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Delimitations of the study pdf download pdf file

i. Acknowledgement

The researchers would like to thank the following persons that helped them in fulfilling with their compliance in Research/Thesis Paper.

The Almighty God, for giving strength, knowledge and wisdom he provided us to deal with our research paper for keeping us safe in conducting interviews and survey with different people.

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To Dr. Amor B. Penalosa, who conducted a seminar regarding our research paper. To Prof. Martha L. Dela Paz that gave us this opportunity to make our research paper, for motivating us and believed that we can pursue this paper works.

To Ms. Ceverina P. Losabia, who is an operational manager of Solid Waste Management Office (SWMO) that allowed us to conduct an interview with her and provided us some information that we need.

Scope
The study covers two programming languages such as Visual Basic 6.0 and JAVA (Norbeaux) in terms of Object Oceand Programming Languages such as Visual Basic 6.0 and JAVA (Norbeaux) in terms of Object Oceand Programming particularly the programming features such as inheritance, abstractions and encapsulation inheritance, the suchbases of a class, specialized versions of a class, which inherit attributes and behaviors from their parent clauses, and can introduced their own. Abstraction simplifying complete reality is modeling clauses appropriate to the problem. Encapsulation conceals the functional details of a class from objects that send ensuings to its II is too ments into the internal representation of an object is generally halden from view outside of the object of definition.

That study will not cover the other object oriented programming features such as Nodelistiy and Polymorphism (Modeliny's as generally system concept, yould, "officion as continuum describing the degree to which a systems components maybe separated and combined. Polymorphism in object-oriented programming it to ability of objects tolenting to different data types to respond to calls of methods of the same name, each one according to an appropriate type-specific behavior.

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• 10 questions your princeologist wants you to ask, don't be shy, speaking up could save your life.
BACKGROUND. Barriers to prenatal care have been extensively investigated in low-income and inner-city communities. Less attention has been directed to the study of prenatal care among middle- and upper-cities pregiant women. This study describes precieved burriers and factors associated with late initiation of prenatal care in a predominantly middle- to upper-class midwestern community.
METHODS. Consenting women in Ofmsted County, Minnesota, who were attending a clinic for

Limitations and Delimitations of Research

http://www.bcps.org/offices/lis/researchcourse/develop_writing_methodology_limitations.html

The limitations and delimitations sections of your research proposal describe situations and circumstances that may affect or restrict your methods and analysis of research data.

Limitations are influences that the researcher cannot control. They are the shortcomings, conditions o influences that cannot be controlled by the researcher that place restrictions on your methodology and conclusions. Any limitations that might influence the results should be mentioned.

When considering what limitations there might be in your investigation, be thorough. Consider all of the

following:

• your analysis.

the nature of self-reporting.
 the instruments you utilized
 the sample.

the sample.
time constraints.

In qualitative research certain limitations might mean that the findings cannot be generalized to the larger population. This is especially true when the definition of the population is broad (ex: elderly

Delimitations are choices made by the researcher which should be mentioned. They describe the boundaries that you have set for the study. This is the place to explain:

the things that you are not doing (and why you have chosen not to do them).

the literature you are not doing (and why you have chosen not to do them).
the literature you will not review (and why not).
the population you are not studying (and why not).
the methodological procedures you will not use (and why you will not use them)

Limit your delimitations to the things that a reader might reasonably expect you to do but that you, for

Delimitations define the parameters of the investigation. In educational research the delimitations will

frequently deal with such items as population/sample, treatment(s), setting, and instrumentation.

As you complete the limitations and delimitations sections on your planning guide, you may want to go back to the <u>Sample Proposals</u> page of this web site, as well as your Reflection: Reviewing Sample Proposals journal for ideas, before you begin writing your own.

http://bold-ed.com/delimitations.htm

Writing the Delimitations

Limitations are those elements over which the research

Limitations are those elements over which the researcher has no control. In most instances, any assumption you make (see the <u>ASSUMPTIONS</u> page) become a limitations a limitation (see the <u>ASSUMPTIONS</u> page for more information on limitations)

Delimitations are those elements the researcher CAN control.

