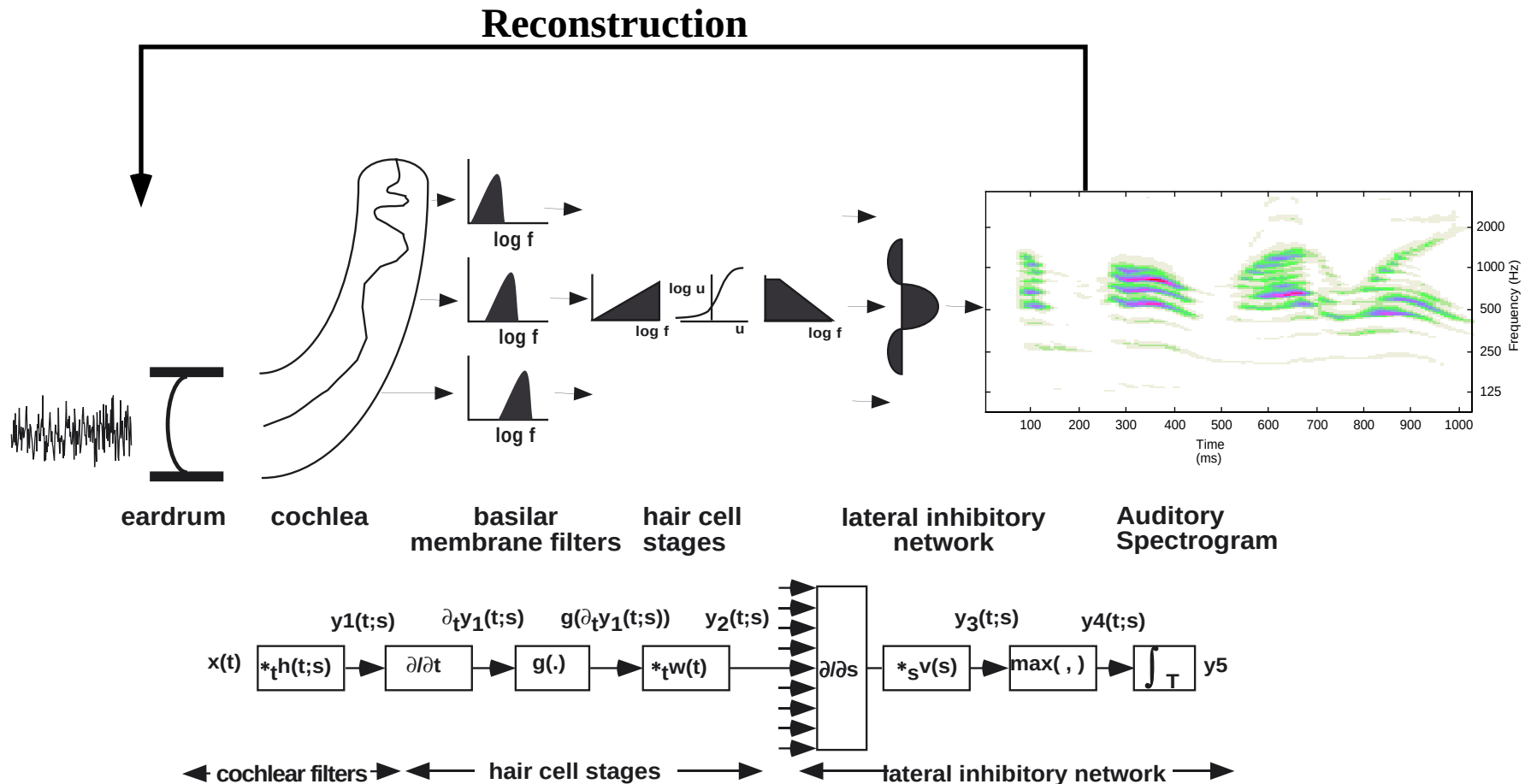


Intelligibility and Representation of Timbre in Primary Auditory Cortex

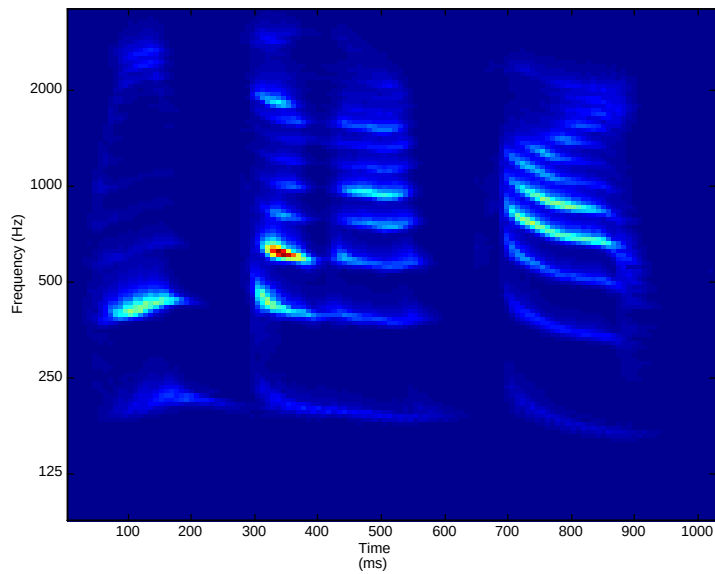
Powen Ru
Taishih Chi
Didier Depireux
David Klein
Nina Kowalski

Center for Auditory & Acoustic Research
Institute for Systems Research
Electrical and Computer Engineering
University of Maryland, College Park

