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# Reaching and Engaging Diverse Audiences

submitted for the  
Open Research Prize 2021

## SUMMARY

Despite immense technological advances finding their way into our everyday life and working practices, scientific publishing has seen much less evolution. While moving on from hand- or type-written manuscripts to electronic documents allowed for faster and more convenient editing, dissemination and review, the (now obsolete and unnatural) limitations of the “movable type” publication format persist. Among others, this glass wall poses significant challenges to effective communication of scientific findings with their ever-increasing volume, velocity and complexity. However, open science has the capacity to overcome these challenges, which we demonstrate using the very diverse research outputs created throughout one of our recent projects, where in collaboration with THALES we have developed FAT Forensics (<https://fat-forensics.org/>) – an open-source algorithmic fairness, accountability and transparency toolkit.

### What did you do?

During the lifetime of this project we fully embraced the open science spirit and published an (arXiv) pre-print, a workshop paper, an open-access journal article with open peer review, an open-source software repository, video recordings and slides of a hands-on tutorial delivered at an international conference, and a collection of interactive learning materials, thus fully embodying the open science paradigms (e.g., see <https://events.fatforensics.org/>). To this end, we integrated multiple formats and technologies to fit the underlying publication type and cater to a wide range of audiences. We ensured high quality of each deliverable, which for our code, for example, meant using open collaboration tools (our work progress and discussions were visible to the public) and adhering to best software engineering practices – such as documentation and testing – as well as choosing an appropriate open-source licence and making the code citable via a Digital Object Identifier (DOI). Our outputs are accessible to both lay and technical audiences; especially the collection of on-line interactive examples and tutorials that can be explored and executed directly in a web browser (including mobile devices), thus alleviating any technological and software barriers.

### Why did you do it?

All of these deliverables constitute different entry points to our research findings, allowing for unfettered exploration of a wide range of aspects as well as ensuring transparency, longevity and reproducibility. Publishing papers, software and learning materials under an open licence also broadens their reach since they can be used freely as academic teaching and corporate training resources. Furthermore, distributing software under the BSD-3 licence permits its commercial use in addition to research applications, thus encouraging contributions from a wider audience. Adhering to the open science publishing standards and making each output citeable – even without an “official” publication outlet – allows us to track their use as well as discover new collaborators and research avenues; for example, we were recently approached by researchers from the French national research institute (INRIA).

## **How did you do it?**

The backbone of our publishing approach are open-source tools and platforms offering free services to academic researchers. We made the most of the open science paradigms by adapting and integrating technologies such as code sharing repository (GitHub), static web page hosting (GitHub Pages), DOI minting (Zenodo), delivery of in-browser interactive materials (Jupyter Notebooks via Google Colab and MyBinder) and video hosting (YouTube). Additionally, we followed standard open science publishing practices, including pre-print publication repositories (arXiv), open journals (<https://www.theoj.org/>) and journals that have signed the open access agreement with the university (e.g., Springer).

## **What barriers / challenges did you have to overcome?**

Among others, we had to learn both how to use and integrate this very wide range of technologies to seamlessly deliver all of our research findings. This is a one-off “setup cost” that scales naturally and has already benefited our other research projects. We also had to invest additional effort in ensuring high quality and transparency of the published software since it supports our on-line interactive materials in addition to being a contribution in and of itself. Another challenge was embracing the “openness” mindset (and suppressing the traditional competitive mindset!) where every aspect of our research is open to public scrutiny and possible errors are clearly visible.

## **What does it mean for you and your research?**

The major benefit of our publication strategy is traceability and reproducibility of our results, making them a strong foundation for future work done both inside and outside of our research group. Additionally, since our outputs are well organised, documented and targeted at both lay and technical users, they can become a springboard for numerous student projects. Furthermore, transparent projects tend to attract more users and collaborators since the learning curve is much more gentle, which we achieved by publishing the on-line interactive materials. Openness is also helpful when reporting progress to funding agencies since all of the research outputs can be easily referenced against the promised deliverables. On a different level, our experience prompted us to rethink the current research, authoring and publishing tools as well as identify possible improvements to peer review – ideas which we are now exploring further within another research project.

## **How might your findings / approach help other researchers?**

Our approach to open research – going beyond the electronic paper paradigm – exemplifies a suite of modern tools and technologies available to researchers, harnessing which increases openness, accessibility, transparency and reproducibility of one’s work. In particular, we showed how to publish citable software, tag on-line resources with DOIs and create interactive research outputs, thus unlocking the full potential of open research built upon modern (internet) technologies.

## **Additional Information**

Our experience with publishing open access resources helped us to secure funding from the Turing Institute to develop on-line interactive teaching and self-study materials. They will be released under the Creative Commons licence and made suitable for both lay and technical audiences. Additionally, our pursuit of open research resulted in numerous contributions to open-source software that facilitates open science – such as Jupyter Book, which enables creation and seamless on-line publishing of interactive reports and books.