

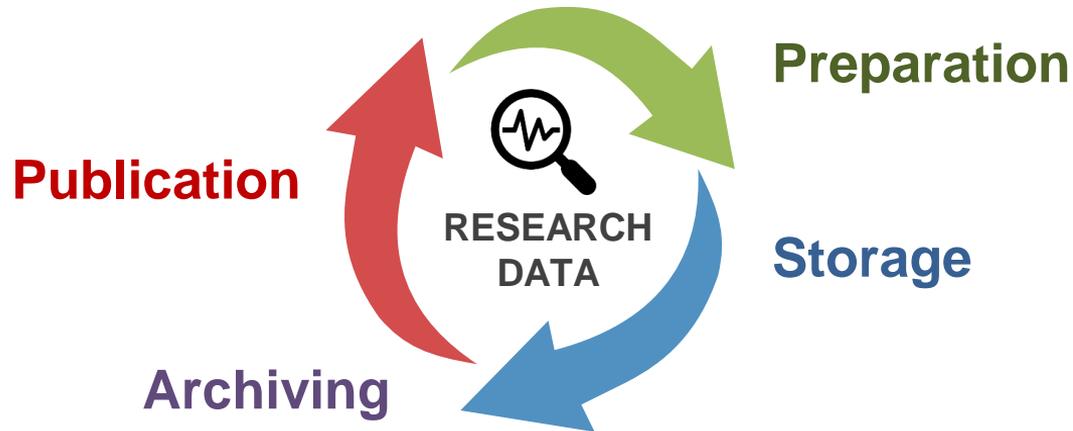
My research data and me: How it can work!

Research Data Management @ Graz University of Technology



Research Data Management

„RDM accompanies the research process from the initial planning stages to the archiving, subsequent use, or deletion of the data.“



Content from: [CC0, https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1](https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1)

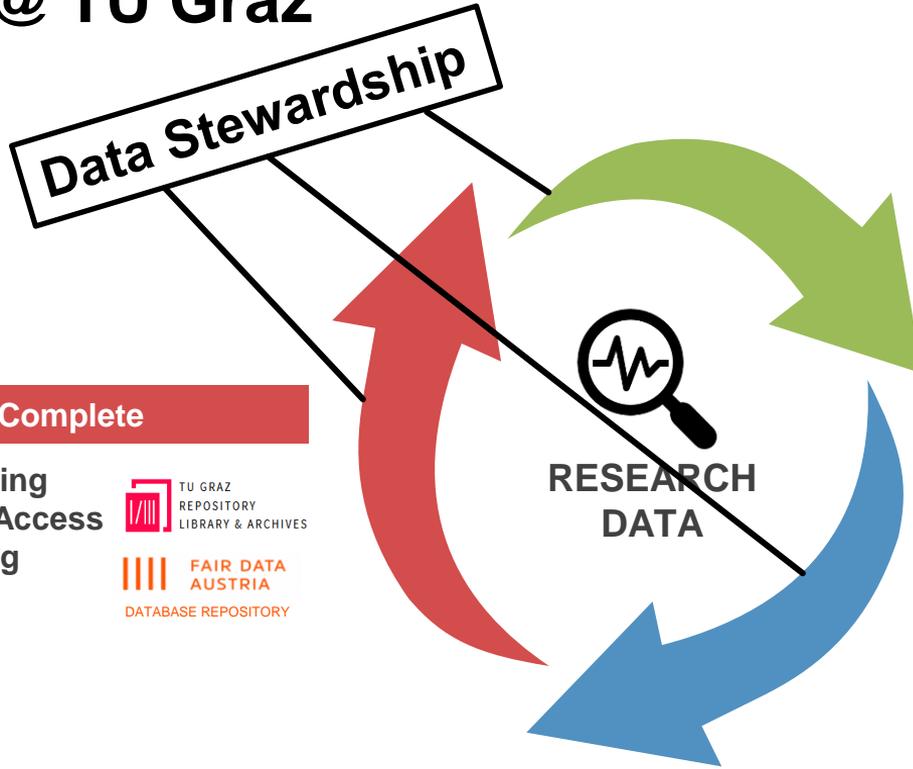
K. Biernacka et al. Train-the-Trainer Concept on Research Data Management, Berlin 2020, DOI:10.5281/zenodo.4071471

RDM Support @ TU Graz

- **Hard'** infrastructure elements
 - Data analysis **platforms**, data **repositories**
- **Soft'** infrastructure elements
 - Policies, **guidelines**, **data stewardship** support & DMPs
- Develop FAIR services led by researchers
 - *“general as possible - subject-specific as necessary”*
 - social & technical solutions
 - between researchers & support



RDM @ TU Graz



maDMPs

Research Planning

- Defining requirements from funding agencies
- Clarifying legal framework and ethical issues
- Re-using existing data

Research Complete

- Preserving
- Giving Access
- Re-using



Active state of research

- Collecting
- Processing
- Analysing
- Tracking
- Sharing



Content from: [CC0, https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1](https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1) - logos excluded



DMP Tools

- Argos: <https://argos.openaire.eu>
- DMPTool: <https://dmptool.org>
- DMPOnline: <https://dmponline.dcc.ac.uk/>
- DS Wizard: <https://ds-wizard.org/>
- **TU Graz DMP Tool** based on DAMAP

Machine actionable DMPs

<https://damap.org/>

DAMAP

- Tool to assist **creating DMPs**
 - Guidance
 - Export
- **Automation**
 - Collecting information from system
 - & Triggering actions in systems
- **Integration** of project/researcher databases, storage, authentication
- TU Graz deployment: <https://dmp.tugraz.at/>





Startseite

DMPs

TU Graz DMP Tool

1 Choose project**2** People involved in data management

This step helps you to provide information on involved persons and their particular roles regarding research data management within this project. Based on the information provided in the Project Database, we have already entered the name of the Project Leader and marked them as the Contact Person for questions related to data management and the DMP (icon with person and envelope). You can change the preset information if needed and add more contributors via the search (start typing the name) and manually. Provide a minimum of one Contact Person as well as a Data Manager (may be the same person).

Search for person...

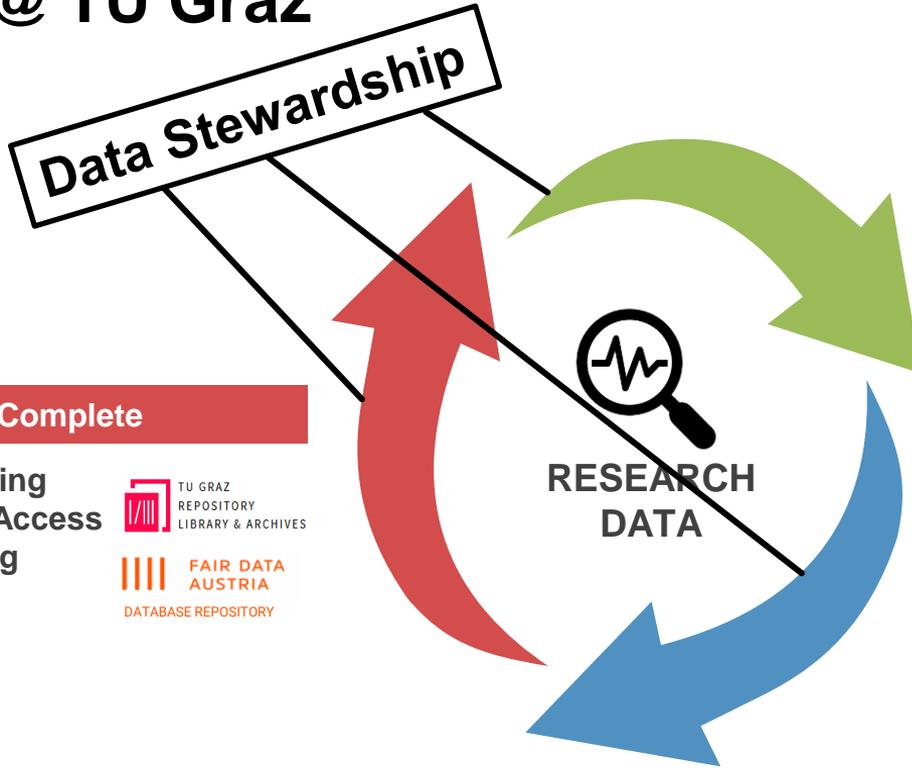
No project members available.

