

How-to-SVM

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Introduction

What is a Support Vector Machine?

Support Vector Machines (aka “SVM”) represent a particular flavor of supervised machine learning, which can be used to predict the classification of observations or as a method of regression. The concept works by generating a set of hyperplanes that best separate pre-defined classes. This makes the algorithm extraordinarily well suited to mimicking manually defined populations, as are typically generated in many single-cell data analyses. This plugin works by creating SVM hyperplanes from high parameter data and using those training vectors to replicate populations in new datasets.

When Should I Use this Type of Machine Learning?

This supervised machine learning technique is going to work best when populations are bi-modal and sit within the saddle-points of parameters used to define the SVM model of the training data.

SVM can also be invaluable when generating regression parameters to help distinguish different conditions, or cell types.

If you have a template which is meant to automatically adjust gating vertices according to some day to day or subject to subject variability, SVM can be used to help maintain reproducibility and achieve maximum efficiency of analysis.

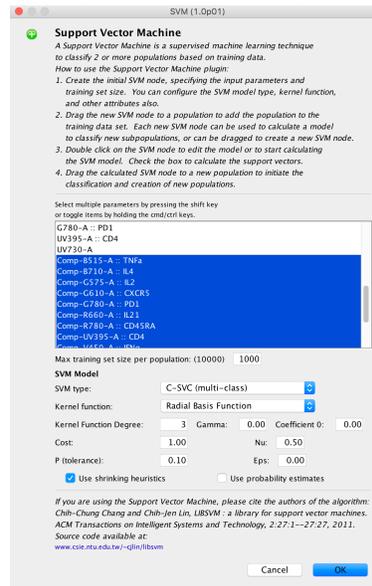
Use

SetUp

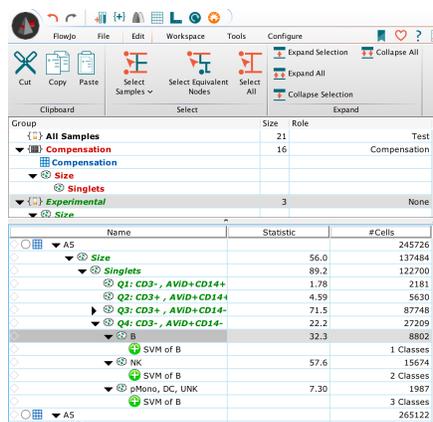
Load the plugin into your plugins folder, and restart your application.

Run SVM Modeling

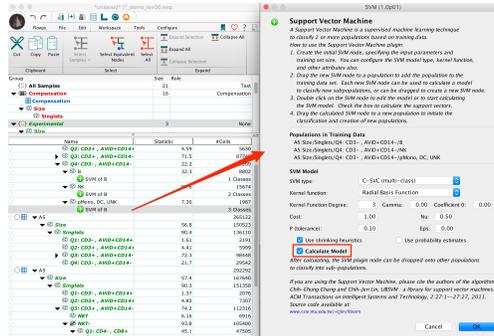
Create a gate, or set of similar gates that you'd like to model with the SVM, and select the first one. From the plugin dropdown menu within the Workspace tab of your workspace, select the "SVM" plugin option there. Follow the instructions listed for selecting parameters of interest, as well as setting up the type of SVM model you hope to utilize.



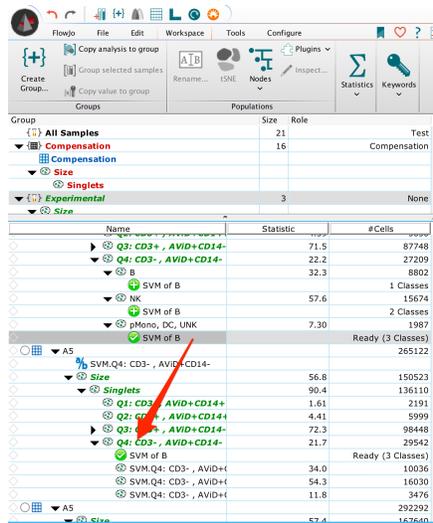
After the first population is set to be included in the SVM model, users can drag and drop the SVM plugin node to other populations in order to include them for classification by the model.



When the final population has been identified for classification, double-click on the SVM plugin node, and run the modeling algorithm by checking the option there to “Calculate Model” in order to model those populations of interest.



To apply the model to a fresh population - drag and drop the finalized SVM plugin node to that new population of interest.



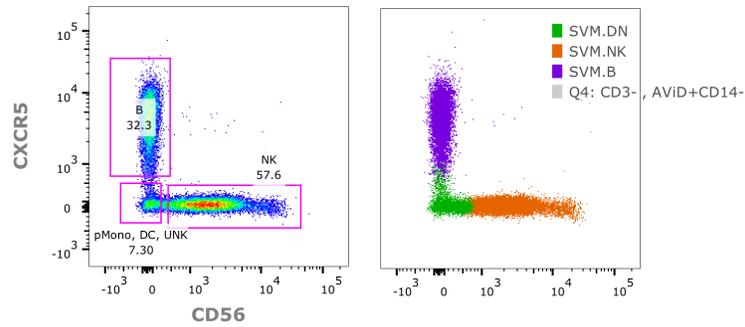
Once the populations of interest have been modeled, you can drag and drop this finalized model to any subset or group owed population of interest in order to generate a similar modeling of those populations.

For additional information on plugin setup, see the documentation, here:

<http://docs.flowjo.com/d2/plugins/installing-plugins/>

Examples

Here we can see the result of an SVM run as compared to the original hand drawn classifications:



References:

- (1) Chih-Chung Chang and Chih-Jen Lin. "LIBSVM A Library for Support Vector Machines".

<https://www.csie.ntu.edu.tw/~cjlin/libsvm/>