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INSTITUT COCHIN ENTITY DMP - IMAG'IC Core Facility

Pierre Bourdoncle, Thomas Guilbert

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INSTITUT COCHIN ENTITY DMP - IMAG'IC

Plan de gestion de données créé à l'aide de DMP OPIDoR, basé sur le modèle "Science Europe: structured template for research entities" fourni par DMP OPIDoR.

Plan Details

Plan title	INSTITUT COCHIN ENTITY DMP - IMAG'IC	
Deliverable		
Version	First version	
Plan purpose/scope	<p>The aim of this DMP is to describe as precisely as possible the various research products produced by the services offered by the core facility. This DMP is part of a wider framework, that of making available all the DMPs of the 9 Institut Cochin core facilities (MOUSET'IC, PROTEOM'IC, PIV, PIME, METABOL'IC, CYBIO, IMAG'IC, GENOM'IC and HISTIM) as well as the DMP of the CID database dedicated to the transfer, storage, consultation and sometimes processing of most of the data produced by the Institut Cochin's core facilities.</p> <p>The purpose of this DMP entity is to provide drafting assistance for researchers wishing to draw up a DMP for their research projects and wishing to call on the expertise of our core facilities.</p>	
Fields of science and technology (from OECD classification)	1.6 Biological sciences	
Language	eng	
Creation date	2024-07-04	
Last modification date	2024-12-11	
Identifier type	DOI	
License	Name	Creative Commons Attribution 4.0 International
	URL	http://spdx.org/licenses/CC-BY-4.0.json

Structure Details

Entity's name	Institut Cochin Core Facility - IMAG'IC
Acronym	IMAG'IC
Identifier	https://institutcochin.fr/plateformes/imagic
Identifier type	URL
Description	<p>The IMAG'IC cellular imaging core facility at the Institut Cochin is part of the France BioImaging national infrastructure. Spread over 130 m² in the heart of Paris, it has 15 acquisition systems: widefield, confocal, super-resolution (PALM, STORM, STED), multiphoton (spectral, intravital, SHG, FLIM), TIRF, FRET-FLIM, flow imaging, etc. It is also equipped with 3 image analysis and processing stations.</p> <p>Anyone working in a public or private laboratory can benefit from assistance or training to become autonomous on the platform's microscopes. IMAG'IC also offers image restoration services using 3D deconvolution, a database (Cochin Image Database), 3D printing, thick tissue sections using the vibratome and tissue clarification.</p> <p>IMAG'IC is an open-access collaborative facility enabling researchers from within Institut Cochin and elsewhere to perform cutting-edge studies using state-of-the-art equipment. This includes research on diverse samples like cells or tissues, both in vitro and in vivo. Many of the instruments are located in biosafety levels 2 and 3 laboratories, which allows imaging of live cells, tissue samples of human origin and/or infected with pathogens, and whole mammals infected with communicable diseases.</p> <p>All our systems are accessible via a CID image database for backup, archiving, processing, analysis & sharing.</p> <p>We are very attached to our different networks which are an inexhaustible source of useful knowledge for our businesses, locally (RTmf, GDR Imabio -MiFoBio & France-BioImaging) and internationally (QUAREP-LiMi & EuroBioImaging).</p>

Creation date 2000-01-01

Research outputs :

