

Cell Sorting with Generic DCNNs

Student: Arash Outadi

Project Sponsor: Hong Ma

Project Period: September 2018 – April 2019

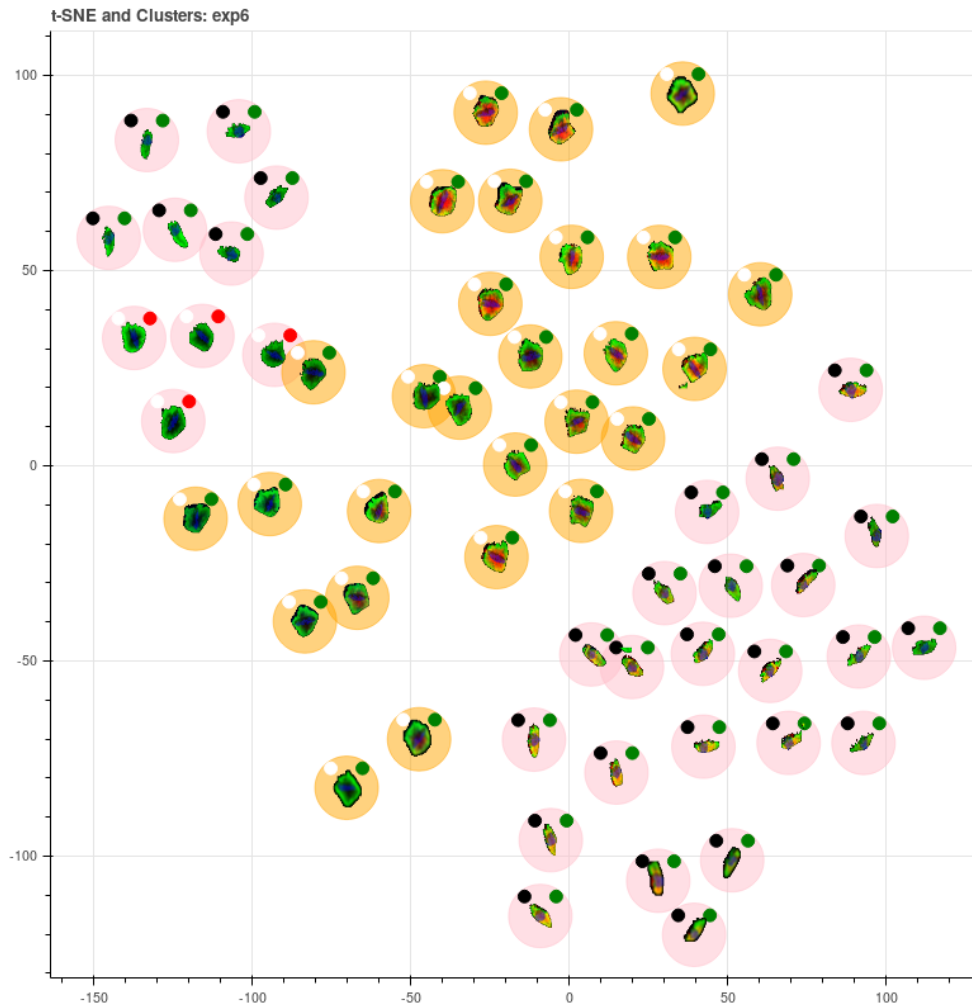


Figure 1: t-SNE graph of two populations of cells clustered together based on features output from Inception V3 DCNN. Background circles represent assigned clusters (orange & pink), top left circles represent actual population class, top right represent if cluster assignment was correct. Finally x, y position is based off of t-SNE

Traditionally cell sorting involves hand picking several hundred measures by an expert to accurately describe the morphological profile of a cell [1] [2]. This thesis explores the use of generic deep convolutional neural network (DCNN) to automatically extract high level features that could be used to cluster cells based on their characteristics without the need for an expert.

This technique can further avoid excessive training times and a need for a large data-set through “transfer learning”; a technique where knowledge is “transferred” from a previously learned task to the task at hand. In this thesis the open-source Inception V3 DCNN with pre-trained weights from the ImageNet data-set is used as a starting point [3] [4].

Notes:

1. Cell Sorting = grouping cells together based on characteristics
2. Morphological Profile = High level features that describe the cell based on its shape, structure, texture and neighboring context
3. Szegedy, Christian, et al. "Rethinking the inception architecture for computer vision." *Proceedings of the IEEE conference on computer vision and pattern recognition*. 2016.
4. Olga Russakovsky*, Jia Deng*, Hao Su, Jonathan Krause, Sanjeev Satheesh, Sean Ma, Zhiheng Huang, Andrej Karpathy, Aditya Khosla, Michael Bernstein, Alexander C. Berg and Li Fei-Fei. (* = equal contribution) ImageNet Large Scale Visual Recognition

Copyright held by UBC. UBC Authors are:

OR

The copyright holders of this file grants permission for its use through a Creative Commons license, and the uploading and use of this file to the UBC Wiki is compliant with the license terms (select specific license):

- Creative Commons Attribution 2.5 Canada ([legal code](#))
- Creative Commons Attribution ShareAlike 3.0 ([legal code](#))
- Creative Commons Attribution ShareAlike 2.5 ([legal code](#))
- Creative Commons Attribution 3.0 ([legal code](#))
- Creative Commons Attribution 2.5 ([legal code](#))
- Creative Commons CC0 Waiver (release all rights, like public domain: [legal code](#))