[Show manual contributor input](#)**3** Specify research data**4** Documentation and data quality**5** Storage and backup during the research process**6** Legal and ethical aspects**7** Data access and licensing**8** Specify repositories for publication and preservation

✓ All changes have been saved.

[Discard changes](#)[Save changes](#)[Save new version](#)[Export document](#)Source: <https://dmp.tugraz.at/>

RDM @ TU Graz



maDMPs

Research Planning

- Defining requirements from funding agencies
- Clarifying legal framework and ethical issues
- Re-using existing data

Research Complete

- Preserving
- Giving Access
- Re-using



Active state of research

- Collecting
- Processing
- Analysing
- Tracking
- Sharing



Content from [CC0, https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1](https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1) - logos excluded



Electronic Lab Notebook (eLabFTW)



© elabftw.net

“Documentation increases reproducibility!”

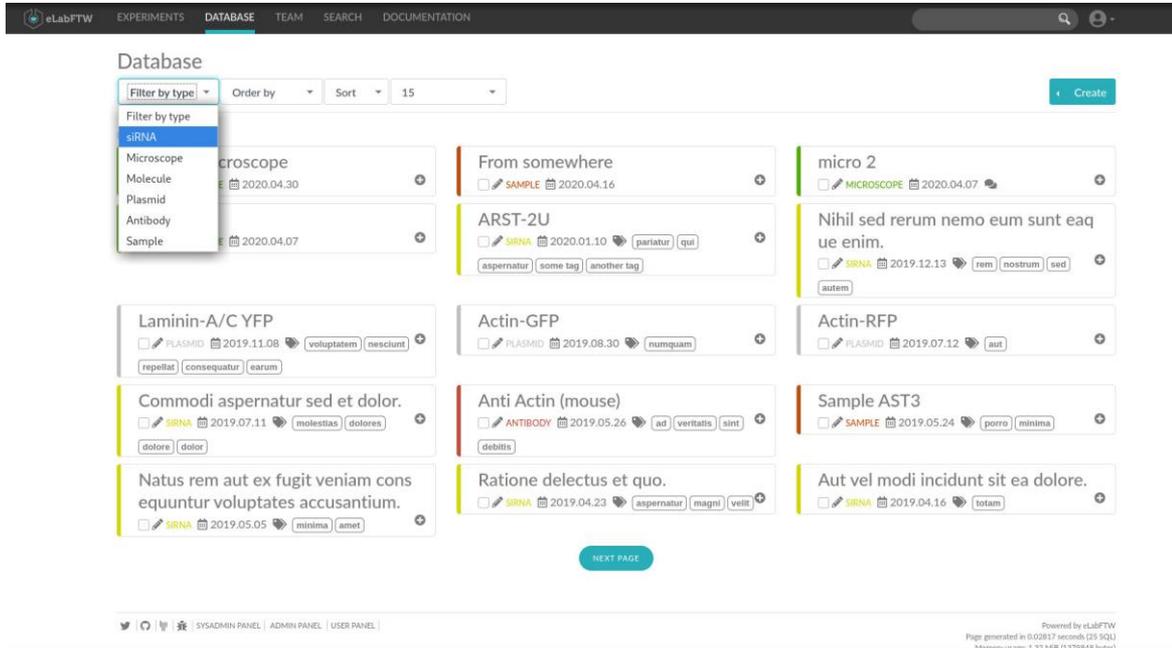
- Purpose: *taking notes, data storage, organization*
- **Replace** paper laboratory notebooks
- **Search** upon, simplify data copying and **backup**
- **Collaboration** amongst many users



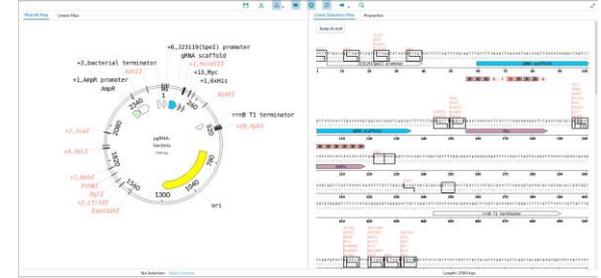
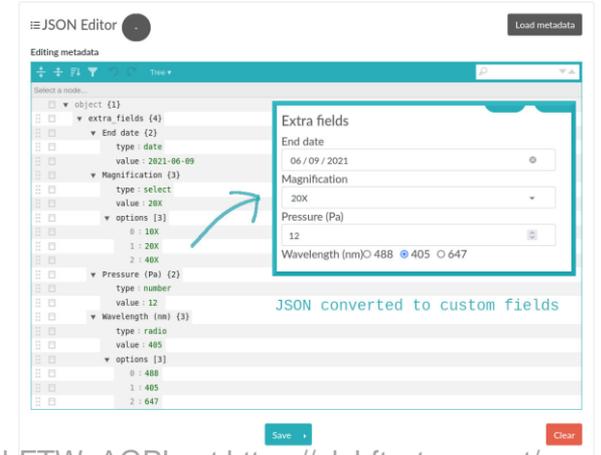
CCO by Mohamed Hassan,
pxhere.com

eLabFTW.tugraz.at

Electronic Lab Notebook (eLabFTW)



The screenshot shows the eLabFTW Database interface. At the top, there are navigation tabs: eLabFTW, EXPERIMENTS, DATABASE (selected), TEAM, SEARCH, and DOCUMENTATION. Below the tabs, there are filters for 'Filter by type' (set to 'siRNA'), 'Order by', 'Sort', and a count of '15'. A 'Create' button is visible in the top right. The main area displays a grid of experiment entries, each with a title, type, date, and associated tags. For example, 'From somewhere' is a 'SAMPLE' from 2020.04.16 with tags 'pariatur' and 'qui'. 'ARST-2U' is a 'siRNA' from 2020.01.10 with tags 'aspernatur', 'some tag', and 'another tag'. Other entries include 'micro 2', 'Nihil sed rerum nemo eum sunt ea que enim.', 'Actin-GFP', 'Actin-RFP', 'Sample AST3', and 'Aut vel modi incidunt sit ea dolore.'.

