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

### 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

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

### 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

#### 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

**In collaboration with:**
- Daniela Aronso, Molecular Imaging Lab

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*MDeconvolutionLab: bigwww.epfl.ch

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