Datenschutzkonforme virtuelle Forschungsinfrastrukturen für Gesundheitsdaten

Actionable Multilevel Health Data

Petra Ritter
Human Health Data

Even after directly identifying information such as names, faces, addresses, or dates of births were removed (often called ‘pseudonymization’), the data is still considered as personal data under GDPR if it could be attributed to a natural person by the use of additional information (Recital 26, GDPR) and hence the requirements for protection nevertheless apply.

Typical biomedical data like MRI or genetic material contain extensive person-related information such that re-identification cannot be excluded (Byrge & Kennedy, 2018; Gymrek et al., 2013; Rocher et al., 2019)
Service for sensitive data: Synergistic developments

EOSC Project Virtual Brain Cloud: Virtual Research Environment
€15Mill 2018-2022 (lead: Charité)

Human Brain Project: Codesign Project The Virtual Brain (SGA2)
€1Mill 2018-2020 (lead: Charité)

Human Brain Project Health Data Cloud (SGA3)
€1Mill 2022-2023 (lead: Charité)

Horizon Europe Infrastructure eBRAIN-Health
13 Mill 2022-2026 (lead: Charité)

www.healthdatacloud.eu
https://ebrains.eu/service/the-virtual-brain
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EBRAINS is powering a new era in Brain Research

Users with Accounts: >5500

Data and Knowledge
- Online solutions to facilitate sharing of and access to research data, computational models and software

Atlases
- Navigate, characterise and analyse information on the basis of anatomical location

Simulation
- Solutions for brain researchers to conduct sustainable simulation studies and share their results

Brain-Inspired Technologies
- Understand and leverage the computational capabilities of spiking neural networks

Medical Data Analytics
- The Medical Data Analytics service provides two unique EBRAINS platforms, covering key areas in clinical neuroscience research
Automated cryptography & sandboxing workflow

1. Data controller
   - Authenticate
   - Create key pair
   - Exchange public keys
   - Encrypt
   - Upload
   - Decrypt
   - Pipeline processing
   - Encrypt results

2. EBRAINS
   - Authenticate
   - Forward public keys
   - Encrypt results
   - Download

3. HPC
   - Start sandbox
   - Create key pair
   - Exchange public keys
   - Decrypt
   - Pipeline processing
   - Encrypt results

Login node / storage FS
Compute node

Pull containers
The Virtual Brain

Patent allowance in the US
(EU, Canada pending)
McIntosh, Mersmann, Jirsa, Ritter

Virtual deep brain stimulation: Multiscale co-simulation of a spiking basal ganglia model and a whole-brain mean-field model with The Virtual Brain

© Jil M. Meier, Dionysios Perdikis, André Blickensdörfer, Leon Stefanovski, Qin Liu, Oliver Maith, Helge U. Dinkelbach, Javier Baladron, Fred H. Hamker, Petra Ritter
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https://virtualbraincloud-2020.eu/
The Virtual Brain Cloud / €15Mill
2018-2022 (lead: Charité)
Successor: eBrain-Health / 13 Mill
2022-2026 (lead: Charité)

https://virtualbraincloud-2020.eu/
Virtual Research Environment
Making it easier for researchers to manage, share, and process complex research data.

Learn more

GDPR READY
The VRE has undergone a successful GDPR Service Readiness audit.
**Community**

The VRE is a community development project. We follow the FAIR guiding principles for scientific data management - Findability, Accessibility, Interoperability, and Reusability.

Please contact us to learn more about how to join the VRE community and participate in the development. We want to ensure that this development is open and accessible to all clinicians and scientists at Charité, BIH, and beyond, so we can solve today's pressing medical challenges together!

<table>
<thead>
<tr>
<th>Members</th>
<th>Projects</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>88</td>
<td>15</td>
<td>156 GB</td>
</tr>
<tr>
<td>Virtual Machines</td>
<td>Cores</td>
<td>RAM</td>
</tr>
<tr>
<td>21</td>
<td>244</td>
<td>1503 GB</td>
</tr>
</tbody>
</table>
neuroscience.

- The initiative brings together data collectors, data users and technology providers to develop processes for data management in research with specific emphasis on neuroscience.
- The consortium works to build a community to develop the conceptual and practical basis of research data management for the neurosciences.

