



Navigating the Bioimage Analysis Landscape

Understanding the Community
and its Collaborative Dynamics

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Introduction - my field background

2015 - Applied Informatics with focus on Image Analysis

2018 - Started as BioImage Analyst in Euro BioImaging node

2019 - Switch to smaller node, not enough tasks for BiA

2019 - First notion of **NEUBIAS**

2020 - First workshop on BiA at Core Facility

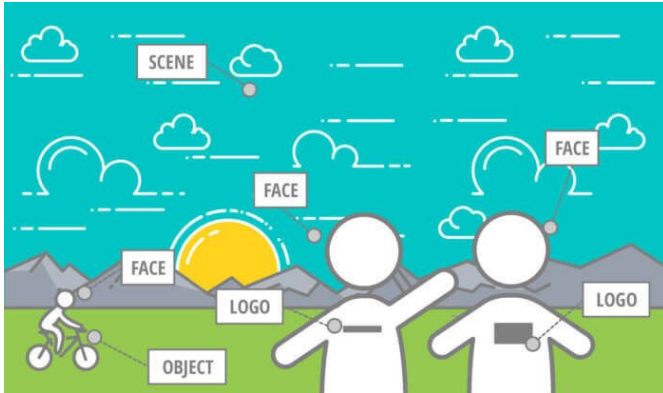
2022 - Plans for **SOBIAS** and **Core-BIAS**

2023 - Start of **Czech BioImage Analysts Society**

BioImage Analysis?

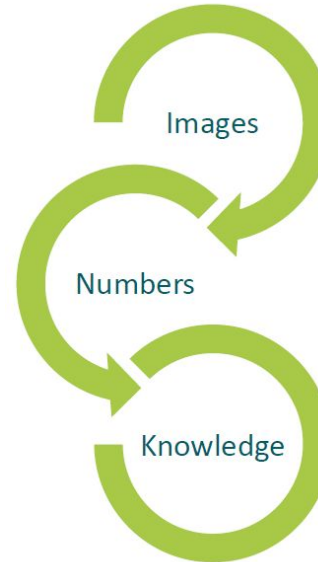
Image Analysis?

Image analysis (also known as “computer vision” or image recognition) is the ability of computers to **recognize attributes** within an image.



BioImage Analysis?

Understanding and quantifying microscopy, medical or any other calibrated image data.



- Objective
- Reliable
- Reproducible
- Replicable
- Repeatable

BioImage Analysis!

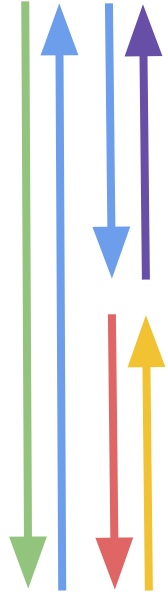
“Where computer vision meets biology.”

As a branch of artificial intelligence, computer vision is concerned with the development of theories and algorithms **to make machines interpret visual data autonomously and quantitatively.**

Its numerous applications include *video surveillance, biometric verification, medical diagnostics*, and many others.

Thus, expert domain knowledge is critical to make computer vision tools successful.

Designing Workflow overview



- Sample preparation
 - Type, clearing, coloring, fixation
- Microscopy Imaging Methods
 - BFM, DFM, PHC, DIC, FM, POL
- Microscope settings
 - type, light/laser, lenses, immersion, PSF
- Digitalization
 - Digital sampling, bit depth, gain, noise
- Data saving/format
 - bit depth, 2D/3D/4D/5D data, compression
- Data analysis
 - ethics, tools, hardware

DEAR NATURE MAGAZINE,

I FOUND NO EVIDENCE SUFFICIENT TO REJECT
THE NULL HYPOTHESIS IN ANY RESEARCH AREAS
BECAUSE I SPENT THE WHOLE WEEK PLAYING
THE LEGEND OF ZELDA: BREATH OF THE WILD.

I'LL SEND YOU ANOTHER UPDATE NEXT WEEK!



THE PUSH TO PUBLISH NEGATIVE RESULTS SEEMS
KINDA WEIRD, BUT I'M HAPPY TO GO ALONG WITH IT.

"Negative Results"

<https://xkcd.com/2341>, [CC-BY-NC 2.5](#)

Changes on the go are
expensive!!!

