Plan Overview

A Data Management Plan created using DMPonline.be

Title: In situ acoustic monitoring for the LPBF process

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Template: FWO DMP (Flemish Standard DMP)

Project abstract:

The lack of quality assurance is hampering the adoption of additive manufacturing (AM) techniques. In an attempt to solve this, several in-situ measurement techniques have been implemented on AM machines. Having a robust monitoring setup which can detect defects would result in a big leap in quality assurance. This leap could even result in the possibility of control actions and this could result closing the loop of AM control.

However, the interpretation of the signals from the in-situ measurements has turned out to be very challenging. My PhD will develop advanced, physics informed signal processing and machine learning algorithms to construct a high fidelity defect detector for localized detection of keyhole and lack of fusion pores. The focus will be on vibro-acoustic sensing techniques with later the addition of coaxial optical measurements.

The application of these methodologies will result in a robust monitoring system which can be used for further development of a quality certificate or later possibly control actions.

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In situ acoustic monitoring for the LPBF process
FWO DMP (Flemish Standard DMP)

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.

				Only for digital data	Only for digital data	Only for digital data	Only for physical data
Dataset Name	Description	New or reused	Digital or Physical	Digital Data Type	Digital Data format	Digital data volume (MB/GB/TB)	Physical volume
Sensor data coming from the AM machine	Acoustic emission sensor, microphone, high frequency camera, photo diode, and machine configurations (numerical data)	Generate new data	Digital	Experimental	.tdms .bin	<10TB	
Metadata	Description of experiments	Generate new data	Digital	Experimental	.ppt, .doc, .txt	<1GB	
Scripts	Scripts used for processing of the gathered data	Generate new data	Digital	Software	.py	<1GB	
Miscellaneous	paper manuscripts, presentations, published literature (textual/multimedia)	Generate new data	digital	Multimedia	.ppt,.pdf	<100GB	

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:

No

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.

- Yes

If the project is successful the developed scripts could be commercially exploited.

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).

Any recorded experimental data will be accompanied by:

- The design of experiment highlighting the used parameters on the machine and the target of the experiment
- The structure of the generated data

The created scripts will be accompanied by:

- A readme.md file
- A demo script showcasing the use of the scripts

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

Custom metadata will be required which is highlighted in the previous questions

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

Where will the data be stored?

The data will mainly be stored on the ManGO platform of the KU Leuven. This platform allows for

- Secure access: management of who can/can't access the data
- 2 location backups

Additionally, the data will be backed up to a local Network Access Storage (NAS) of the research group.

If required, parts of the data will be uploaded to a password protected folder on the HPC for processing on the HPC
The scripts will be backed up on the onedrive of the research group and on the gitlab of the research group.

How will the data be backed up?

ManGO has copies on multiple physical locations and there is an additional backup on the NAS.
The scripts will be uploaded on multiple secure cloud locations.

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?

The project will not use any personal data. All data will be stored on solutions managed by the KU Leuven with proper authentication. The ManGo platform will be used for the data sharing where proper permissions can be managed (to prevent editing) for every person given access.

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

The ManGo will cost 35 euros per TB per year. The costs will be covered using available internal funds.

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 data will be retained for future research projects

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

On the same locations as previously specified:
The ManGo platform and the local NAS for the experimental data
The gitlab belonging to the research group and the Onedrive of the research group for the scripts

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

The ManGo will cost 35 euros per TB per year. The costs will be covered using available internal funds.

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 a restricted access repository (after approval, institutional access only, …)

The data and scripts will be made available.

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

Members of the research group will be able to access the data.
In future, the data can be shared in possible collaborations with other researchers/research groups.

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.

The people in the research group will be given access through the ManGo platform.

When will the data be made available?

Upon publication of the results, the data will be shared within the research group and with possible future collaborators.

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

Not yet fixed. We will likely provide the Creative Commons Attribution (CC-BY-4.0) license.
This is the standard creative commons license that gives others maximum freedom to do what they want with our work (they are free to share and adapt), but they need to give appropriate credit
and indicate if changes were made.

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.

- No

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

No costs are expected

6. Responsibilities

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

The researcher will manage the code and datasets with proper metadata.

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

The researcher will manage data storage and backup during the research project. Supervised by Konstantinos Gryllias, the promotor, and Bey Vrancken, the co-promotor.

Who will manage data preservation and sharing?

The researcher will manage data preservation and sharing during the project in collaboration Konstantinos Gryllias, the promotor, and Bey Vrancken, the co-promotor. After the research project, the promotor and co-promotor will have this responsibility.

Who will update and implement this DMP?

The researcher will update and implement this DMP.