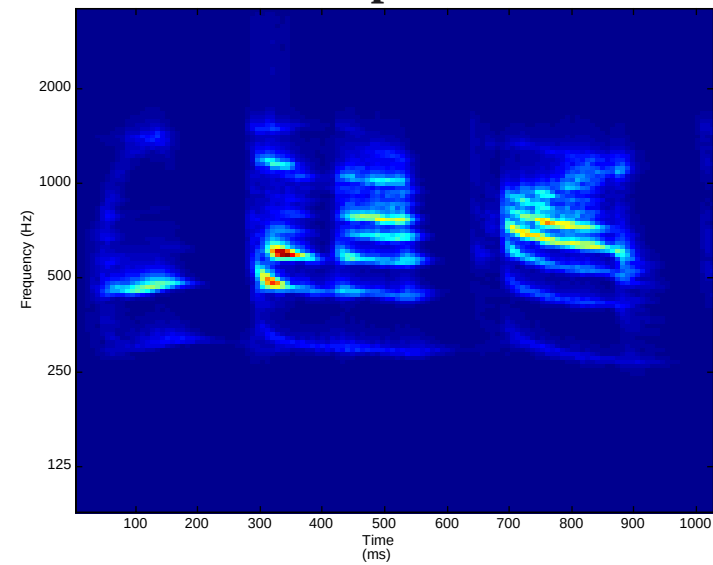
Early Auditory Processing Stages



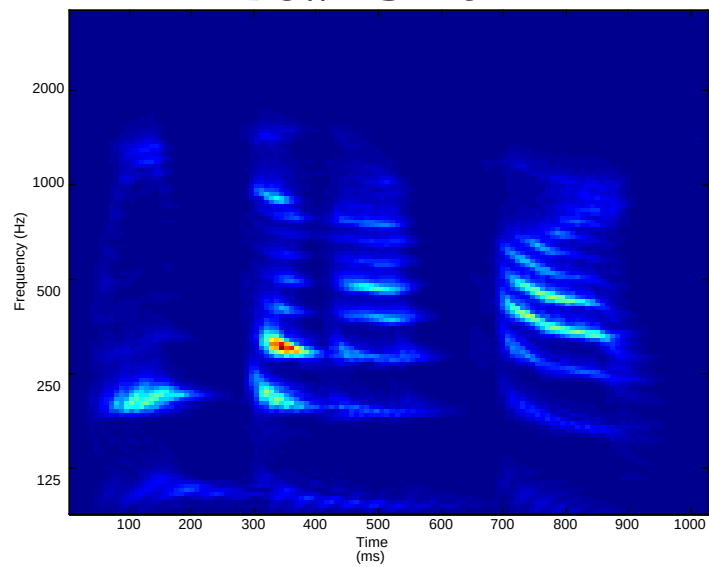
Normal



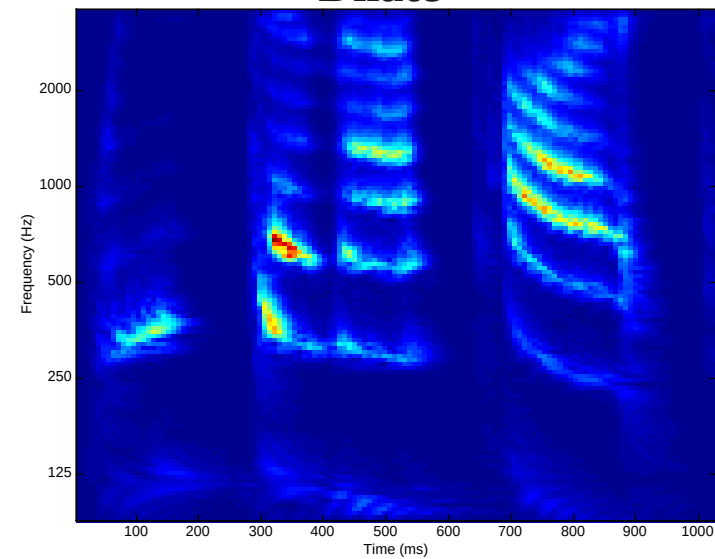
Compress



Down-Shift

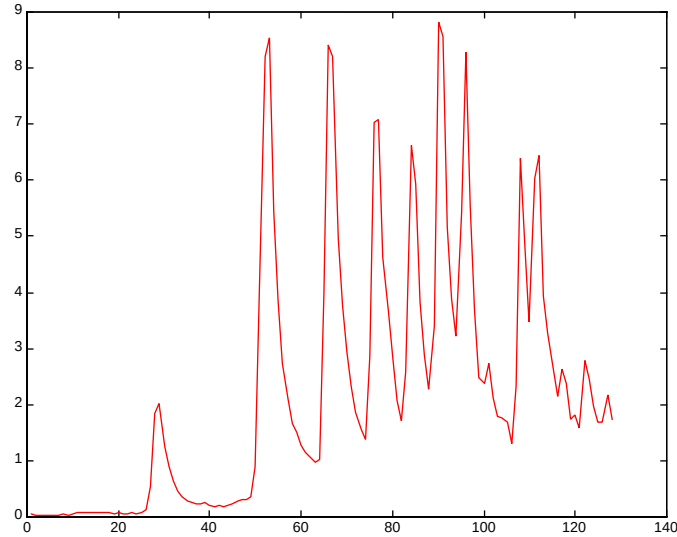
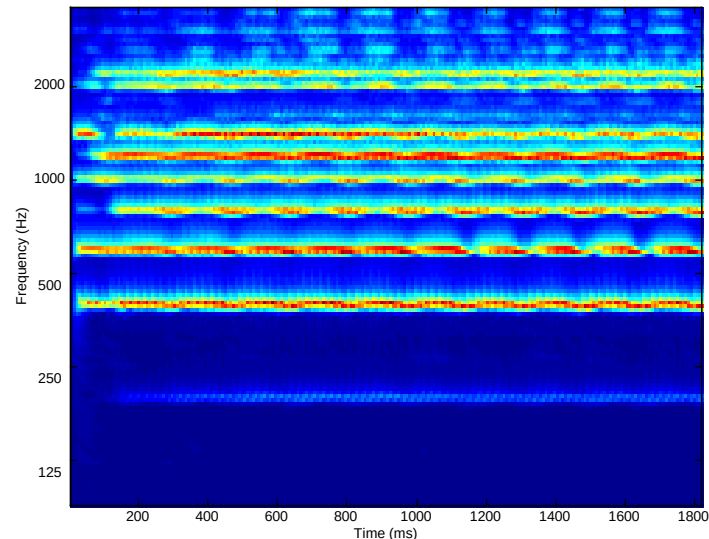


Dilate

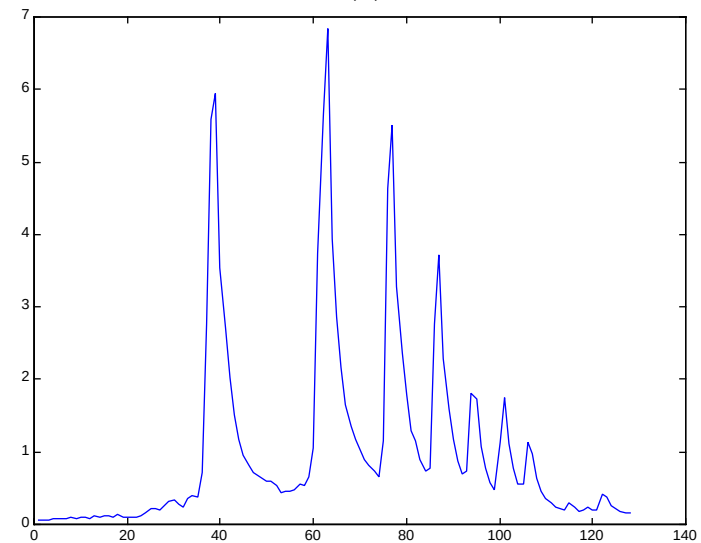
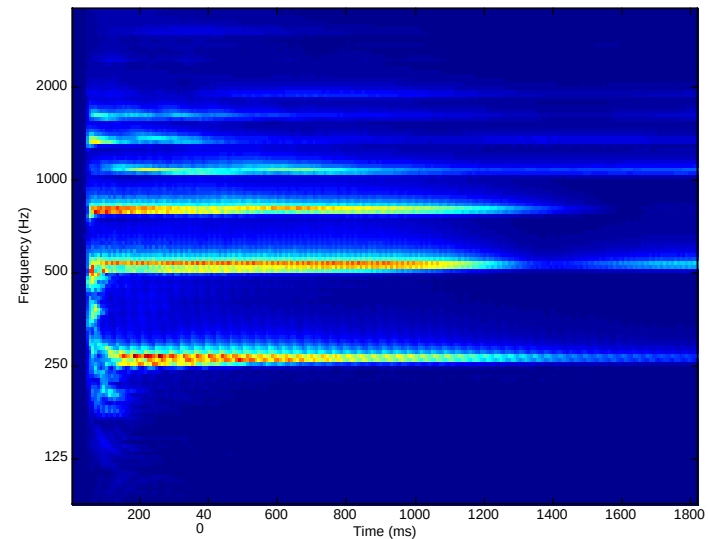


Musical Spectrograms

Violin (vibrato)