Best practice approach

To optimally design and execute experiments involving bioimage analysis, **expertise in bioimage analysis, imaging and biology is needed.**

Computer scientists tend to be dismayed at the irreproducibility of biological systems and the seemingly fuzzy questions asked.

Biologists find computer scientists tend toward overly reducing complex systems to make problems tractable.

Why it is so challenging

As a scientists, we took the challenge very proactively: learned how to communicate, engaged in training school, symposia, communities, ... but:

It accelerated the whole development process!

As **it is** increasingly **difficult to keep track of** the number of available image analysis **platforms**, **tool** collections, **components** and emerging **technologies**. Because we need fairly conservative overview of **software** to use in daily routine.

After all in science we need **stability**, repeatability, reusability and **reproducibility**!

The Bridging part of Science

Global BioImaging is an international network of imaging infrastructures and communities, which was initiated in 2015 by a european (Horizon 2020, CZI) funded project. One of their tasks is also support bridging biology and computer science.

2013–2015 - EUBIAS

2015–2023 - NEUBIAS (2020 official end)


2023–9/2025 (forever hopefully) Global BioImage Analysts' Society (GloBIAS)



Communities

Chan Zuckerberg Initiative Calls

Grants to support collaborative projects aimed at accelerating the **dissemination** and **adoption** of **imaging technologies**, methods, platforms, or **training resources**.

 Back to Imaging

Creating Community & Building Capacity

The imaging of molecules, cells, and tissues are central to biomedical research and clinical practice. Advancing imaging tools and accelerating their use will help drive breakthroughs in curing, preventing, or managing disease. Networks of imaging scientists, imaging software fellows, and researchers around the world are building hubs of imaging expertise for local biomedical researchers.

[Read more.](#)

Filter by: CYCLE (1) ▾

Showing 14 results for

ADVANCING IMAGING THROUGH COLLABORATIVE PROJECTS ✕

Imaging Scientists in core facilities often participate in experimental design, sample preparation, technology adaptation, data acquisition and **image analysis** while ensuring and instilling a healthy respect for research integrity and technical quality assurance.

Establishing Bioimage Analysis (BIAS)

Four different types of expertise.

- **Life Scientists** (e.g. Biologists) ask questions and seek answer by setting up experiments.
- **Instrumentalists** (e.g. Microscopists) develop optical systems, collaborate and provide support for the acquisition of BioImage data.
- **Developers** (e.g. Image processing algorithm developers, programmers and computer scientists) provide novel algorithms and their implementations to process images.
- **Bioimage analysts** are a new type of experts in BioImaging, they select appropriate image processing algorithms and their implementations, and assemble them for conducting practical Bioimage Analysis.

One of the aim of NEUBIAS is to explicitly **promote the mutual communication between these four communities of experts and to establish the role of Bioimage Analysts** in Life Science.

NEUBIAS Academy is a new initiative, aimed to provide **sustainable material** and activities focused on **Training in Bioimage Analysis**.

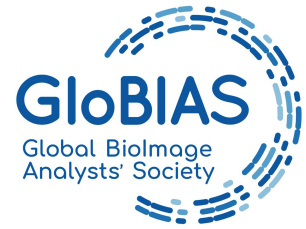
- YouTube channel with talk/tutorials records
- Defragmentation Training School(s) records

BiolImage Informatics Search Engine > BiolImage Informatics Index BIII.eu

Promoting <https://forum.image.sc/>

F1000research NEUBIAS gateway, with free option to publish slides and posters!

Global BioImage Analysts' Society



The Global BioImage Analysts' Society ([GloBIAS](#)) aims to be a **worldwide association** that brings together all those interested in **bioimage analysis**.

The society will enable learning and **knowledge exchange** between members. This will be achieved by a number of different tools, such as **online events**, **in-person workshops** and **online repositories**.

The GloBIAS will be a non-profit association that is expected to be officially constituted during 2024.

First in person workshop: Nov, 2024 | Gothenburg, Sweden

Scientific Community Image.sc Forum

- Focus Areas:
 - **Image analysis, processing, acquisition, storage, and management**
 - Open to **beginners, experts, life scientists, and computer scientists**
- Objectives:
 - Foster **independent learning** and **inclusive discussions**
 - Support **open-source software** projects and all imaging software packages
- Guidelines:
 - Post questions with representative images and clear explanations
 - Avoid science-specific jargon for clarity

Operation: Jointly operated by the **Broad Institute** and **UW-Madison** via **COBA**

Local-BIAS or BioImaging based communities

Core facility, knowledge or experience exchange or national?

