

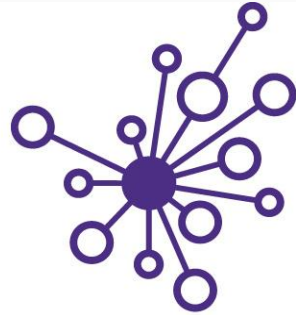
Can we extract neuropil signal automatically?

Valentina Staneva

eScience Institute

University of Washington

February 1, 2016

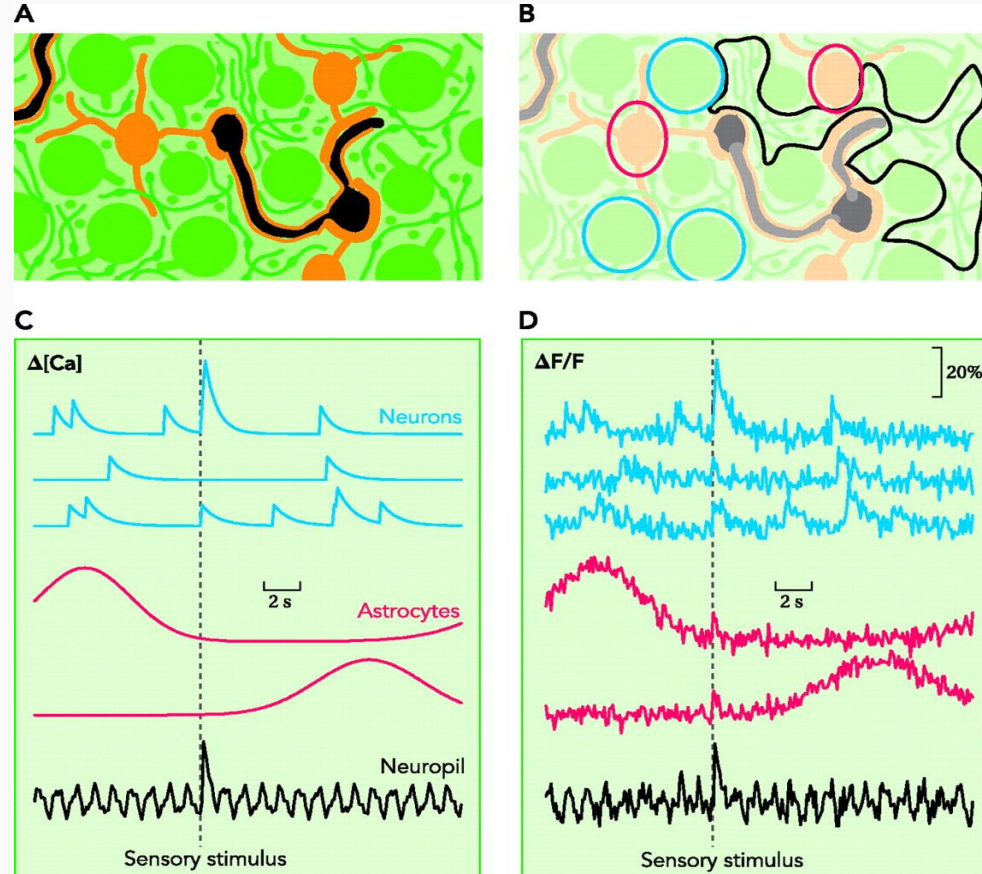


UNIVERSITY *of* WASHINGTON
eScience Institute

Neuropil Signal

Problem:

- neuropil responds to the calcium indicators
- cell signals are mixed with the neuropil signal
- usually extracted manually by selecting ROIs



Can simple dimensionality reduction techniques separate neuropil signal from cell spiking and noise?

Multiple Scales:

Cell Spiking >> Neuropil Signal >> Noise

Big Variations >> Mid Variations >> Small Variations

CRCNS Somatosensory Data (ssc-1)

Simon Peron, Jeremy Freeman, Vijay Iyer, Karel Svoboda (2014); Calcium imaging data from vibrissal S1 neurons in adult mice performing a pole localization task. CRCNS.org. <http://dx.doi.org/10.6080/K000001D>

