

---

**User Manual**

# **VisCanvas Data Visualization Software**

**Provided by:  
Daniel Ortyn  
Nicolas Espitia  
Shane Vance  
Brennan Barni**

Data Visualization Group A

2-22-2018

## Contents

Introduction.....	3
Getting Started .....	3
Saving/Loading VisCanvas Files.....	3
Main Window .....	4
Options Panel .....	5
Help Tab.....	5
Data Analysis/Manipulation Functions .....	5
Click and Drag.....	6
Sorting .....	6
Hypercube and Cluster Functions.....	7
Specifying Coordinate Relation Functions.....	8
Accessibility Functions .....	9
Secondary Properties Window – Tools Panel.....	10
Class Tab .....	11
Class Set Tab.....	12
Set Tab.....	13
Dimension Tab .....	14
Cluster Tab .....	15

## Introduction

VisCanvas is a data visualization software that creates visual representations of numerical data, commonly referred to as “data visualizations”. Data is read from comma delimited text files with no spaces. The software includes a suite of data manipulation, analysis, and classification functions, as well as a host of accessibility features to allow users of varied backgrounds and skillsets to interpret and interact with their data in visual form.

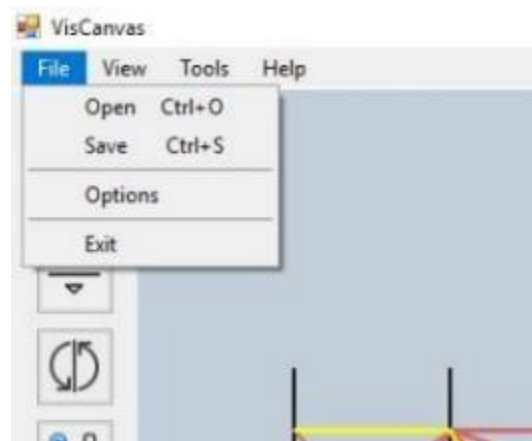
## Getting Started

The program has two windows in total that will allow the user to access VisCanvas functions: the primary window and secondary window. The primary window contains the graphing panel where all n-dimensional data and graphing functions will be presented. The secondary window will allow the user to access all functions regarding the properties of data (i.e. data color, names, values, class assignment, etc.), and preferences. The secondary window functions will be separated by tabs, segregating functions by the data it affects (class, set, and dimensions).

Upon startup of VisCanvas, the user will be greeted with the main window. To begin graphing data points, the user can open a comma delimited text file either through clicking the open file button on the top left of the screen or by pressing “CTRL+O”. From there, a dialog box will pop-up, wherein the user can choose a text file from any directory. Once a file is chosen, a visualization will be created from the data stored within the text file before being drawn to the graphing window, where it may then be interacted with by the user.

## Saving/Loading VisCanvas Files

Along with reading data from a comma delimited text file, VisCanvas allows the user to save their progress with their visualization for later sessions of the software. Previously saved data may be read in again into the software, ready to continue analysis where left off.



*Figure 1 Save and open files through the File button at the top left of the main window*

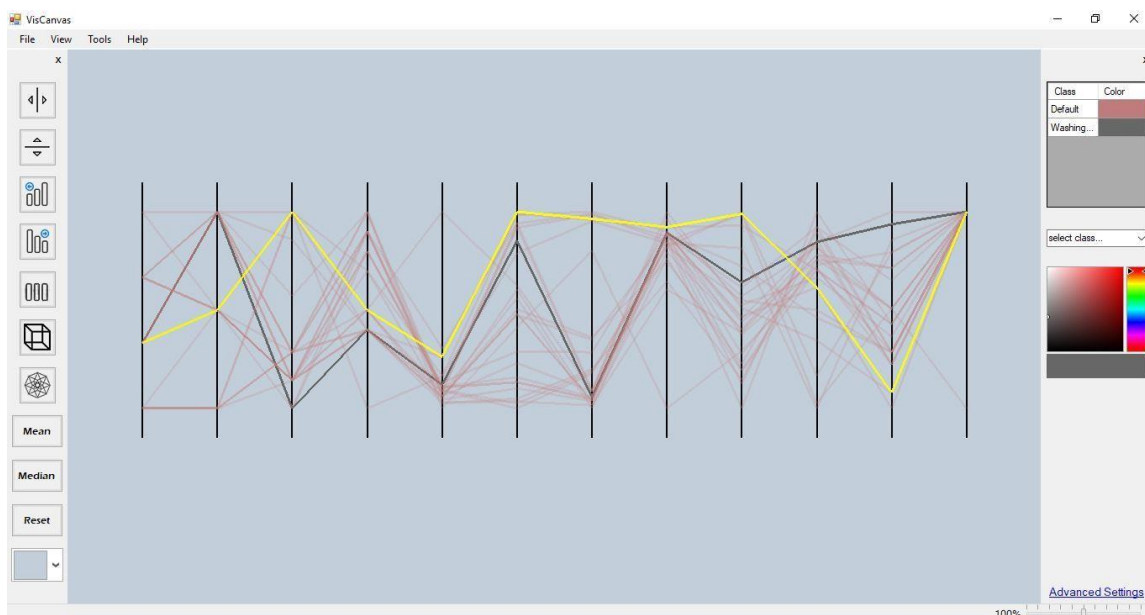
To save a file, one may do so by either accessing the “Save as” option in the “File” button at the top of the main window, or by simply pressing the hotkey “CTRL+S”. Choose the preferred directory the user will wish to save the text file to. Once finished, the software will leave the text file in the desired directory. **WARNING:** manipulating the file outside of the VisCanvas software may result in a corrupt file.