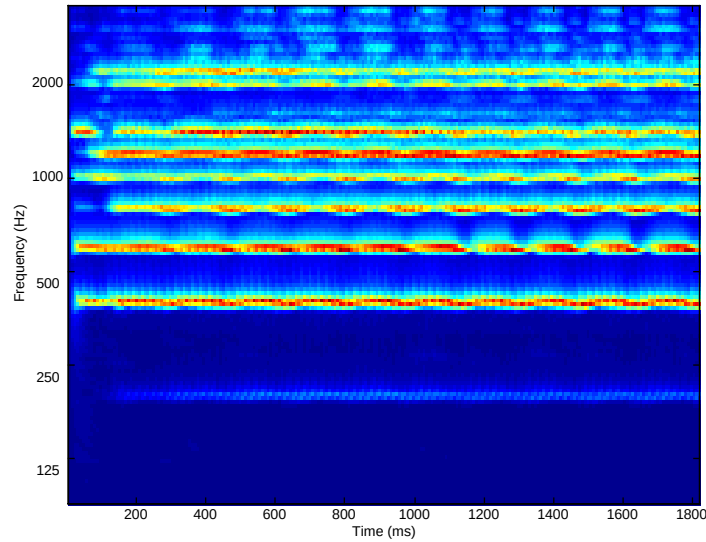
Piano



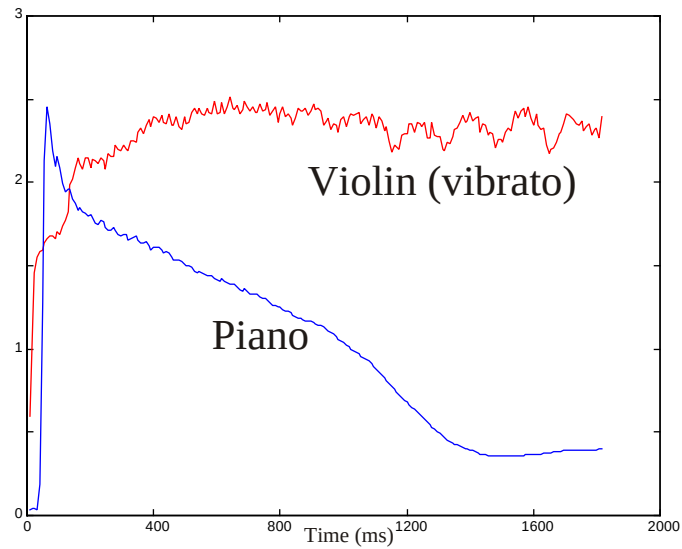
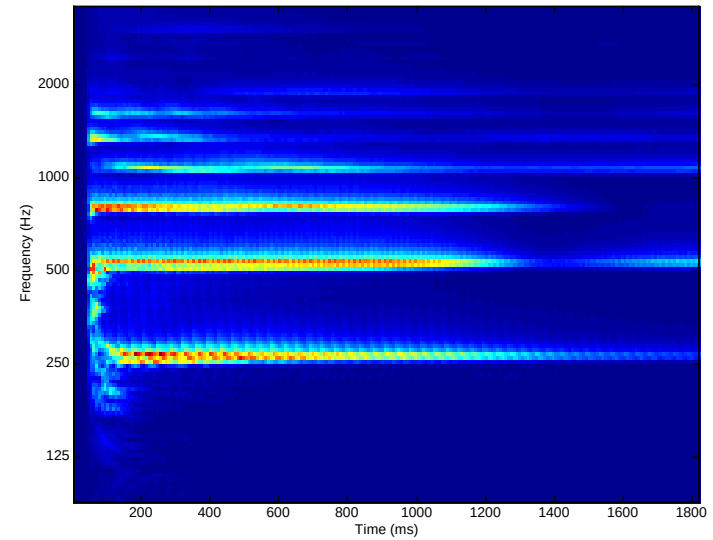
Time (ms)

Spectral Dynamics

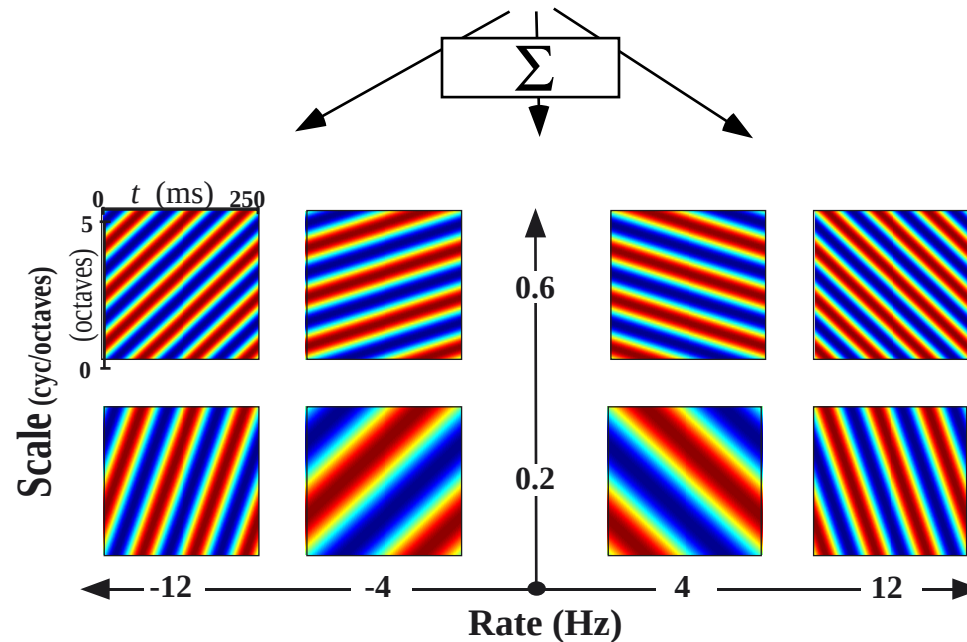
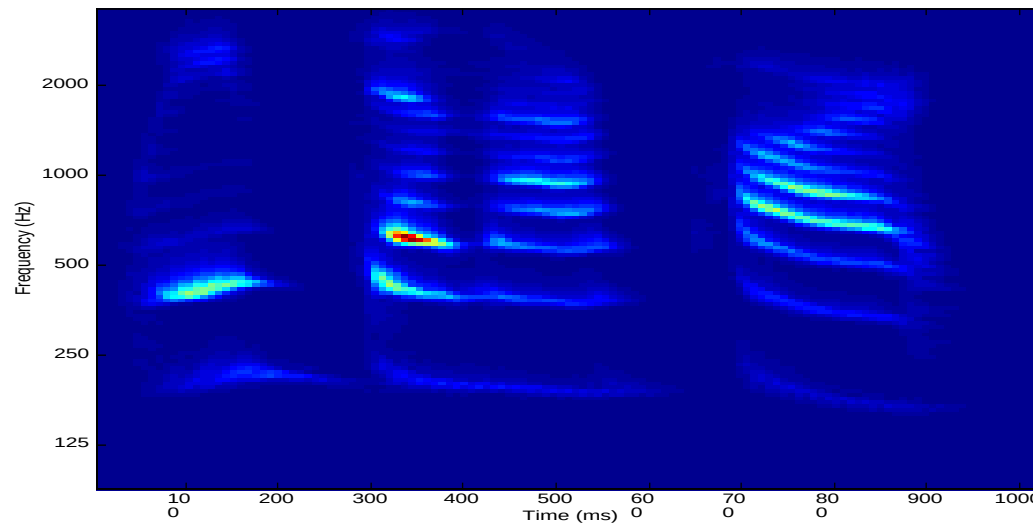
Violin (vibrato)