As a inspiration of non-profit no-cost examples:

SwissBIAS: <https://swissbias.github.io/>

CzechBIAS: <https://czechbias.github.io/>

You can start one?

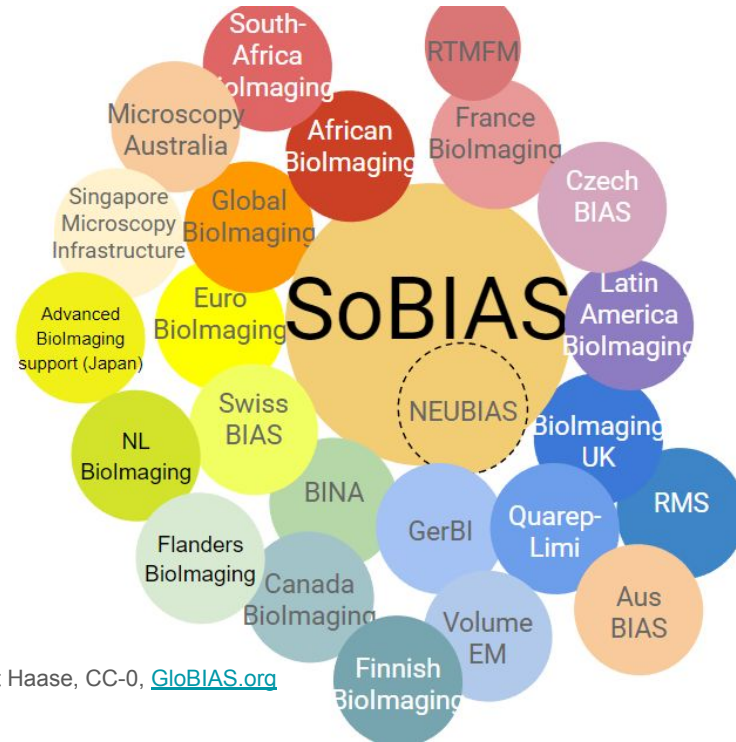
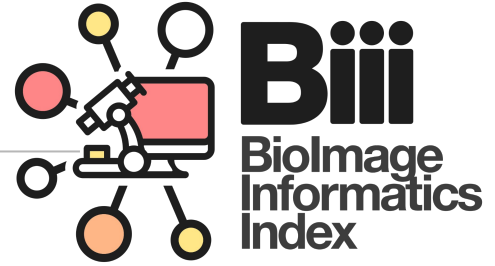


Image by: Robert Haase, CC-0, GloBIAS.org

Tools

Bioimage Informatics Index



Biii seeks to provide a unification of views:

- **problem-based** (e.g. “find nuclei in cells”),
- **method-based** (e.g. “active contour-based segmentation”),
- **tool-based** (e.g. “CellProfiler”).

The platform will **also gather commented links on articles describing algorithms** with high potential but without a usable source code “**Calls for implementation**” to plan collaborative implementation through threads in the forum. The database is edited in a manner **similar to Wikipedia**: i.e. the **community** provides content that is managed by **curators**.

Image.SC



Tool specific threads.

General questions.

Knowledge base!

▼  Community Partners



Source: printscreen from [Image.SC](https://image.sc)