Delimitations are those characteristics selected by the researcher to define the

boundaries of the study. The researcher makes conscious **exclusionary** and **inclusionary decisions** regarding the sample (including such information as geographic location), the variables studied, the theoretical perspectives, the

JOURNAL OF TEACHING AND LEARNING, 2012, VOL. 8 NO. 1

Predicting Teacher Anxiety, Depression, and Job Satisfaction

Kristen Ferguson Nipissing University

Lorraine Frost Nipissing University

David Hall Nipissing University

Abstract

This study investigates predictors of anxiety, depression, and job satisfaction in teachers in northern Ontario. Using data from self-report questionnaires, factor analysis and multiple linear regression were performed to determine which sources of stress predict stress-related symptoms among teachers and to explore job satisfaction as predicted by: stress, depression, anxiety, years of teaching experience, gender, grade level assignment and position (part-time vs. full-time). The results indicate that workload and student behaviour were significant predictors of depression in teachers in the study. Workload, student behaviour, and employment conditions were significant predictors of anxiety. In addition, stress and depression had a significant and negative impact on job satisfaction. Years of teaching experience was a significant and positive predictor of job satisfaction. Anxiety, gender, grade level, and position were not statistically significant predictors of teacher job satisfaction. Therefore, efforts made to improve workload, student behavior, and employment conditions may lead to reduced stress among teachers and thus lower levels of depression and anxiety. These results may provide guidance for teachers and administrators, as well as inform teacher retention efforts and attempts to improve teacher job satisfaction.

Kyriacou (2001) defines teacher stress as "the experience by a teacher of unpleasant, negative emotions, such as anger, anxiety, tension, frustration or depression, resulting from some aspect of their work as a teacher" (p. 28). Teacher stress appears to be prevalent in the teaching profession. In their pivotal study, Kyriacou and Sutcliffe (1978) found that approximately 20% of comprehensive school teachers in England found teaching to be very stressful or extremely stressful. Borg and Riding (1991) found even higher results in the stress levels of Maltese teachers, with almost 34% of Maltese teachers rating their jobs as either very stressful or extremely stressful. A study of New Zealand intermediate teachers by Manthei and Gilmore (1996) found that just over 26% of teachers felt that teaching was either very or extremely stressful.

Assumptions, Limitations, Delimitations, and Scope of the Study

By Marilyn K. Simon, PhD, and Jim Goes PhD.

By Marilyn K. Simon, PhD and Jim Goes PhD
Includes excerpts from Simon & Goes (2013), Dissertation and 3

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Of all the elements in a standard doctoral dissertation, few are more confusing to doctoral learners than assumptions, limitations, and delimitations. Many doctoral students have

of the proposal are essential elements in explaining and framing the study the proposed stuAssumptions are a necessary element in proposals, because they are required to enable and
conduct the study. Often there are beliefs in the proposed research that are necessary to

comount the research, but cannot be proven. A classic example is the assumption that participants in a study will answer survey or interview questions honestly and factually. would take considerable time and effort to validate answers of each participant, we assu honest responses. Similarly, we might have a common belief about a phenomenon with study concultation web en unable to prove it. If there is evidence that supports the assum

However, it is not sufficient just to assume what cannot be proven. You need to justify that each assumption will likely be met (in the proposal) and was probably true (in the dissertation) otherwise, the study is of no value. To assume, for example, that participants will expend honesthy, you can explain how identities of participants will be (or were) concealed and their confidentiality preserved. Assuming study participants that their responses are confidential and kept secure makes it much more likely that they will respond honestly.

