

Rhadius: a cloud-based framework interfacing with OMERO.server for bioimaging analysis of large scale datasets

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Rhadius is a cloud-based web-service that takes advantage of cloud scalable computational infrastructures to run custom analysis pipelines built with different open source bioimaging software. Rhadius is able to interface to OMERO.server remote imaging repositories.

Cloud architecture



- Fully dockerized
- Installed as a single package on any hardware/software platform
- Require minimal IT knowledge and effort



Running on AWS instance

Demo available at rhadius.fbk.eu

Rhadius interface

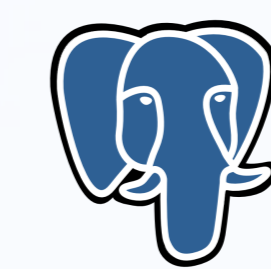
The interface shows a 'Home' page with navigation links (Home, MPBA, Datasets, Script, DeconvolutionLab, Results) and a main banner for 'Rhadius' with a description: 'Interface and complex networks for molecular medicine data. Create an account or login and load data from omero to start.' Below is a 'Result' table with columns: Submitted, Task id, Pipeline Name, Project > Dataset, Status, Result, Download, Delete.

Submitted	Task id	Pipeline Name	Project > Dataset	Status	Result	Download	Delete
April 15, 2015, 10:34 p.m.	f47edc7a-ce75-4a6a-901c-12dfaf5403bc	NB	NB > test	SUCCESS	Result Page	Download	Delete
April 2, 2015, 11:33 a.m.	5fa192f4-0afb-4698-9a26-178563299bf9	DeconvolutionLab - Tikhonov miller		SUCCESS	Result Page	Download	Delete
April 2, 2015, 11:32 a.m.	14102348-b2c9-4e22-bc2e-5f5b0159150a	DeconvolutionLab - FISTA		SUCCESS	Result Page	Download	Delete
April 2, 2015, 11:31 a.m.	ab831dd1-5fd6-4fee-b459-215ea72c52db	DeconvolutionLab - Thresholded landweber		SUCCESS	Result Page	Download	Delete
April 2, 2015, 11:30 a.m.	8acda104-219a-44de-9a34-cf6c498cb87	DeconvolutionLab - Regularized inverse filtering		SUCCESS	Result Page	Download	Delete

System solution



- Open source web app. framework
- Python-based



- PostgreSQL
- Open source
- Object-relational DBMS



- Asynchronous tasks and jobs queue
- Real-time operations
- Process scheduling



- Open source key-value cache and store
- Message broker

Direct interface to OMERO



- OMERO plugin for exporting images
- Can export images to:
 - Original raw images
 - OME-TIFF files converted by OMERO

Upload Images.py

Upload images to Rhadius on which the a

Data Type: * Project

IDs: *

Project Name:

Dataset Name:

Choose File Type: TIFF

URL: * rhadius.fbk.eu

Username: *

Password: *

The upload images OMERO plugin interface

Custom pipeline support

- Upload and run new custom analysis pipelines
- Support scripts based on open source frameworks (Fiji/ImageJ, Python, R)