RELATED COMMUNITIES



SPONSORED BY
 COBA

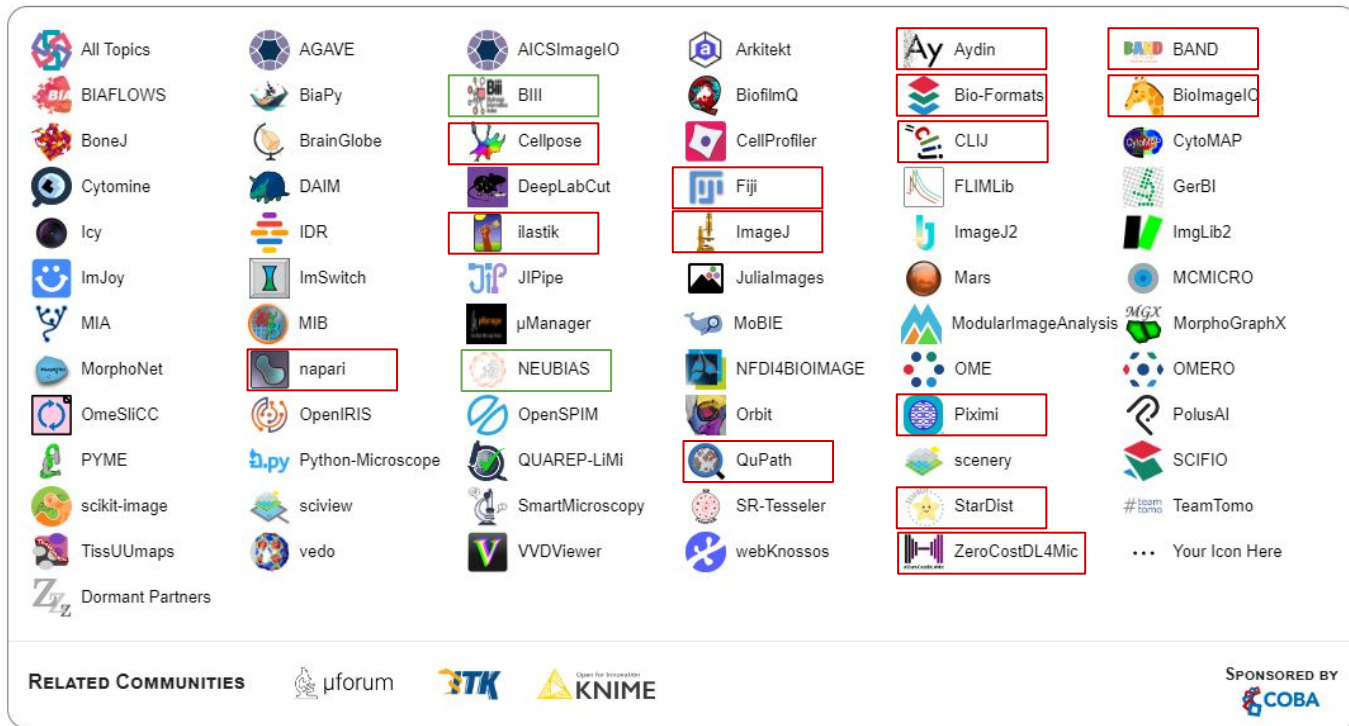
Image.SC



What Martin knows...



Only a part, but
community can help
support me in
learning other tools!

A screenshot of the Image.SC website's 'Community Partners' page. The page displays a grid of logos for various scientific image analysis tools and communities. Some logos are highlighted with red rectangular boxes. The logos include: All Topics, BIAFLOWS, BoneJ, Cytomine, Icy, ImJoy, MIA, MorphoNet, OmeSIIICC, PYME, scikit-image, TissUUmaps, Zyz, AGAVE, BiaPy, BrainGlobe, DAIM, IDR, ImSwitch, MIB, napari, OpenIRIS, Python-Microscope, sciview, vedo, AICSImageIO, Bill, Cellpose, DeepLabCut, ilastik, JIPipe, JManager, NEUBIAS, OpenSPIM, QUAREP-LIMI, SmartMicroscopy, VDVViewer, Arkitekt, BiofilmQ, CellProfiler, Fiji, ImageJ, JuliaImages, MoBIE, NFDI4BIOIMAGE, Orbit, QuPath, SR-Tesseler, webKnossos, Aydin, Bio-Formats, CLIJ, FLIMLib, ImageJ2, Mars, ModularImageAnalysis, OME, Piximi, scenery, StarDist, ZeroCostDL4Mic, BAND, BioImageC, CytoMAP, GerBI, ImgLib2, MCMICRO, MorphoGraphX, OMERO, PolusAI, SCIFIO, TeamTomo, and a placeholder 'Your Icon Here'. At the bottom, there is a section for 'RELATED COMMUNITIES' with logos for uforum, STK, KNIME, and COBA. The text 'SPONSORED BY' is also visible.

