NEW PROJECT, NEW TOOLS?! 

How granular should our tools and data-processing workflows be to allow for reusability?

openmod workshop Grenoble, March 2024
What makes small tools reusable?

- Documentation with tutorials and ready to use example datasets
- Simple installation, few dependencies, up to date code
- Based on common basic software (e.g. you are used pandas)
- Active community and support
- Functionality is separated from GUI or config files, clear API
- Tested code
- Readable source code (use speaking names)
- No implicit assumptions inside the code, make it transparent
- Use of repository templates
What makes large workflows reusable?

- All in one suite
  - easy installation, few dependencies
  - few manual steps, e.g. open excel, then do 1, then open QGIS, then run y

- Repository structure follows cookiecutter templates from the domain
  - Similar structure for all your projects?

- Publish small parts of your workflows, that may be of use for others as own library
  - e.g. PyPSA -> PyPSA, atlite, linopy
  - oemof -> demandlib, feedinlib, oemof-solph, oemof-tabular, …
How to write reusable code

- Regular interaction with colleagues and peers
- Refactor your monoliths regularly
- Publish your code repository together with the paper
  - Responsibility does not end with paper acceptance
- Adhere to design patterns
  - io, controller, model, views, …
- Follow basic coding principles
  - Don't repeat yourself, integration operation separation principle, single responsibility principle, …
- Test driven development (wish for a tutorial for openmod 2025)
- Read blogs/essays
- We need to be better software engineers really
Some Resources

- **Blogs/Books/Essays**
  - Tons of js libraries: [https://evolutionjobs.com/exchange/why-are-there-so-many-javascript-frameworks/](https://evolutionjobs.com/exchange/why-are-there-so-many-javascript-frameworks/)
  - Mini js libraries. They do one job and they do it well: [https://medium.com/@PepsRyuu/tips-on-writing-good-javascript-libraries-e3c3068ec705](https://medium.com/@PepsRyuu/tips-on-writing-good-javascript-libraries-e3c3068ec705)
  - Microservices granularity: [https://medium.com/@hviaznio/how-to-choose-wisely-when-defining-microservices-granularity-8e223072636c](https://medium.com/@hviaznio/how-to-choose-wisely-when-defining-microservices-granularity-8e223072636c)
  - Start a monolith, break it down to small pieces: [https://martinfowler.com/bliki/MonolithFirst.html](https://martinfowler.com/bliki/MonolithFirst.html)
  - The Cathedral and the Bazaar (more of a systemic essay on open source, but with some touches to granularization, which was a success factor in this case): [http://www.catb.org/~esr/writings/cathedral-bazaar/cathedral-bazaar/index.html](http://www.catb.org/~esr/writings/cathedral-bazaar/cathedral-bazaar/index.html)
  - [Freedium for firefox users ;)](https://martinfowler.com)
  - "Clean Code" by Robert Martin
  - "The art of UNIX programming"

- **Papers/Research**
  - Rescience: [https://rescience.github.io/](https://rescience.github.io/)
  - Reproducible computational research: [https://doi.org/10.1371/journal.pcbi.1003285](https://doi.org/10.1371/journal.pcbi.1003285)
  - Workflow management: Snakemake – A framework for reproducible data analysis | Hacker News
  - Workflows and data used for a specific paper: [https://github.com/fneum/spatial-sector/](https://github.com/fneum/spatial-sector/)

- **Tutorials/Best practices**
  - Scientific workflow management in julia (principles apply for other languages): [https://juliadynamics.github.io/DrWatson.jl/](https://juliadynamics.github.io/DrWatson.jl/)
  - Introduction of basic coding principles: [https://aeturrell.github.io/coding-for-economists/](https://aeturrell.github.io/coding-for-economists/)
  - [https://lfenergy.org/training-certification/](https://lfenergy.org/training-certification/) for open source model / quality training
  - [https://coderefinery.org/](https://coderefinery.org/) for software modularity training
  - [https://software-carpentry.org/](https://software-carpentry.org/)
  - [https://www.workingsoftware.dev/the-ultimate-list-of-domain-driven-design-books-in-2024](https://www.workingsoftware.dev/the-ultimate-list-of-domain-driven-design-books-in-2024)
  - [https://www.hello-startup.net/](https://www.hello-startup.net/)

Francesco Witte, Grenoble, 2024
Imprint

Date: 2024-03-28
Author: the openmod community
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