MathRepo

an example of a mathematical research-data repository

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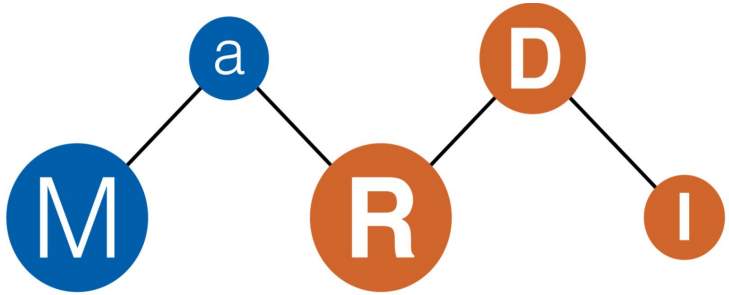

National research-data infrastructure NFDI

Some facts

- 90 mio euros funding volume
- 20-30 consortia
- 5-10 years
- aim: make research data FAIR

- management guidelines, data formats, workflows, knowledge graphs, ...
- ‘joint solutions for individual problems’
- ‘culture change’

But: no hardware infrastructure.
→ **Where should you store your research data?**

Hartl, N., Wössner, E. & Sure-Vetter, Y. Nationale Forschungsdateninfrastruktur (NFDI). *Informatik Spektrum* **44,** 370–373 (2021). https://doi.org/10.1007/s00287-021-01392-6

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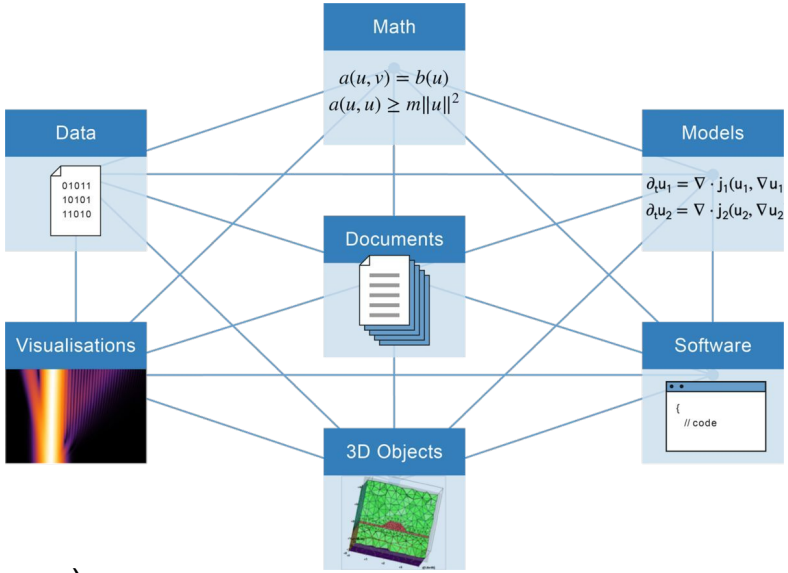
MaRDI and mathematical research data

- comes in many different forms
- hence many different formats
- with many different needs

some obvious challenges but also

- relevance?

- should be FAIR
- annotated with metadata (which?)



no island/decentralised solutions (no personal homepages)
→ but **good** repositories… what does good mean?

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What makes a ‘good’ repository?

- trustworthy storage (known institution?)
- appropriate audience
- long term

‘Researchers must be certain that data held in archives remain useful and meaningful into the future.’

- information about services
- data protection and curation
- access/license/policy statements
- persistent identifier (citability)
- external certification

re3data.org
REGISTRY OF RESEARCH DATA REPOSITORIES

CORE TRUST SEAL

zenodo

CoreTrustSeal Standards and Certification Board (2019). CoreTrustSeal Trustworthy Data Repositories Requirements 2020–2022 https://doi.org/10.5281/zenodo.3638211