1. Light microscopy images (Image)
2. Biological Samples (Physical object)
3. Image processing softwares (Software)

Contributors

Name	Affiliation	Roles
Bourdoncle Pierre - 0009-0005-0868-363X	Institut Cochin - 051sk4035	<ul style="list-style-type: none"> • Data Collector (Images, Softwares, Softwares) • Entity's Manager (Images, Images, Images, Images, Images, Images, Images, Images, Softwares, Samples, Samples, Softwares, Softwares, Softwares, Softwares, Softwares, Images) • Entity's manager
Braud-Mussi Raphaël - https://institutcochin.fr/annuary/raphael-braud-mussi	Institut Cochin - 051sk4035	<ul style="list-style-type: none"> • Data Collector (Softwares, Images, Softwares)
Guilbert Thomas - 0000-0001-5069-0730	Institut Cochin - 051sk4035	<ul style="list-style-type: none"> • DMP manager • Data Collector (Softwares, Images, Images, Softwares)
Le Goff Gabriel	Institut Cochin - 051sk4035	<ul style="list-style-type: none"> • Contact Person (Softwares) • Data Collector (Softwares, Images, Images, Softwares)
Lesieur Julie	Institut Cochin - 051sk4035	<ul style="list-style-type: none"> • Contact Person (Samples) • Data Collector (Samples, Samples, Samples, Samples, Samples, Images)

INSTITUT COCHIN ENTITY DMP - IMAG'IC

Data description and collection or re-use of existing data

Light microscopy images

Research output description

Name	Light microscopy images
Description	<p>The IMAG'IC photonic microscopy core facility provides users with around fifteen microscopes that generate images in different formats and of varying dimensions. These images are used by the biology community for fundamental and applied research.</p> <p>Microscopes provide multidimensional images:</p> <ul style="list-style-type: none">• 2D images (x, y),• 3D images (diverse spectral channels or z),• 4-5D combining spectral and/or temporal information,• histological pyramidal images of tissues,• high content screening images• fluorescence lifetime images <p>Particular attention is paid to the formats of the saved data, with preference given to formats that allow the enrichment of metadata and formats that can be used by open-source software. Similarly, formats that allow the data to be saved in raw form, or possibly with lossless compression, are used.</p> <p>Formats list: *.tif, *.lif, *.vsi, *.ome.tif, *.nd</p> <p>All these formats are openable through BioFormat software, enable us to read, collect and use metadata of all images.</p>
Type	Image
Workpackage	
Keywords (free-text)	photonic microscopy, light microscopy, images
Language	eng
Issued Date	
Persistent identifier	After publication, the images are deposited in a public archive and identified by DOI.
Identifier type	DOI
May contain personal data?	No
May contain sensible data?	No
May take ethical issues into account?	Yes

Will existing data be reused?

Justification

Images from photonic microscopes can be reused in a number of contexts:

1. analysis
2. complementary analyses
3. reuse by third-party researchers, provided that the image metadata are sufficiently enhanced

How new data will be collected or produced?

Name of the method Photonic microscopy

Description The images are obtained using proprietary acquisition software. Different file formats are generated depending on the acquisition software used. The data collected is saved locally, on the acquisition computer, on a data hard disk physically separate from the system hard disk, in a folder named after the team leader (Institut Cochin), or in a folder named after the unit external to the Institut Cochin, associated with the name of the team leader.

Data Nature Experimental Data

Equipments, technical platforms used

- IMAG'IC : <https://cat.opidor.fr/index.php/IMAG'IC>

Biological Samples**Research output description**

Name Biological Samples

Description The biological samples are of many kinds:

- Tissue slices
- Tissue cleared
- Prepared slides for SMLM and STED
- ExM (Expansion microscopy samples)

Type Physical object

Workpackage

Language eng

Issued Date

Persistent identifier Researcher's one

Identifier type Identifiant local

May contain personal data? No

May contain sensible data? No

May take ethical issues into account? Yes

Will existing data be reused?

Justification

Biological samples can be re-used as often as necessary.

How new data will be collected or produced?

Name of the method

Vibratom, Clearing, SMLM slide preparation, Cell Biology

Description

- **Tissue slices**

The tissues are recovered according to the protocols adapted to their origins, and are then cut using a vibratome located in the BSL2 . The samples are tracked using the OpenIris website, allowing the prepared samples to be traced (their origins, the number of samples, the thickness of the cut).

- **Tissue cleared**

The fixed tissues (whole organs, slices or organoids) are recovered by the core facility after a request for service via the Open Iris website. The clarification protocol is defined with the user, and the sample is prepared in compliance with the procedures and protective measures appropriate to the chosen protocol.