To open a saved file created from VisCanvas, simply access the “Open” option located in the “File” button at the top of the main window, or by pressing the hotkey “CTRL+O”. The user then may navigate and choose the desired file to read in. The resulting visualization will be drawn from the data with all previously made changes committed from the earlier session of the saved file.

## Main Window

The main window will have access to all data analysis and manipulation functions with limited properties manipulation functions on the left and right panels respectively. Once data is read into the software and visualized to the screen, the graphed data will have one n-dimensional coordinate highlighted in yellow. This highlighted coordinate is important as the sorting and hypercube functions are performed relative to this coordinate. The highlighted coordinate can be changed by pressing either the “Up arrow” or “Down arrow” on the keyboard.

The left and right panels can be minimized in-order to reduce visual clutter, allowing the user to view the graph independent of the left and right panels. To toggle the left panel, press “CTRL+ALT+T”. To toggle the right panel, press “CTRL+ALT+O”



*Figure 2 Main Window with read in data and a highlighted n-dimensional coordinate*

## Options Panel

Under the “View” drop down menu of the main window, there is a tab marked “Options Panel”, here will open up a small window containing a few properties to manipulate the display of data for hypercube functions, displaying dimension names and the color of the highlighted set.

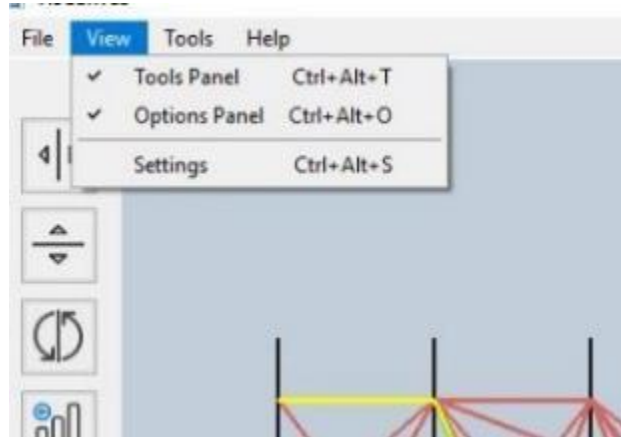


Figure 3 Options panel located in the "View" drop-down menu

## Help Tab

In the case the user is unfamiliar with a function while in the middle of running the software. The user may open up this manual on the fly by clicking on the “Help” button on the at the top of the main window to open a PDF of this user manual

## Data Analysis/Manipulation Functions

The main window holds all data analysis and manipulation functions contained in the left panel. Many of these functions can also be performed either through accessing the “Tools” tab or hotkeys.