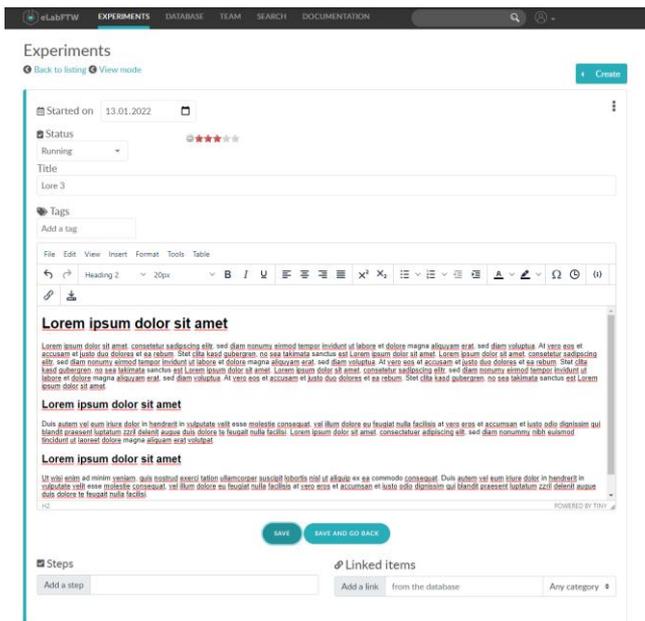



The screenshot shows the JSON Editor interface. The top bar includes 'JSON Editor', 'Load metadata', and 'Save'. The main area displays a tree view of metadata with a search bar and a 'Tree' dropdown. The tree view shows a hierarchy of objects and arrays, including 'extra_fields (4)', 'End date (2)', 'Magnification (3)', 'options (3)', 'Pressure (Pa) (2)', 'Wavelength (nm) (3)', and 'options (3)'. A blue arrow points from the 'extra_fields' section to a preview window on the right. The preview window shows 'Extra fields' with input fields for 'End date' (06 / 09 / 2021), 'Magnification' (20X), 'Pressure (Pa)' (12), and 'Wavelength (nm)' (488, 405, 647). Below the preview, the text 'JSON converted to custom fields' is displayed. At the bottom, there are 'Save' and 'Clear' buttons.

Source: elabFTW, [AGPL](https://elabftw.tugraz.at/), at <https://elabftw.tugraz.at/>



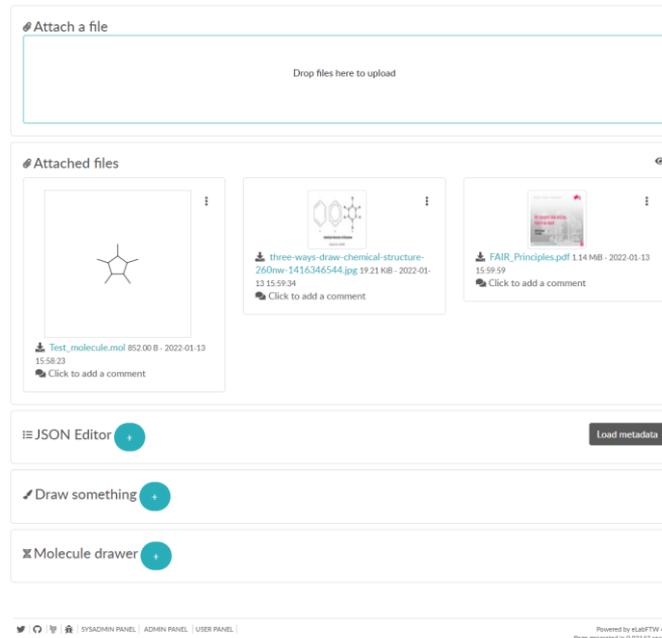
Documentation of results & tasks - EXPERIMENTS



The screenshot shows the 'Experiments' page in eLabFTW. It includes a navigation bar with 'EXPERIMENTS', 'DATABASE', 'TEAM', 'SEARCH', and 'DOCUMENTATION'. The main content area has a 'Create' button and a 'Back to listing | View mode' link. The experiment details show it started on 13.01.2022 and is in a 'Running' status. There is a text editor with placeholder text 'Lorem ipsum dolor sit amet...' and a 'SAVE AND GO BACK' button at the bottom.

← Modification in the graphical text editor

Attach files with preview →

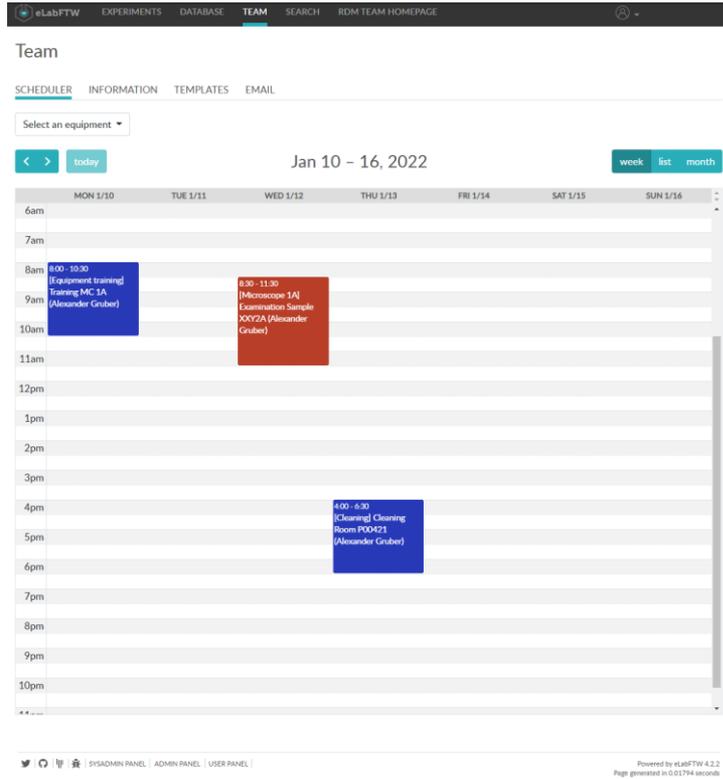


The screenshot shows the file management interface in eLabFTW. It features an 'Attach a file' section with a 'Drop files here to upload' area. Below this is an 'Attached files' section displaying three items: a chemical structure, a file named 'three-ways-draw-chemical-structure-260hw-1416346544.jpg', and a PDF document 'FAIR_Principles.pdf'. At the bottom, there are buttons for 'JSON Editor', 'Draw something', and 'Molecule drawer', along with a 'Load metadata' button.

Source: elabFTW, [AGPL](https://elabftw.tugraz.at/), at <https://elabftw.tugraz.at/>



Member overview and item booking options - TEAM



The screenshot shows the 'Team' page in eLabFTW. At the top, there are navigation tabs: SCHEDULER, INFORMATION, TEMPLATES, and EMAIL. Below these is a dropdown menu for 'Select an equipment'. The main area is a calendar for 'Jan 10 - 16, 2022'. The calendar shows several booking events:

- 8:00 - 10:30:** Equipment training Training MC 1A (Alexander Gruber) - Monday, Jan 10, 8am-10am.
- 8:30 - 11:30:** [Microscope 1A] Examination Sample XYZA (Alexander Gruber) - Wednesday, Jan 12, 8am-11am.
- 4:00 - 6:30:** [Cleaning] Cleaning Room P00421 (Alexander Gruber) - Thursday, Jan 13, 4pm-6pm.