Source: printscreen from [Image.SC](https://image.sc)

A Hitchhiker's guide through the bio-image analysis software universe

An overview of the bio-image analysis software universe by means of a glossary of software routinely used by bio-image analysts.

It refer to previously defined groups of software:

- **Image/data analysis algorithms** provided in a sustainably reusable fashion are referred to as ‘components’.
- **Software libraries** and standalone applications that combine multiple components are ‘collections’.
- **Workflow templates** as software that combines multiple components, potentially from multiple collections to solve a given variety of image analysis questions in a standardised form.
- **Workflows** as the software that is specific for solving particular scientific questions using given components in one specific assembly.

A Hitchhiker's guide through the bio-image analysis software universe

Aspects to consider when choosing bio-image analysis software for your research

Citations serves as a criterion to select software; continuous maintenance and reliable support by a vivid community is important.

Other published or curated list of software for:

- Quantitative plant initiative
- Microscope hardware and control
- Lightsheet microscopy
- Cryo-electron microscopy (cryoEM)

MicroscopyDB does not store the microscopy-related content itself. Instead, **it contains links to existing online microscopy resources** (educational materials, jobs etc.). It has several advantages:

- **sharing a job, event or other online resource** only requires one submission to MicroscopyDB and then it **appears on multiple partner community websites**
- it **channels visitors** to partner website for the searchable content
- it **avoids duplication** and helps visitors find relevant information – a one-stop shop for all levels of microscopy user

The goal of AI4Life is to radically **reduce the disparity between the theoretical applicability and the practical use** in life sciences **of state-of-the-art AI-based image analysis methods.**

AI4Life will bridge the gap between two rapidly developing fields: **AI method development, and biological imaging**; providing urgently needed services through the European trans-national and virtual access infrastructures.

AI4LIFE - BioImage Model Zoo



FOR LIFE SCIENTISTS: Use our models and methods on your data

FOR COMPUTER SCIENTISTS: Share your models with the world

OPPORTUNITIES FOR THE IMAGING SCIENTISTS: To support our users, regular and targeted training events are organised in the form of workshops and seminars on usability of our services as well as its general driving principles.



BioImage Model Zoo: [BioImage.IO](https://biomodelzoo.org/)

Advanced AI models **in one-click**, Integrated with Fiji, ilastik, ImJoy and more, Try model instantly with **BioEngine**, Contribute your models via Github, **Link models to datasets and applications**.

EMBL Bioimage ANalysis Desktop (BAND)



Cloud based desktops accessible with a web browser from **anywhere with an internet connection**.

Choose your desired configurations (CPUs, Memory, GPUs, Screen resolution, and desktop running time):

- Current limits per user (≤ 28 CPUs, ≤ 128 G RAM, ≤ 3 GPU, and ≤ 14 days desktop lifetime)
- Please only select what you need, and stop your desktop after use.

Software: FIJI, CellProfiler, Cellpose, Napari, QuPath, KNIME, OMERO and more

Test it yourself: <https://band.embl.de/#/eosc-landingpage>

BIOP-desktop



The BIOP-desktop is a Versioned Computer with software pre-installed and pre-configured so you can focus on your analysis (and not on the installation).

The [BIOP-desktop](#) is:

- **Developer Point of View:** a Docker image that you can build using multi-stage
- **IT Point of View:** a Docker image that you can simply pull and run
- **Users Point of View:** a Computer with “everything” installed and running!

Fiji, Cellprofiler, Cellpose, devbio-napari, Ilastik, Qupath, EMPanADA, Stardist, ...

Explore details on [Image.SC](#)

Collaborations

Goal of Collaboration

- Consultations
 - Knowledge exchange
 - Experience exchange
 - Tools/Workflows
- Service
 - BioImage Analysis
 - Code writing
 - Consultation/Reviews
- Teaching
 - Learning tools/workflows
 - Groups or individuals

Job Shadowing!

Grants, travel exchanges or even communities provides support for job shadowing.

Benefit is having dedicated time to specific task.

Core Facilities or Groups

Naming goes along '*bioimage analysis core-facility*', '*bioimage analysis hub*' or '*bioimage analysis technology development group*'.

Core facilities:

- Usually **provide specific or specialized services for their base users**. It will be different by university, faculty or department focus.
- Are usually organized under BioImaging Research Infrastructures, however, these are usually focused on imaging methods.