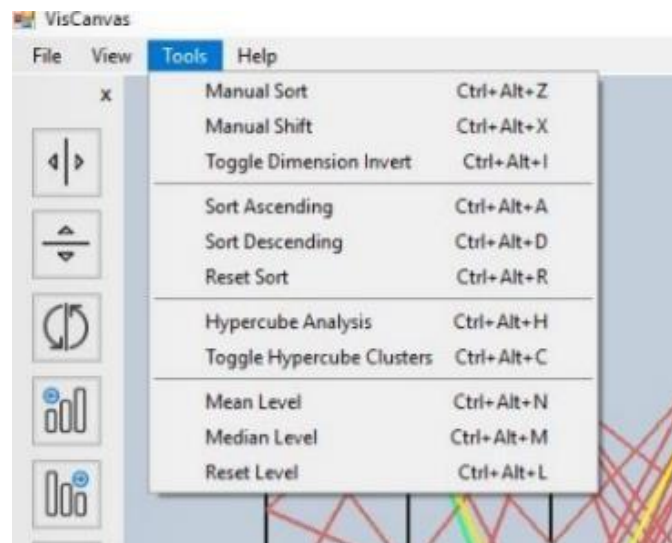


Figure 4 "Tools" Tab open to show the different functions and respective hotkeys in addition to the provided buttons on the left panel

## Click and Drag

The VisCanvas software can perform both horizontal click and drag dimension swapping as well as vertical click and drag vertical dimension shifting. In some instances the user must double-click the toggle buttons to activate them.



*Figure 5 Dimension swapping - Toggle this on in order to perform click and drag dimension swapping*

To move dimensions around the graph, the user may do so by first clicking the button with two arrows pointing horizontally outwards away from each other, separated by a vertical line (clicking toggles on/off). Toggling the function may also be performed by pressing “CTRL+ALT+Z”. When the user toggles this button on, they may manually sort any dimension they desire by simply clicking and holding on whatever dimension they want to move then dragging and dropping to whatever dimension location they would like to move that dimension to.



*Figure 6 Vertical Dimension Shifting - Toggle this on in order to perform click and drag vertical dimension shifting*

To shift dimensions up or down, the user may do so by first clicking the button with two arrows pointing vertically outwards away from each other, separated by a horizontal line (clicking toggles on/ off). Toggling the function may also be performed by pressing “CTRL+ALT+X”. When the user toggles this button on, they may now move any dimension they desire by simply clicking and holding on whatever dimension they want to shift then dragging and dropping to whatever the desired height they would like that dimension to be graphed at.

## Sorting

VisCanvas sorting functions arrange the data dimensions in either ascending or descending order, to the discretion of the user, and in respect of the highlighted n-dimensional coordinate. That said, not all n-dimensional coordinates will not all be sorted along said highlighted coordinate.



*Figure 7 Sort in Ascending order - Sorts data from smallest to largest values in respect to the highlighted n-dimensional coordinate*

Sorting the data in ascending order with respect to the currently highlighted n-dimensional coordinate is performed by clicking the button depicting bars arranged from smallest to largest from left to right. The function may also be performed by pressing “CTRL+ALT+A”.



*Figure 8 Sort in Descending Order - Sorts data from largest to smallest values in respect to the highlighted n-dimensional coordinate*

Sorting the data in respect to the currently highlighted n-dimensional coordinate is performed by clicking the button depicting bars arranged from largest to smallest from left to right. The function may also be performed by pressing “CTRL+ALT+D”.



*Figure 9 Removing Sorts - Click button to revert changes to dimensional arrangements performed by ascending or descending sort functions*

To undo any sorting and revert the dimensions to their original configuration before being sorted, the user can press the button depicting three bars of equal length. Doing so will reset the dimensions to the positions they were in before any sorting occurred. The function may also be performed by pressing “CTRL+ALT+R”.

## Hypercube and Cluster Functions



*Figure 10 Hypercube Analysis - Click button to perform hypercube analysis in respect to the highlighted n-dimensional coordinate*

Hypercube analysis with that software entails projecting a minimum and maximum coordinates of an n-dimensional coordinates cluster where each coordinate has each dimension reside within that threshold. If at least one dimension does not rest within the specified threshold, the entire coordinate will not be graphed. To perform a hypercube analysis function, the user simply clicks on the button depicting a 3-dimensional cube. The function may also be performed by pressing “CTRL+ALT+H”. Each hypercube analysis will project three coordinates: the maximum, the minimum, and the user’s choice between the mean or median of the hypercube. The mean is calculated from each dimension taking the values of all sets in the hypercube and finding the mean of each dimension’s values creating an artificial ‘middle’, the median is also an artificial middle when there is an even number of sets, taking the mean of the two middle to form the middle.