Learn more about the initiative

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**Latest news**

**Global survey on data-sharing barriers in neuroscience**

6. October 2022 | No Comments

The INCF Infrastructure Committee is trying to identify barriers to data sharing and reuse among neuroscience researchers worldwide, with a brief anonymous survey. The results

Read More »

**eBRAIN-Health project awarded funding by European Union!**

5. July 2022 | No Comments

NFDI-Neuro is proud to announce that the eBRAIN-Health project: "Actionable Multilevel Health Data", coordinated by our Consortium spokesperson, Prof. Petra Ritter, has been funded with

Read More »

**NFDI Neuroscience Co-Spokesperson**

Thomas Wachtler contributed to the

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**Upcoming events**

**NOV** November 7 @ 00:00 - November 10 @ 19:00 CET

7 EBRAINS Training Event – Simulate with EBRAINS

View Calendar

The Virtual Research Environment (VRE) is a collaborative project, developed for the research community and with the research community. VRE Community Meetings are organized for members of the research community to discuss their projects and use cases and for the development team to update on new features and development activities.

Registration link for the biweekly Virtual Research Environment Community Meetings
Collections

Virtual folders to group files without affecting their storage location or data lineage
Datasets

Create a Dataset

Add Project data

Add Metadata Annotations

Explore & Organize

Publish Versions
Datasets—Validate Datasets

My new Dataset

Dataset Code: shortcode / Created on 2022-03-21 by schirmem

Bids Validation

- Not Validated
- 1 Errors

We found 1 Errors in your dataset.
Last validated time: 2022-03-21 16:35

view 1 errors in 1 files

[Code 61] QUICK_VALIDATION_FAILED

data
Location:
data
Reason:
Quick validation failed - the general folder structure does not resemble a BIDS dataset. Have you chosen the right
Datasets–Metadata schemas
Datasets – Versioning

### Releasing Dataset Version

Please select if this is a minor or major release.
- [ ] Minor Release: 1.2
- [ ] Major Release: 2.0

**Version Notes**

```
Recent changes since 1.1

**Version 1.1**
```

[Submit]
Data lineage

Current File
Represents the current state of the file in its lineage. Hover over the file node to view the Type, Name, and Process Time of the current file.

Processing Node
The Processing node indicates a processing activity such as a processing pipeline, or copy/delete action. Hover over the Processing node with your cursor to view the processing action and the date and time it was completed.

Upstream or Downstream Version of Current File
Represents either an upstream or downstream version of the current file. Hover over the file node to view the Type, Name, and Upload Time of the file.

Data Transfer Node
This node represents data transfer or copy from the Green Room to the Core.
Data onboarding—User roles

- **Project Contributors** can only upload files to isolated (user-specific) spaces in the Green Room or private Core zone.
- Only **Project Administrators** can make data accessible to the entire Project team.
- All files that can be accessed by a user, can also be downloaded by that user.
• Only after the **Use and Access Committee** approved all necessary contracts a dedicated VRE Project is created by a **Platform Administrator** and adds the specified controller and processor as team members.

• Controller can then import the purpose-specific health data to make it available to processor for performing the processing operation.
Wiki with support resources

- User guide
- Policies and templates to assist researchers with GDPR compliance
T&O measures—IT infrastructure

- VRE is hosted at the IT center of the Berlin Institute of Health at Charité
- As a designated ‘critical infrastructure’ of the German government Charité IT implements state of the art security measures and industry best practices (certification every two years)
- Independent data protection evaluation of the VRE completed in July 2021 concluded that the services of the VRE can be offered as commissioned data processing for health-related research projects in compliance with the requirements of the European GDPR
T&O measures—Isolation of data and resources

- VRE restricts direct access to its resources such as storage and compute
- Users can interact with resources only via controlled routes via the GUI and the CLI
- Kubernetes namespaces to create isolated zones
- Additionally, zones are hosted on different VMs; traffic restricted by network filters
- Copy To Core can only be authorized by Project Administrators and uses a multi-step protocol to prevent accidental exposure
T&O measures—Encryption

• Data are encrypted during transmission to/from the VRE
• Data stored ("at rest") on the VRE are encrypted using disk-level (hardware) encryption
T&O measures—Authentication and authorization

