Segmentation of EM Images of Neuronal Structures Using CellProfiler

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Abstract

CellProfiler is a flexible, open-source tool designed to analyze microscopy images. CellProfiler's primary focus is on analysis of fluorescently labeled cells, but it can be adapted to other uses. This poster describes the analysis of the ISBI 2012 EM challenge images using CellProfiler in conjunction with custom software written for the challenge. The images are first scored with a custom pixel-based classifier trained on the ground truth. This scoring is then used as the input for CellProfiler. I first identify potential centers within tissue surrounded by membrane, and then grow these using a seeded watershed. Finally, I use a module that was custom-designed for the challenge to clean up artifacts in the resulting segmentation.

The CellProfiler EM Challenge entry demonstrates techniques for analyzing neuronal structures. It also demonstrates how CellProfiler can be used as an algorithm development platform. CellProfiler can run ImageJ and ImageJ 2.0 plugins written in Java as well as native modules written in Python. An analysis method can be distributed as a CellProfiler pipeline, contributing to the reproducibility and documentation of the method and allowing researchers to easily integrate both their algorithms and others to arrive at a production-quality and scale solution.

Keywords

CellProfiler, machine Learning, ISBI 2012 EM challenge