what the study covers — and is closely connected to the framing of the problem. The problem you seek to resolve will fit within certain parameters. Think of the scope as the domain of your research—what's in the study domain, and what is not. You need to make it as clear as possible what you will be studying and which factors are within the accepted range of your study. For example, if you are studying the negative effects of builtying on middle school children, the

detection of packages that used the:: method. We also analyze the replication datasets from journals' collections and discuss the impact of the journal policy strictness on the code re-execution rate. For the 15 studies, they contacted the corresponding authors. As an example from the implementation, a line library(dplyr) would be replaced with:if (!require("dplyr")) install.packages("dplyr")) install.packages("dplyr")Usage of the:: method in R allows access to a single function from a specific package. By selecting the datasets linked to a journal, we find a slightly higher than average re-execution rate (42% and 45%). Test your code in a clean environment before sharing or publishing it, as it could help you identify dependencies and missing files. Such an outcome demonstrates the need to capture the R software and dependency versions required for reuse. F., Murta, L., Braganholo, V. The same goes for additional documentation within the dataset. A bundle of these files associated with a published scientific result is called a replication package (or "replication data" or dataset in Dataverse repositories). The FAIR guiding principles for scientific data management and stewardship. Finally, "verified" means the journals ensure that the datasets enable reproducing the results presented in a paper. Therefore, journals play a critical role in making scholarly communication successful, and they have the power to require that the underlying data and code accompany articles. The filename length distribution (Fig. 4a) shows that most file lengths are between 10 and 20 characters. Proceedings of the 3rd International Workshop on Practical Reproducible Evaluation of Computer Systems, 15-20 (ACM, 2020). Chuah, J., Deeds, M., Malik, T., Choi, Y. Many libraries among the top ten are used to import and manage data, such as foreign, dplyr, plyr and reshape2. "No-policy" means that journals do not mandate the release of datasets. • run log r[VERSION] [NO]env[DOWNLOAD] provides information whether all files from a replication package downloaded without a checksum error. All in all, though we see some evidence of backward compatibility, we do not find a significant correlation between the R version and the release year of a replication package. D. Advancing Computational Reproducibility in the Dataverse Data Repository Platform. The primary purpose of variable naming is to describe its use and content, therefore, they should not be single characters or acronyms but words or phrases. & Crosas, M. Another more Python-ic approach to the environment capture is saving dependencies in a configuration file named install.R. We have not found a single install.R among the analyzed datasets, but we found similar files such as: installrequirements.R, 000install.R, packageinstallation.R or postinstall. We explore some aspects of this use in follow-up works46. Claims about a reproducibility crisis attracted attention even from the popular media, and many studies on the quality and robustness of research results have been performed in the last decade2,3. Folkestad for helpful conversations. The code does not give errors or warnings. While successful code re-execution is not a sufficient measure for reproducibility will be successful. Though this study is framed around pre-defined research questions, it has certain limitations in answering them due to its automatized and large-scale nature, which cannot detect the nuances in research code. We have not found any files named 'sessionInfo', but we found four packages containing .lock files (two of those called renv.lock) used in the renv library.RQ 4. & Mullen, L. These ratios are comparable to the ones in the whole dataset (40% on file-level and 45% on dataset-level), meaning that "other code" does not significantly change the re-execution success rate. Therefore if we detect that a needed library was not present in the working environment, we should add this command to install it and avoid an error. In this research question, we aim to assess the use of best practices and programming literacy in the following three aspects: meaningful file and variable naming, presence of comments and documentation. Another notable library is xtable, which offers functions for managing and displaying data in a tabular form, and similarly provides data visualization. Lastly, R 4.0 is a recent version representing a significant change in the software best practices? There is a surge of literature on best coding practices and literate programming 12,13,14,15,16 meant to help developers create