- **Prepared slides for SMLM and STED**

Following a discussion between the user and the super-resolution microscopy experts, the appropriate protocol for the project (fixed or unfixed cells) is defined beforehand. Users then bring their samples to the core facility to finalise the sample mounting using the appropriate mounting buffer supplied by the expert.

- **ExM**

Following a discussion between the user and the core facility experts, the appropriate protocol for the project (choice of the expansion microscopy protocol) is defined. Then, user bring the stained samples (fixed tissue or fixed cells) to the core facility , and all the next steps are realised by the expert from gel preparation to imaging acquisition.

Data Nature

Experimental data

Equipments, technical platforms used

- IMAG'IC : <https://cat.opidor.fr/index.php/IMAG'IC>

Image processing softwares

Research output description

Name	Image processing softwares
Description	<p>Via the CID database, the IMAG'IC core-facility provides a wide range of automated online image processing (Huygens deconvolution, CellPose segmentation, QuPath, ImageJ macros).</p> <p>On request, the core-facility also produces source code enabling users to carry out specific image processing.</p> <p>These programs can take the form of ImageJ macros or plugins, workflows with BitPlane IMARIS, CellPose, Ilastik software, or a combination of different software packages, known as workflows.</p> <p>The user will be trained in the use of these programmes.</p>
Type	Software
Workpackage	
Language	eng
Issued Date	
May contain personal data?	No
May contain sensible data?	No
May take ethical issues into account?	Yes
Will existing data be reused?	
Justification	Image processing programmes developed for the users are intended to be re-used for any useful purpose.
How new data will be collected or produced?	
Name of the method	Image Processing
Description	Source code is written according to user requirements. The code is commented on and users are trained in its use. Test processing is carried out using images supplied by the users, then ideally on model images with known expected results (ground truth).
Data Nature	Simulation data
Equipments, technical platforms used	<ul style="list-style-type: none"> • IMAG'IC : https://cat.opidor.fr/index.php/IMAG'IC
Related references	<ul style="list-style-type: none"> • Macro ImageJ : https://imagej.net/ij/developer/index.html • CellPose : https://github.com/MouseLand/cellpose • QuPath : https://qupath.github.io/

Documentation and data quality

Light microscopy images

What metadata and documentation (for example way of organising data) will accompany the data?

Description

For quality, interpretation, reproducibility and sharing value, science data should be accompanied by detailed descriptions of the conditions that were used to produce them. For light microscopy, Micro-Meta App is an intuitive, highly interoperable, open-source software tool that was developed in the context of the 4D Nucleome (4DN) consortium and is designed to facilitate the extraction and collection of relevant microscopy metadata as specified by the recent 4DN-BINA-OME tiered-system of Microscopy Metadata specifications. For the IMAG'IC core facility, when images are imported to the CID database, the machine metadata are automatically recorded as tags for archiving: [Microscope name, Acquisition software, Objectives, Lasers, Filtres, Tube, Acquisition date, User name].

Users can also add sample tags: [Cell type, Tissu type, Staining, Protein, molecule, ...].

It is thus possible to retrieve any data imported into the CID by searching for these machine or sample tags.

Metadata/data standards

- NBO-Q (4DN-BINA-OME-QUAREP Microscopy Metadata Specifications) : <https://rdamsc.bath.ac.uk/api2/m111>

Metadata language code

eng

Documentation software

Bio-Formats

What methods will be used to ensure their scientific quality?

Description

The data generated on the IMAG'IC core facility comes from microscopes that are checked three times a year on seven measurement points (quality control procedure, as described in Faklaris et al., JCB (2022)) in order to optimize the reproducibility and therefore the quality of the data generated. The IMAG'IC core facility is a partner in the international consortium [QUAREP-LiMi \(Quality Assessment and Reproducibility for Instruments & Images in Light Microscopy\)](#) which works to improve quality control in photonic microscopy. A working group is working on the implementation of an image quality score.