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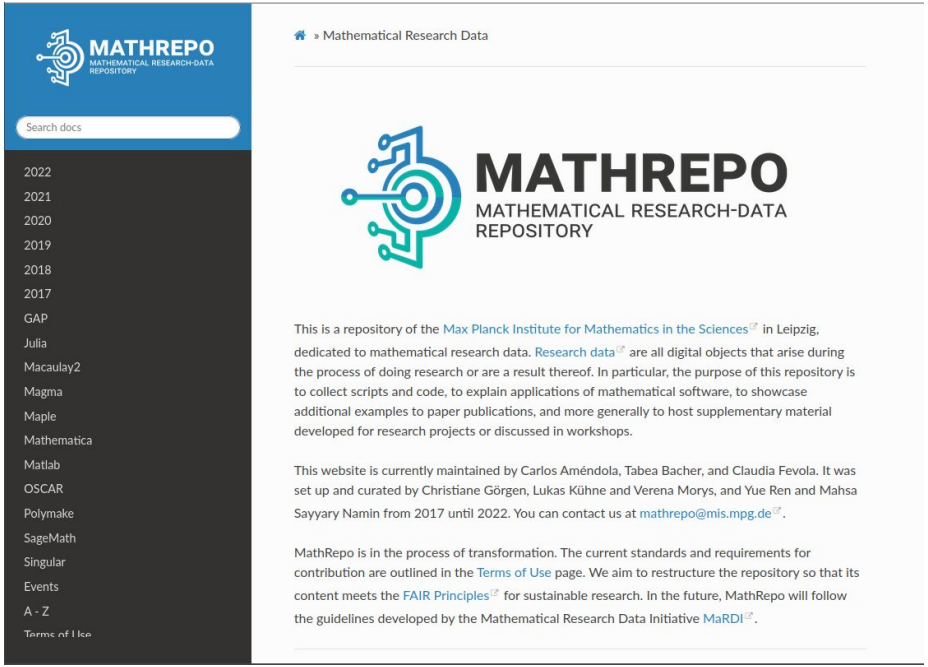
MaRDI

One maths-specific solution

http://mathrepo.mis.mpg.de



- established 2017 at MPI MiS
- hosted by the MPG
- underlying gitlab
- maintained by postdocs
- some 50 contributions
- maths foremostly non-linear algebra
- sortable alphabetically, by year, and by programming language
- three main types: code for computations, additional examples to papers, material for workshops/teaching

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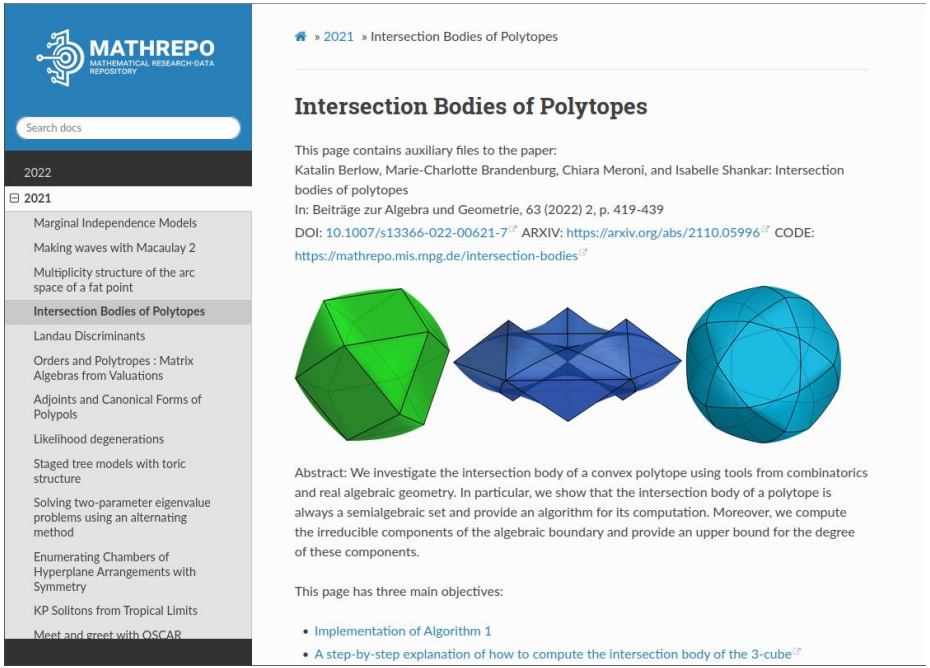
A typical contribution



- supplementary material to a paper
- doi/arxiv link to paper, authors' names, dates, software and version
- subpages with downloadable code
- and interactive visualisations
- extra explanatory text
- blog-style entry
- MathRepo page cited in paper as URL

