NFDI4BIMP

National Research Data Management Infrastructure

for Biological Imaging and Medical Photonics

Spokesperson: Prof. Dr. Elisa May, Unversität Konstanz

Co-Spokespersons: Dr. Stefanie Weidtkamp-Peters, Universität Düsseldorf

PD Dr. Thomas Bocklitz, Leibniz Institut für Photonische Technologien, Jena

Status Quo and User needs

In the last two decades, a wave of technological innovations in the field of bioimaging has transformed microscopy from a low throughput, merely qualitative technique for the visualization of biological samples into a big data, quantitative analytical approach delivering insights into biological processes at molecular detail. To exploit the full potential of these data it is necessary that they become available to the whole scientific community. Comparing, reanalyzing, and reproducing interesting microscopy datasets represents a source of new knowledge for researchers from all disciplines of the life and biomedical sciences. Yet, the sharing of imaging data is far from being routine posing a major obstacle to scientific progress. Presently, the reality of image data handling in most laboratories or core facilities in Germany is quite far from the FAIR principles. Image data, once acquired, is mostly stored locally on the PC of the microscope user, on USB drives or external hard disks. Data is often not routinely and instantly sorted and labeled in a systematic manner, so that, typically, only the scientists who carried out the experiment knows which data belong to which sample, and under which conditions it was generated. Another hurdle for reusability are proprietary file formats of primary and processed data generated by the imaging system, which might not be accessible once the instrument is replaced by a new one even from the same manufacturer. The same applies to data processed and analysed with proprietary software which may become unavailable because of e.g. license issues or just release changes. Even in the case of open source image analysis software, it is not easy for the average end user who has not developed the workflow to reproduce an analysis because of a lack of documentation i.a. about the version used.

A prerequisite for community-wide exchange of imaging data is the adoption of data management practices that ensure that data are stored in open formats, that they can be properly connected to experimental details via metadata, that these metadata can be read and correctly interpreted, and that all this information is stored in public archives that can be easily accessed.

Objectives

The main objective of NFDI4 Biological Imaging and Medical Photonics (NFDI4BIMP) is to become the national reference entity for FAIR management of image data across research disciplines within the NFDI.

NFDI4BIMP aims at developing strategies and workflows, as well as implement, test and provide tools and processes for the proper management of research image data according to the FAIR principles to a large community of researchers. It will cover, in the first instance, data from biology, the life sciences and photonics-based medical diagnostics, but will also strive to create image-data related resources and services that are valuable for the whole NFDI. NFDI4BIMP aims also at becoming a gateway for German researches to access and use open repositories for image data which are being created at the European level, in the first place the BioImage Archive hosted at EMBL-EBI, as well as further pertinent international repositories. NDFI4BIMP will also ensure interoperability of these archives with national or local solutions for long-term image data storage.

To achieve these objectives, the consortium will address the following main task areas:

- Define, implement and distribute standards and calibration tools for image data acquisition for improved data quality, comparability and reproducibility in different scientific areas.
- Identify suitable schemes for the accurate and exhaustive description of image data and the respective metadata, and promote their usage by the scientific community.
- Extend and promote the usage of database systems based on image data models in combination with data structuring ontologies.
- Identify and address the need for interfaces between different image data management systems, between different data models and file formats used in the imaging community to enable interoperability and collaboration.
- Support the development of linkages between open source software for image data analysis and image data management platforms. Promote the proper documentation and publication of data analysis workflows.
- Uphold openness for other (non-image) data types by developing e.g., interfaces to data bases for other data types, in order to foster the combination and integration of knowledge from different disciplines and methodological approaches.
- Consolidate and expand the links to international and in particular European endeavours aimed at the FAIR management of image data to foster synergies and avoid the duplication of efforts. Ensure communication and compatibility between national and international image data management solutions.

− Promote awareness for the necessity of FAIR data management plans and of resources for image data in the scientific community and create extensive education and training opportunities.

− Promote the inclusion of commercial providers of microscopy and photonics equipment in the processes for the development of FAIR image data management.