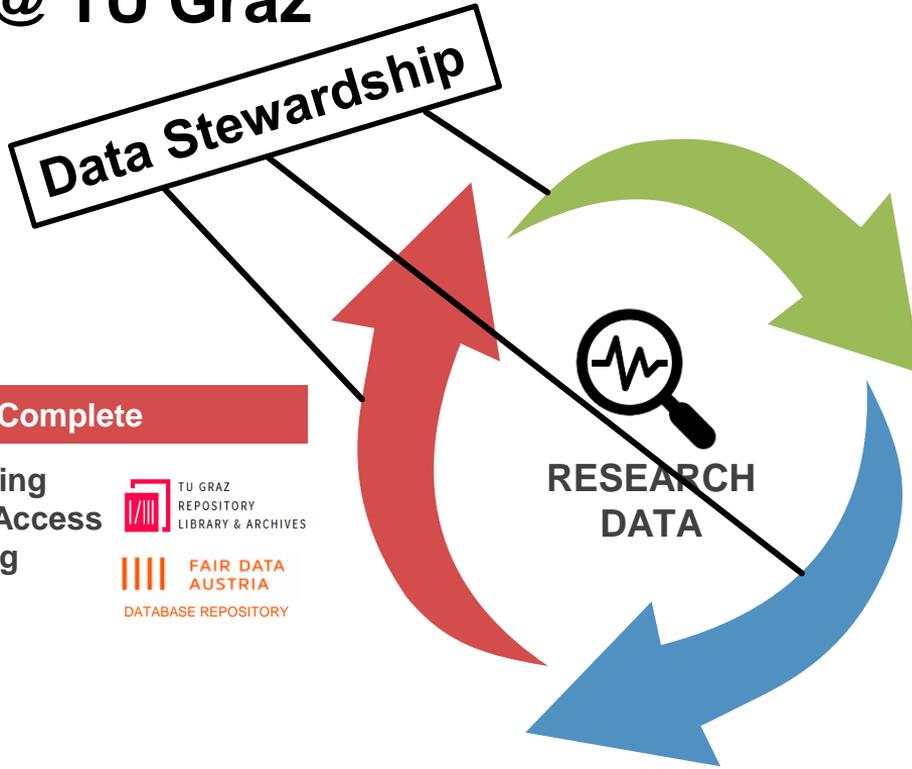
At the bottom of the page, there are navigation links for SYSADMIN PANEL, ADMIN PANEL, and USER PANEL, along with a footer indicating the page is powered by eLabFTW 4.1.2.

Feature	User	Admin	SysAdmin
Modify Profile Information	X	X	X
Use ToDo-List	X	X	X
Create/Edit/Delete Experiments	X	X	X
Upload to Database	X	X	X
Add Users		X	X
Create Groups		X	X
Add Database item types		X	X
Define Experiment Status		X	X
Create Teams			X
System Settings			X
Security & Email settings			X

Source: elabFTW, [AGPL](https://elabftw.tugraz.at/), at <https://elabftw.tugraz.at/>



RDM @ TU Graz



maDMPs

Research Planning

- Defining requirements from funding agencies
- Clarifying legal framework and ethical issues
- Re-using existing data

Research Complete

- Preserving
- Giving Access
- Re-using



Active state of research

- Collecting
- Processing
- Analysing
- Tracking
- Sharing



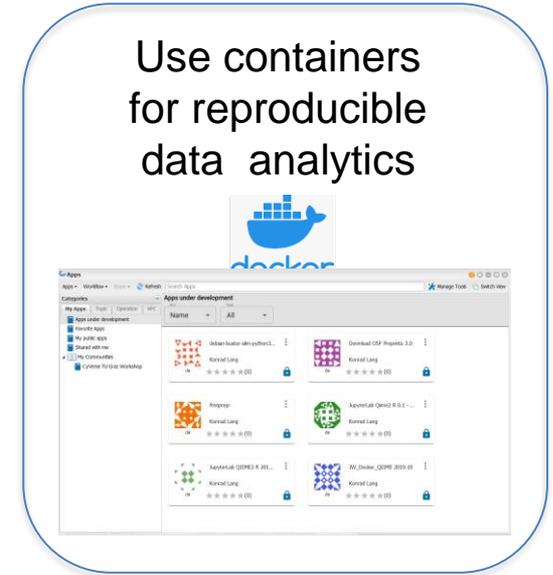
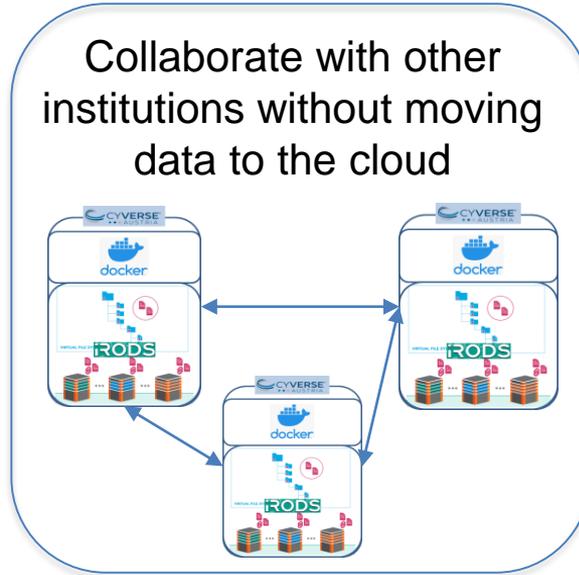
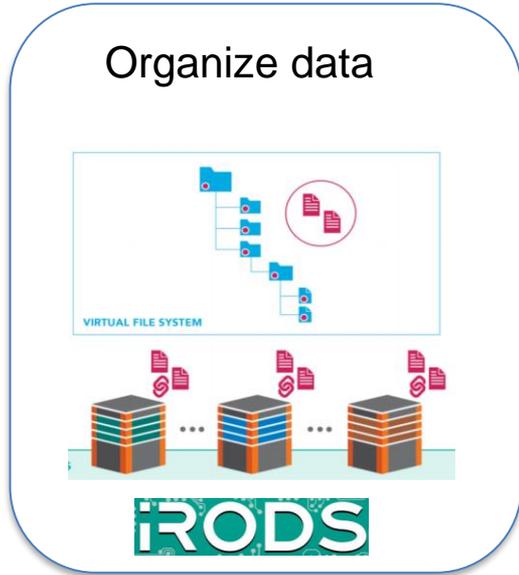
Content from: [CC0, https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1](https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1) - logos excluded



Platform for RDM & data analysis



Data storage & analysis infrastructure for huge datasets to enable data-driven discovery



This material is based upon work supported by the National Science Foundation under Grant Nos. DBI-0735191, DBI-1265383, and DBI-1743442 URL: www.cyverse.org



Data infrastructures: benefits compared to local working

- No installation on local machines,
Data access from everywhere
- Usage via web browser or command line
- HPC & shared resources
- Container-based applications (reliability)
- Independent from own system (OS, infra)



Adapted (color) from
pxhere.com/de/photo/1571969 by
Mohamed Hassan, [CCO](#)