The quality metadata are automatically calculated when each data is imported:

e.g. SNR SVI: calculation of the signal-to-noise ratio on 12bit for each image produced on IMAG'IC. There is one value per channel. This SNR SVI is used by the Huygens software to adapt the 3D deconvolution restoration to each type of signal.

WG10 of QUAREP-LiMi consortium also work on these topic trying to improve the image quality definition.

The IMAG'IC core facility is a partner of the ANR QUALIHEALTH which seeks to improve the quality of data in clinical and preclinical research. Data curation and formatting work is envisaged within this framework on the CID.

Related references

- Quality assessment in light microscopy for routine use through simple tools and robust metrics : 10.1083/jcb.202107093

Biological Samples

What metadata and documentation (for example way of organising data) will accompany the data?

Description

All data documentation are structured on electronical lab notebook CLEclassified by project.

We also use OpenIris website to collect requests for services. All these requests and services are archived.

What methods will be used to ensure their scientific quality?

Description

- Tissue slices

Visual inspection of the original tissue.

Visual inspection after vibratom slice and photonic microscopy quality.

- Tissue cleared

Visual inspection before and after the clearing

- Prepared slides for SMLM and STED

Photonic microscopy data quality.

- ExM

Photonic microscopy data quality.

Image processing softwares

What metadata and documentation (for example way of organising data) will accompany the data?

Description	For quality, interpretation, reproducibility and sharing value, science data should be accompanied by detailed descriptions of the conditions that were used to produce them. For image processing, IMAG'IC core-facility personnel comment code as much as possible.
Metadata language code	eng
Documentation software	Bio-Formats

What methods will be used to ensure their scientific quality?

Description	Test processing is carried out using images supplied by the users, then ideally on model images with known expected results (ground truth).
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Legal and ethical requirements, codes of conduct

Light microscopy images

How will other legal issues, such as intellectual property rights and ownership, be managed? What legislation is applicable?

Description	Promulgated in 2016, the Law for a Digital Republic (LRN) includes several measures on which the national open science policy is based. These measures are transposed, in particular, into the Research Code and the Code governing relations between the public and the administration (CRPA). IMAG'IC core facility follows these recommendations.
Related references	<ul style="list-style-type: none">• Guide d'application de la Loi pour une République numérique pour les données de la recherche : 10.52949/31

What ethical issues and codes of conduct are there, and how will they be taken into account?

Description

The vast majority of samples imaged on our platform are fixed. IMAG'IC provides microscopes at 3 different containment levels: BDSL1, 2 and 3, enabling users to handle living biological material at different levels of contamination risk.

Intravital imaging is performed under the ethical conditions laid down by law. User are responsible about their APAFIS certification.

Any establishment that uses animals for scientific purposes must hold an accreditation. This is issued by a prefectural decree, following inspections by veterinary inspectors from the Departmental Directorate for Social Cohesion and Population Protection (DDPP or DDCSPP). To begin, any research project involving animals must obtain authorization from the Ministry of Research. The authorization is granted for a maximum duration of 5 years, provided that the project has received a favorable evaluation from the ethics committee of the establishment where it will be carried out.

The core facility manager must ensure that the applicant complies with the legislation (Decree No. 2013-118 of February 1, 2013, concerning the protection of animals used for scientific purposes). The core facility manager can assist in drafting the project authorization request (APAFiS Platform on the website of the French Ministry of Higher Education and Research).

Related references

- JORF n°0032 du 7 février 2013 : <https://www.legifrance.gouv.fr/loda/id/JORFTEXT000027038013>

Biological Samples

How will other legal issues, such as intellectual property rights and ownership, be managed? What legislation is applicable?

Description

The data belong to the core facility users until their publication, at which point they become public.

What ethical issues and codes of conduct are there, and how will they be taken into account?

