# Plan Overview

*A Data Management Plan created using DMPonline.be*

**Title:** Rigidity of von Neumann algebras

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**Principal Investigator:** Stefaan Vaes

**Affiliation:** KU Leuven (KUL)

**Funder:** Fonds voor Wetenschappelijk Onderzoek - Research Foundation Flanders (FWO)

**Template:** FWO DMP (Flemish Standard DMP)

**Principal Investigator:** Stefaan Vaes

**Project abstract:**

Von Neumann algebras appear naturally in several areas of mathematics, in particular in the study of groups, representations of groups, group actions, quantum information theory and model theory. Thanks to the ground-breaking work of Alain Connes in the 1970s, there is a complete classification of all amenable von Neumann algebras. The challenges of modern von Neumann algebra theory are to obtain classification and structure results in non-amenable situations. Using Sorin Popa's deformation/rigidity theory, it is now possible to answer a number of questions on von Neumann algebras that a few years ago were still completely out of reach. In this project, we want to solve some of these questions. We want to obtain far reaching results on the possible symmetry groups of von Neumann algebras and on superrigidity for group von Neumann algebras. We also want to develop new methods to distinguish families of von Neumann algebras up to elementary equivalence and up to measure equivalence.

**ID:** 214779

**Start date:** 01-01-2025

**End date:** 31-12-2028

**Last modified:** 20-04-2025

## DPIA

**Have you performed a DPIA for the personal data processing activities for this project?**

- Not applicable

**GDPR**

**Have you registered personal data processing activities for this project?**

* Not applicable

# Rigidity of von Neumann algebras
## FWO DMP (Flemish Standard DMP)

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## 1. Research Data Summary

**List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.**

No datasets will be generated.
This is a research project in pure mathematics. We are not doing experiments that generate data. Our only work and output consists of mathematical theorems and their proofs. The peculiarity of pure mathematics is that published articles contain all these proofs in complete detail. So, the publication itself not only provides the theorems, but also all the methods, reasonings and proofs, making everything entirely reproducible. In this way, the published articles contain all the data that is produced. Prior to publication in a journal, all these articles are posted to the www.arxiv.org repository. In that sense, all data produced by this research project is permanently available to the world.

**If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:**

We are not reusing existing data.

**Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? Describe these issues in the comment section. Please refer to specific datasets or data types when appropriate.**

- No

**Will you process personal data? If so, briefly describe the kind of personal data you will use in the comment section. Please refer to specific datasets or data types when appropriate.**

- No

**Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, …)? If so, please comment per dataset or data type where appropriate.**

- No

**Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements/ research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.**

- No

**Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.**

- No

## 2. Documentation and Metadata

**Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g., in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).**

As explained above, the peculiarity of publications in pure mathematics is that the publication itself contains all the information to reproduce and reuse the research results. For that reasons, these publications are often quite long (rarely less than 20 pages, regularly between 50 and 100 pages). Contrary to publications in experimental sciences, the publications in pure mathematics contain both the data and the results and the accompanying information that makes the data understandable and usable.

**Will a metadata standard be used to make it easier to find and reuse the data? If so, please specify (where appropriate per dataset or data type) which metadata standard will be used. If not, please specify (where appropriate per dataset or data type) which metadata will be created to make the data easier to find and reuse.**

- No

The publications in pure mathematics follow an extremely rigid and rigorous writing standard, which is thoroughly checked by peer reviewers, to ensure that the published papers are written in such a way that all the results and proofs can be reproduced.
In that sense, pure mathematicians actually do use a metadata standard since at least 100 years, since the inception of the current standard of mathematical writing, based on the axiomatic system of set theory.

## 3. Data storage & back-up during the research project

**Where will the data be stored?**

As explained above, the data is contained in the publications. All these publications are permanently stored in the www.arxiv.org repository, and publicly and permanantly available.

**How will the data be backed up?**

The www.arxiv.org repository has numerous backups in mirror databases all over the world.
When preparing the publications, the early versions of the publications are stored and backed up in the standard KU Leuven backup facilities based on SharePoint.

**Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely.**
**If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.**

- Yes

**How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?**

For the preliminary versions of a publication, the data security of Sharepoint is ensured by Microsoft. For the final versions of a publication, the data security is ensured by www.arxiv.org.

**What are the expected costs for data storage and backup during the research project? How will these costs be covered?**

There are no expected costs.

## 4. Data preservation after the end of the research project

**Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).**

All the publications, which are the only produced data, will be permanently stored in the www.arxiv.org repository. So all the data will be retained for more than five years.

**Where will these data be archived (stored and curated for the long-term)?**

In the www.arxiv.org repository.

**What are the expected costs for data preservation during the expected retention period? How will these costs be covered?**

There are no expected costs.

## 5. Data sharing and reuse

**Will the data (or part of the data) be made available for reuse after/during the project? In the comment section please explain per dataset or data type which data will be made available.**

- Yes, in an Open Access repository

[www.arxiv.org](www.arxiv.org)

**If access is restricted, please specify who will be able to access the data and under what conditions.**

Access is not restricted.

**Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain in the comment section per dataset or data type where appropriate.**

- No

**Where will the data be made available? If already known, please provide a repository per dataset or data type.**

[www.arxiv.org](www.arxiv.org)

**When will the data be made available?**

Immediately after finishing the final version of a publication, it is posted on [www.arxiv.org](www.arxiv.org).

**Which data usage licenses are you going to provide? If none, please explain why.**

The arxiv.org license explained here: [https://arxiv.org/licenses/nonexclusive-distrib/1.0/](https://arxiv.org/licenses/nonexclusive-distrib/1.0/)

**Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, you have the option to provide it in the comment section.**

- Yes

All submissions to [www.arxiv.org](www.arxiv.org) are assigned a DOI.

**What are the expected costs for data sharing? How will these costs be covered?**

There are no expected costs.

## 6. Responsibilities

**Who will manage data documentation and metadata during the research project?**

PI Stefaan Vaes

**Who will manage data storage and backup during the research project?**

PI Stefaan Vaes

**Who will manage data preservation and sharing?**

PI Stefaan Vaes

**Who will update and implement this DMP?**

PI Stefaan Vaes