Consortium

NFDI4BIMP is a joint initiative of German BioImaging Gesellschaft für Mikroskopie und Bildanalyse e.V. (GerBI-GMB) and the Leibniz Research Alliance "Health Technologies". GerBI-GMB unites the majority of biological and biomedical imaging core facilities at German research institutions in a well-organised and very active network. In the Leibniz Research Alliance "Health technologies", photonic research groups, photonic data science groups, and research groups which apply photonic methods in combination with data science to biomedical research questions are represented. We see ourselves as a methodological and thus "transversal" consortium within the NFDI spanning across a wide range of disciplines. As these cross-cutting consortia take shape during the build-up phase of the NFDI, we will seek to become integrated in many disciplinary ("vertical") consortia dealing with image or image-related data.

Expectations for the conference

We plan to apply for the NFDI in October 2021. The University of Konstanz has committed to support this effort with a coordinator who will start in August 2020 and work exclusively for the preparation of the NFDI4BIMP proposal. For us, it will be important to hear about the experiences with the first round of applications, learn about the recently approved consortia, and, as a cross-cutting consortium identify as many potential collaborating partners within the NFDI as possible.

Participants in the NFDI4BIMP

Imaging core facilities and research groups of GerBI-GMB and partners within the Leibniz Research Alliance "Health Technologies".

Persons who have been contacted until 16.08.2019:

- Dr. Hella Hartmann; Center for Regenerative Therapies, Technical University of Dresden
- Dr. Roland Nitschke, Life Imaging Center, Center for Biological Systems Analysis, University of Freiburg
- Dr. Jan Peychl, Light Microscopy Facility, Max Planck Institute of Molecular Cell Biology and Genetics.

- Dr. Werner Zuschratter, Leibniz Institute for Neurobiology, Magdeburg
- Dr. Aurelie Jost, Imaging Center of the Excellence Cluster „Balance in the Microverse",
  Friedrich-Schiller-Universität, Jena
- Dr. Karol Szafranski, Leibniz-Institute for Aging - Fritz-Lipmann- Institut e.V., Jena
- Dr. Markus Becker Leibniz-Institute for Plasma Research and Technology e.V., Greifswald

Further potential collaborating sites (to be contacted yet):

Name	Full Name	City
ALM MDC Berlin	Advanced Light Microscopy Technology Platform	Berlin
BMC LMU München	Biomedical Center (BMC) at the LMU München	Martinsried
BioDIP CFCI	Core Facility Cellular Imaging	Dresden
BioDIP DZNE Imaging Platform	Light Microscopy Facility of the DZNE Dresden	Dresden
BioDIP LMF CMCB	CMCB Light Microscopy Facility	Dresden
CECAD Cologne	CECAD (Excellence Cluster for Aging Research), University of Cologne	Cologne
DKFZ	DKFZ - Light Microscopy Facility	Heidelberg
EMBL-ALMF	Advanced Light Microscopy Facility (ALMF), EMBL	Heidelberg
IBiOs	Integrated Bioimaging Facility Osnabrück (IBiOs)	Osnabrück
ICCE	Imaging Centre Campus Essen (ICCE), University of Duisburg-Essen	Essen
IMB Mainz	Core Facility Microscopy of IMB Mainz	Mainz
Infectious Diseases Imaging Platform	Infectious Diseases Imaging Platform (IDIP)	Heidelberg
Leibniz-ISAS	Leibniz-Institut für Analytische Wissenschaften	Dortmund
Leibniz-HKI	Leibniz-Institut für Naturstoff-Forschung und Infektionsbiologie	Jena
LMF - DZNE Bonn	Light Microscope Facility at the German Center for Neurodegenerative Diseases (DZNE) Bonn	Bonn
MPI for Biology of Ageing	FACS & Imaging Core Facility - Max Planck Institute for Biology of Ageing	Cologne
MPI for Developmental Biology	MPI for Developmental Biology	Tübingen
MPI for Experimental Medicine Light Microscopy Facility	MPI-EM Light Microscopy Facility	Göttingen
MPI-BPC Goettingen	Max Planck Institute for Biophysical Chemistry	Göttingen
MPI-Biochemistry Martinsried	MPI-Biochemistry Martinsried, Imaging Facility	Martinsried
MiN-Münster	Münster Imaging Network at WWU Münster	Münster
ZMBH	Zentrum für Molekulare Biologie der Universität Heidelberg (ZMBH)	Heidelberg
Zelluläre Bildgebung Marburg	Zelluläre Bildgebung, Centre of Cancer and Immunology, University of Marburg	Marburg