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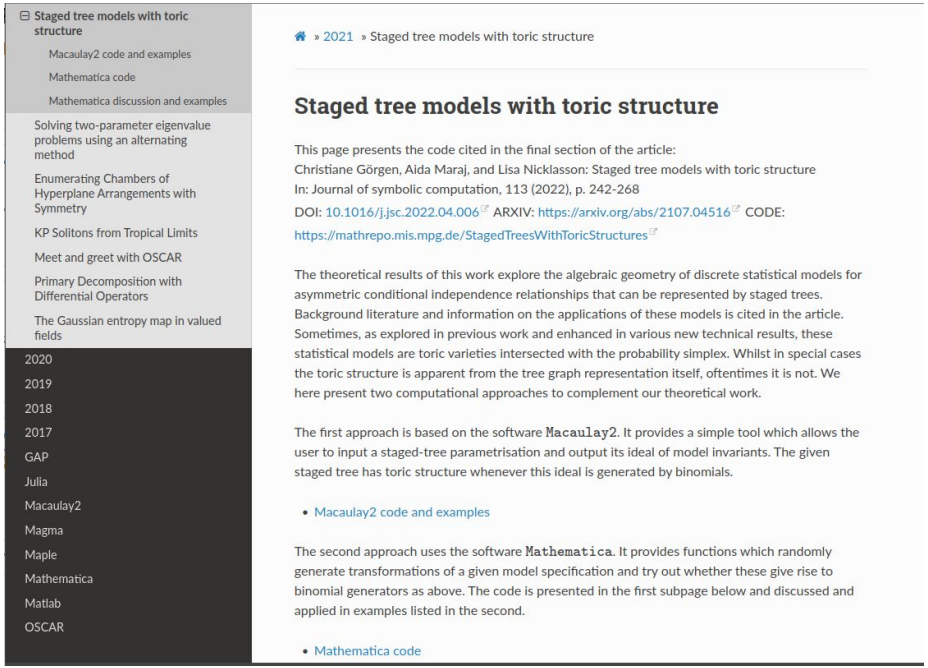
My most recent research project



- Algebraic statistics: connect discrete statistical models with algebraic varieties, study their properties
- ‘pure maths’ paper
- supplementary code
  - proofs
  - extra examples
  - conjectures
- relevant links to publication
- expository text (not the abstract)

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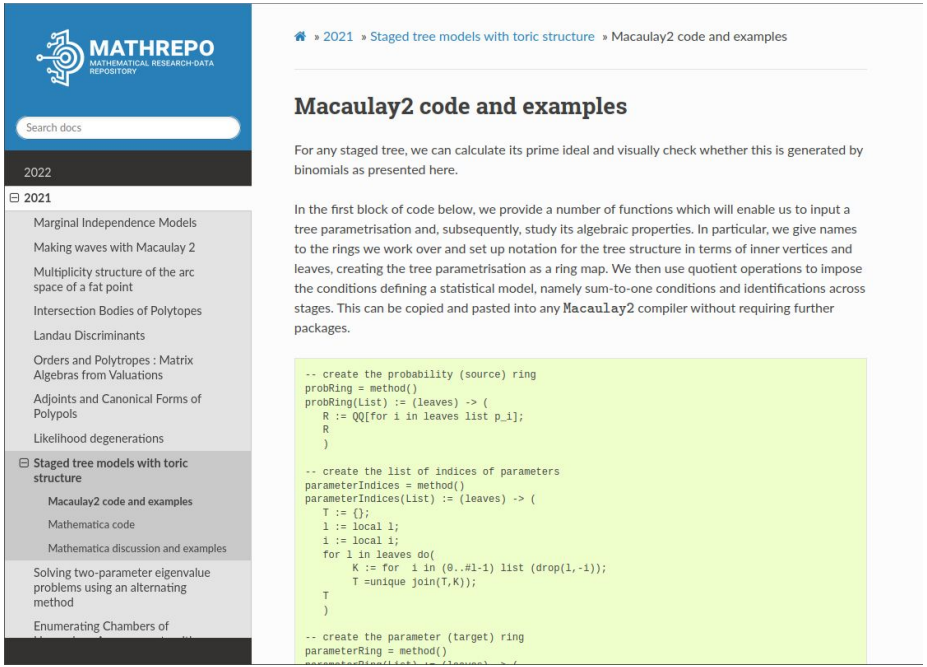
Providing code for proofs



- how did we come up with (re-)parametrisations we found?
- function specification, extra libraries, M2 version,...
- extra example plus picture
- copy&paste code from the screen
- verify our results and reuse them!