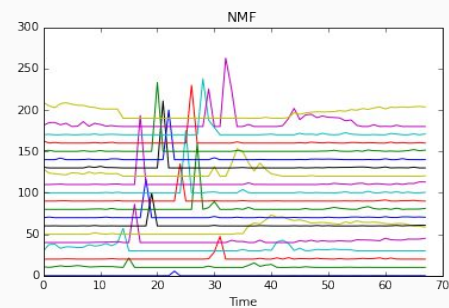
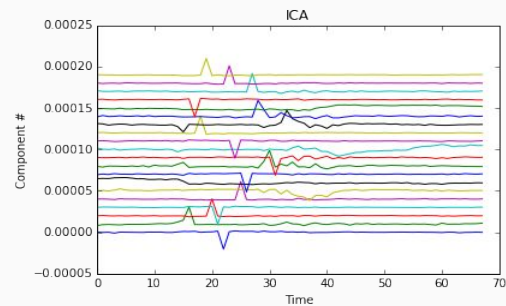
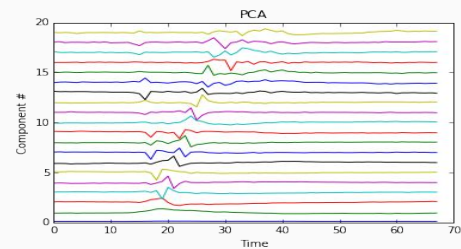
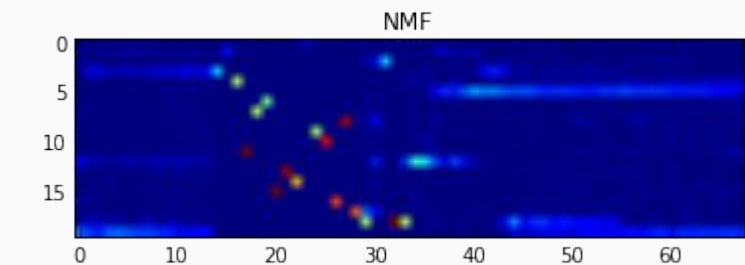
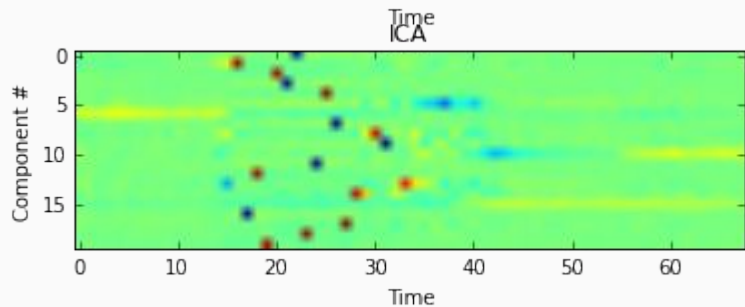
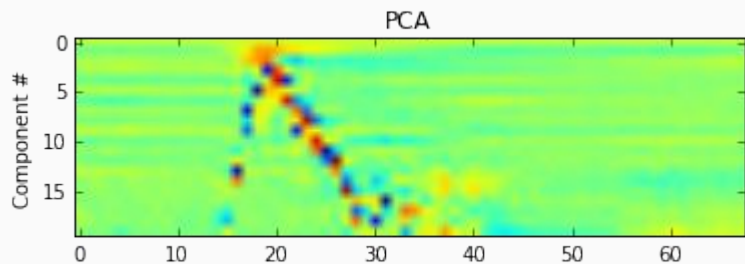
Channel 1 (GCaMP6)



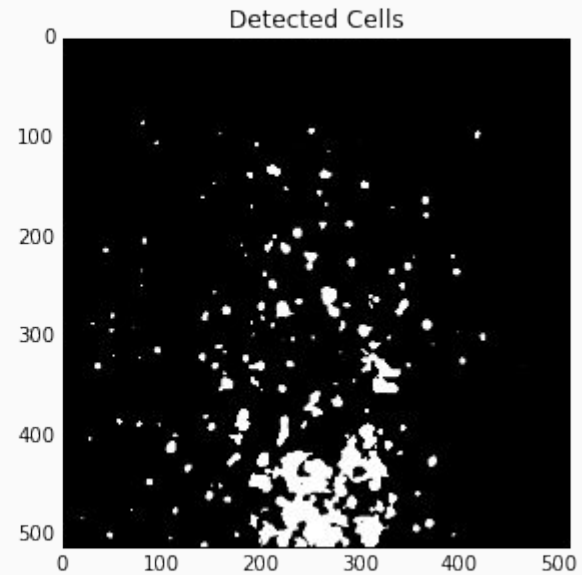
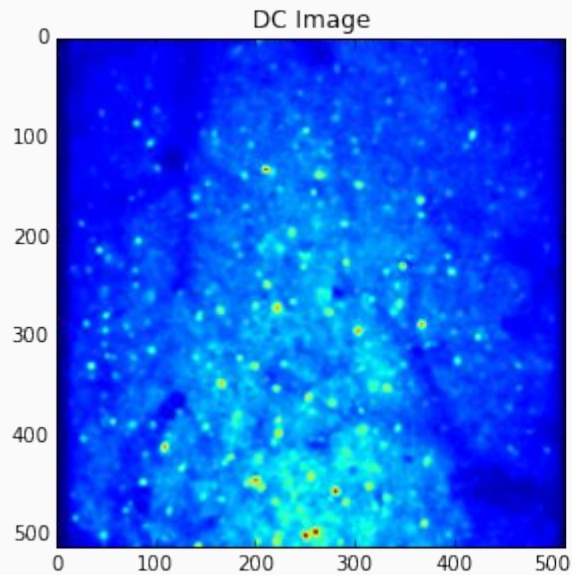
Channel 2 (structural)