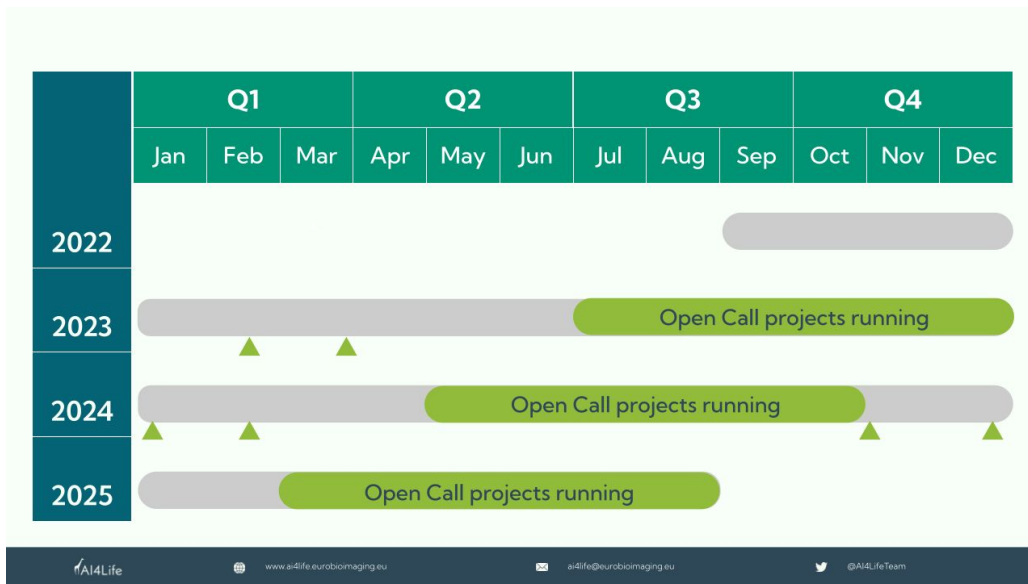
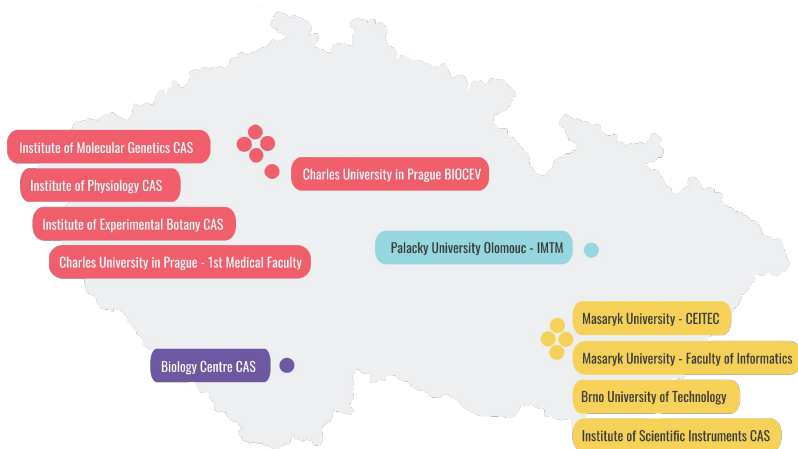
As a rule of thumb: if **facility provides imaging technology**, they would **also know how to analyze** outputs.

Core Facilities Grants or Project Calls

French Biolmaging [Image Analysis HUB](#) (Institute Pasteur)

[Czech Bioimaging](#) open access grants (16 centers)

AI4LIFE - open calls



GloBIAS Database



Self listed database:

- [Trainer](#)
- [Analyst](#)

