

Helmholtz Innovation Lab FERN.Lab

Helmholtz-Zentrum

GFZ

remote sensing for sustainable use of resources

How to develop technology transfer ready software as a team? Case study FERN.Lab

> Julia Neelmeijer GFZ RSE Day - 14. September 2022



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fernlab@gfz-potsdam.de



FERN.Lab - bridging the gap to foster technology transfer



It's about working together towards one aim - so who are we?



Dr. Daniel Spengler Management



Dr. Julia Neelmeijer Management/Methods



André Lingenfelser **Business Development**



Nora Meyer zu Erpen **BD** / Networkmanagement



Maria Thiele **Public Relations**



Dr. Romulo Goncalves

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Daniela Rabe Software Development Software Development Software Development



Arash Madadi



Dr. Robert Behling Method Development



Dr. Alison Beamish Method Development



Daniel Scheffler Method Development



Realizing transfer ready software development as a team

Challenges:

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- break down main goal into single tasks (what needs to be done)
- coordinate people (who does what)
- time management (when are due dates)
- do not break existing code



sprint session at FERN.Lab

Team organization:

- 1 lead coordinator per project (+1 optinal backup)
- min. 1 person method development (for projects with scientific background)
- 1-3 software developers (depending on project size)

Time and project organization:

- lead needs to know the aim of the project very well
- lead responsibility: aligning people, tasks, time
- weekly jour fixes and short notice stand-up meetings
- working remotely easily integrateable

Sprint sessions to get stuff done:

- meet for software development sprints (2 days 1 week)
- optional: include/invite project partners to your sprint session



The basis of software organization: GFZ GitLab

增料 FernLab	FemLab	
% Group information D Issues 260 % Merge requests 7	FernLab Group ID: 710	△ ~ New subgroup New project
🕼 CI/CD	Remote Sensing for a Sustainable Use of Resources - FERN.Lab.	
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one subgroup per project

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larger projects may consits of multiple repositories

All software development is organized at:

https://git.gfz-potsdam.de powerful DevOps plattform:

- - team organization
 - version-controlled code development
 - CI/CD integration for automatic testing
 - granular access control
 - and much more...

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MiSaC 2.0) FernLab > •••• > MiSaC 2.0
Subgroup information ssues Merge requests	53	MiSaC 2.0 & Group ID: 1526
CI/CD Packages & Registries Settings		Subgroups and projects Shared projects Archived projects
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		MiSaC Backend API A FastAPI web application for APIs. ■ The set of the s
		U Ser Interface

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Organization of the project repository by using templates

tookiecutter stable	Docs » Cookiecutter	O Edit on GitHub
Search docs		
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Cookiecutter		
Features	pypi v2.1.1 python 3.7 3.8 3.9 3.10 Build Status 🌳 code	cov 100% Discord cookiecutter
Available Cookiecutters	docs passing code quality 9.21	
Community	A command-line utility that creates projects from cookier	sutters (project templates) e.g. creating a
Support This Project	Python package project from a Python package project te	emplate.
Code of Conduct		
Creator / Leader	Documentation: https://cookiecutter.readthedocs.io	
Overview	Cittle bits // ite bits // ite bits // ite	
Installation	GitHub: https://github.com/cookiecutter/cookiecutter	
Usage	PyPI: https://pypi.org/project/cookiecutter/	
Command Line Options		
Tutorials	Free and open source software: BSD license	
Advanced Usage		
Troubleshooting		
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Case Studies	Cross-platform: Windows Mac and Linux are officially su	innorted
Code of Conduct	Cross-plation. Windows, Mac, and Linux are officially su	pportea.
	You don't have to know/write Python code to use Cookie	ecutter.
	Works with Python 3.7, 3.8, 3.9., 3.10	
	Project templates can be in any programming language of	markup format: Puthon JavaScript Pub
Band dha Dana ƙas Businana Antonio	CoffeeScript, RST, Markdown, CSS, HTML, vou name it. Y	ou can use multiple languages in the same
docs deployment of private & public	project template.	
repos. Get started today.		

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Use extensive template for repository organization:

https://github.com/cookiecutter/cookiecutter/

- programming-language independent
- cross-platform support
- included features:
 - basic repository structure
 - automatic documentation (using SPHINX)
 - CI/CD support

cookiecutter comes with a rich documentation

Same repository structure for all projects

- follow standardized project setup
- all required files are available from the beginning
- allows all contributors to quickly navigate through the projects

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exemplary content of a project respository



Organizing the ToDo's in Issues

- assign issues to specific persons to align work
- task explanation and discussion
- use labels for sorting and rating importance and order of issue handling

Shiny App	🏽 FernLab > 🚥 > 🌒 MiSaC > 🌒 Shiny App > Issues
 Project information Repository 	Open 57 Closed 196 All 253
D' Issues 57	Search or filter results
List	
Boards Service Desk	Overview: server load with test users ■ #229 · created 11 months ago by Julia Neelmeijer (Persistent)
Milestones	[helpdesk]: Issue 4 #253 · created 3 months ago by Romulo Pereira Goncalves ① Product Beta version (Improvement) (Medium Priority)
រិរ Merge requests 2	interface changes to add to the documentation 23 of 28 checklist items completed
ወ Security & Compliance	
Deployments	Add class accuracy result #247 · created 8 months ago by Julia Neelmeijer O Product Beta version Improvement Low Priority
 Packages & Registries Infrastructure 	visualization of uploded layer file #232 · created 10 months ago by Robert Behling () Product Beta version (Improvement)

all project-related code development tasks are organized at one place

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discussion and commenting of issues