quality code. Such an approach saved time and reduced the chances of errors caused by duplicated code. 7Most frequently used R libraries. The infrequent usage and absence of libraries also tell us what researchers are not doing in their projects. Readers can learn more about the technical implementation of code cleaning in Appendix 3. We define ten research guestions to provide a framework for the researchers who use R: 1. Libraries such as reny, packrat and pacman aid in the runtime environment management, and workflow libraries, such as workflowR, workflowR, workflows, and drake provide explicit methods for reproducibility and workflow optimization (e.g., via caching and resource scaling). In particular, issues like a wrong directory, deprecated function, missing library, missing data, and faulty calls that they report are also frequently seen in our study. Large-scale studies have the strength to process hundreds of datasets in the same manner and examine common themes. In principle, less popular encoding is often advised 11.RQ 2. In the brackets are the number of datasets and the number of R files, respectively.RQ 8. "Reviewed" journals make datasets part of their review process and ensure that it plays a role in the acceptance decision. Nature Physics 15, 113-119 (2019).CAS Article Google Scholar Lee, B. Towards fair principles for research software. For our analysis, we use only the deposited datasets (not harvested) due to the metadata differences across different repositories. Sharing and Preserving Computational Analyses for Posterity with encapsulator. Second, we re-execute the code after it was modified in the code-cleaning step. All things considered, we note that our automated study has a comparable success rate to the reported manual reproducibility studies 25,26, which gives strength to the overall significance of our results. Researchers increasingly publish their data and code to enable scientific transparency, reproducibility, reuse, or compliance with funding bodies, journals, and academic institutions1. Fig. Code re-execution is one of the essential aspects of its quality and a prerequisite for computational reproducibility. Data 6, 15 (2021). Article Google Scholar Muenchen, R. Digital Science (2019). National Academies of the study is to examine the properties code cleaning. It detects the setwd function and replaces it with a new one that makes the current directory with the downloaded files, a working directory. Other file path errors were solved with the use of the basename function. It is currently ranked as the 13th most popular language in the TIOBE index (. • readability metrics captures research code readability metrics such as the average number of periods, commas, spaces, parenthesis, which was explored in a follow-up publication at ref. We allocated up to 1 hour to each R file. Finally, a R user may use the library packrat or renv or a built-in function sessionInfo() to capture the local environment. H. R Markdown (Rmd) files combine formatted plain text and R code that provide a narration of research results and facilitate their reproducibility. C. In particular, it fixed all errors related to the command setwd that sets a working directory and is commonly used in R. Some of these packages had restricted access and caused an'authorization error' when we attempted to retrieve them. We explore if the code re-execution rates vary between different disciplines and other available features, and analyze the practices behind the best-performing ones. & Goodall, J. To objectively determine the effects of code cleaning, we subset the results that have explicit "successes" and errors while excluding the ones with TLE values as the outcome. The same copy of data files is available on GitHub at . Applying a relative number of modules per lines of code, we can estimate that one function on average contains 82 lines of code (mode is 55). Though we can conclude that these approaches are not currently intuitive for the researchers, encouraging their use could significantly improve research reproducibility and reuse. Finally, we look for configuration files used to build a runtime environment and install code dependencies. The benefit of using the "require" function is that it returns a logical value by default, or "true" if the package is loaded and "false" if it is not. In the past, it was ranked as the most popular language and has been rated among the top in the Kaggle Machine Learning & Data Science Survey in the previous few years 8. Furthermore, in some cases, the R software might not be compatible with some versions of the libraries. Table 2 Dataset publication date. Considering the release years of R versions (Table 3), we examine the correlation in the success rates between them and the release year of the replication package. Reusing data and code should propel new research and save research ers' time, but in practice, it is often easier to write new code than reuse old. Because R 4.0 was released in summer 2020, likely none

