Supplemental Materials

Supplemental Table 1

A non-exhaustive list of relevant communities and initiatives.

Type	Name	Link
European FAIR data and service infrastructure	European Open Science Cloud	https://www.eosc.eu/
European imaging data initiative	EUCAIM: EUropean Federation for CAncer IMages	https://www.eibir.org/projects/eucaim/
Federation of Scientific Societies	FASEB Dataworks	https://www.faseb.org/data-management-and-sharing
German National Scientific Data Infrastructure	Multi Disciplinary (Data Science, BioImage, etc. etc.)	https://www.nfdi.de/
International community	ABRF: Association of Biomolecular Resource Facilities - Committee on Core Rigor and Reproducibility (CCoRRe)	https://www.abrf.org; https://www.abrf.org/core-rigor-and-reproducibility-ccorre-
International community	African BioImaging Consortium (ABIC)	https://www.africanbioimaging.org/
International community	AI4Life: AI models and methods for the life sciences (image data)	https://ai4life.eurobioimaging.eu/
International community	BioImaging North America (BINA) Quality Control and Data Management working group and AIMM interest working group	https://www.bioimagingnorthamerica.org/
International community	Global BioImaging	https://globalbioimaging.org
International Community	Human BioMolecular Atlas Program	https://portal.hubmapconsortium.org/
International Community	IBEX Imaging Community	https://ibeximagingcommunity.github.io/ibex_imaging_knowledge_base/

International community	Latin American Bioimaging (LABI)	https://labi.lat/
International community	NEUBIAS - Network of European BioImage Analysts/SoBIAS - Society for Bioimage Analysis	https://eubias.org/NEUBIAS/
International community	Open Microscopy Environment (OME)	https://www.openmicroscopy.org/
International community	QUAREP-LiMi	https://quarep.org/ https://quarep.org/working-groups/wg-7-metadata/
International community	vEM: Volume Electron Microscopy	https://www.volumeem.org/#/
International imaging infrastructure (open access)	Euro-BioImaging ERIC	www.eurobioimaging.eu
National/International community	Canada BioImaging	https://www.canadabioimaging.org/
National/International community	I3D:bio - Information Infrastructure for BioImage Data initiative (Germany)	https://www.i3dbio.de
National imaging data initiative	NCI Imaging Data Commons (USA)	https://portal.imaging.datacommons.cancer.gov/
National imaging data initiative	NFDI4BIOIMAGE (Germany)	https://nfdi4bioimage.de
National image data initiative	RDM4mic (Germany)	https://german-bioimaging.github.io/RDM4mic.github.io/

Supplemental Figure 1

Software tools depend on complex sets of other software and the dependency chain has to be document: napari example

Harmonizing_Data_Gen_and_Stewardship_2024.01.27_SuppFig_1.pdf

(see next page)

To Do List Text

- Ensure the **long term sustainability of national and international bioimaging communities** (e.g., ABIC, ABRF, BINA, CBI, GBI, LABI and QUAREP-LiMi; see also Table 1 in supplemental materials) thus enabling recurring gatherings to coordinate (i.e., discuss, recommend, update) the development of:
  - ❖ **Consensus guidelines for quality control procedures and standards** to encourage the implementation and reporting of QC protocols and performance benchmarks, including for imaging instrumentation.
  - ❖ **Shared metadata specifications, exchange frameworks, and tools to minimize barriers to metadata guideline adoption by academic, government and industry stakeholders.** Specifically, this will empower the annotation of all phases of the image-data lifecycle, including details about samples, reagents and experimental protocols, instrument hardware specifications and image acquisition settings, QC protocols and metrics, image data processing and analysis workflows, and persistent association of metadata and image data.
  - ❖ **Shared computational cyberinfrastructure for image data generation and pre-publication stewardship needs**. This consists of well documented and maintained, enterprise-grade, and high-speed software tools, frameworks, computing and storage equipment, and networks to carry out all steps of the imaging pipeline from data annotation to image acquisition, and analysis. To this aim community-defined standards must be used to ensure transparency regarding all relevant instruments and algorithms.
- **Invest in core facilities (aka Shared Research Resources) and their Personnel from all backgrounds and regions** to:
  - ❖ **Provide expertise** on sample preparation, validation of staining protocols, image acquisition, and image analysis.
  - ❖ **Democratize access** through shared resources and the promotion of collaborations to facilitate access to advanced technology.
  - ❖ Serve as **pivotal hubs for the dissemination of expertise and user training** on all topics essential for the preparation of FAIR image data that is ready to be shared and to engender maximum reuse value, across both resourced and under-resourced regions and communities.
  - ❖ **Develop strong connections with software development centers** to ensure the usability, customization, and democratization of cyberinfrastructure for imaging pipeline automation.
- Support the **career and recognition of imaging scientists** specializing in the generation and stewardship of FAIR image data. These include core facility personnel, image data stewards and curators, image analysis experts, and research software engineers.
- In collaborations with vendors, **develop and deploy automated methods to capture harmonized and consistent metadata documenting all steps of the imaging pipeline** from reagents used to generate image data, to microscopy instruments and peripherals.
- **Promote the use of Persistent Identifier (PID)** for the FAIR description of research resources (i.e., reagents, instruments, core facilities) and outputs (i.e., datasets), to facilitate, reproducibility, and reuse, to democratize access to advanced technologies, improve efficiency, and to ensure that the personnel involved in the research enterprise are appropriately acknowledged.
- **Develop metrics that describe the qualities of resultant image data**.