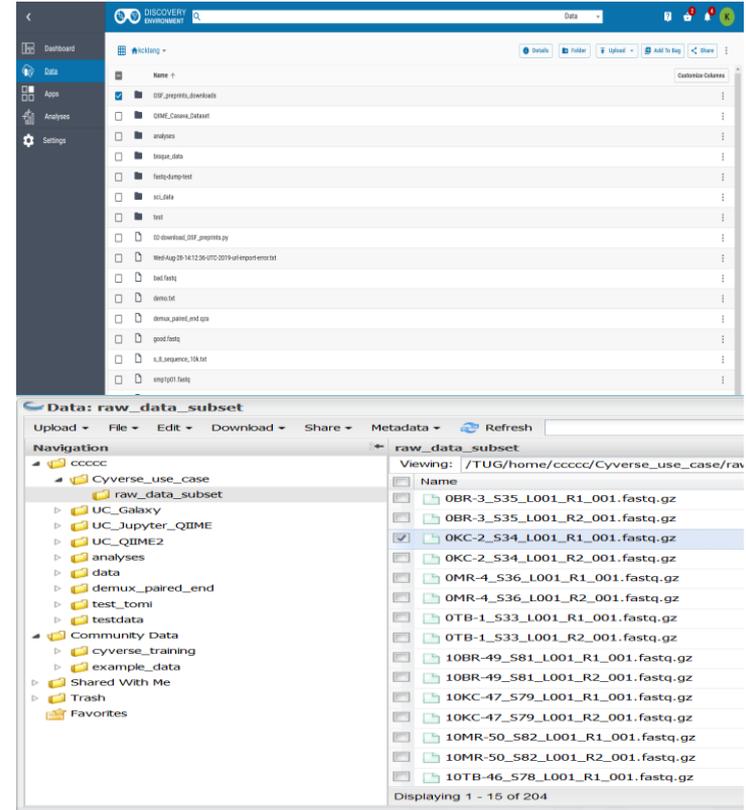
<https://www.docker.com>

CyVerse Austria @ TU Graz

Data Management

- UI & Command-line
- Logfiles of activities
- ElasticSearch
- Link external data via iRODS
- Data exchange with collaborators
- FAIR data management & meta data standards
- Automation of metadata extraction

This material is based upon work supported by the National Science Foundation under Award Numbers DBI-0735191, DBI-1265383, and DBI-1743442. URL: www.cyverse.org

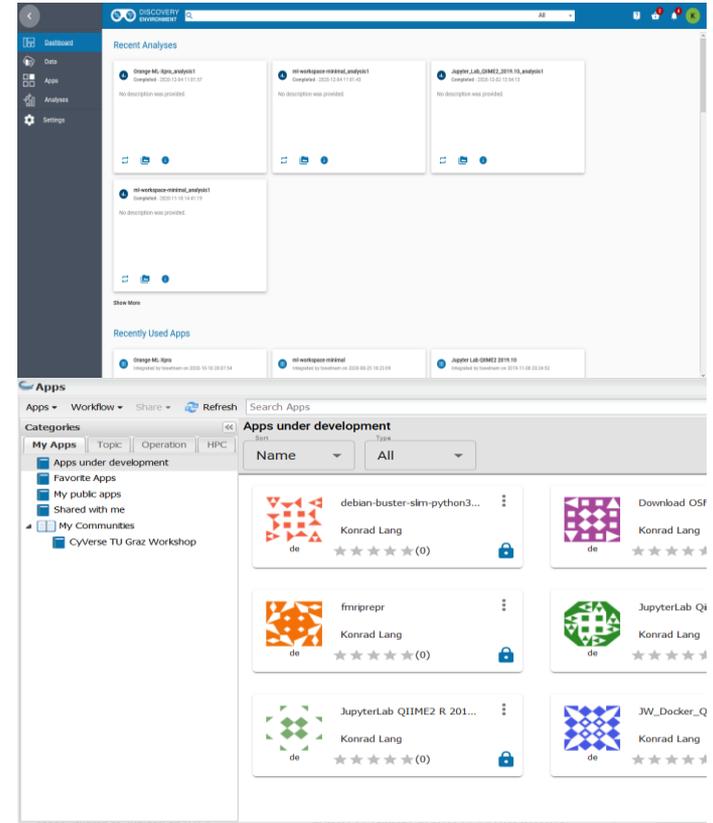


CyVerse Austria @ TU Graz

Analytics

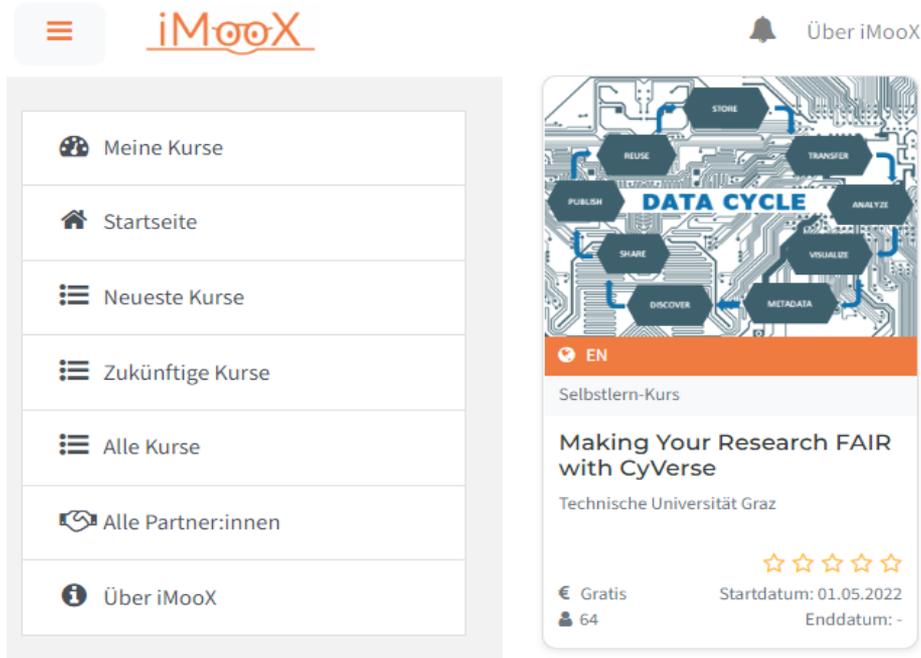
- UI & Command-line
- Interactive Applications & scripts
- Data & apps in-house (VPN Access)
- Life Science community & generic tools
- Integration of own tools
- Logfiles of activities
- Reproducibility (*containerized app versions*)
- Analysis pipelines using workflow engine
- HPC resources

This material is based upon work supported by the National Science Foundation under Award Numbers DBI-0735191, DBI-1265383, and DBI-1743442. URL: www.cyverse.org