The recreated third log file nearly matched the original, but there were occasional discrepancies in some of the decimal digits (though the outputs were in the same order of magnitude). Though all re-executions were conducted in an environment that included r-essentials (or about 200 most popular R packages), we have not implemented a pre-

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of the examined replication packages originally used that version of the software. It could be implemented as a part of the research submission workflow41. Similarly, from 2015 to 2020, we do not observe significant changes in the dataset, nor the number of R code files, which remain around reported values
(see RQ 1). In hindsight, these instances were excessive for this type of study, and we should have used small to medium-sized instances. Finally, based on our results, we propose a set of recommendations for code dissemination aimed at researchers, journals, and
repositories. Figure 10 incorporates the survey and the re-execution results. & Horton, N. et al. • rfile stats gathers information on each R code file, such as the number of code lines, code comments, functions, classes, tests and file encoding. Therefore, our results suggest that the strictness of the data sharing policy is positively correlated to the re-
execution rate of code files. Fig. Alternatively, it may be that different analysis steps are seamlessly done in different languages, for example, data wrangling in R and visualization in Python. What is the code re-execution rate? We re-execution rate? We re-execution rate R software versions, R 3.2, R 3.6, and R 4.0, in a
clean environment. Information such as their size, content, presence of comments in the code, and documentation in the directory help us understand the current state of research code. However, the pop-up plotting functions are suppressed due to the re-execution in the Docker container. The code cleaning approach is kept relatively simple to
minimize the chance of breaking the code' or creating errors that were not previously there. While code repositories such as GitHub are used for software development, temporary projects, research, education, and more, the datasets published on Harvard Dataverse are primarily created for research purposes. Preprint at (2021).Konkol, M., Kray, C.
"R object not found" error occurs when using a variable that does not exist. The State of Open Data Report 2019. In other words, we observe that comments comprise about 20% of the shared code. A large-scale study on research code from publicly-
available replication datasets at the Harvard Dataverse repository. The Dataverse project () is an open-source data repository platform for sharing, archiving, and citing research data. While we cannot directly compare the success rate due to the different approaches, we note that much of the reported issues overlap. The code is released under MIT
license. In the implementation, a code line like: file.path("/Dropbox/my datafile.csv") would therefore be replaced with:basename(file.path("/Dropbox/my datafile.csv")) In the R programming, all libraries can be installed directly from the script using the install.packages command. Proceedings of the National Academy of Sciences 115, 2584-2589
(National Academy of Sciences, 2018). Chang, A. All Python dependencies with their versions are captured in a text file requirements.txt at the root directory. The file is then excluded to avoid misclassifying a script that may have executed if given more time. What is the success rate in the datasets belonging to journal Dataverse collections? More
than 80 academic journals have their dedicated data collections within the Harvard Dataverse repository to support data and code sharing as supplementary material to a publication. Even if the library was successfully installed, it might not work as expected if the author used an earlier version. Some of the limitations were imposed by the number of
resources we had on the AWS cloud. We collect data on the size and content of the replication package. & Ma, Z. Are code files designed to be independently of each other (Fig. 9a), while some are structured in a workflow? R files in many datasets are designed to produce output independently of each other (Fig. 9b), meaning
that the files need to be executed in a specific order to produce a result. It is important to note that the subversions). Therefore, a higher number of dependencies can lower the chances of their successful installation and ultimately code re-execution and reuse. The possible
re-execution outcomes for each file can be a "success", an error, and a time limit exceeded (TLE). For this study, we define ten questions to address aspects impacting research reproducibility and reuse. & Freire, J. The research code is modified to install the used library if it is not already present in the environment. A large-scale study about quality
and reproducibility of Jupyter notebooks. In particular, we ask what the common errors are in executing this code and whether they can be solved with simple changes in the code. Proceedings of the 2008 ACM SIGMOD international conference on Management of data, 1345–1350 (2008). Pasquier, T. The average number of code lines per file is 312
