

# OpenWIM

## *Open Science and Weigh in Motion Research*

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### Introduction

The proposal of the OpenWIM Project is to create an open environment to support WIM researchers to improve their research using open science concepts.

Open Science happens when 3 components are openly accessible:

- their publications (Open Access);
- their algorithms (Open Source) and;
- their data (Open Data).

To extend the benefits, it is important to work on:

- design standards;
- a guideline to support researchers to implement open science concepts.

At the end, the OpenWIM repository can be used by other researchers to store their research and other scientific communications in a centralized way.

### Open Access



Figure 1: Open Access

One of the main ideas behind the use of open science communication is to maximize research paper reuse and reduce their costs.

An openly accessible paper publishing can offer benefits

like the increasing of visibility and the impact factor (IF), the promotion of collaborative work, etc.

Most of the time, when researchers need to publish their paper in a subscription journal, they can publish pre-prints or post-prints (or both) on Open Journals.

### Open Source

The algorithms play a very important role in research development. They allow some processes that, if done manually, would be impossible in reasonable time. Not only can the article be published but also the source code (e.g. <http://www.pythonpapers.org>).

Publishing the source code allows other researchers to use it and cite it. Algorithms are also a scientific product and should be published. To improve reproducibility, an open programming language should be chosen and, additionally, an open notebook science (e.g. <http://jupyter.org>) can be used to allow an easy way to share and show algorithms and results.

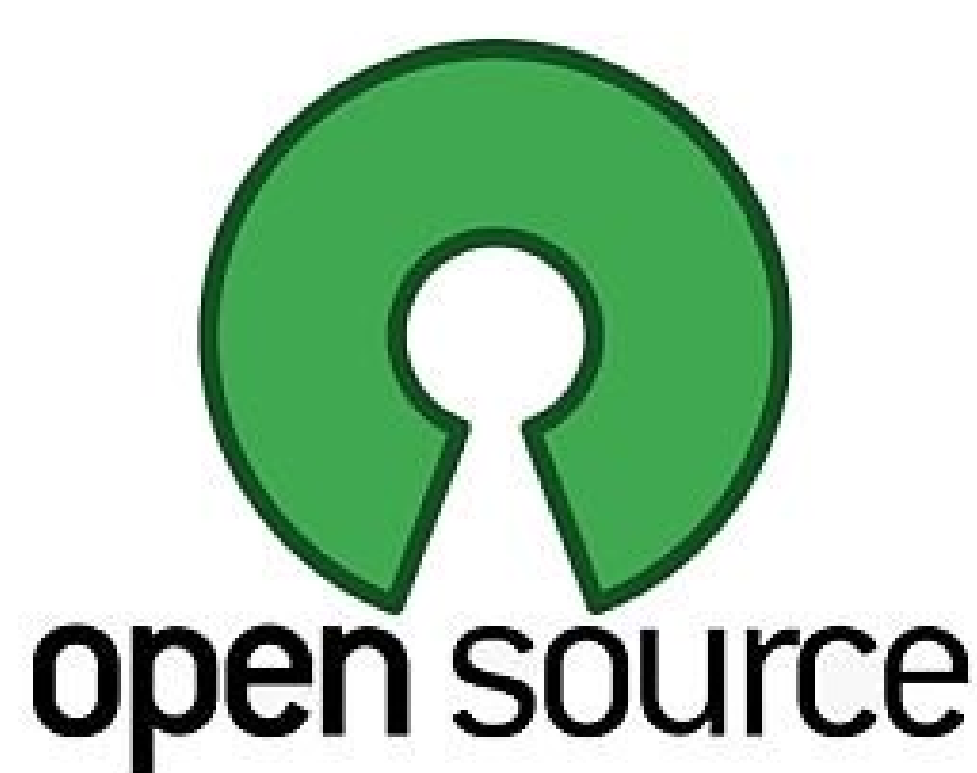


Figure 2: Open Source Initiative

### Open Data

Most studies use some kind of data. Standardizing and sharing data can be very useful. Some fields, like astronomy, have some data format defined to improve data sharing, processing and storage (e.g. FITS, NetCDF, HDF5, etc).

In weigh-in-motion field, would be a repository with raw sensor data from research with additional information in a standard format. That will help other researchers to verify some aspects of their methods. Like the source code, the data can be reused and cited by other researchers.



Figure 3: Open Data

Some important repositories are:

- Havard Dataverse;
- Figshare;
- Dryad.

### Discussion

Until this moment, no study about the applicability of open science concepts in weigh-in-motion research can be found in literatures, so we do not have any information about the differences between traditional research and open research in this field. Although, some initiatives in this field are very important, such as:

- disseminating the importance of open science methodology;
- disseminating information about communication platforms;
- offering support and training about computational techniques.

### Conclusions

When more researchers on the weigh-in-motion field understand the benefits about the use of open science methodology, more scientific communications will be openly available, allowing more reproducibility and collaborative work. Other fields are already more advanced in implementing the concept of open science and they can be used as reference to help weigh-in-motion researchers understand this methodology.

### References

- [1] Bernard Jacob, EJ OBrien, and S Jehaes. Weigh-in-motion of road vehicles: Final report of the cost 323 action. *Laboratoire Central des Ponts et Chaussées Publications, Paris*, 2002.
- [2] Erin C McKiernan, Philip E Bourne, C Titus Brown, Stuart Buck, Amye Kenall, Jennifer Lin, Damon McDougall, Brian A Nosek, Karthik Ram, Courtney K Soderberg, et al. How open science helps researchers succeed. *eLife*, 5:e16800, 2016.
- [3] Brian H Toby, Doğa Gürsoy, Francesco De Carlo, Nicholas Schwarz, Hemant Sharma, and Chris J Jacobsen. Practices and standards for data and processing at the aps. *Synchrotron Radiation News*, 28(2):15–21, 2015.