A new approach to nonperturbative physics

A Data Management Plan created using DMPonline

Creator: Marcel Vonk

Affiliation: University of Amsterdam (Universiteit van Amsterdam)

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Project abstract:

The mathematical technique of resurgence, used to study physics outside the conventional realm of perturbation theory, has received a lot of interest in the physics community lately. On the one hand, this field still has many interesting fundamental open problems; on the other hand, it has matured enough to start looking for applications in “real-world problems” beyond the scope of toy models. In this mathematical physics proposal, I apply for a budget for a PhD student who will work on the the topic of resurgence. Under the supervision of the applicant, who is currently the leading expert on resurgence theory in the Netherlands, the student will study two fundamental questions in resurgence theory – non-standard transmonomials and the derivation of Stokes constants – and will investigate two applications of these ideas to the field of cosmology: large scale structures and the wave function of the universe.

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Data creation/collection, organisation & documentation

We will generate a small amount of computer code (most likely in Mathematica), expected to be less than 100MB. Mathematica .nb files are ASCII based and can be read in any text editor. The code will generate numerical output, expected to be of the order of 10GB or less. This output will also be in ASCII-based .dat files, readable in any text editor. Other than that, there will be the LaTeX and PDF files for publications and images and slides for presentations (1-10 MB each).

The data will be stored on the regularly backed up university server (P: drive) as well as on our own regularly backed up hard drives. Data files will be produced once and individual files do not need to be updated, so syncing is not an issue - once the data files are produced they will immediately be backed up. Code will be stored and archived on the secure UvA GitLab environment. Publications will be stored in the same places and on the respective preprint- and journal servers (all Open Access).

The data will be stored with a "readme" file and clear folder structure and filename descriptions. The code will be commented in the file itself to make it easy to read and reuse. The publications will contain the processed data in the forms of graphs, tables, equations etc., as well as references to the code and raw data that has been used. (After publication the raw data and code can be obtained from the authors upon request for further use.)

Data security

Loss of data and unauthorized access by other researchers of numerical output before publication.

- Other (please specify)
- Physical security
- Access restrictions on network storage
- Avoidance of third-party storage (e.g. Dropbox)

The data will be stored on well-protected laptops (with up-to-date firewalls and virus/trojan protection) and servers (university servers). Loss of data will be prevented by making regular backups. The backups will be stored in the secure faculty and/or institute storage that is in place with this specific purpose, to minimize the risk of unauthorised access.

Before publication, only the PI, the PhD student and our collaborators (at most 1 or 2 per project, at UvA and abroad) will have access to the data. Collaborators will be given a copy of this data management plan and asked to acknowledge it before being allowed access to the data. Access will be granted by the PI only.

After publication, the publications, containing the processed data, will be Open Access and the generated raw numerical data and code will be available to anyone upon request.

Produced data will be backed up immediately, all working folders will moreover be backed up on a weekly basis. We will check that the backups are free of errors and can still be restored twice per year.

No non-digital data will be used.

Data archival and preservation

All code, numerical data and publications will be archived after the end of the research project. Given the relatively small amount of data produced, we don't expect to ever need to delete any data, but we will make sure they are archived for at least 10 years. The code and data will be archived in the original file formats, i.e. Mathematica .nb files and ASCII-formalled .dat files.

- Other (please specify)
- Deposit in UvA/AUAS figshare

Since after publication the raw data and code is public domain and available upon request to anyone, we will (besides secure archiving in UvA/AUAS figshare) also keep copies on our personal work computers. Code will be stored with the data produced by it, and will moreover be stored and archived on the UvA GitLab environment.

- Dublin Core (when using e.g. UvA/AUAS figshare or DANS EASY)

The data will be stored with a "readme" file and clear folder structure and filename descriptions. The code will be commented in the file itself to make it easy to read and reuse. The publications will contain references to the code and data that has been used.

Data publication and access

The relatively large numerical files (~1GB each) will not be part of the publication, but will be available from the authors upon request; this will be clearly indicated in the Open Access publications. The processed data in the form of graphs, tables and equations will be published in the relevant publications. We expect one or two publications per year, containing the processed data obtained so far. The PhD thesis that the PhD student produces at the end of the project (which will be pre-published as Open Access on arxiv.org) will contain an overview of all processed data.

All data will be published in processed form. Individual numerical files will not be published (but available upon request) because of file size and irrelevance to most of the research community; only researchers who want to do a followup-project will need those data, and will probably want to reproduce them themselves.

Once published, all data will be public domain and all publications will be Open Access.

- Copy in UvA/AUAS figshare

Roles, responsibilities and resourcing

Both the PI and the PhD student will be responsible for data management, backups, checking backups, archiving, etc. Data management will be a regularly occurring agenda point in our weekly group meetings.

- University of Amsterdam IT Security policy
- University of Amsterdam Research Data Management policy

- None

We expect this to be unlikely, but when another researcher wants to reuse our data while the data are not publicly available, we will draw up a user agreement.

Data management will be discussed regularly in our weekly meetings. Adherence to the plan will further be checked annually when the PI and PhD student have their annual review. Adherence to the plan will be reported on in the final report for the project.

Data management and IT expertise (and if needed - unlikely - legal expertise) is available at UvA. Existing backup and archiving servers at UvA will be used. In terms of staff time data management takes a small amount of time and most of it (e.g. backing up newly produced data) is part of the normal workflow.

The project proposal contains an overview of the research we will carry out in which the data will be produced.

Mariëtte van Selm at UvA RDM Support (rdm-support@uva.nl) has given feedback on the draft of this data management plan (17 June 2020) and has approved this final version for submission on 18 June 2020. The data storage part of this plan was discussed on 18 June 2020 with Jeroen

Roodhart at the UvA Faculty of Science IT support (feiog@uva.nl).