Multiple hypercubes can be created and graphed simultaneously. The user may do so by simply highlighting another n-dimensional coordinate and clicking the hypercube analysis button again. Note that once a hypercube analysis cluster is graphed, this does not permanently destroy or alter any data, but rather renders coordinates outside of the hypercube’s threshold invisible. Consequently, the user will still be able to highlight the invisible data and perform other hypercube functions if desired. Multiple cluster scan be managed in the settings window.

If the current threshold value for hypercube analysis is not desires, the user may change the value through accessing the secondary window in the hypercube tab. Data is scaled from a

[0,1] range. That said, if the user changes the threshold value to 1, all coordinates will effectively be within the threshold (Default: 0.2 threshold). If the user changes the value to 0, only coordinates that are virtually identical to the highlighted n-dimensional coordinate will be graphed.

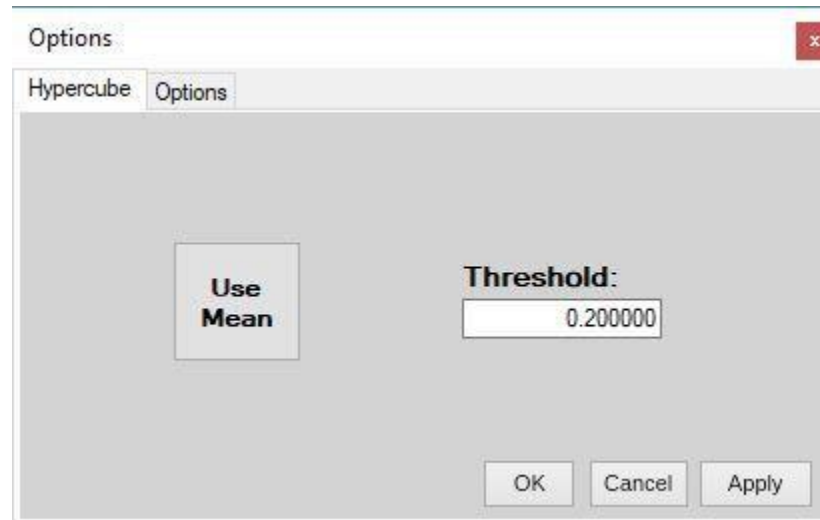


Figure 11 Hypercube operation properties are located in the options tab

From the options tab located in the “View” drop down bar, the user may change the behavior of the hypercube analysis function. The “Use Mean” is a toggle button that will use the calculated mean of the class the hypercube will reside in. The “Threshold” field will determine the radius of how far the hypercube function will consider the maximum and minimum n-dimensional coordinates from the highlighted n-dimensional coordinate.

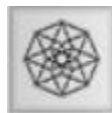


Figure 12 Toggle clusters - Click to toggle showing hypercube analysis clusters and data without hypercube analysis functions,

In the case the, user wants to revert to analyzing the data without hypercube analysis functions, they may do so by clicking on the star button (toggles on/off). This button toggles between graphing the data with hypercubes and without hypercubes the function may also be performed by pressing “CTRL+ALT+C”.

## Specifying Coordinate Relation Functions

Leveling analysis entails projecting all dimensions shifted in respect to either the mean of a class or the median of a class, so that coordinate’s values are presented in a straight horizontal line across the middle of the screen. The mean of a class is defined as an n-dimensional coordinate where each dimension value is generated through the average of every dimension of every coordinate within that class. The median of a class is defined as an already existing n-dimensional coordinate that has the closest resembling dimensional values to the mean of the respective class.





*Figure 13 Mean Leveling - Shift all dimensions in respect to mean of a particular class*

To perform a function in respect to a coordinate mean, click the button labeled “Mean” on the left panel.



*Figure 14 Median Leveling - Shift all dimensions in respect to the median of a particular class*

To perform a function in respect to a coordinate median, click the button labeled “Median” on the left panel.



*Figure 15 Reset Leveling - Revert all graphed dimensions back to original positions before mean or medial leveling*

To revert any changes performed by either leveling functions mentioned, click the button labeled “Reset” to undo the mean and median leveling functions.

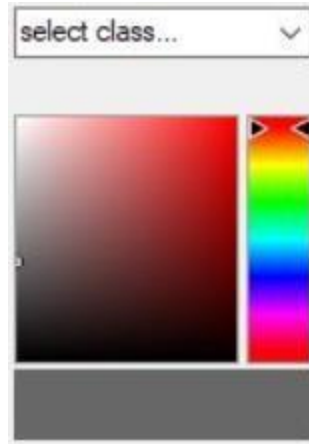
## Accessibility Functions

The main window also includes several functions that enhance accessibility of the software. Colors of datasets can be altered on an individual basis, as well as being changed along with their entire associated class. Additionally, the background color of the graphing window can be altered to the user’s preference.