Piano

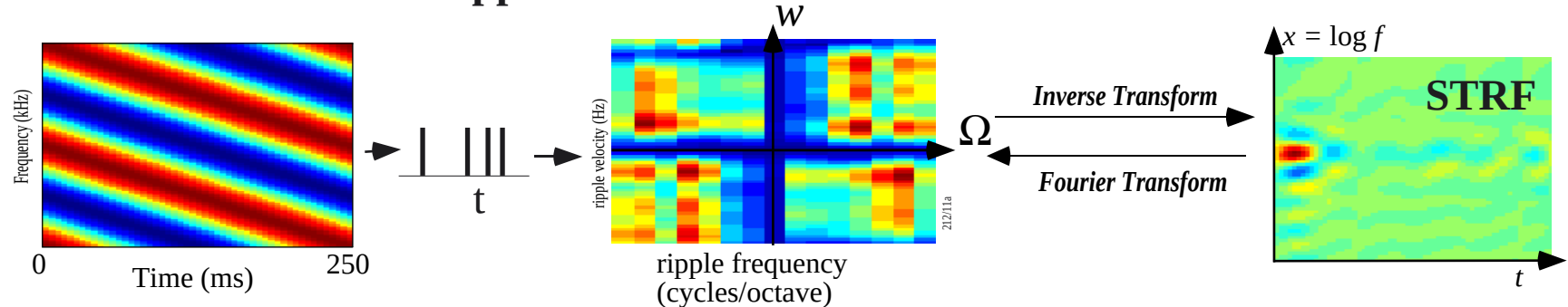


Decomposing a Spectrogram into Dynamic Ripples

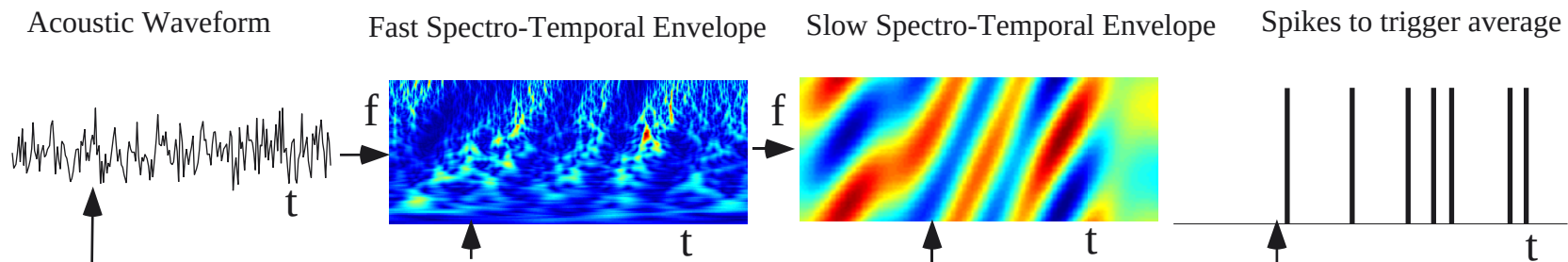


Experimental Methods to Measure the STRF

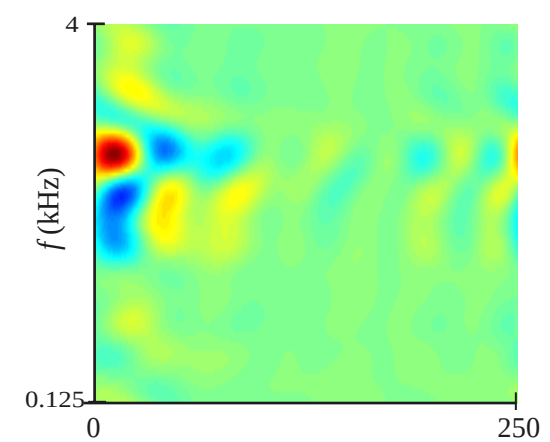
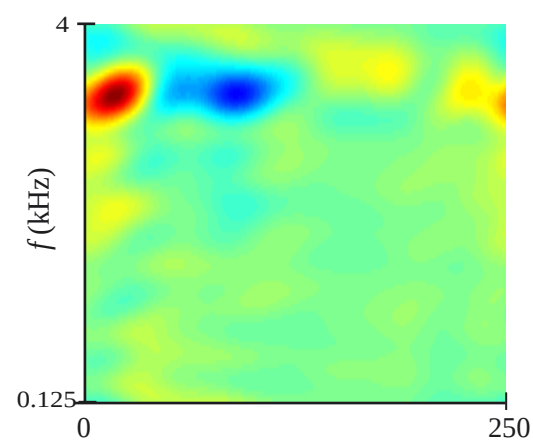
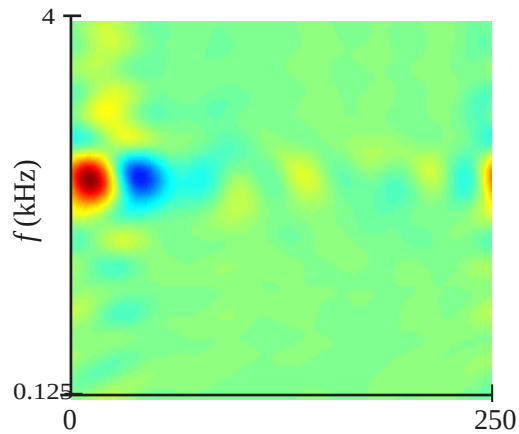
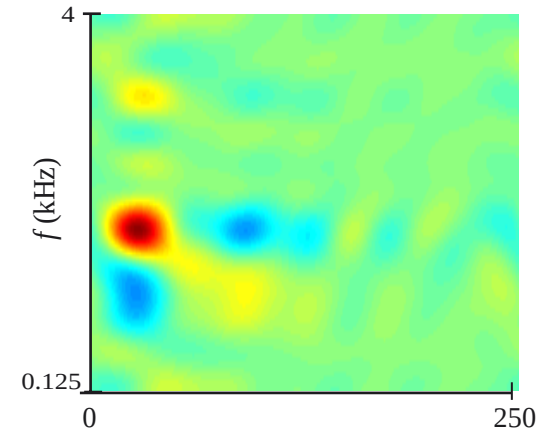
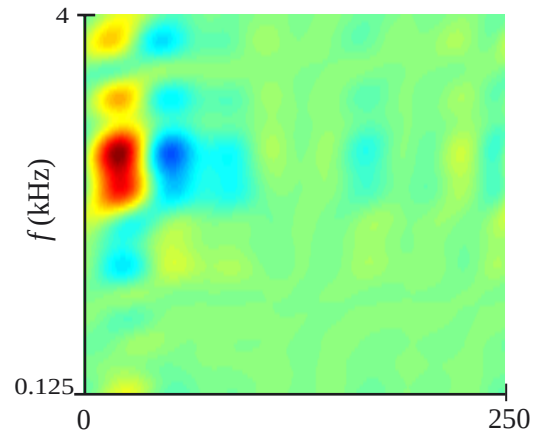
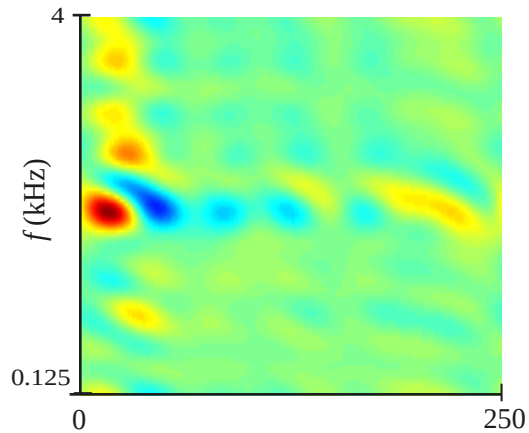
Ripple Transfer Function Method



