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

Luca Coviello, Marco Mina, Cesare Furlanello

FONDAZIONE BRUNO KESSLER · FBK · MPBA

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

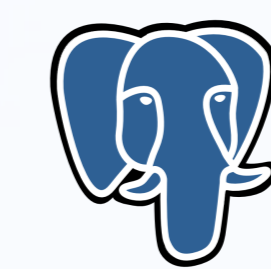**Demo available at** rhadius.fbk.eu

Rhadius interface

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

The upload images OMERO plugin interface

Custom pipeline support

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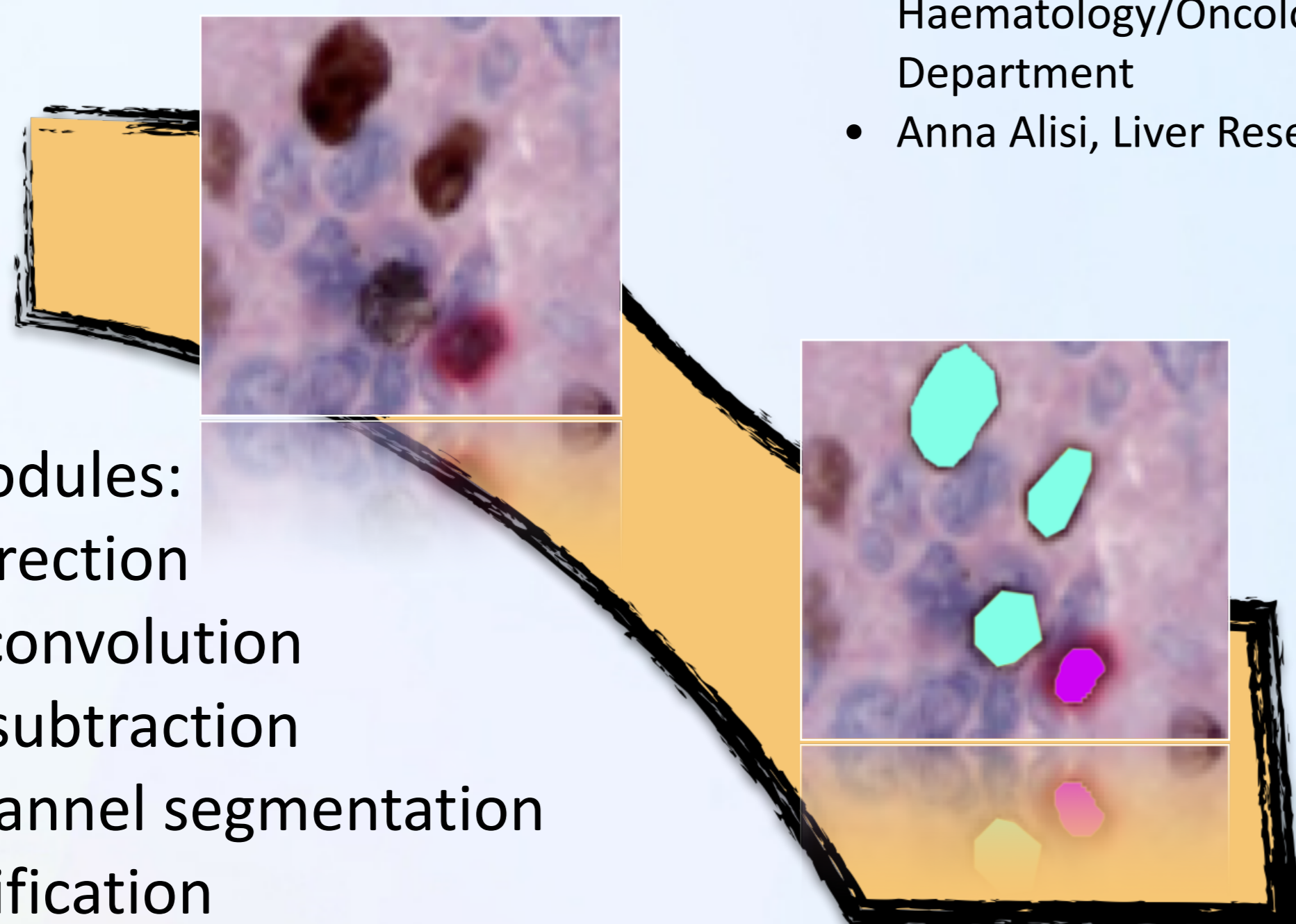- Support scripts based on open source frameworks (Fiji/ImageJ, Python, R)

The Script upload interface of Rhadius

A selection of pipelines available in Rhadius

A. Cellular segmentation and classification pipeline

Immunohistochemistry bright field microscopy image acquisition

In collaboration with:
- Doriana Fruci, Paediatric Haematology/Oncology Department
- Anna Alisi, Liver Research Unit

Bambino Gesù OSPEDALE PEDIATRICO

Pipeline modules:
- Color correction
- Color deconvolution
- Channel subtraction
- Single-channel segmentation
- Cell classification

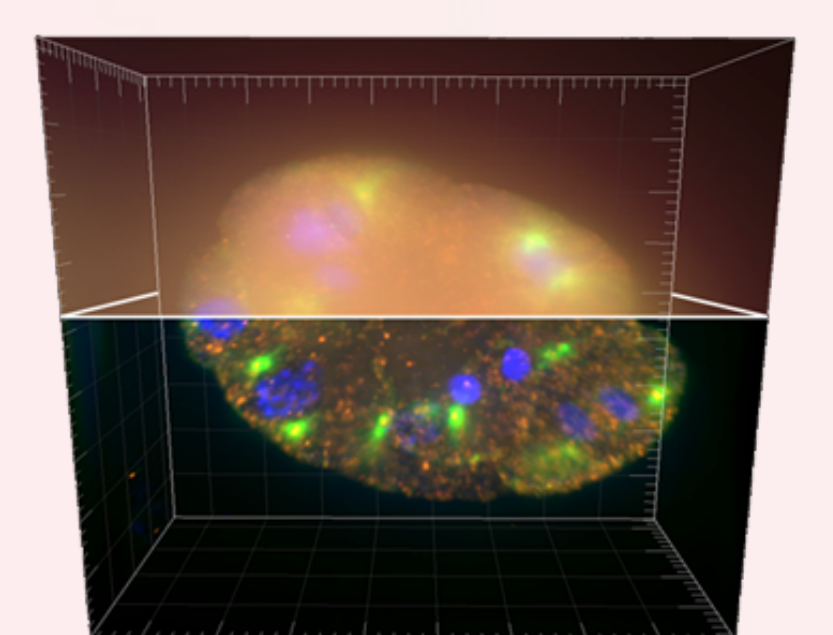Mina M. et al., Oncoimmunology (2015)
Ceccarelli S. et al., Journal of Hepatology (2014), 60(S1), S159.

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

*DeconvolutionLab: bigwww.epfl.ch

In collaboration with:
Daniele Arosio, Molecular Imaging Lab

IBF-CNR

The deconvolutionLab interface of Rhadius