napari 0.4.18
app-model 0.2.2
magicgui 0.7.3
npe2 0.7.2
napari-console 0.0.8
dask 2023.9.3
napari-svg 0.1.10
scikit-image 0.21.0
numpydoc 1.5.0
cachey 0.2.1
jsonschema 4.19.1
PyOpenGL 3.1.7
tqdm 4.66.1
wrapt 1.15.0
in-n-out 0.1.8
pydantic 1.10.13
Pint 0.22
docstring-parser 0.15
psygnal 0.9.4
build 1.0.3
rich 13.6.0
superqt 0.6.0
typer 0.9.0
tomli-w 1.0.0
appdirs 1.4.4
PyYAML 6.0.1
qtconsole 5.4.4
cloudpickle 2.2.1
fsspec 2023.9.2
importlib-metadata 6.8.0
partd 1.4.1
napari-plugin-engine 0.2.0
vispy 0.12.2
imageio 2.31.4
tifffile 2023.9.26
networkx 3.1
PyWavelets 1.4.1
scipy 1.11.3
lazy-loader 0.3
pandas 2.1.1
Sphinx 4.5.0
HeapDict 1.0.1
jsonschema-specifications 2023.7.1
typing-extensions 4.8.0
mypy-extensions 1.0.0
pyproject-hooks 1.0.0
markdown-it-py 3.0.0
ipykernel 6.25.2
QtPy 2.4.0
click 8.1.7
ipython-genutils 0.2.0
zipp 3.17.0
locket 1.0.0
toolz 0.12.0
hsluv 5.0.4
kiwisolver 1.4.5
freetype-py 2.4.0
numpy 1.26.0
Pillow 10.0.1
pytz 2023.3.post1
tzdata 2023.3
imagesize 1.4.1
sphinxcontrib-applehelp 1.0.4
sphinxcontrib-devhelp 1.0.2
sphinxcontrib-jsmath 1.0.1
sphinxcontrib-htmlhelp 2.0.1
requests 2.31.0
sphinxcontrib-serializinghtml 1.1.5
sphinxcontrib-qthelp 1.0.3
docutils 0.17.1
snowballstemmer 2.2.0
Babel 2.12.1
alabaster 0.7.13
Jinja2 3.1.2
referencing 0.30.2
tomli 2.0.1
mdurl 0.1.2
psutil 5.9.5
ipython 8.16.0
debugpy 1.8.0
nest-asyncio 1.5.8
comm 0.1.4
jupyter-client 8.3.1
packaging 23.1
certifi 2023.7.22
charset-normalizer 3.3.0
idna 3.4
urllib3 2.0.5
MarkupSafe 2.1.3
attrs 23.1.0
rpds-py 0.10.3
Pygments 2.16.1
jedi 0.19.0
prompt-toolkit 3.0.39
exceptiongroup 1.1.3
pexpect 4.8.0
backcall 0.2.0
decorator 5.1.1
matplotlib-inline 0.1.6
pickleshare 0.7.5
stack-data 0.6.3
appnope 0.1.3
tornado 6.3.3
jupyter-core 5.3.2
pyzmq 25.1.1
python-dateutil 2.8.2
parso 0.8.3
wcwidth 0.2.8
ptyprocess 0.7.0
pure-eval 0.2.2
asttokens 2.4.0
executing 2.0.0
traitlets 5.10.1
platformdirs 3.10.0
six 1.16.0