Description

Any establishment that uses animals for scientific purposes must hold an accreditation. This is issued by a prefectural decree, following inspections by veterinary inspectors from the Departmental Directorate for Social Cohesion and Population Protection (DDPP or DDCSPP). To begin, any research project involving animals must obtain authorization from the Ministry of Research. The authorization is granted for a maximum duration of 5 years, provided that the project has received a favorable evaluation from the ethics committee of the establishment where it will be carried out.

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Related references

- JORF n°0032 du 7 février 2013 : <https://www.legifrance.gouv.fr/loda/id/JORFTEXT000027038013>

Image processing softwares

**How will other legal issues, such as intellectual property rights and ownership, be managed?
What legislation is applicable?**

Description

The source code developed is the property of the coder and is made available to the community on the platform's GitHub, under a CC BY NA licence.

What ethical issues and codes of conduct are there, and how will they be taken into account?

Description

CC BY NA

Related references

- Creative Commons rules : <https://creativecommons.org/licenses/by-nc-sa/4.0/deed.fr>

Data processing and analysis

Light microscopy images

How and with what resources will the data be processed / analyzed?

Description

To ensure the FAIR principle, an image processing workflow is copied to allow the exact same processing to be reproduced despite the constant evolution of software and its updates.

Online processing

Some processing can be done directly by the CID database, such as image restoration by 3D deconvolution. A "Huygens" script can be launched, via the CID, on one or all of the images in a dataset, directly at the import if necessary. Thus, the CID moves the raw images selected by the user to the computer or virtual machine containing the Huygens SVI software. Then the script launches the Huygens software with the semi-automatic parameters selected by the user and taken from the image's metadata. Once the processing is complete, the CID deletes the moved raw data and retrieves the resulting images and places them in a sub-dataset with the name Huygens. For each resulting image has been added in the processing metadata: itm, quality, scaleX, scaleZ, NA, binning, snrw, snrc, Ril

Other processing available online are dedicated to denoising, deblurring, upsampling and segmentation using CellPose3. Whether for conventional-sized fluorescence images or for large pyramidal coded images, the CID can process these cases with CellPose either directly or in a QuPath environment.

Quantitative analysis

All the methods described before are also available on personal request.

IMAG'IC core facility also provides software resources as research output.

Related references

- Cellpose3: one-click image restoration for improved cellular segmentation : 10.1101/2024.02.10.579780
- Huygens Deconvolution: Restore microscopy images : <https://svi.nl/Huygens-Deconvolution>
- QuPath : <https://qupath.github.io/>
- Cellpose: a generalist algorithm for cellular segmentation : 10.1038/s41592-020-01018-x

Equipments, technical platforms

- IMAG'IC : <https://cat.opidor.fr/index.php/IMAG'IC>

Biological Samples

How and with what resources will the data be processed / analyzed?

Description

none

Equipments, technical platforms

- IMAG'IC : <https://cat.opidor.fr/index.php/IMAG'IC>

Image processing softwares

How and with what resources will the data be processed / analyzed?

Description

The attached publication describes the issues involved in image processing. The softwares used by the core-facility has been described above.

Related references

- The crucial role of bioimage analysts in scientific research and publication : <https://doi.org/10.1242/jcs.262322>

Equipments, technical platforms

- IMAG'IC : <https://cat.opidor.fr/index.php/IMAG'IC>

Storage and backup during the research process**Light microscopy images**

How will data be stored and backed up during the research?

Storage needs

For obvious security reasons, the connection of USB sticks or external hard disks is forbidden on the data acquisition machines.

As soon as the data is imported into the CID, it is archived and can be searched using the different tags accumulated during the import and the different processing and analysis. In all cases the raw data is kept intact, just as the results of processing or analysis will be new data linked to the raw data.