Open Issue created 11 months ago b	y 🚱 Julia Neelmeijer 🕐	wner									Close i	ssue	ļ
elect which data to do	wnload (after r	esul	ts is	ge	ene	rat	ed))					
e user should decide which data should be s	saved in the download and v	which is r	not nec	essar	y to d	ownlo	ad (e	.g. sar	mple i	ref po	oints).		
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Robert Behling @behling · 11 mont	hs ago							Mair	ntaine	r) (9 🖓	0	
for now, the R code either allows to mentioned, the selection would be r	save the complete object of ice and this would help the	r nothing user to u	J. But th Ise the	resul	mplete ts in fi	e obje urther	cts ca conte	n get exts	pretty	/ big.	As Juli	ia	



Keeping an eye on the time - working with milestones



view on issues assigned to specific milestone

- assign time period to specific milestone
- add issues to milestones to align work to expected time frame
- quickly observe what:
 - has been completed
 - is ongoing
 - has not been started within the milestone





Organization of code contributions

- extensive use of branching with internal rules:
 - no direct code changes in the main branch
 - always push latest main into development branch before merging

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O Project information Project information Issue#86#96 Repository Repository You can move around the graph by using the arrow keys. 🗞 Merged Romulo Pereira Goncalves requested to merge issue#96 😭 into main 5 days ago Files D Issues Commit Overview 2 Commits 5 Pipelines 5 Changes 2 Git revision Begin with the selected commit 11 Merge requests Branches Merge branch 'sentinel portal 0.5.1' into 'main CI/CD Tags Merge branch 'main' into sentinel_portal_0.5.1 Test new functionality Contributor D Security & Compliance Check if the documentation is complete for all functions and follows the example shown in Issue #37 (closed) Merge branch 'issue#83' into 'main' Graph Remove unnecessary print commands Make lint Deployments Remove unnecessary comment blocks Compare Merge with main and solve conflicts 🖰 Packages & Registries ClassNames in UpperCamelCase, functionNames in lowerCamelCase, var_names with under_score D Issues upport 'avg' in RunInterpolation(). evaluate and save prediction map for 'avg' 100 Add new dependencies to Issue #3, setup.py and tests/CI_docker/context/environment_soc_mapper.yml Merge branch 'main' into sentinel_portal_0.5.1 12 Merge requests Make sure all the issues listed below are covered. Update version and HISTORY. 🖳 Monitor CI/CD Closes issues #86 (closed) and #96 (closed) 🕌 Unpinn geopandas. Analytics Merge branch 'issue#85' into 'main Edited 5 days ago by Daniela Rabe Deployments Wiki Fix plot. 🖰 Packages & Registries X Snippets orrected error message @ Infrastructure Pipeline #49320 passed for 8ab0b92e on issue#96 5 days ago When the base_model is not selected, do render tables and plots for it. Settings Monitor Test coverage 89.00% (0.00%) from 1 job @ Bolete it where it is used. Analytics Merge branch 'issue98' into 'main' > View exposed artifact Wiki delete misleading comment X Snippets updated doc string. No IOError raised anymore in cropRaster2AOI() 8[✓] Approved by Settings Merge main and solve conflicts. Merge branch 'config schema' into 'main

different code commits were added to different branchesensure code quality: code is reviewed before a merge

work with **merge requests**:

merge template

test and review code following defined criteria

pipeline passing check (all tests succesful)

approve merge by at least one other person



CI/CD to support developing process - integrate automatic testing

- continuous integration and continuous delivery of software development
- extensive use of automatic tests to quickly identify problematic parts of code

Project information	All 331 Finished	Branches Taos		
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🖏 Merge requests 🛛 🔳				
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overview of all failed and passed pipeline runs the pipeline is triggered after each push to the repository

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using different test stages helps to pinpoint the problem



Focus on users - provide extensive documentation

Documentation content:

- purpose
- installation
- setup
- usage
- optional: demo
- license

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entinel-2 Portal	
tal to access Sentinel-2 data.	
beline passed coverage 96.00% Documentation GitLab Pages	
detailed information, refer to the documentation. See also the latest coverage report and the pytest HTML report	ort.
le of Contents	
Feature Overview	
 Features 	
 Open To Dos 	
Installation	
Expected Input Configuration	
 Config File 	
 Query Parameters 	
Usage	
Expected Output	
History / Changelog	
License	
Contribution	
Credits	

example: documentation in the readme.rst



example: documentation within autogenerated documentation with SPHINX



Make your code usable for others - attach a license

- a license is required no matter whether code is released to the public (open source project) or to a customer/project partner
- for open source projects: choose a free and open source software (FOSS) license
- beware of permissive/copyleft regulations
- help for licence choice:
 - TT office

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• legal department



EUPL v1.2 attached to a project (strong copyleft FOSS license)



Final step: report to GFZ before any release!

ESSENTIAL REQUIREMENT: fill out the software distribution form and **wait for approval** before any release:

https://forms.gfz-potsdam.de/en/other/software-distribution

Zentrum	IT-Services and Operation	GFZ-Webpräsenz	Other	GFZ IT-Services and Operation GFZ-W	ebpräsenz Ol —
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ence can be found here: https://media.gfz-potsdam.de/gfz/w//doc/0 xt step	RG/GFZ-Organigramm-de.pdf			Please list users or groups that used the software Description *	

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provide info about author and content of the software in the software distribution form





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Thank you and happy coding!

Julia Neelmeijer GFZ RSE Day - 14. September 2022



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