(the median is 160) (Fig. 5a). Creating a working group that would support various aspects of reproducible research, investigate state of the art, and improve the quality of shared code would be beneficial. For the Harvard Dataverse repository, replication packages are typically prepared and deposited by researchers themselves in an unmediated
fashion (self-curated). The most popular programming languages among the Harvard Dataverse repository users are Stata and R, as shown from the frequency of deposited code files in Fig. 1. Four simple recommendations to encourage best practices in research software.
policies at academic journals that have their own collections on Harvard Dataverse. All code files can be freely accessed on on GitHub at trisovic/dataverse-r-study. Even though it may seem that there is a large variety between datasets, by looking at the distributions, we observe that most of the datasets amount to less than 10 MB (Fig. 3a) and
contain less than 15 files (Fig. 3b). Fig. What are the basic properties of a replication package in terms of its size and content. AWS Batch automatically provisions resources and optimizes the workload distribution while executing jobs without interactions resources.
with the end-user. We count the occurrences of user-defined functions and classes in R files to learn how researchers structure their code. Out of 8875 R files, 2934 files have either functions or classes. Similarly, Rnw (or Sweave) files combine content such as R code, outputs, and graphics within a document. Ten simple rules for documenting
scientific software. Their observed popularity can be attributed to Harvard Dataverse repository initially specializing in sharing social science research data. If there are one or more files that successfully re-executed in a dataset, we mark that dataset as success. Promoting reproducibility with Code Ocean. Preprint at (2018). White, A. Each job re-
executes code from a single replication package using an Amazon EC2 instance with 16 vCPUs and 1024 GB of memory. We also see that it has had a lower success rate with code cleaning, we note that many common errors could be avoided. Therefore, we can
conclude that the majority of authors upload some form of documentation alongside their code. Fig. Stodden and collaborators conduct a study reporting on both reproducibility rate and journal policy effectiveness 25. According to a synthesis of interviews with top software engineers, a function should include about 10 lines of code 12. R markdown:
Integrating a reproducible analysis tool into introductory statistics. However, in our study, we have not found a single use of these provenance libraries. The Pragmatic Programmer: your journey to mastery (Addison-Wesley Professional, 2019). Hyde, R. Computational reproducibility in geoscientific papers: Insights from a series of studies with
geoscientists and a reproduction study. The following are our recommendations for data repository operators and curators: 1. Across all of the datasets, the most frequently used library is ggplot2 for plotting, indicating that the most common task is data visualization. Harvard Dataverse (2021). Baumer, B., Cetinkaya-Rundel, M., Bray, A., Loi, L. We
find an increase in the success rate for all R versions, with a total increase of about 10% in the combined results (where only explicit errors and successes were recorded, and TLE values were excluded). Looking at the breakdown of coding errors in Fig. 8, we see that code cleaning can successfully address some errors. The paradigm was encouraged
for scientific computing and data science to facilitate reproducibility and transparency. Most of these journals require or encourage research verification and reproducibility. Second, we execute the code in a clean runtime environment to assess its ease of reuse. In
the last five years, it has become a general-purpose, inter-disciplinary data repository. To develop and execute the analysis code, we used Python 2.7. The code is released as a single version, which was used for both data collection and analysis. These tools use container technology that has been deemed valuable for preserving code42. PLoS Comput
Biol 9 (Public Library of Science, 2013). McConnell, S. For a research package (compendium), a DESCRIPTION configuration file that captures project metadata and dependencies was proposed 19. There were no cases of code cleaning "breaking" the previously successful code, meaning that a simple code cleaning algorithm, such as this one, can
improve code re-execution. Similarly, we cannot draw conclusions for many of the other fields due to the low sample size (see the number of R files in the brackets), and therefore, the results should not be generalized. Fig. In some cases, the code would not fail to complete if it was re-executed in RStudio or had a minor change in file paths. R is free
and open-source software frequently used among statisticians and data analysts in the social sciences. After re-executing two of the R files, we find that the log files are almost identical and contain identical tables. If these data could talk. They report that two studies ran without any issues, and two had issues that could not