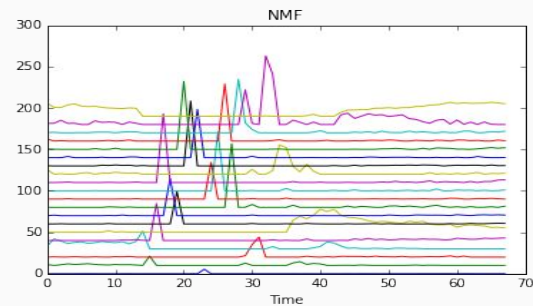
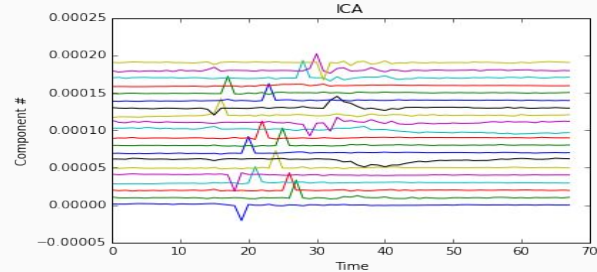
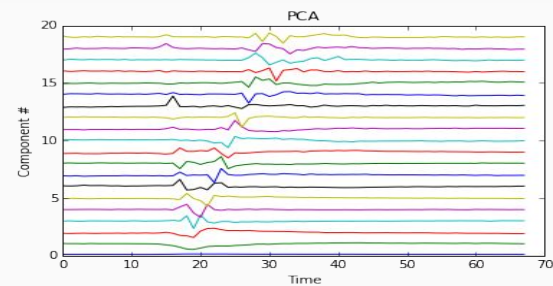
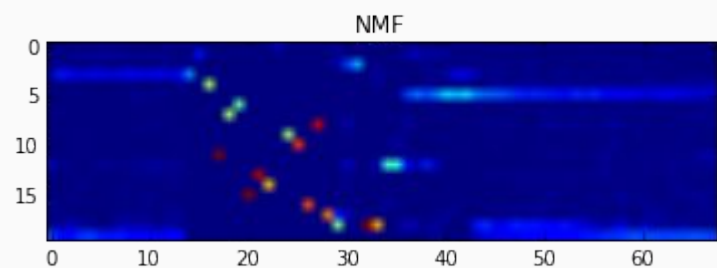
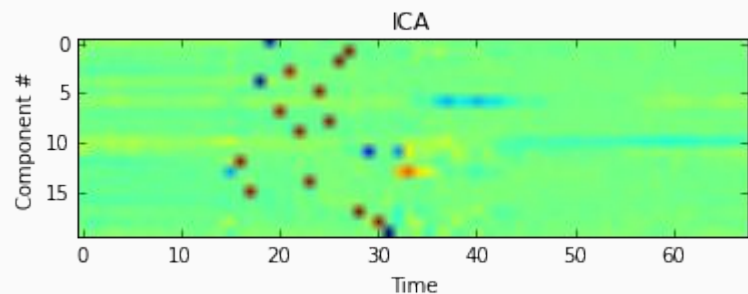
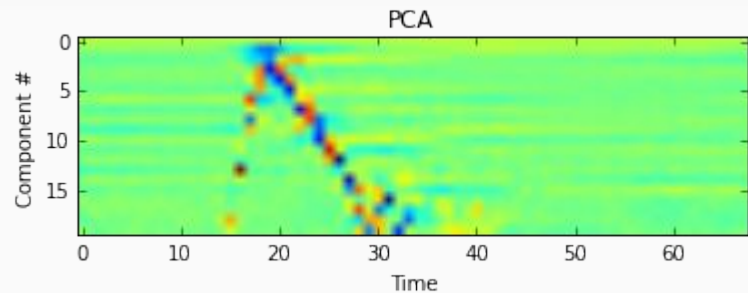
Linear Decomposition Analysis



Extract Cells through Fourier Transform in Time



Linear Decomposition Analysis after Cell Removal



Future Directions

- Learn the correlation structure (in time/in space/both)
- Define a probabilistic version for spatiotemporal decomposition
- Extract structure at all scales: wavelet analysis
- Learn neuropil shape features
- Build a stochastic process which models neuropil and cell signaling simultaneously
- How can we test the performance (both algorithmic and statistical)?

Linear Decomposition Analysis