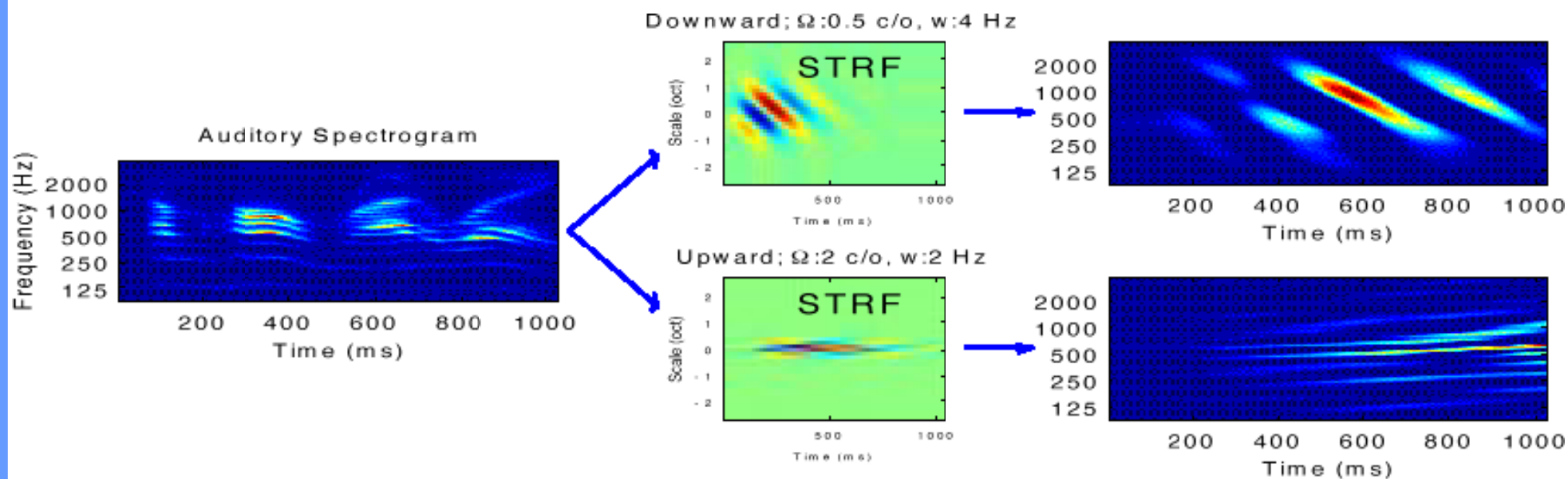
Reverse-Correlation Method



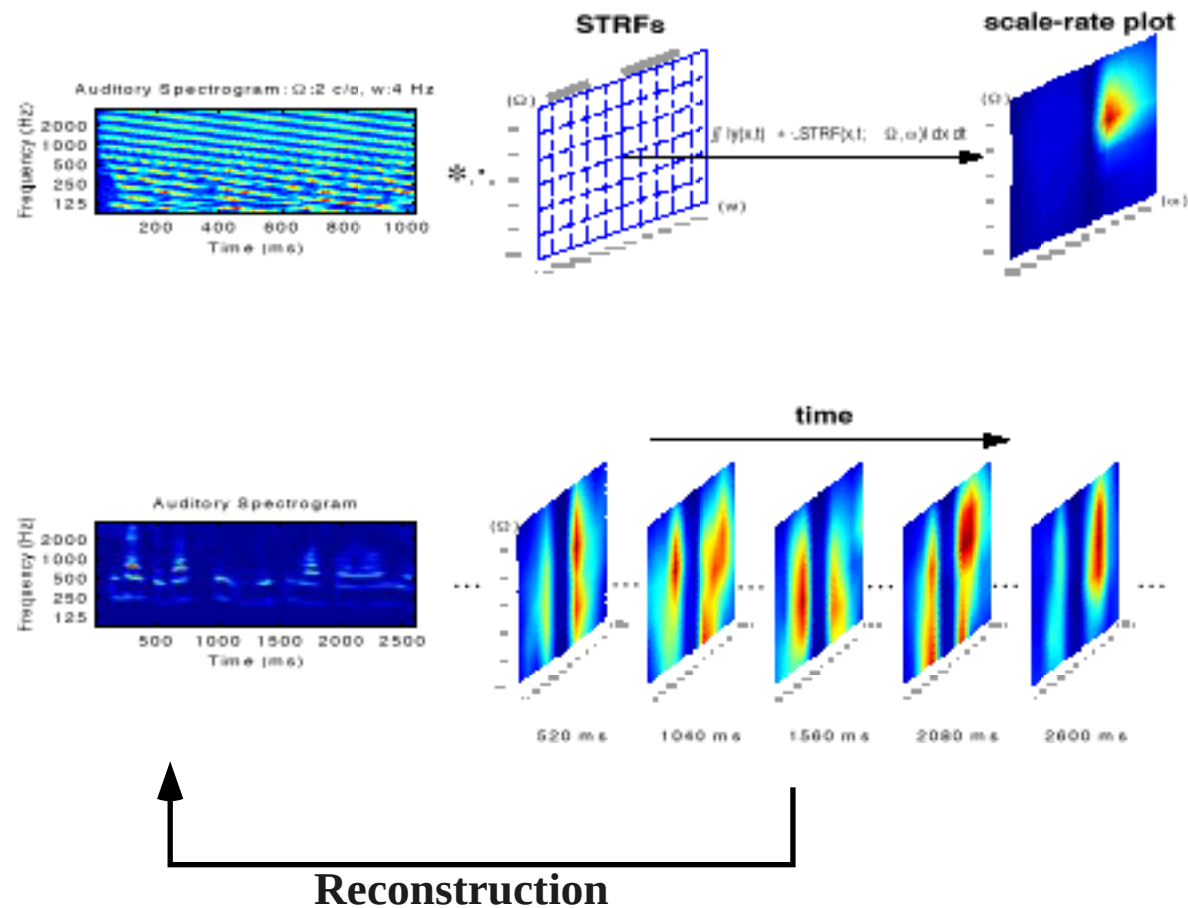
Examples of AI STRF Shapes



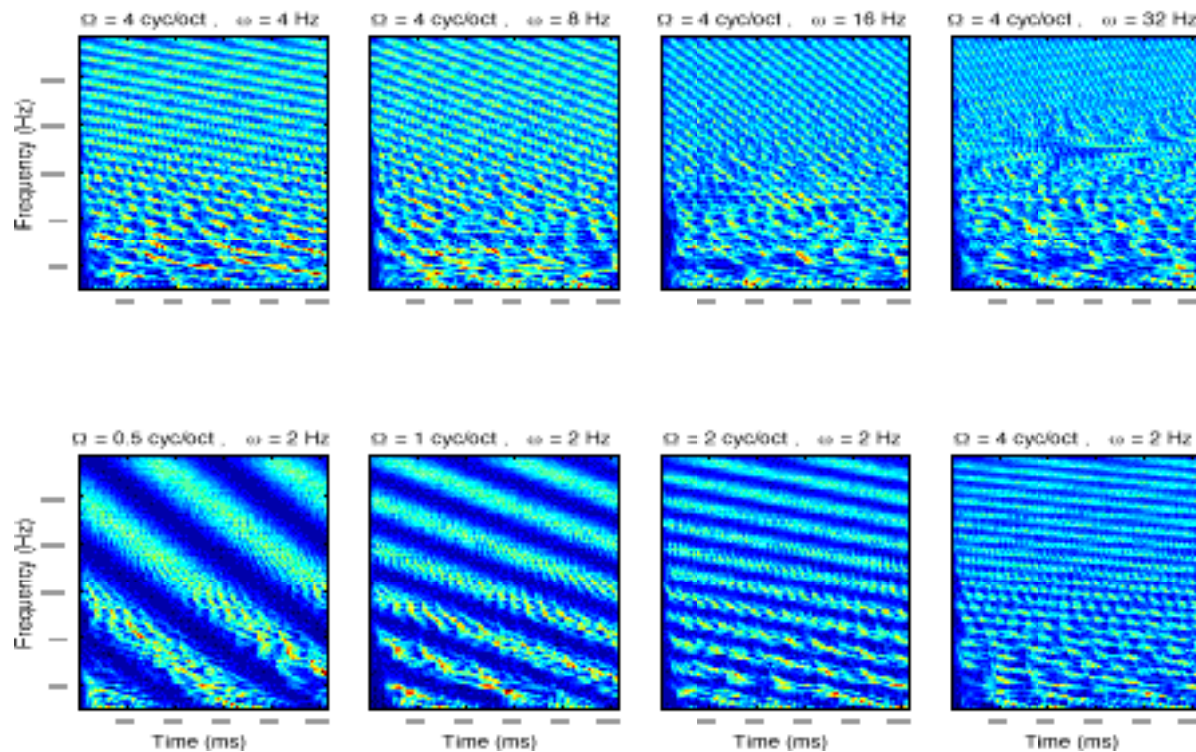
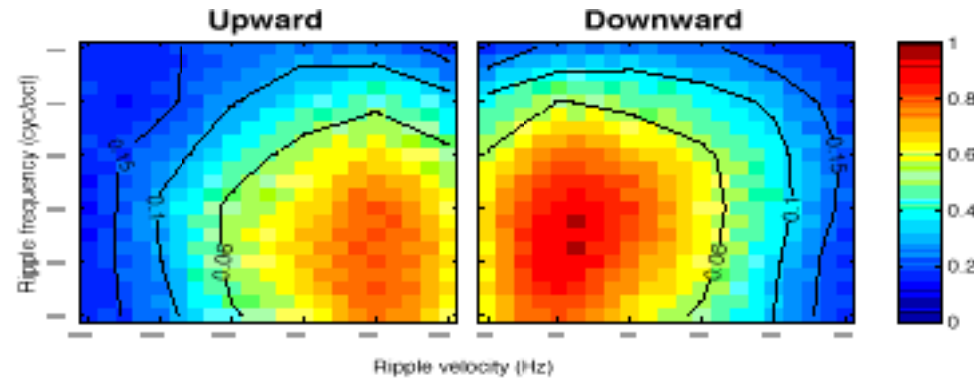
Spectro-Temporal Response Field Decomposition