Baserow | GloBIAS Trainer Database | Filter | 1 Sort | Group | Hide Fields

	Organization Name	URL	Country	Available extern...	Training expertise	Training modaliti...	Traini...
1	Mary Brown	https://www.linkedini...	USA	Yes, to all acad...	Lectures and workshops on q...	Online In person	Tutorials
2	Broad Institute Imaging Pla...	https://cimini-lab.b...	USA	Yes, to anyone	CellProfiler, CellProfiler Analys...	In person Online	Courses
3	Image Analysis Collaboratory	https://iac.hms.har...	USA	Yes, to a limited ...	ImageJ/Fiji, QuPath, ML-base...	In person	Tutorials
4	Mariana De Niz	https://www.feinbe...	USA	Yes, to anyone	Analysis of protein dynamics, ...	In person Online	Tutorials
5	Rocco D'Antuono (The Fran...	https://roccodant.g...	United Kingdom	Yes, to anyone	FIJI, ImageJ macro, beanshell ...	In person Online	Courses
6	Lior Pytowski, Pixel Biology...	https://www.pixelbi...	United Kingdom	Yes, to anyone	Fiji, ImageJ macro, CellProfiler...	In person Online	Tutorials
7	Tong LI - Wellcome Sanger ...	https://www.sange...	UK	Yes, to a limited ...	python, nextflow workflow, im...	Online In person	Tutorials
8	Robert Haase, ScaDS.AI, L...	https://haesleinhue...	Germany	Yes, to anyone	Bio-image Analysis, Large Lan...	In person Online	Courses
9	Christian Tischer, Data Scie...	https://www.embl...	Germany	Yes, to anyone	CellProfiler, Fiji, ImgLib2	In person Online	Tutorials
10	Richard De Mets, Universit...		Denmark	Yes, to all acad...	ImageJ/Fiji QuPath Napari Ma...	In person Online	Courses

You can also join!

www.globias.org

Baserow | GloBIAS Analyst Database | Filter | 1 Sort | Group | Hide Fields | Q

	Organization Name	URL	Country	Available externally for a...	Analysis expertise	Analysis types offered
1	Mary Brown	https://www.linkedini...	USA	Yes, to all academics	Cell segmentation; quantit...	Workflows in open sou...
2	Broad Institute Imaging Pla...	https://cimini-lab.b...	USA	Yes, to anyone	CellProfiler, CellProfiler Ana...	Advising on existing w...
3	Image Analysis Collaboratory	https://iac.hms.har...	USA	No	Analysis of light and electr...	Workflows in open sou...
4	Mariana De Niz	https://www.feinbe...	USA	Yes, to all academics	Analysis of protein dynami...	Workflows in open sou...
5	Rocco D'Antuono (The Fran...	https://roccodant.g...	United Kingdom	Yes, to all academics	FIJI, ImageJ macro, python...	Help with macros and ...
6	Lior Pytowski, Pixel Biology...	https://www.pixelbi...	United Kingdom	Yes, to anyone	Fiji, ImageJ macro, CellProf...	Workflows in open sou...
7	Tong LI - Wellcome Sanger ...	https://www.sange...	UK	Yes, to a limited group of ...	python, nextflow workflow,...	Workflows in open sou...
8	Robert Haase, ScaDS.AI, L...	https://haesleinhue...	Germany	Yes, to anyone	Bio-image Analysis, Large ...	Workflows in open sou...

The Center for Open Bioimage Analysis



[COBA](#)'s mission is to meet the biology community's increasing demand for advanced software to analyze complex and large-scale light microscopy images, essential for modern biological and biomedical research.

[COBA](#) will continue to develop and maintain the open-source software **CellProfiler** and **ImageJ** while making **new deep learning tools and workflow** solutions for bioimaging.

The Center for Open Bioimage Analysis



- Tech R&D Projects:
 - Deep learning-based image processing
 - Workflows and **accessibility** of image processing algorithms for biologists
 - Objectives:
 - Develop advanced algorithms and user-friendly software
 - **Foster a community** to share software and resources



- Driving Biological Projects:
 - Hub for new computational strategies for biological problems
 - Enhance and support ImageJ and CellProfiler
 - **Train the biological community** in advanced software applications



- Community Engagement:
 - **Organize bioimaging training materials, workshops, hackathons, and conferences**
 - **Support biologists, microscopy facility staff, and software**

Image Analysis Collaboratory



HARVARD
MEDICAL SCHOOL



They research, develop, and apply algorithms to analyze scientific images.

And also offer **workshops**, **consultations**, and **project support** in matters quantitative bioimage analysis.

Collaboratory:

*“center without walls, in which [...] researchers can perform their research **without regard to physical location, interacting with colleagues, accessing instrumentation, sharing data and computational resources, [and] accessing information in digital libraries.**” (Wulf, 1989)*

Thank you
for your attention!

Thank you
for being a part of such great community!