Analyses d’images avec le logiciel Icy

Webinar RTMFM
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Icy a bioimage analysis software

Input images
- 2D/3D, timelapse, multichannels
- Mo to Go
- Supported formats:
  https://docs.openmicroscopy.org/bio-formats/5.8.2/supported-formats.html

Processing possibilities
- Object counting, object detection
- Object segmentation, pixel classification
- Particle and object tracking
- …

Output formats
- Images
- Spreadsheets (.xls, .csv)
From Pasteur institute

Bioimage analysis unit


Gather biologists, bioimage analysts, developers & computer vision researchers

Give access to state-of-the-art & cutting-edge image processing tools

Promote and facilitate quantitative approaches & reproducibility

Original kernel developers

- Fabrice de Chaumont
- Alexandre Dufour
- Stéphane Dallongeville

Project leader

- Jean-Christophe Olivo-Marin

Current kernel developers

- Stéphane Dallongeville
- Daniel Gonzalez Obando
- Amandine Tournay
Give access to state-of-the-art & cutting edge image processing tools

• Rich bioimage analysis toolbox
  • Basic tools: filters (Gaussian blur...), morphological operations (erosion, dilation...)
  • Advanced tools: active contours, tracking...

• Supported and constantly enriched by the Bioimage Analysis unit at Institut Pasteur

• Also constantly enriched by other computer vision labs
Examples of applications

Object Detection
Spot Detector

Seung et al. (2020) Plos One
Examples of applications

**Object Detection**
Spot Detector

**Object Segmentation**
HK-Means, Active Contours...

Seung et al. (2020) *Plos One*

Bottom image: D. Gaboriau
Examples of applications

Object Detection
Spot Detector

Object Segmentation
HK-Means, Active Contours...

Particle Tracking
Track manager, Bioflow

Seung et al. (2020) Plos One

Bottom image: D. Gaboriau

Top: M. Manich; Bottom: Boquet-Pujadas et al. (2017) Nature Scientific Reports
Examples of applications

Object Detection
Spot Detector

Object Segmentation
HK-Means, Active Contours...

Particle Tracking
Track manager, Bioflow

Registration
ec-CLEM

Seung et al. (2020) Plos One

Bottom image: D. Gaboriau

Top: M. Manich; Bottom: Boquet-Pujadas et al. (2017) Nat Sci Rep

Kuri et al. (2017), JCB

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Gather several communities

• **Modular**: new algorithms are packaged for end-users as « plugins » (developed in Java) and **open source**

• **Suited for nonprogrammers as well as developers**
  • A rich graphical user interface
  • Tasks automation and workflows building even without programming knowledge (**protocols**)
  • **Scripting possibilities**

• **Documented and supported** by a community of users and developers through
  • the **image.sc forum**: help and discussion forum
  • the **Icy website**: central repository for plugins and protocols
Modular and open source

GPL3 license
Source code: https://gitlab.pasteur.fr/bia/icy

Anyone can contribute to plugins and protocols (http://icy.bioimageanalysis.org/plugins/)
A rich Graphical User Interface (GUI)

Detached mode: windows are floating

Image: https://zenodo.org/record/2577053
Display options & sequence properties
Regions Of Interest (ROI)

How to...

Sort ROIs: click on the name of the column (« Name », « Area »...)
Select a group of ROIs: Shift + click
Delete ROIs: select + press delete
Change the color of one or several ROIs: select + color
Prevent accidental ROIs modifications: 

Image: [https://doi.org/10.5281/zenodo.3706554](https://doi.org/10.5281/zenodo.3706554)
Regions Of Interest – get features

Image: https://doi.org/10.5281/zenodo.3706554
Image processing tools are packaged into plugins

ROIs = Region Of Interest
Labels = new image with a given pixel value per object

Run/Pause  Save/Load parameters  Online documentation
How to find a plugin: the search bar

- Installed locally on the computer in the /plugin folder
- Plugin stored on the Icy website http://icy.bioimageanalysis.org/
- Use the search bar to search for plugins, protocols, commands...
- Documentation on the Icy website
How to use a plugin: the documentation

Direct access to plugin documentation via
- The search bar of the software
- The plugin window
- The search bar of the Icy website
Where to get help

- Forum image.sc: [https://forum.image.sc/](https://forum.image.sc/)
Promote and facilitate the use of quantitative approaches & reproducibility

• Outputs to spreadsheets for further data analyses
• Possibility to save and reload plugins parameters
• Graphical programming to build bioimage analysis workflows with protocols
Protocols overcome plugins limitations

Advantages
- Graphical user interface with nice little buttons
- Possibility to save/reload parameters

Disadvantages
- One image at a time
- One image processing step at a time
- Not easy to reproduce

Advantages
- Workflow: several processing steps
- Batch processing: several images
- Some kind of graphical user interface
- Reproducible and easy to share (light xml file)

More info:
http://icy.bioimageanalysis.org/plugin/protocols/
How to cite

• In scientific publications
  • Cite the plugins you use. Look for the reference in the online documentation
  • Publish your protocols: http://icy.bioimageanalysis.org/tutorial/how-to-publish-a-protocol/

• On Twitter
  • Did you publish recently a paper using Icy? Did follow a course on Icy? Do you have a favorite plugin? Are you proud of your last protocol? Share it!
    • @Icy_Bioimaging to notify the Icy team
    • Follow @Icy_Bioimaging to get news from the Icy team
Have fun with Icy and keep in touch with us!

Support forum
https://forum.image.sc/tag/icy

Don’t forget to cite Icy and its plugins ;)

@Icy_BioImaging
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