be resolved. Among the 146 survey participants, 7% tried to reproduce previous results, and about a quarter of those have done that successfully. 5. Therefore, in the re-execution stage of our study, it is reasonable to expect that replication packages with only R code would perform better than those with multiple programming languages (where R
code might depend on the successful execution of the code in other languages). The use of R Markdown and Rnw have been encouraged to facilitate result communication and transparency 10. Sometimes R files exceeded the allocated time, leaving no time for the rest of the files to execute. The DOI list is used to define the AWS jobs, which are then
sent to the batch queue, waiting until resources become available for their execution. Due to the wide variety of file naming conventions, we are unable to detect the order in which the files should be executed. 6. Replication Data for: A large-scale study on research code quality and execution. Studies have reported a lack of research
reproducibility2,3 often caused by inadequate documentation, errors in the code, or missing files. Paradigms such as literate programming could help in making the shared research code more understandable, reusable, and reproducibility via containers in psychology. A dataset that only contains errors is marked as'error'
and datasets with TLE values are removed. Therefore, we could check if the package is present and only install it if it is not. The authors thank Christopher Chen and Margo Seltzer for their contributions. The Harvard Dataverse archives more than 40,000 datasets containing over 500,000 files at the time of writing. The issue is partially solved with
the use of basename function in the code cleaning stage. However, in practice, researchers write code intending to obtain scientific insights, and there is often no incentive to structure and annotate it for reuse. Although these libraries are primarily used to test other libraries, they could also confirm that data analysis code works as expected. Create
a reproducibility checklist that include code best practices (as recommended above) and testing code re-execution in a clean environment to make the submission and review process more straightforward43,44,45. 12Success rate per research field.RQ 10. Therefore, this study provides an insight into researchers' coding practices in R, and for that
reason, it required a research-focused repository such as Dataverse. In this study, we saw that many errors in research code could be prevented with basic good practices. In any case, our result highlights that the execution environment evolves over time and that additional effort is needed to ensure that one can successfully recreate it for reuse. Tableau that additional effort is needed to ensure that one can successfully recreate it for reuse. Tableau that additional effort is needed to ensure that one can successfully recreate it for reuse. Tableau that additional effort is needed to ensure that one can successfully recreate it for reuse. Tableau that additional effort is needed to ensure that one can successfully recreate it for reuse. Tableau that additional effort is needed to ensure that one can successfully recreate it for reuse.
3 Release date of used R versions. Fig. & Yoon, J. It contains two R files and a Readme. Use Docker to document your runtime environment in a machine-readable way, and to ensure others can recreate your computational environment in a machine-readable way, and to ensure others can recreate your computational environment in a machine-readable way, and to ensure others can recreate your computational environment with all the necessary dependencies. These libraries represent the core activities in R: managing and formatting
data, analyzing it, and producing visualizations and tables to communicate results. These studies give strength to our analysis of Python code from Harvard Dataverse repository6. In particular, it removes absolute file paths,
standardizes file encoding, and identifies and imports used libraries to set up a proper execution environment. Of the top two, R is open source and free. The R programming language is the main focus of our study due to its open source and free. The R programming language is the main focus of our study due to its open source and free. The R programming language is the main focus of our study due to its open source license and popularity in scientific computing. Some of the reasons for the reduced reproducibility rate are
proprietary software and missing (or sensitive) data. We retrieve the content of 2109 publicly-available replication packages published from 2010 to July 2020 that contain 9078 R code files from the Harvard Dataverse repository. However, using multiple programming languages may hinder reproducibility, as an external user would need to obtain all
necessary software to re-execute the analysis. Replicable services for reproducible research: a model for academic libraries. They successfully reproduced 33% of the results without contacting the authors and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the authors are also a second and 43% with the author
final analysis. Our results suggest that the research community that uses Harvard Dataverse does not comply with these conventions, and one reason for that may be its recent emergence as the publication was released in 2018 (before that, a DESCRIPTION file was typically used for R libraries). Scientific data 3, 1-9 (2016).Article Google Scholar
