

# RVComparison 1.0

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Given two *a priori* defined groups of observations (i.e. two species, two populations,...) and a set of variables divided in two blocks (modules), this software computes the Escoufier RV coefficient (Escoufier, 1973) for each of the groups, the difference in the coefficient and then performs a permutation test of the null hypothesis of no difference in the RV coefficient between the two groups of observations (Fruciano *et al.*, 2013).

## Input format

The data should be provided as a comma-delimited file (easily obtained with Excel) with rows representing observations and columns representing variables.

The observations should be arranged so that all the observations in the first group come first. In a similar fashion, the variables should be arranged so that all the variables belonging to the first module come first.

Further, the first line of the input file should contain four numbers representing, respectively, the number of variables in the first block, the number of variables in the second block, the number of observations in the first group, the number of observations in the second group.

Example:

In the following example, there are 7 variables (columns) and 9 observations (rows) in total. The numbers in the first line suggest that the first block contains 3 variables, the second 4, while the first group contains 4 observations and the second group 5.

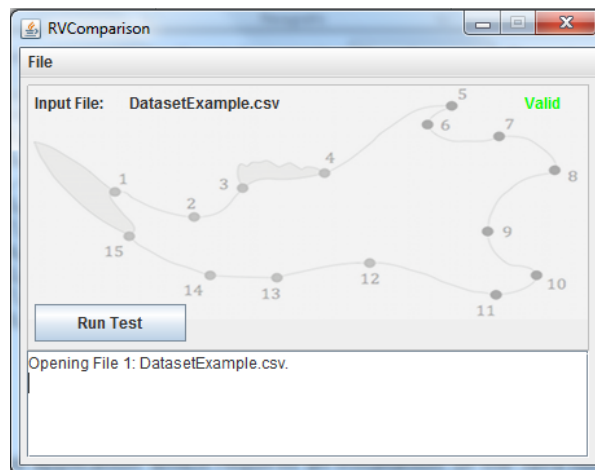
```
3, 4, 4, 5
-0.36279, 0.074496, -0.24875, 0.019401, -0.18734, 0.044223, -0.044949
-0.37687, 0.083735, -0.25152, 0.01635, -0.18221, 0.061104, -0.030313
-0.3756, 0.077186, -0.2531, 0.020972, -0.18273, 0.054688, -0.046054
-0.36961, 0.080215, -0.24104, 0.018963, -0.17488, 0.053051, -0.04112
-0.37073, 0.085067, -0.2471, 0.020927, -0.18333, 0.059428, -0.044074
-0.37367, 0.077514, -0.25022, 0.019372, -0.18519, 0.055878, -0.046801
-0.38259, 0.074062, -0.24422, 0.018536, -0.17825, 0.064817, -0.046236
-0.36731, 0.072767, -0.24781, 0.015713, -0.17564, 0.057804, -0.047393
-0.36875, 0.073868, -0.25122, 0.012253, -0.1769, 0.059708, -0.036239
```

## Using the program

The program is a Java application which requires an installation of the Java Runtime Environment to be used.

Upon opening the .jar file, the user can interact with the software through its graphical user interface.

The data file, formatted as explained above, can be opened choosing "Open file" from the menu "File". Upon opening the data file, a check of the data file format is performed and, if no problem is detected, a green message stating "Valid" is displayed on the right side of the window, otherwise a red "invalid" is displayed.



At this point, clicking the button “Run Test” will open a new window asking for the number of random permutations to be used for the test. Upon clicking on “OK”, the computations will start and, when they are finished, on the lower side of the window a report will provide the values for the RV coefficient for each group, the difference in the RV coefficient and a p-value obtained with the permutation procedure.

## How to cite

When using the results obtained using this software, please cite:

Fruciano C, Franchini P, Meyer A (2013) Resampling-based approaches to study variation in morphological modularity. PLoS ONE 8(7): e69376. doi:10.1371/journal.pone.0069376

## References

Escoufier Y (1973) Le traitement des variables vectorielles. Biometrics 29: 751–760.

Fruciano C, Franchini P, Meyer A (2013) Resampling-based approaches to study variation in morphological modularity. PLoS ONE 8(7): e69376.