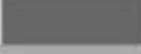
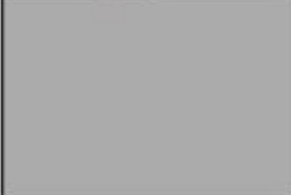
*Figure 15 Graphing Window Color - Default to grey, click button to change to any desired preset color to change background of the graphing window*

The background of the graphing window will be grey upon startup of the software; if the user desires a different background color, they may choose among a variety of preset colors that can be accessed by pressing the bottom-most button on the left panel.



*Figure 16 Class Color Assignment - Change class graphing colors*

Colors of each class can be changed through the provided color palette on the right panel. To perform color changes, choose the desired class by clicking on the drop-down menu just above the color spectrum palette, then choose the desired color and shade via the color palette. Each class and their respective color will be presented on the legend provided at the top of the right panel.

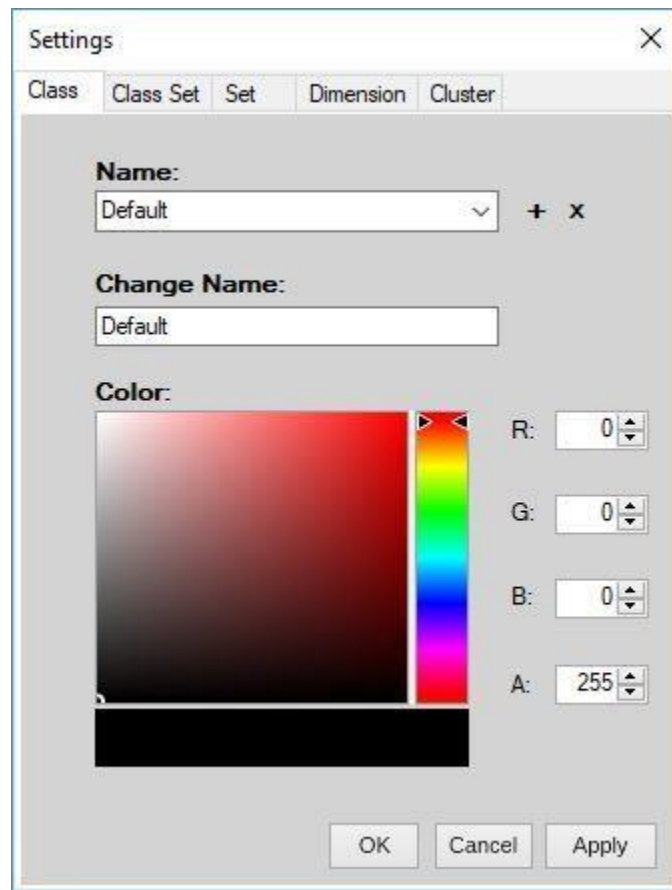
Class	Color
Default	
Washing...	
	

*Figure 17 Legend - Provides name of class and assigned color*

## Secondary Properties Window – Tools Panel

There are three levels at which the user can manipulate data: classes, sets, and dimensions. A class may contain one or multiple sets and a set may contain one or multiple dimensions. In the case the user would like to see or manipulate properties of these levels, the user can do so with either the right panel of the main window, or the secondary window. While the user can access most commonly used functions and settings via the right panel, commands and functions not found in the right panel or secondary properties window will be in the settings menu.

## Class Tab



*Figure 18 Class tab manages the class's name and color fields*

Within VisCanvas, classes contain groups of multiple  $n$  dimensional coordinates. While the ideal number of classes is no more than five, the software is capable of graphing more, limited only by the resultant density of dimension lines making for an unreadable file. By default, each class is by default labeled as “Class 1, Class 2, ..., Class  $n$ ” respectively, where ‘ $n$ ’ is the total number of classes. The name and color of individual classes can be changed in the “class” tab of the settings menu. Changes affect the class currently selected in the “Name:” drop-down list. When satisfied with field changes, press either “OK” or “Apply” for the changes to go into effect.