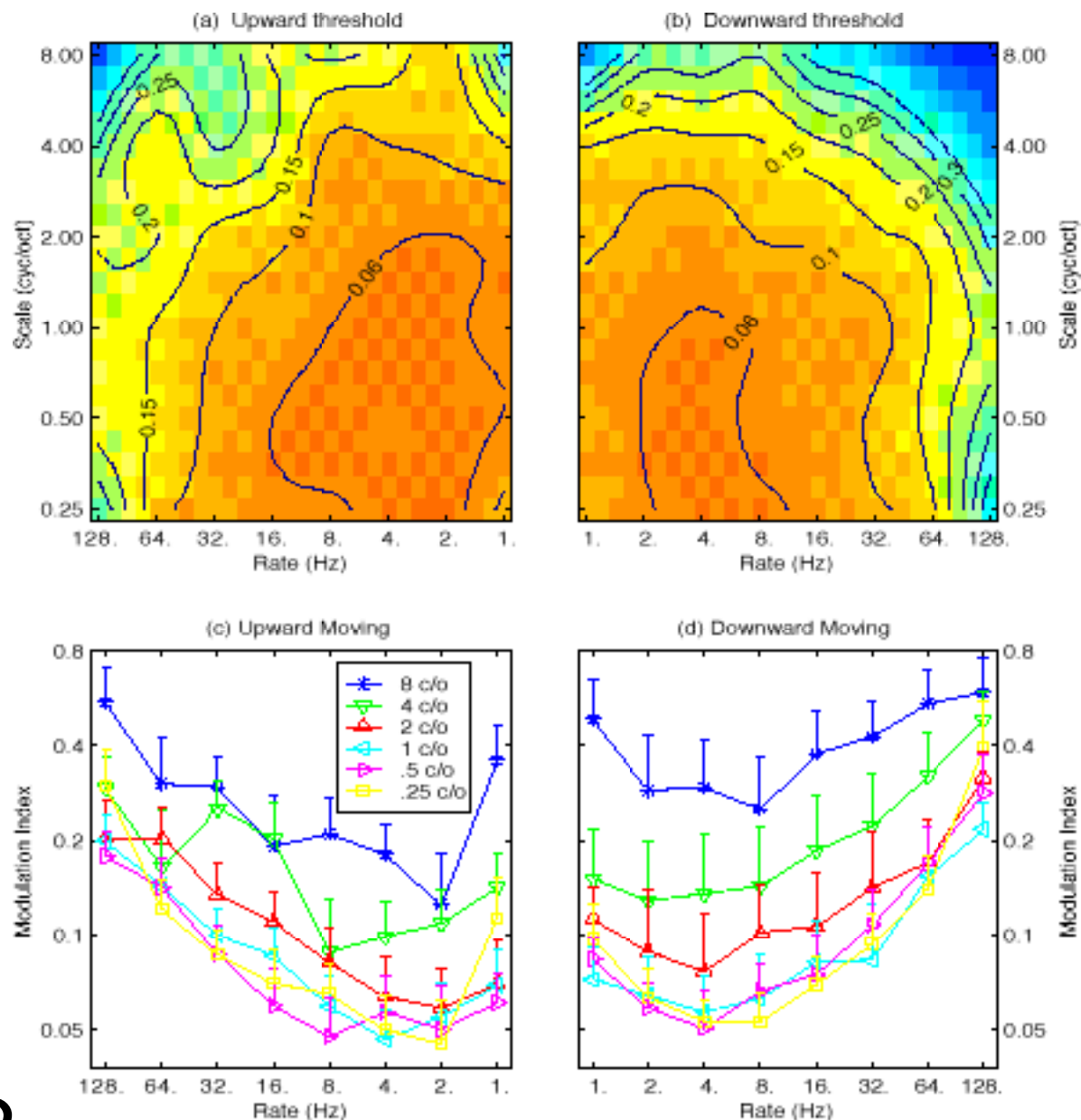
Model of Scale-Rate Decomposition



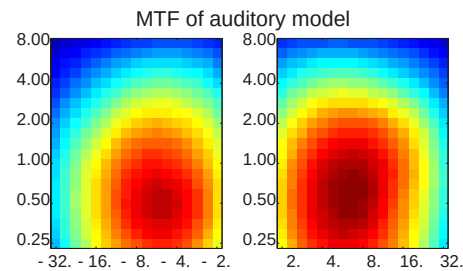
Spectro-Temporal MTFs of the Auditory Model



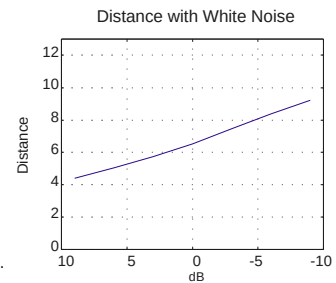
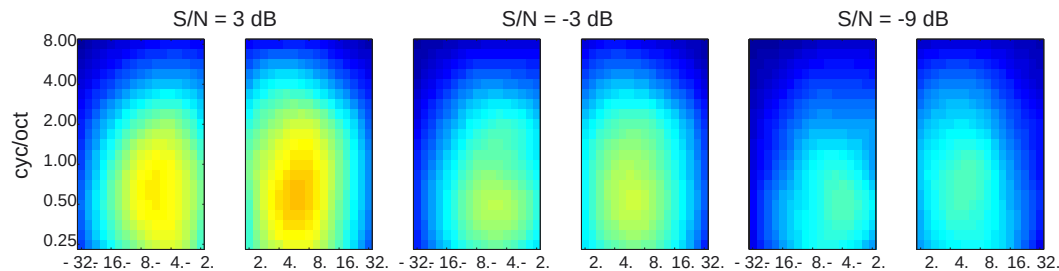
Combined Spectro-Temporal Modulation Transfer Function



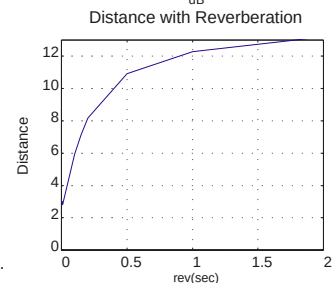
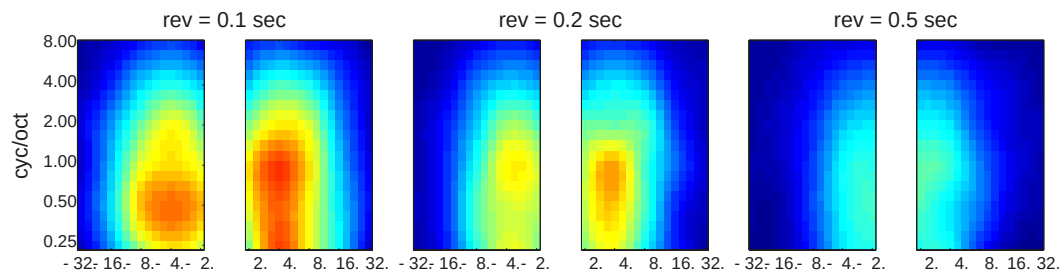
Evaluating Intelligibility



