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ASTERICS: A Simple Tool for the ExploRation and Integration of omiCS data

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1 Introduction

The rapid development of omics acquisition techniques has induced the production of a large volume of heterogeneous and multi-level omics datasets measured on the same individuals. Complex information of biological interest is obtained from so-called *integration methods*, which have been increasingly developed in the past few years. Some of these methods are already available in R packages (like **mixOmics** [1] or **mixKernel** [2] to which our team has contributed). However, the use of these packages still requires to learn a programming language and to have access to sufficient statistical knowledge to choose method parameters and interpret outputs.

2 ASTERICS

2.1 Features

ASTERICS is a web application that aims at making complex exploratory and integration analysis workflows easily available to biologists. Data edition, exploration and integration menus organize the interface to perform

- 1. data edition, missing value imputation, and normalization,
- 2. data exploration with interactive plots, numerical summaries, PCA, tests, clustering, and self-organizing maps,
- 3. data integration with differential analysis, MFA, or PLS-based methods.

Analyses, especially normalization and differential analyses, are adapted to the most standard omics datasets (RNA-seq or count data from sequencing technologies, microarray, metabolomics, metagenomics or other compositional data).

ASTERICS is also designed to make the analysis flow understandable with a navigable workspace that displays uploaded or obtained datasets and performed analyses in a DAG (Directed Acyclic Graph; see Figure 1). In addition, ASTERICS offers options to export results (as CSV or RDATA files) and to generate HTML reports on the performed analyses.

Finally, ASTERICS also comes with

• a documentation for beginners that helps interpret the results, choose proper options or the next analysis to perform https://asterics.pages.mia.inra.fr/user_documentation/;

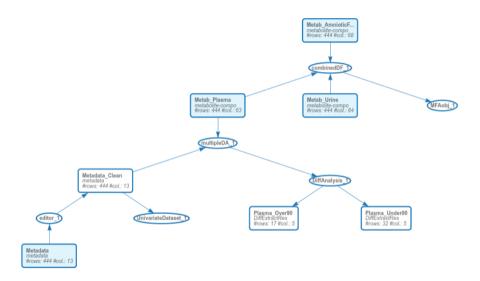


Figure 1. Example of a workspace as displayed in ASTERICS.

• two use cases, including one that is directly available as a ready-to-use workspace https://asterics. miat.inrae.fr/workspace/piglet_usecase and described in our companion article [3]. This use case can also be reproduced using data available at https://doi.org/10.57745/TCKSTD (outputs of ASTERICS analysis, including HTML reports generated by ASTERICS, are also available in that data repository).

2.2 Technical information

ASTERICS is based on Rserve, pyRserve, and flask. R package versions are controlled using **renv**. Frontend is developed in Vue.js and uses the CSS framework Bulma.

ASTERICS is available online at https://asterics.miat.inrae.fr/ and its installation can be performed locally using the three docker images available at https://forgemia.inra.fr/asterics/ asterics/container_registry. Installation instructions and source code are provided on our github repository https://forgemia.inra.fr/asterics/asterics.

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