CyVerse Austria @ TU Graz

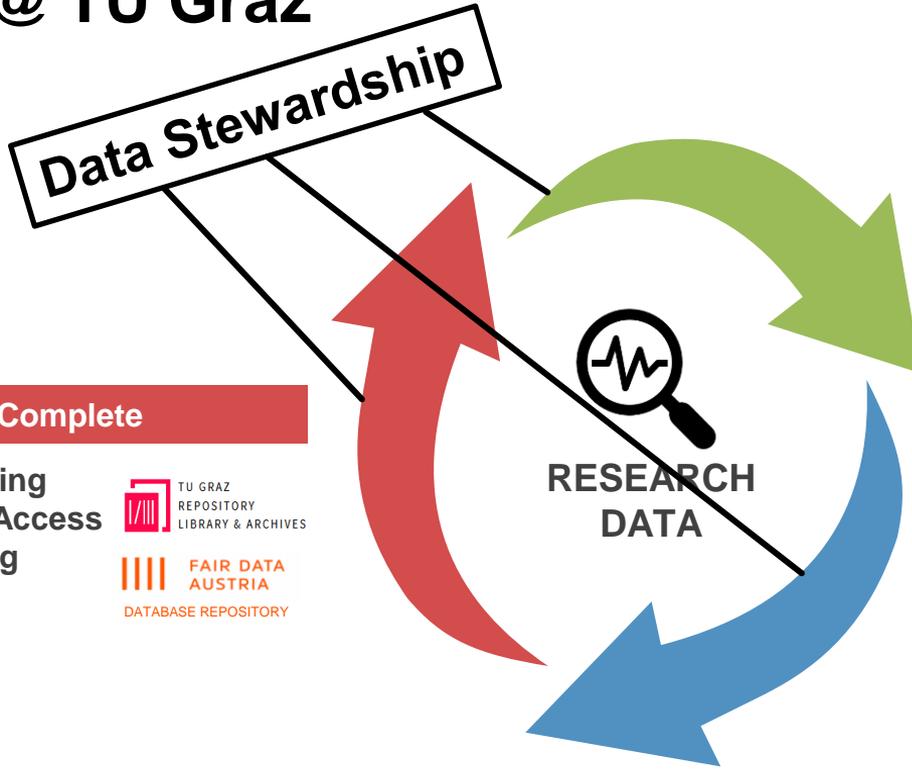
Online Course: <https://imoox.at/course/catmooc>



Making Your Research FAIR with CyVerse, TU Graz, [CC BY-SA 4.0](https://creativecommons.org/licenses/by-sa/4.0/)



RDM @ TU Graz



maDMPs

Research Planning

- Defining requirements from funding agencies
- Clarifying legal framework and ethical issues
- Re-using existing data

Research Complete

- Preserving
- Giving Access
- Re-using



Active state of research

- Collecting
- Processing
- Analysing
- Tracking
- Sharing



Content from: [CC0, https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1](https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1) - logos excluded



Git basics

Manuscript-pre-alpha-CJ-sendout-HJ.docx



Manuscript-Vers-checked-CJ-sendout-HJ-rev-AB.docx

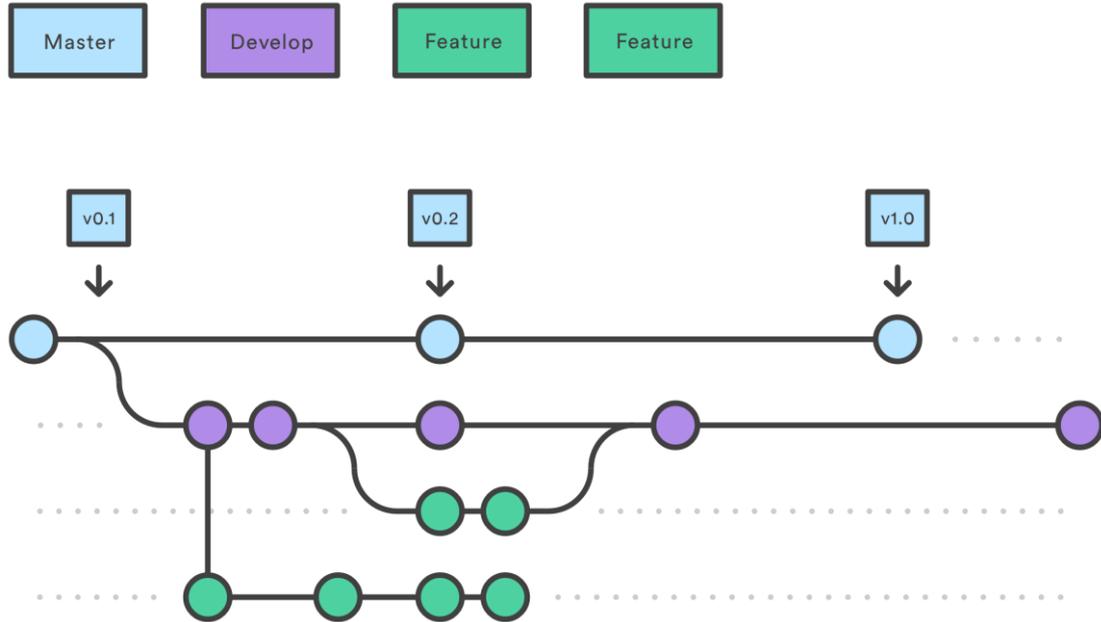


Manuscript-Vers-checked-CJ-sendout-HJ-rev-AB-repeatdcheck-CJ-
rev-HJ-checkedAB-final.docx



Manuscript- Vers-checked-CJ-sendout-HJ-rev-AB-repeatdcheck-CJ-
rev-HJ-checkedAB-final-repeat-HJ-comments-GG-corr-HB-
whatsoever-who-is-that-what-has-been-done-0815-GG-final-final.docx

Git basics - branches



CC0 by gbrown, <https://openclipart.org/detail/278050/1492474981svg>



GitLab

- **Repository Manager** like GitHub
- Accessibility and work via any browser
- Suitable for work-related & commercial projects
- TU Graz instance by **ZID**
- Local cloning
- <https://gitlab.tugraz.at>



GitLab

LDAP AD	Standard
LDAP AD Username	
<input type="text"/>	
Password	
<input type="password"/>	
<input type="checkbox"/> Remember me	
<input type="button" value="Sign in"/>	



A complete DevOps platform

GitLab is a single application for the entire software development lifecycle. From project planning and source code management to CI/CD, monitoring, and security.

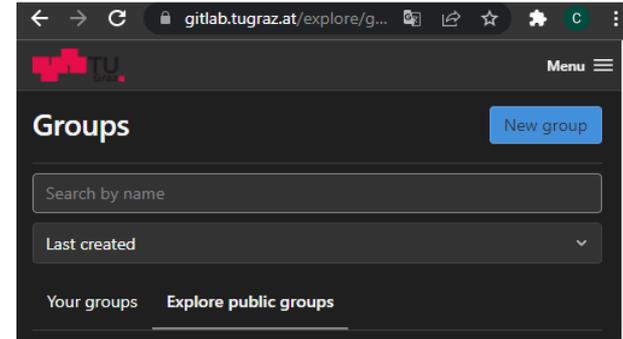
This is a self-managed instance of GitLab.