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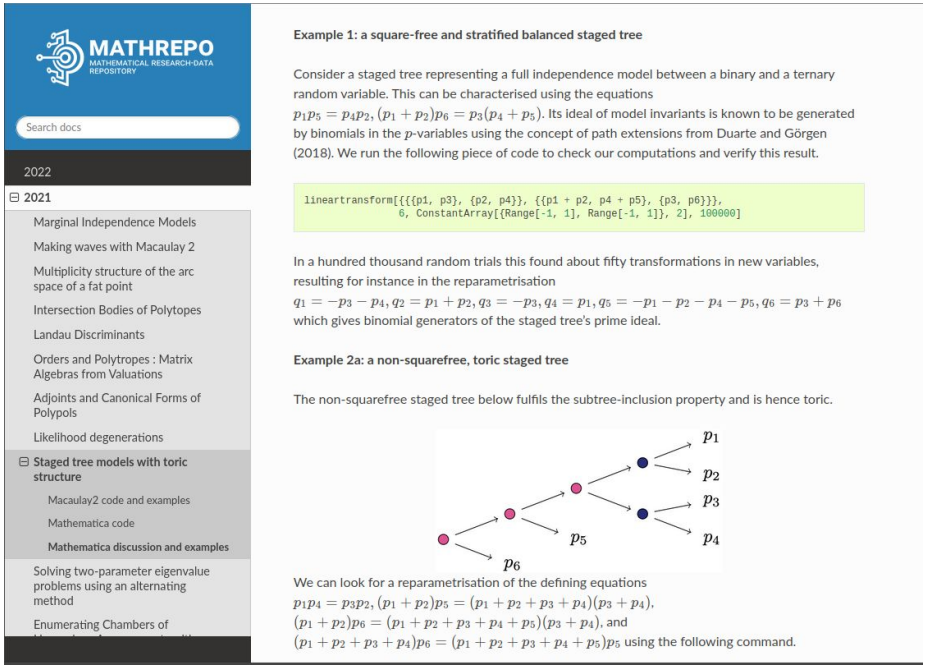
Providing code for conjectures



- how did we come up with conjectures?
- randomised component, yes/no existence questions
- separate page explaining individual functions in the code
- lots of examples to play around with
- all tools available to continue our conjectures, come up with your own

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How FAIR is this?

Findable

- ✅ URL stable for the foreseeable future
- ✅ git and MR findable in google search e.g.
- ✅ known academic institution / group
- ❌ no DOI
- ❌ no indexing or field classification

Accessible

- ✅ no pay walls
- ✅ no sign-up process for readers
- ✅ low barrier for new contributions
- ❌ no automated retrieval of (meta) data

Interoperable

- ✅ maths with explanatory text, link to articles
- ✅ code annotated with software name, version, date, hardware setup
- ❌ very case specific, reproducibility might fail

Reusable

- ✅ author names for contact
- ✅ often a lot of detail provided
- ❌ no license information

C. Fevola and Ch. G. (2022). The mathematical research-data repository MathRepo. Computer Algebra Rundbrief, Nummer 70. Preprint on arxiv:2202.04022[math.HO].

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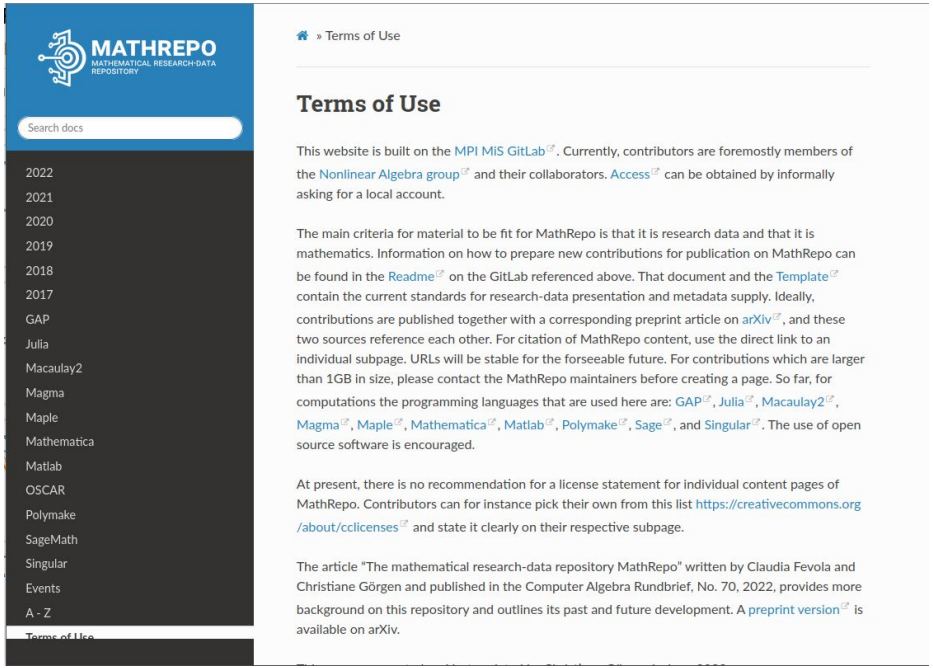
MaRDI

