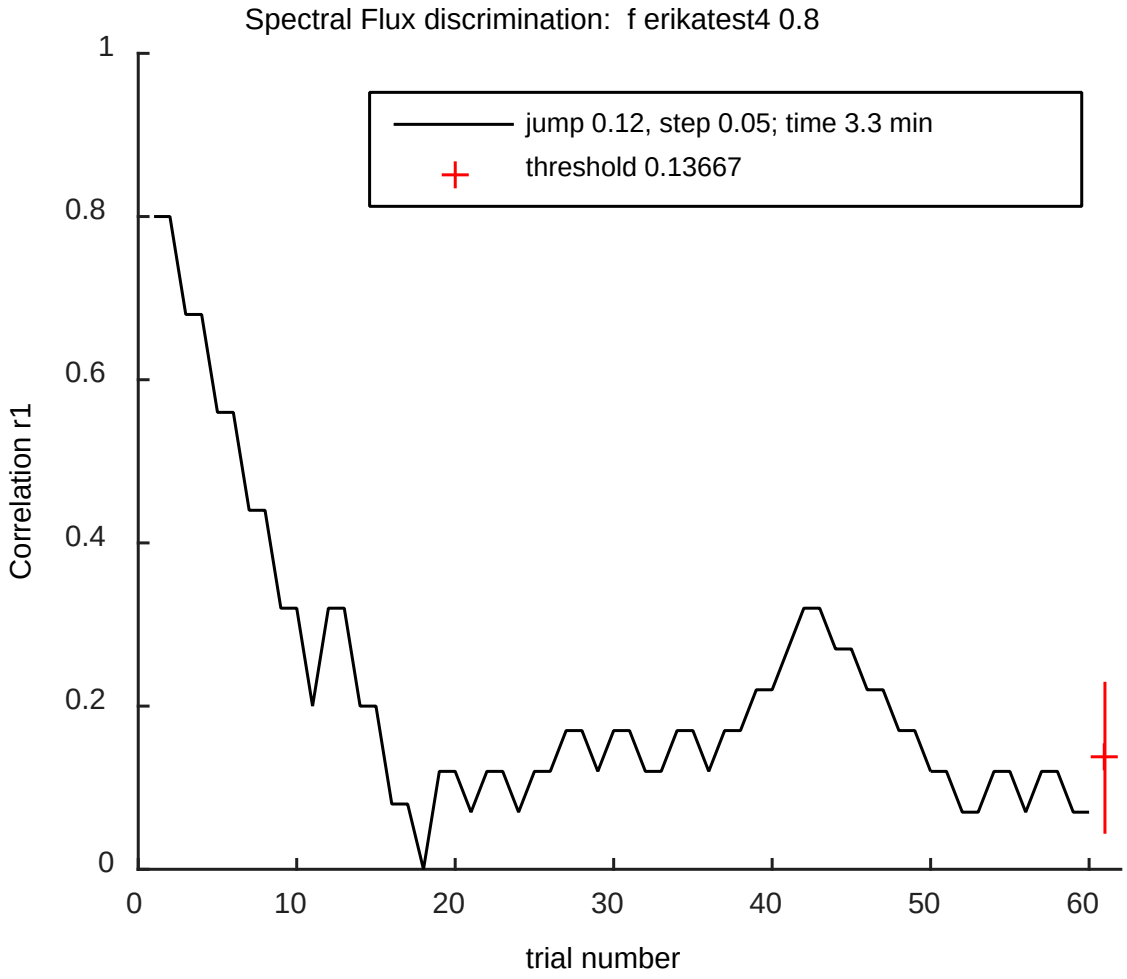
- Study human processing of auditory signals
- Quantitatively describe auditory phenomena
- Investigate *spectral flux*, an aspect of sound that describes how much the frequencies of the sound change over time
- Modify existing studies for clinical applications
- Design hardware for auditory movement studies
- Create all-inclusive scripts for studies so that they can be used in schools by people with limited computer ability

The Newcastle University medical complex, home to the Institute of Neuroscience

Spectral flux study

- Created sound stimuli comprised of many sinusoidal tones of different frequencies using MATLAB
- Variable: percentage of tones that changed in frequency over each time step (varied from 0.0 to 1.0)
  - This is known as *spectral flux*
- Goal of study: determine at what threshold humans can detect a difference in spectral flux
  - Example: if we play two stimuli at o.2 flux and one stimuli at 0.4 flux, can people tell which one is the different one?
- Staircase design that increases the difference in flux if people answer correctly and decreases if they are incorrect

Example spectral flux trial showing a detection threshold of about 0.14 difference in flux



Contributions to lab

- Cleaned up existing code and wrote entirely new self-explanatory script that can run spectral flux trial
- Ran 20 participants through spectral flux trial to generate preliminary results for future human and primate studies
- Contributed ideas to the development of an auditory motion study, in which the lab will build and use a contraption that will move a speaker around a participant's head to generate authentic moving sounds
- Modified stimuli for a third study on foreground vs. background noise to be easier for clinical patients to detect by applying modulation to parts of the stimuli

Me with Pradeep Dheerendra, the doctoral student with whom I worked most closely

Impact on academics/career

- Seriously improved programming skills and MATLAB knowledge
- This was my first chance to apply my programming skills outside of my coursework and I gained a much greater understanding of how to work on coding projects with multiple people effectively
- Introduced me to the dry lab environment
- Introduced me to signal processing
- Introduced me to several fields of neuroscience through the weekly seminars I went to, including retinal prosthetics and single-cell recording

Cultural experiences: England and Scotland

The beautiful Newcastle Quayside, always bustling with activity on summer weekends