## Class Set Tab

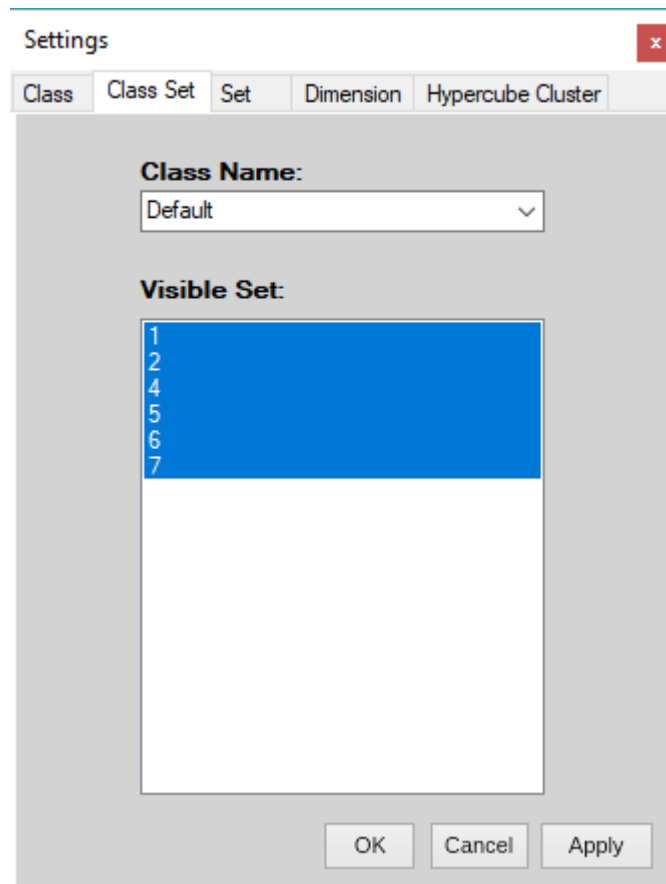
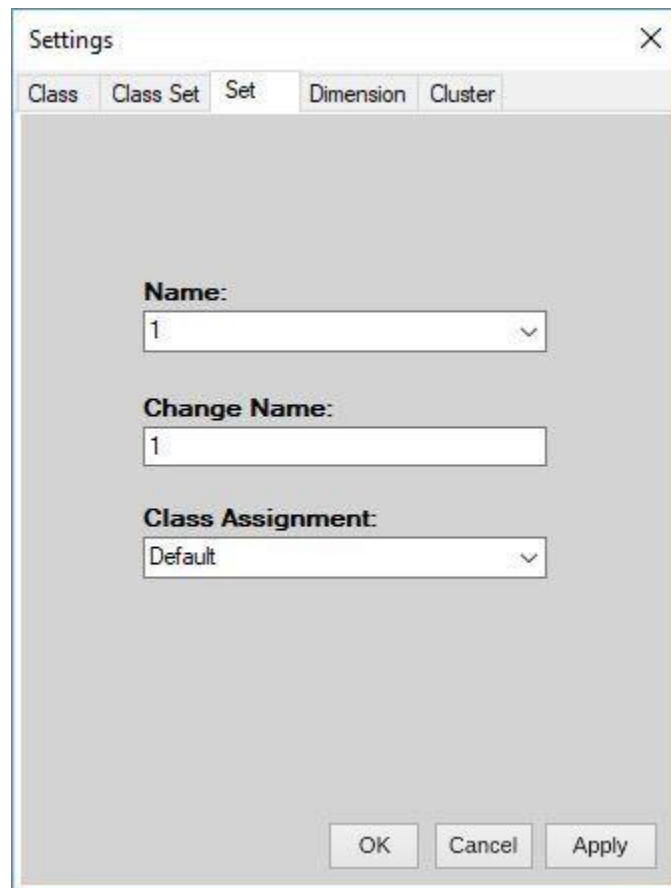


Figure 19a Class Set tab manages classes and class assignment

This allows the user to see what class is associated to what sets. In-order to change its visibility the user must select from the combo-box the class that they want to see the associated sets for. To change the visibility the user must select the highlight set (in blue) and use the CTRL+LEFT-MOUSE to select the set they want visible/not visible.

## Set Tab



The image shows a 'Settings' dialog box with a close button (X) in the top right corner. It has five tabs: 'Class', 'Class Set', 'Set', 'Dimension', and 'Cluster'. The 'Set' tab is currently selected. Inside the 'Set' tab, there are three labeled input fields: 'Name:' with a dropdown menu showing '1', 'Change Name:' with a text input field containing '1', and 'Class Assignment:' with a dropdown menu showing 'Default'. At the bottom right of the dialog box are three buttons: 'OK', 'Cancel', and 'Apply'.