Recent improvements



- added terms of use page
  - contributor community
  - gitlab access
  - how to / standards
  - thoughts on licenses
  - historical / future comments
- discussed maintainer handover
- adapted logo
- provide workshops and training, also in a MaRDI context

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How to FAIR your research data

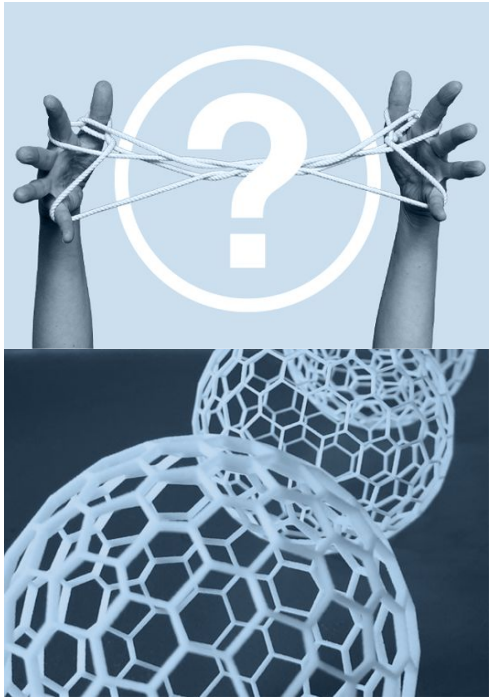
current MaRDI recommendations

- research data on Zenodo
- metadata on Wikidata

→ make integration into the portal possible

two user stories in the MaRDI Newsletter
https://www.mardi4nfdi.de/community/newsletter

Subscribe: t1p.de/ewmt6



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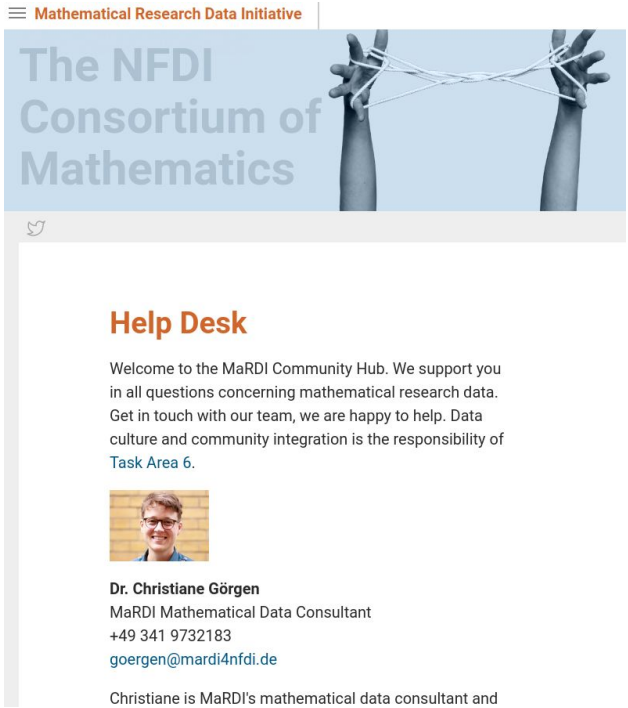
Take home message



- for RDMPs:
  - where do you put your data?
  - why?
  - → choose trustworthy repositories
- in maths there's no one-size-fits-all solution
- MR is one local solution

- MaRDI provides plenty of opportunity to discuss improvements

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