Source: <https://gitlab.tugraz.at/>



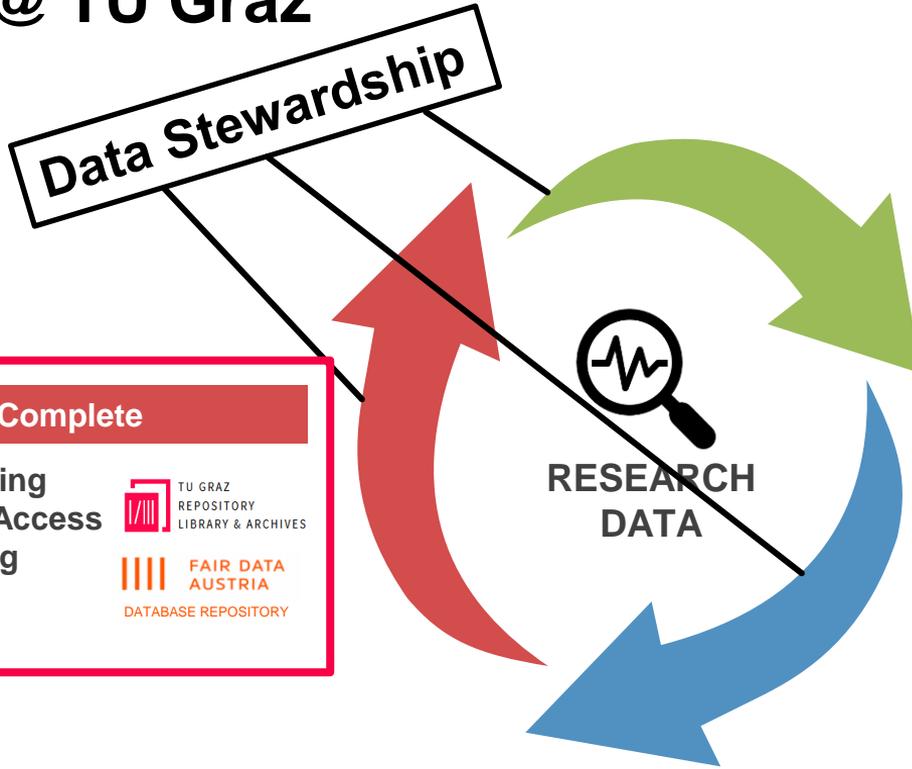
Differences from GitHub

- No registration for **TU Graz members**
- GitHub: Just “private” or “public” option
- Viewable internally, for institution, authentication required
- **Fine-tuned permissions** for different team members
- Advanced **issue tracker** to which attachments can be added
- Worldwide community smaller, rather TU Graz community relevant



Source: <https://gitlab.tugraz.at/>

RDM @ TU Graz



maDMPs

Research Planning

- Defining requirements from funding agencies
- Clarifying legal framework and ethical issues
- Re-using existing data

Active state of research

- Collecting
- Processing
- Analysing
- Tracking
- Sharing



Research Complete

- Preserving
- Giving Access
- Re-using

TU GRAZ
REPOSITORY
LIBRARY & ARCHIVES

FAIR DATA
AUSTRIA
DATABASE REPOSITORY

Content from: [CC0, https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1](https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1) - logos excluded

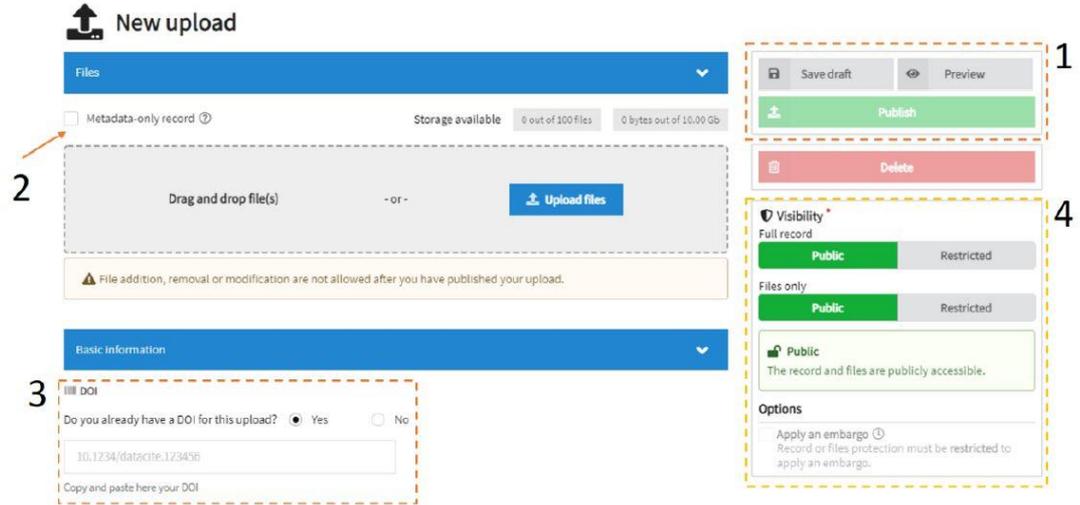


Repositories for research output



<https://repository.tugraz.at>

- **Increased citability** via DOIs
- **InvenioRDM** (CERN & TU Graz)
- Continuously new features



RDM encompasses all activities related to preparation, storage, archiving and publication of research data, including outputs as models next to code, scripts, software, images, video, or related materials.*

*C. Strasser. Research data management. National Information Standards Organization, 2015. ISBN: 978-1-937522-65-0



Some useful licences

1) Data

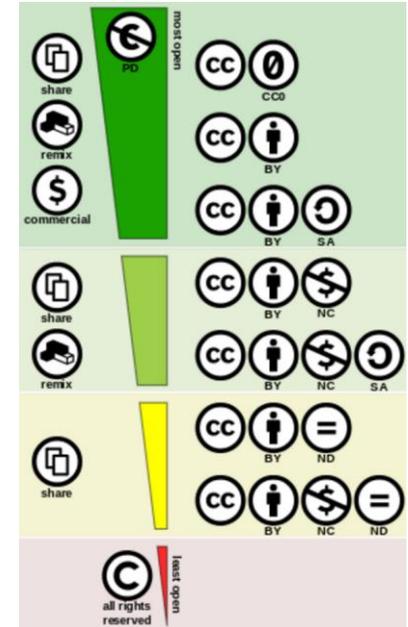
- CC0 No rights reserved
- CC BY Attribution
- CC BY & (SA, ND, NC) ShareAlike, NoChanges, NonCommercial

2) Databases

- Open Data Commons PDDL (corresponds to CC0)
- Open Data Commons ODbL
- Open Data Commons ODC-By