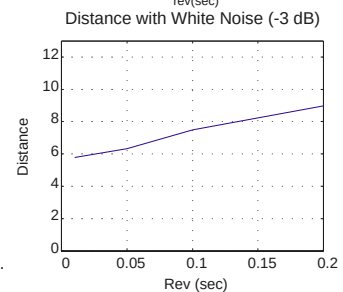
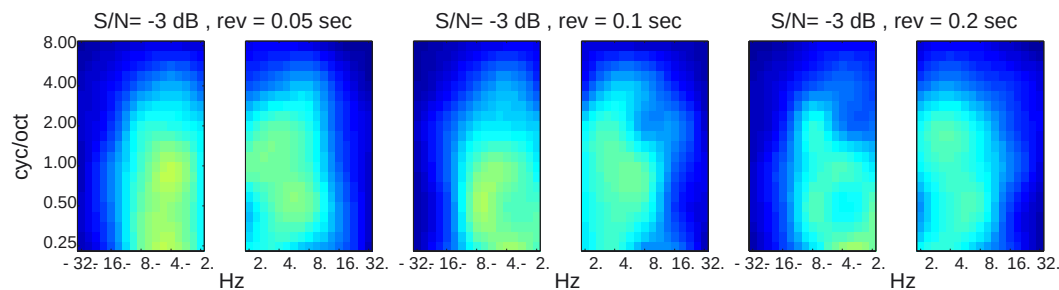
**Stationary
White
Noise**

