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Automated ROI analysis for calcium imaging

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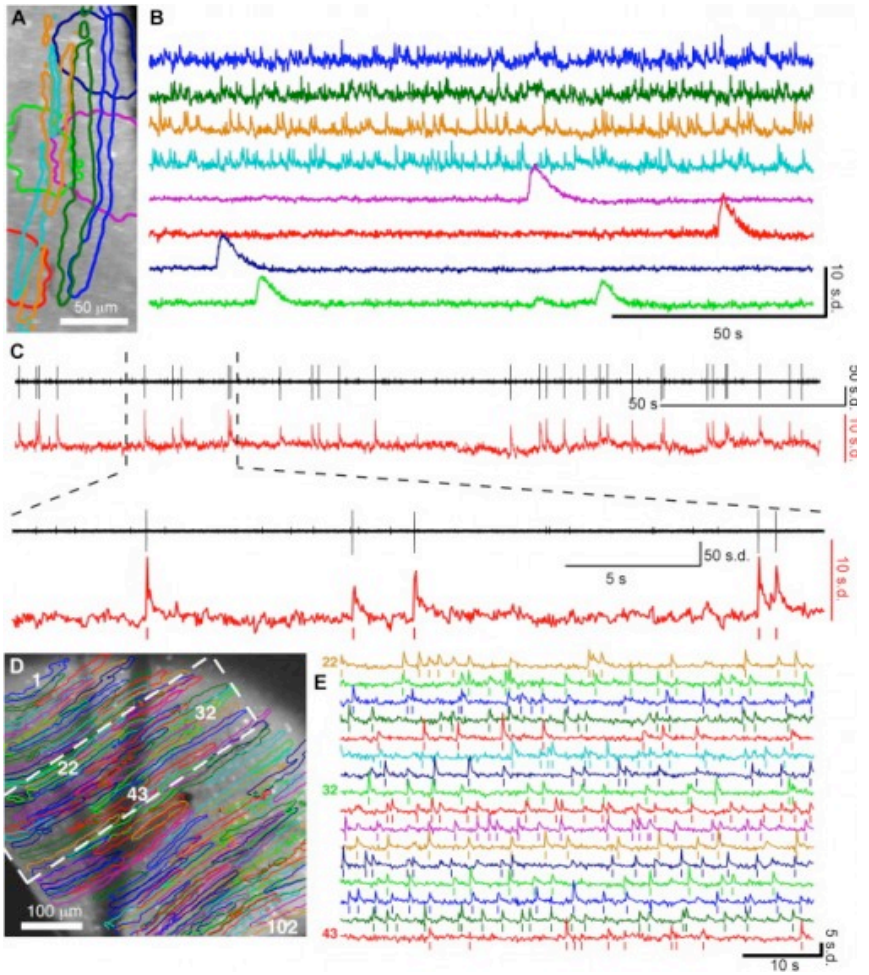
One of the most time consuming and frustrating tasks associated with fluorescence imaging in the brain is picking out your regions of interest. Which pixels do you include in as part of the cell and which are part of the surrounding neuropil? Often, the answer is not obvious, and even with painstaking selections you can make errors. Eran Mukamel et. al, from Mark Schnitzer's lab just published this Neurotechnique Automated Analysis of Cellular Signals from Large-Scale Calcium Imaging Data that aims to simplify and improve the results of ROI selection.

The authors used a multistage approach to identify and quantify the calcium-dependent fluorescence changes of imaged neurons. First, they used principal component analysis to identify the components of the image that were likely calcium signal related and which were noise. The sparse nature of the calcium response (calcium transients are brief and spatially confined) helped the separation from the noise. They threw the noise away. Then they used independent component analysis to pick out which components of the calcium signal changed in a manner independent from other pieces of the signal. These likely represent individual cells. Using this output, they performed auto-segmentation of the image into numerous individual neurons or processes and measured the fluorescence change in those regions. In simulations of data, it resulted in superior data fidelity over hand drawing ROIs. They also validated it with real *in vivo* calcium imaging.



Automated Cell Sorting Identifies Neuronal and Glial Ca2+ Dynamics from Large-Scale Two-Photon Imaging Data

Whether its neuronal imaging, high-speed motion tracking or multielectrode recordings, tremendously large data sets are currently being generated in systems neuroscience. It is simply impossible for a single post-doc to crunch all of her data without major automated computational techniques. In calcium imaging, the resources that have been poured into the development and release of powerful new tools requires an equal effort on the data analysis end to maximize the value of this technique. The automated algorithms presented in this paper look very promising and we will definitely be checking them out in the near future.

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