3) Software and Code

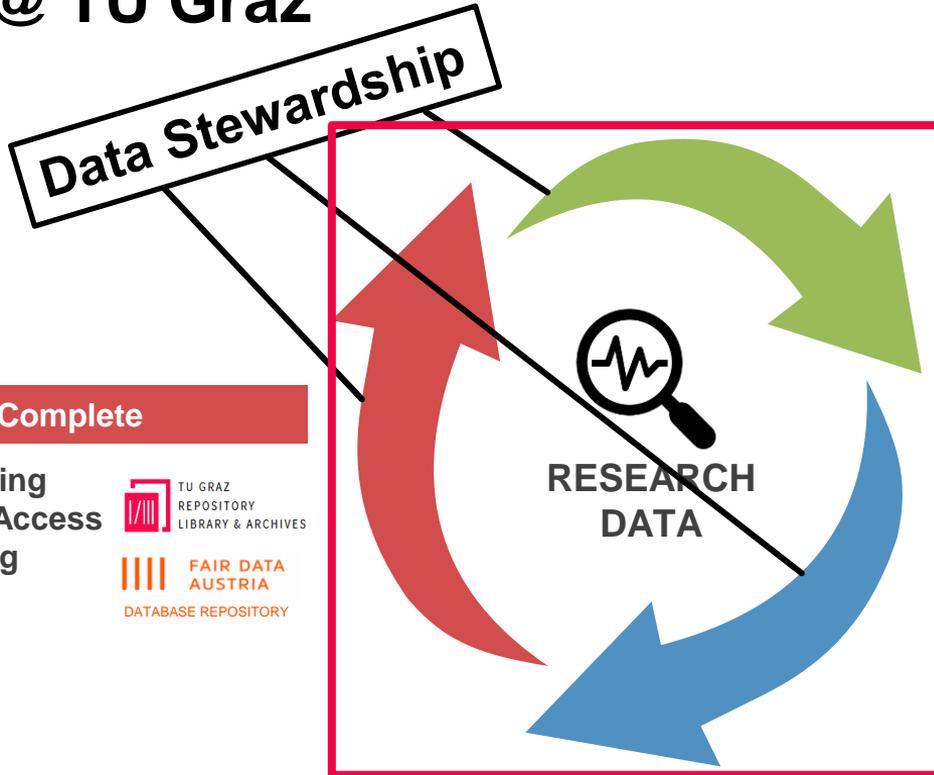
- MIT Licence: Software, licence itself modifiable
- Apache Licence: Software, no Copyleft
- GNU General Public Licence: Software, widely used
- 3-Clause BSD License: Software, no Copyleft
- European Union Public License: Software, applies to EU law



„Creative Commons license spectrum“,
created by Shaddim, [CC by 4.0](https://creativecommons.org/licenses/by/4.0/)



RDM @ TU Graz



maDMPs

Research Planning

- Defining requirements from funding agencies
- Clarifying legal framework and ethical issues
- Re-using existing data

Research Complete

- Preserving
- Giving Access
- Re-using



Active state of research

- Collecting
- Processing
- Analysing
- Tracking
- Sharing



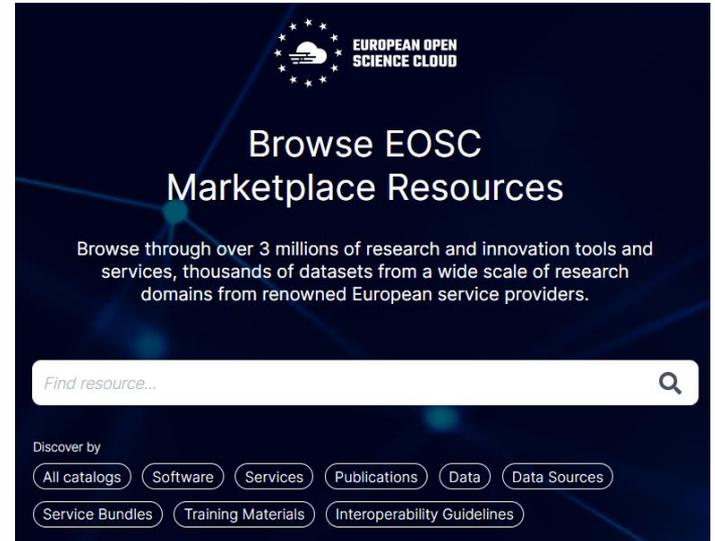
Content from: [CC0, https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1](https://figshare.com/articles/DTU_Research_Data_Life_Cycle/4258019/1) - logos excluded



European Open Science Cloud



- **Services** to use
- Shared **data**
- Disseminate project/output
- **Connect** to international community
- **Feedback** to implement own ideas or requirements



Source: marketplace.eosc-portal.eu

The EOSC Portal is currently operated by the EOSC Future (Grant Agreement no. 101017536) projects funded by the European Union's Horizon 2020 research and innovation programme.

Research Data Management @ TU Graz

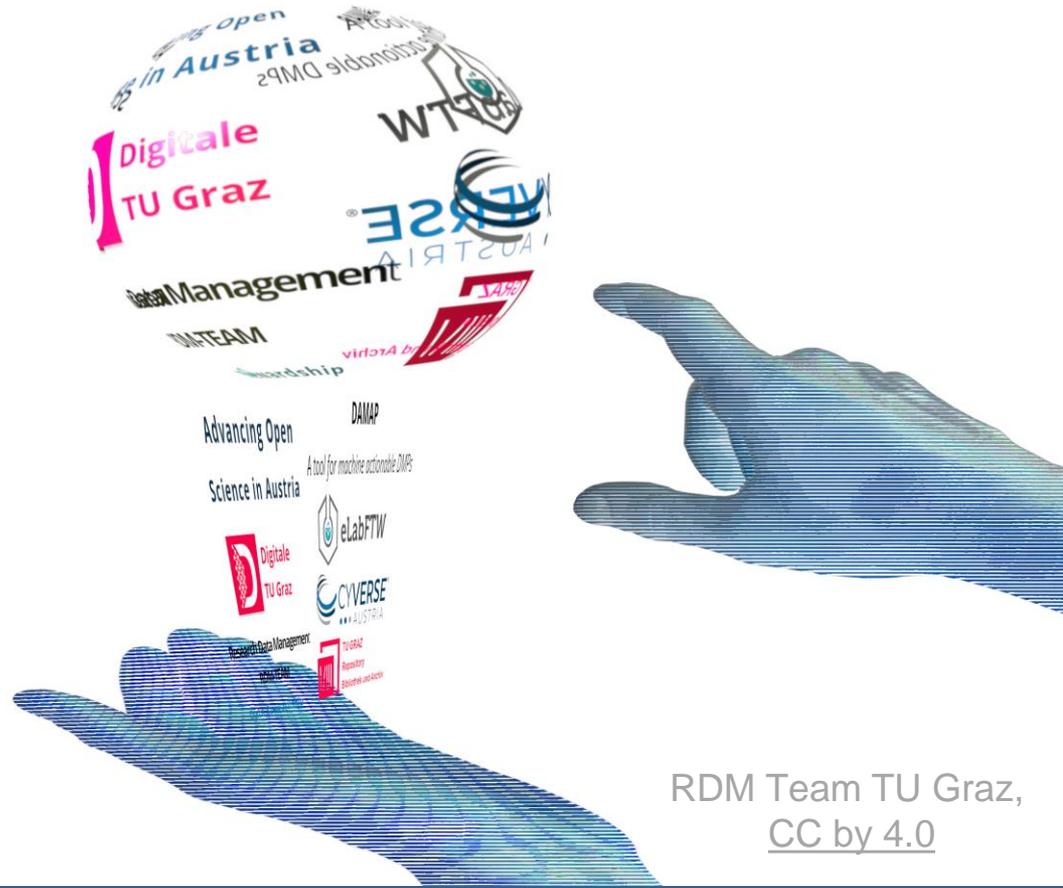
- DMP Support
- RDM Optimization Institute/Group: Workflows/Pipelines, Infrastructure
- RDM Individual support & support in Research Projects (Collaborations)
- RDM guidelines & policies
- Tool-dependent support
(workshops, introduction, training, assistance, development)

Supporting reproducible research

rdmteam@tugraz.at



<https://rdm.tugraz.at>



RDM Team TU Graz,
[CC by 4.0](https://creativecommons.org/licenses/by/4.0/)