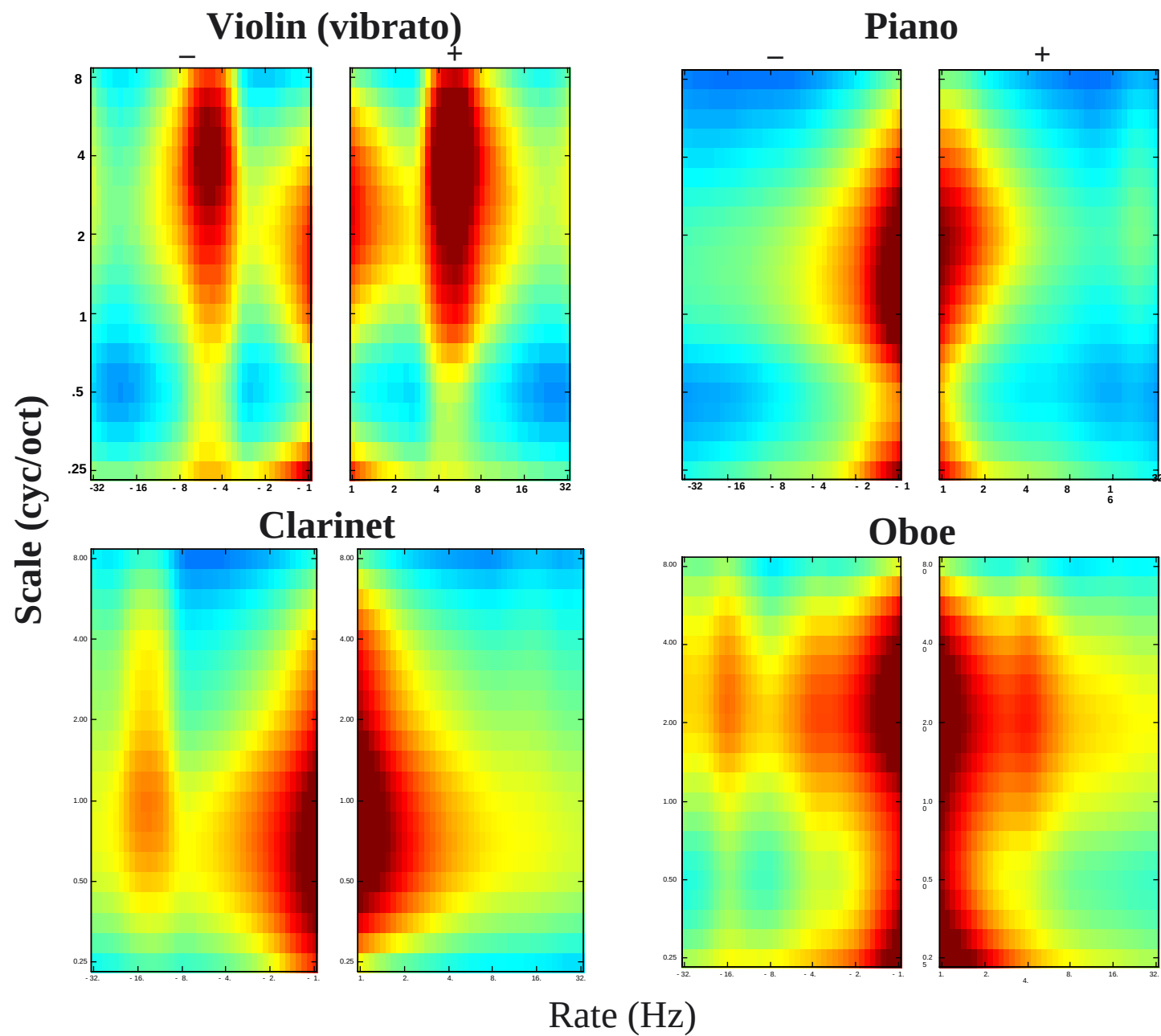


**Reverberant
Environment**



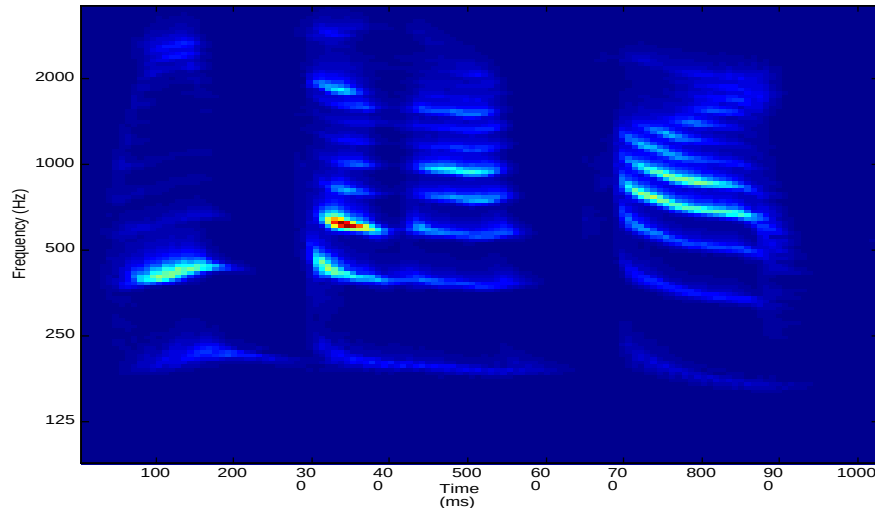
**Noise &
Reverberation**



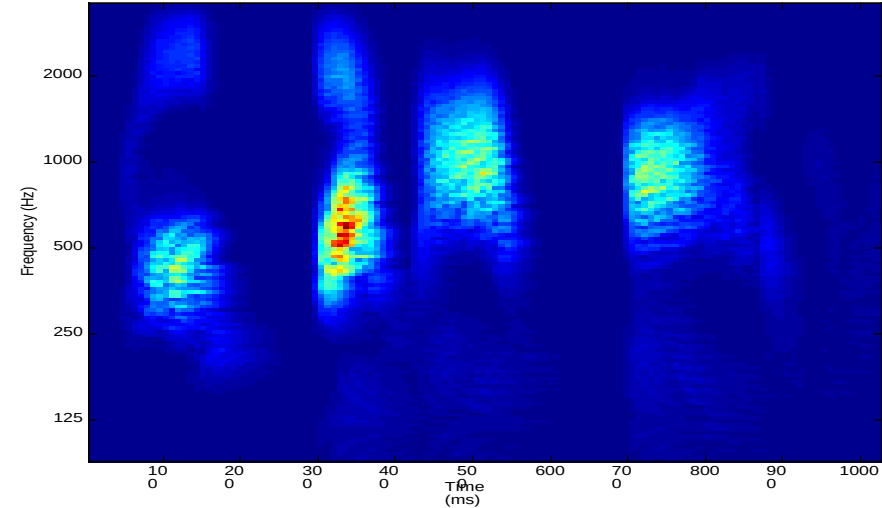


Manipulating Temporal and Spectral Modulations

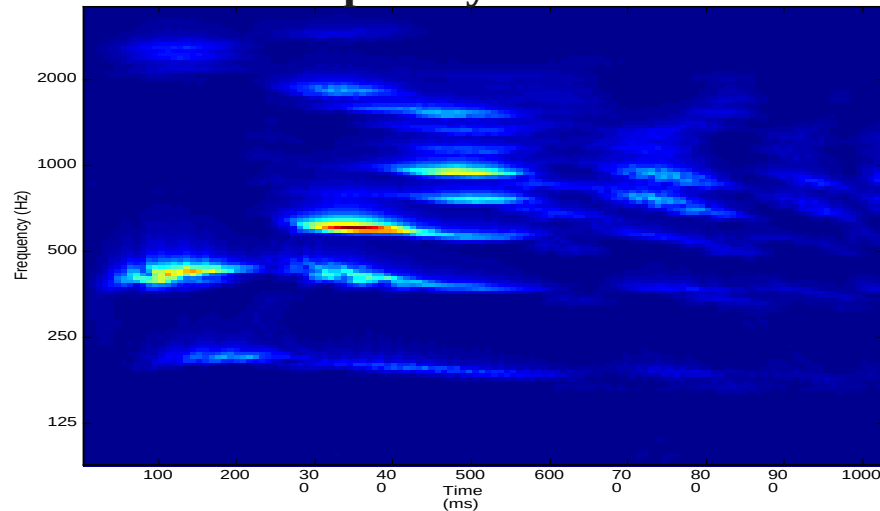
Normal



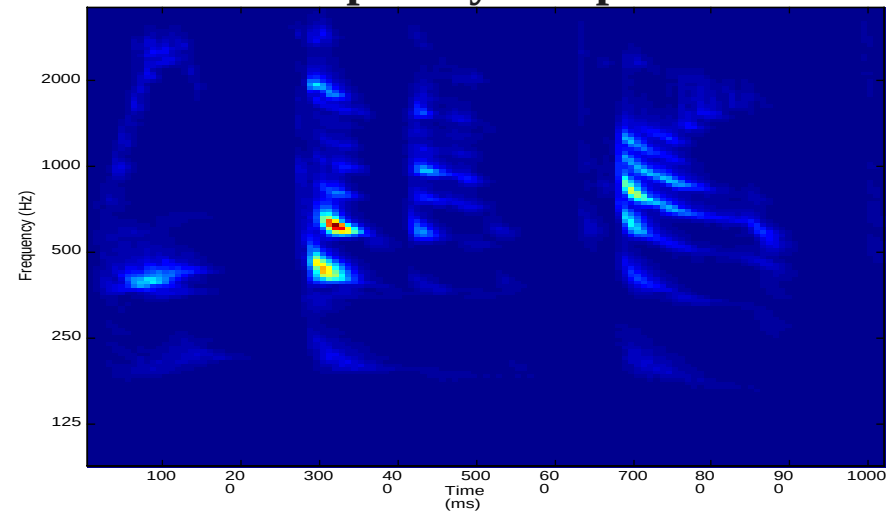
Spectrally smeared

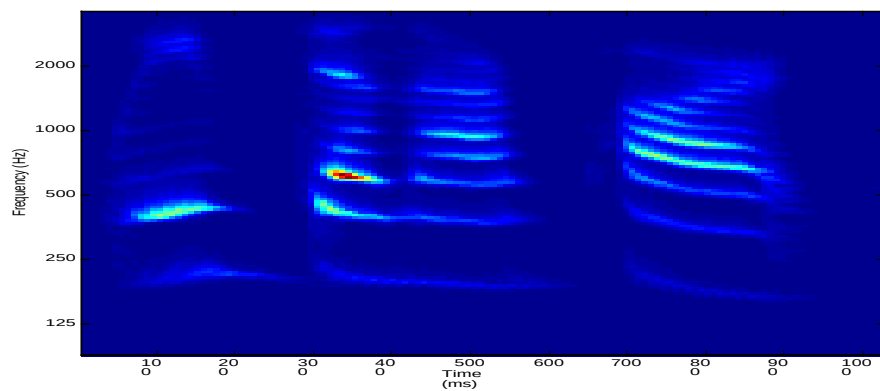


Temporally smeared

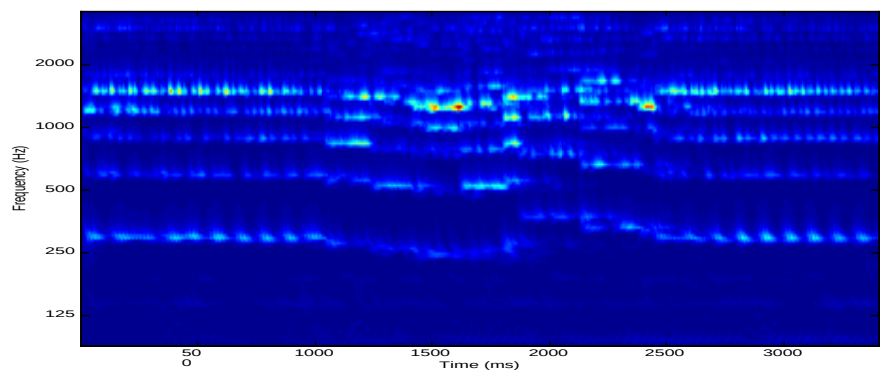


Temporally sharpened

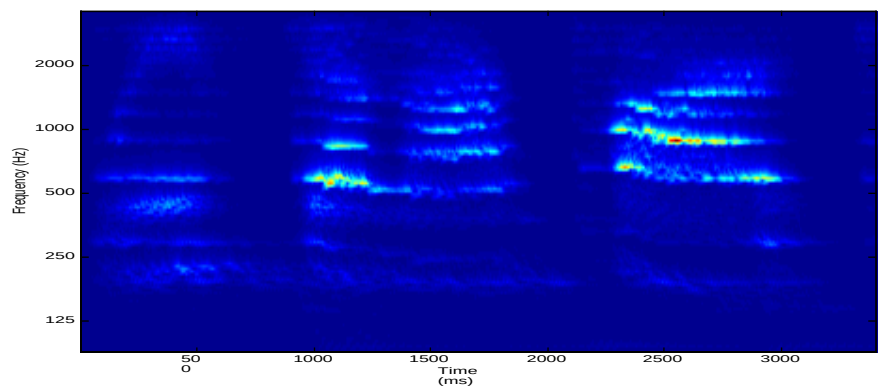




Female



Oboe



Female Oboe

Spectro-temporal modulation transfer functions and speech intelligibility

Chi et al., JASA, Nov. 1999

[<http://www.isr.umd.edu/CAAR/pubs.html>](http://www.isr.umd.edu/CAAR/pubs.html)