

# Fighting the Reproducibility Crisis: Sustainable research software and RRR for computer-based experiments

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Computer-based experiments have gained increasing importance over the last few decades. Nonetheless, sufficient documentation of how computational results have been obtained in experiments described in research publications is often not available. In some cases, even the replication of ones own results is difficult for researchers. The reproduction of other people’s findings on their own computational setup is a daily challenge for researchers around the world. The reusability in new contexts to accelerate the evolution of knowledge at the rate one should be able to expect is often entirely out of scope.

In the recent few years this has been observed as an issue across the sciences and the term “reproducibility crisis” has evolved. The ultimate goal of easy reuse of software developed for a research project by a completely different group in a potentially very different computational environment is likely to far fetched, since in the end researchers are typically not software engineers. This is due to the lack of software development education outside computer science, and would require a whole new infrastructure with positions for research software engineers, having enough knowledge about the field to understand the methodology, but also being educated in modern software development strategies. Still, in a work-group or a research community the reusability-goal can be addressed.

We discuss simple recommendations that make replicability, reproducibility and reusability easier to achieve. Furthermore, we provide basic guidelines for the handover of research software projects that increase their lifetime, make their development more sustainable and enable researchers to find answers to their scientific challenges rather than reinventing the wheel writing yet another basic code for their communities favorite academic toy problem.