**Step by step guide**

All CPU, no GPU

Tested on Windows 10, MATLAB 2020b. Older versions of MATLAB are expected to run normally.

Required MATLAB Toolboxes:

-Image processing Toolbox

-Deep learning Toolbox

Download all the components to run the provided examples, and classification used in our manuscript.

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**Binarized\_DataSet.zip**

This folder contains the contour polygonal 2D shapes of the 62 cells used in this study (x-y-z-t).

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**Polygon\_to\_3D.m**

This code is used to reconstruct and visualize a 3D cell from its segmented 2D x-y images over Z and T. Example image set is provided in the folder name “TrjctID\_0005\_MS” that contains 4D (X,Y,Z,T) binarized polygonal images that represent a single cell (cell#5). This cell was tracked over 23 time points (T3 to T25), and for each time point the number of Z planes might be different because of difficulties during time-laps live imaging, by which deeper Z planes were sometime difficult to be recorded.

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**SIM\_Generator.m**

This code generates a 2D Signature Intensity Map (SIM) image from the binarized boundary images of a cell. Image dataset found in folder name “TrjctID\_0005\_MS” can be used and this will transform them into their 360 rotations of SIM images, RGB, of size 224×224.

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**Find\_Significant\_Locations.zip**

A robust cell (here for example cell ID 5) was tested over 33 locations for SVM insertion over ResNet-101. Group\_A contains 8 SIM images of each cell in T25. Group\_B contains 8 SIM images of cell ID5 in T24 only. Locations that could produce the answer 5 for all 8 SIM images (8/8) are considered to be significant locations for SVM insertions. Results are shown in excel file: RESULT\_T24\_all\_matching\_possibilities\_forExperimenting\_TrjctID\_0005

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**One\_vs\_All\_Cells\_in\_T25.zip**

First apply **One\_vs\_Rest\_of\_folders.m** for the folders found in Parent\_Folder. This will arrange folder in one vs all fashion (Group\_A for training set, and Group\_B testing set) to train our ResNet-101.

**Major\_SIM.m** Used to select the desired SIM images from all 360 SIM images.

**ResNet\_101\_SVM.m use B12 as insertion location for SVM over ResNet-101**

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**Connection\_Graph.m** will generate the connection map between cells at the desired stringency level.