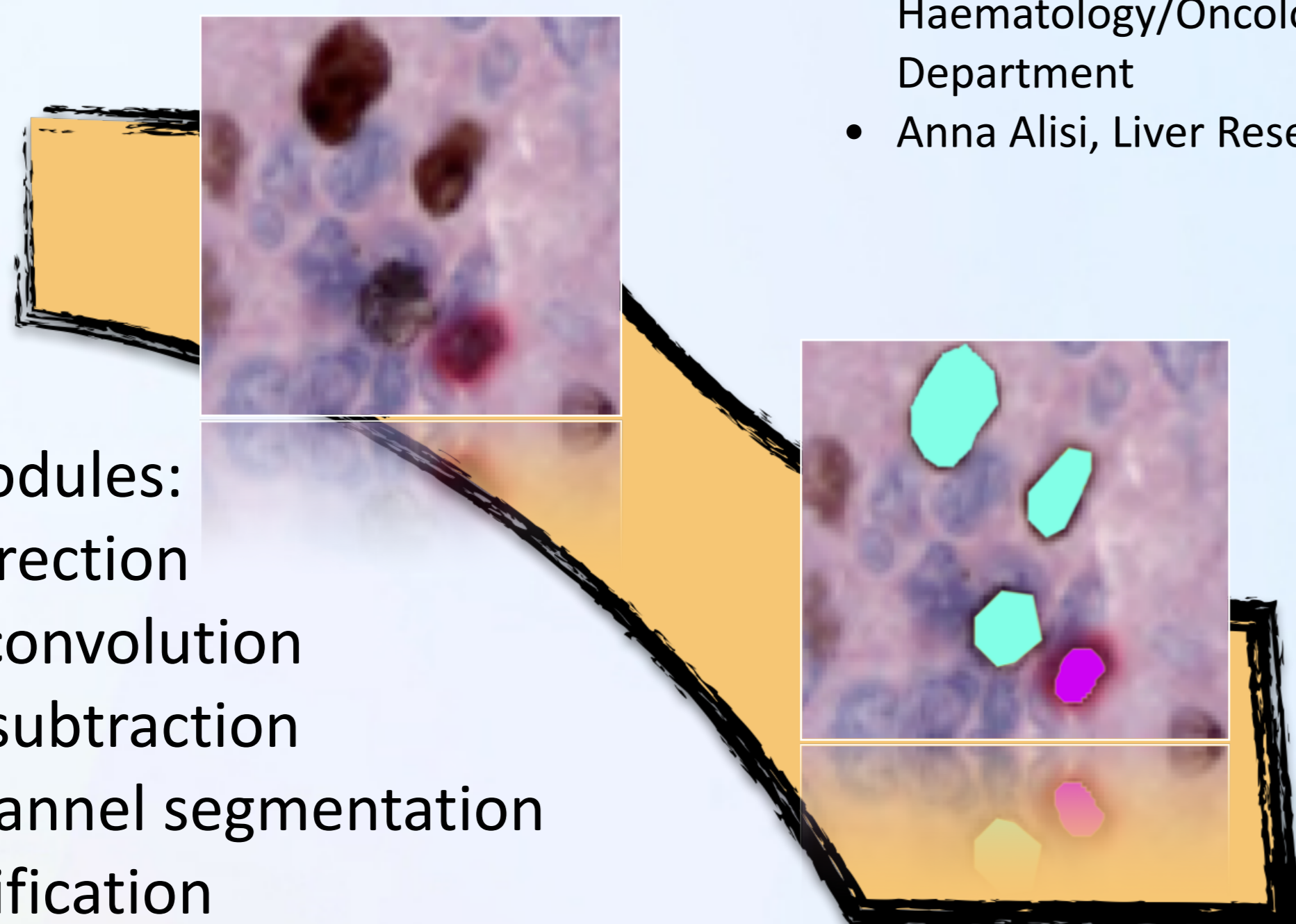
The Script View shows a table with columns: Name, Uploaded, Description, Input, Output. Below is a code editor with a Python script using ImageJ and Watershed.

The Script upload interface of Rhadius

A selection of pipelines available in Rhadius

A. Cellular segmentation and classification pipeline

Immunohistochemistry bright field microscopy image acquisition



Pipeline modules:

- Color correction
- Color deconvolution
- Channel subtraction
- Single-channel segmentation
- Cell classification

In collaboration with:

- Doriana Fruci, Paediatric Haematology/Oncology Department
- Anna Alisi, Liver Research Unit



Mina M. et al., Oncoimmunology (2015)

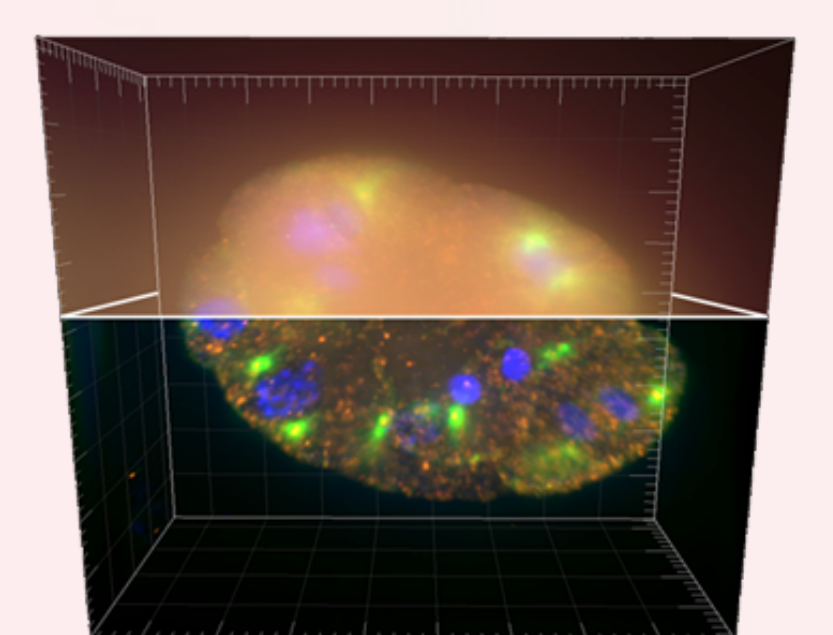
Ceccarelli S. et al., Journal of Hepatology (2014), 60(S1), S159.

B. 3D image deconvolution package

- Interface to the DeconvolutionLab* ImageJ plugin
- Deconvolve 2D or 3D microscopic images
- Several deconvolution algorithms supported
- We are extending the deconvolution package to support 5D images

The interface shows steps: 1. Select the images to be deconvolved, 2. Select the pdf, 3. Select the algorithm. The 'Tikhonov-Miller' algorithm is selected.

The deconvolutionLab interface of Rhadius



*DeconvolutionLab: bigwww.epfl.ch

In collaboration with:
Daniele Arosio, Molecular Imaging Lab