- Keycloak/OpenID Connect for single sign-on and to authenticate communications between the VRE front-end, API Gateway (which connects all back-end services), and workbench tools
- Identity of VRE users federated between the VRE identity and access management system (IAM) Keycloak and the Charité IAM Microsoft Active Directory (AD)
  - Registration in the Charité AD is a precondition for using the VRE
  - External users must complete a registration procedure and provide a form of personal identification and evidence of a contractual relationship with the Charité to be authorized for inclusion in the Charité AD
  - Account information and credentials are stored in the Charité AD and not within the VRE itself
- Password complexity requirements and session inactivity timeouts reduce the risk of unauthorized access
T&O measures—**Access control**

- Fine-grained role-based and project-based access control governed by transparent Use and Access Policies that promote fair and democratic access to the VRE
- Onboarding a new project follows a streamlined procedure: Service Agreement, Data Processing Agreements, Terms of Use, and positive Research Ethics Board evaluation
- After approval, Project Administrator is first granted access by invitation from the Platform Administrator; Project Administrator can then invite specified users to access the project data
- a VRE user may be a member of multiple projects and may have different roles in each project
EGL: Advanced computing for research

We support data-intensive research with a wide range of advanced computing services
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Governance

**Supervisory Authorities**
EU, Federal, State

**Processor**
Maintains the Data Platform.
Implements Technical and Organizational Measures
Processes data on behalf of the controller.

**Data Platform**
A secure data processing environment

**Controller**
Determines the purpose and means of processing
Prepares a data protection impact assessment for the research study

**Derivative Datasets**
Dataset use terms
Data Processing Agreement with receiving data controller

**Research Ethics Board**
Ethical evaluation of the research project

**Data Subject**
An identified or identifiable natural person whose personal data is the subject of processing.
Consents to their data being used and shared for research.

**Data Protection Officer**
Designated by the controller and processor
Involved in issues relating to protection of personal data.
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EBRAIN-Health

In collaboration with:

Innovative Health Initiative

EBRAIN-Health

- Data Gateway
- Federated AAI
- Metadata
- Data
- HPC
- Workbench
- Core Services
- Workflows
- Provenance
- Data structure
- BIOMED2
- Annotation
- Metadata
- Access Control
- sandboxing
- Graphical and scripting interfaces securely connected with HPC for resources intensive simulations

€13Mill, Coord. CHARITÉ, 2022-2026

https://cordis.europa.eu/project/id/101058516
Action: Closing the Gap in the Innovation Chain for Health-AI & Robotics

Service Categories:
- Data
- Standards
- Testing
- AI/Robotics
- Certify

Single EU-wide entry point through Ebrains.eu (ESFRI RI)

€60 Mill
2022-2026 (lead: Charité)
PD 11 - How to Achieve a Global Health Data Space
Oct. 18, 2022, CEST: 09:00 AM - 10:30 AM / UTC: 07:00 AM - 08:30 AM
Panel Discussion (PD 11) - Europe

Breaking the data silos is essential to reshape the future of healthcare and crisis preparedness. Digital health and artificial intelligence (AI), we are, more than ever before, in the pole position that could help to treat and govern data for health as a global public good. However, across all divide in the capacity to effectively work with data. The 2021 I-DAIR Global Research Map reveals leaders based in a small number of countries and the rest of the world is growing. Additionally, race, and age limit the universal benefit and the trust in data use.

Only when used equitably and ethically, the work with data can offer an unprecedented possibility to improve health outcomes and achieve UHC 2030. Impact at the global level will thereby only be possible with the combined efforts of stakeholders. The panel aims to inspire meaningful action to advance the implementation of HDS to improve and sustain global health outcomes. Panelists will discuss discourses, barriers, and opportunities for a global Health Data Space (HDS).

Chairs:
Prof. Dr. Petra Ritter
Charité - Universitätsmedizin Berlin | Berlin Institute of Health (BIH) | Professor for Brain Imaging

Speakers:
Dr. Marlies Dorlächter
DLR Project Management Agency | International Health Research | Head of Division | Germany

Dr. Mehdizadeh
International Digital Health and Artificial Intelligence Research Collaborative (I-DAIR) | CEO
Pawel Świeboda
Human Brain Project | Director-General | Belgium
Thank you!