*Figure 19b Set tab manages set's name and class assignment*

Groups of multiple n-dimensional coordinates are referred to as “sets” within VisCanvas. Sets can consist of data in as many dimensions as the user desires. Within the “Set” tab of the settings menu, set name and class assignment can be altered. Each set is by default labeled as “1,2,3, ... n” respectively, where ‘n’ is the number of sets. Changes made will affect only the set that is currently selected in the “Name:” drop-down menu. When satisfied with field changes, press either “OK” or “Apply” for the changes to go into effect.

## Dimension Tab

Settings

Class Class Set Set Dimension Hypercube Cluster

**Name:**  
Month

**Change Name:**  
Month

**Change Scale:**  
☐ **Min:** -100 ☒ **Max:** 20

Set Name	Set Data
0	7
1	7
2	7
3	8
4	8

< >

OK Cancel Apply

Figure 20 Dimension tab manages dimension's name, scaled minimum and maximum, and dimension values

Dimensions are scaled with the min being 0 and the max being 1. The panel labeled “Set Data” shows the data values in the selected dimension. Dimensions can be reordered and shifted vertically without altering the data in the dimension. Within the “Dimension” tab of the settings menu, dimension name and the minimum and maximum scaling bounds can be changed. Changes affect the dimension that is currently selected in the “Name:” drop-down list. When satisfied with field changes, press either “OK” or “Apply” for the changes to go into effect.

## Cluster Tab

Clusters are the formed product of the hypercube analysis functions. Each cluster will produce three n-dimensional sets of data onto the graph, two in respect to either the median or the mean of the highlighted n-dimensional coordinate and within the threshold: 1) The maximum coordinate; 2) The minimum coordinate; 3) the median or mean of the highlighted n-dimensional coordinate (See hypercube section for more details on mean/median). Within the “Cluster” tab of the settings menu, the cluster’s name and color can be changed to the user’s discretion. Changes affect the cluster that is currently selected in the “Name:” drop-down list. When satisfied with the field changes, press either “OK” or “Apply” for the changes to go into effect.

R: Red of the color

G: Green of the color

B: Blue of the color

A1: Alpha for the cluster view

A2: Alpha for cluster and sets view.

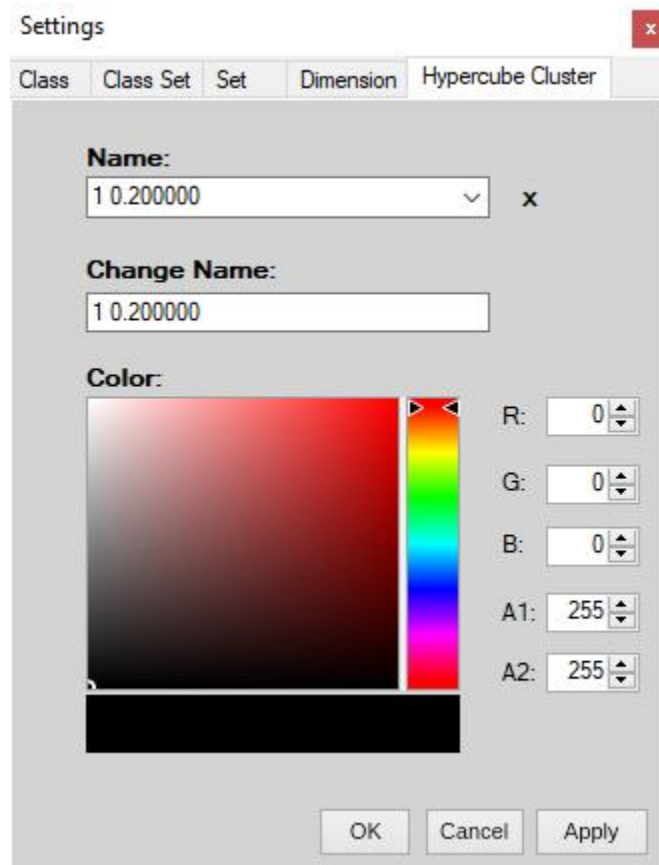


Figure 21 Cluster tab manages the cluster’s name and color