- Data that have been used to publish research must be accessible at any time.
- It is very important to keep the data that is usable at the state of the art of current research. The lack of short-term storage means that we must consider the notion of data quality and therefore retain only those data that have reliable and rich metadata, and those that allow us to answer a properly posed scientific question.
- It is therefore urgent to find a solution for storing data that has not been consulted for more than two years, for example, on a medium that does not clog up the storage of useful data in common use (storage on magnetic tapes, optical disks, etc.).

One of the main purposes of the CID DB is to allow the long-term archiving of this type of data. If the WEB server is attacked, it can be rebuilt at any time by the Image server. All the data are stored on an Image server in the premises of the Institut Cochin. A complete backup is made every day in one of the 4 other buildings of the Institut Cochin. If the Image server is damaged, a restoration is launched via this copy.

To summarize, the IMAG'IC IT architecture runs on 3 servers:

- Data server (backed up every day to a storage bay in another building)
- DMZ: for the imaging website (backed up every day on a storage bay in another building)
- MZ: Database server (no backup) a solution will have to be found here

All images are saved to the Cochin Image Database.

cf. [INSTITUT COCHIN ENTITY DMP - CID](#)

Estimated volume of data

10

Unit

TB

Equipments, technical platforms

- CID : <https://cat.opidor.fr/index.php/CID>

Measures taken for data security

CID access by institutional login and personal password.

Biological Samples**How will data be stored and backed up during the research?****Storage needs**

No storage, every samples are given to users.

Measures taken for data security**Image processing softwares****How will data be stored and backed up during the research?**

Storage needs	Typically, the source code is stored on the programmer's computer. It is then made available to the user, either directly by network copy or on the CID. The size of the source files is negligible.
Equipments, technical platforms	<ul style="list-style-type: none"> • CID : https://cat.opidor.fr/index.php/CID
Measures taken for data security	CID access by institutional login and personal password.

Data sharing and long-term preservation

Light microscopy images

How will data be shared?

Modalities of sharing Raw data from research is increasingly in demand by publishers. Reproducibility in science is of utmost importance and providing raw data is one way to make the results of an experiment more reliable. Institut Cochin's researchers are therefore invited to deposit their raw data from a publication work on the CID (openData of Cochin Image Database). A direct download web page will then be generated and this link can be protected by a unique DOI (Digital Object Identifier). The IMAG'IC core facility is responsible for generating this link. A contract has been signed with the OPIDoR service of the Inist-CNRS via the DataCite consortium: <https://opidor.fr/identifieur/>
Also, once the images has been used for scientific publication, they are shared through pulbic archive website BioImage Archive. The link is then identify with a DOI link that we are able to create.

Reusability YES, with no condition

Data repository/catalogs

- BioImage Archive : <https://cat.opidor.fr/index.php/BioImage Archive> ()
- CID : <https://cat.opidor.fr/index.php/CID> ()

How will data be long-term preserved? Which data?

Justification Every image is available on CID database for an amount of time which has not been defined yet.

Estimated volume of data 10

Unit TB

Start date 2024-01-01

End date 2024-12-31

Final dispositions

Biological Samples

How will data be shared?

Modalities of sharing none

Reusability

How will data be long-term preserved? Which data?

Justification none

Start date

End date

Final dispositions

Image processing softwares

How will data be shared?

Modalities of sharing For the purposes of scientific reproducibility, the source codes are made available to the community after publication of the data on the IMAG'IC platform's GtHub.
<https://github.com/IMAG-IC/>

Reusability YES, under CC BY SA licence.

Data repository/catalogs • CID : <https://cat.opidor.fr/index.php/CID> ()

How will data be long-term preserved? Which data?

Justification

Ideally, proven source code can be stored on the dedicated Software Heritage site.

Start date**End date****Archive**

Title	Software Heritage
Repository ID	https://cat.opidor.fr/index.php/Software_Heritage
Identifier type	URL
Geo location (country)	FR
Certification	
PID system	SWHID
Available metadata standards	

Final dispositions