Lamprecht, A.-L. This R version likely had some backward compatibility with older R subversions, which explains its high success rate in 2016 and 2017. It is good practice to minimize the number of comments not to clutter the code and replace them with intuitive names for functions and variables 12. The average size of a dataset is 92 MB (with a
median of 3.2 MB), while the average number of files in a dataset is 17 files (the median is 8). Documenting computing environments for reproducible experiments. Sixty published papers from thirteen journals say "usually not". 1Most popular code file types on Harvard Dataverse (Oct, 2020). Finally, some of them are used for statistical analysis, like
stargazer, MASS, lmetest and car. All R files are converted to ASCII (to reduce the chance of syntax error caused by symbols from other operating systems), scanned and modified if a common problem is detected. Out of 2091 datasets, 620 contained Stata code (.do files), 46 had Python code (.py files), and 9, 7, and 6 had SAS, C++, and MATLAB code
files, respectively. All data records are stored in a simple CSV (or text) file format and can be opened with a text editor. The highest re-execution rates were observed for the health and life sciences. Our study is loosely inspired by the effort undertaken by Chen48 in his undergraduate coursework, though our implementation, code-cleaning and
analysis goals differ. Use free and open-source software whenever possible, as proprietary software can hinder transparency and reproducibility of your research. Finally, the results and information related to the re-execution are stored on DynamoDB (. • all metadata captures the collection (journal or other) and the academic field of each
replication dataset. Digital Science et al. Best practices for publishing linked data (2014). Martin, R. The popularity of data analysis software. Binder 2.0 - reproducible, interactive, sharable environments for science at scale (2018). Trisovic, A. For instance, the pipeline can be transformed into a GitHub Action (that helps researchers test their code
with every new commit. As a result, the count of files in this figure is lower than the total count. Most code files had other, more complex errors after code cleaning resolved to be the best solution (i.e., only if the library cannot be loaded with require it
is installed from the code). The rest of the datasets, over 65,000, are harvested from other federated repositories. Based on our results, we give recommendations in Section 4.RQ 6. They look into 204 scientific papers published in the journal Science, which previously implemented a data sharing policy. 2. Still, most of the datasets are labeled'social
science,' though some have multiple subject labels. We find that 74% of R files failed to complete without error in the initial execution, while 56% failed when code cleaning was applied, showing that many errors can be prevented with good coding practices. It downloads a replication package from the Harvard Dataverse repository. As a result,
execution errors would be promptly identified and fixed. Another approach that can aid in result validation and facilitate reproduce results from 67 papers published in 13 well-regarded economic journals using the deposited supplementary material 26. R originated as an
open-source and free version of S, a statistical command language that made programming accessible without the necessity of formal training. Journal of Machine Learning Research 22 (2021). Bahaidarah, L. We verify and note if the file has correctly downloaded or if there was a checksum error. & Riegelman, A. Genome Biol 22, 65 (2021). Article
Google Scholar Brinckman, A. In literate programming, traditional source code is interspersed with explanations of its logic in a natural language4. We conduct an automatic code cleaning, scanning and correcting the code for some of the most common execution errors, such as hard-coded path variables (see the next section). Another significant
jump in the re-execution rate results from resolving the errors that relate to the used libraries. While it is hard to pin the cause of this error precisely, it is often related to missing files or incomplete code. In these aggregated results (dataset-level), 45% of the datasets (648 out of 1447) have at least one automatically re-executable R file. We note that
while 9078 R files were detected in 2109 datasets, not all of them got assigned a result. Future Generation Computer Systems 94, 854-867 (2019). Article Google Scholar Jupyter et al. In practice, this means that we have identified a version of R able to re-execute a given R file. The collected datasets are: • run log r[VERSION] [NO ]env provides
information of whether or not an R code file executed with an error for three versions of R (3.2, 3.6 and 4.0) and in two different environments (before and descriptive metadata, but they cannot always prevent irreproducibility and code-rot due
to the vast diversity of programming languages and complex computing processes. It would resolve the ambiguity of the file execution order (workflow) and showcase its input arguments. The basename function ignores the path and the path separators. One of the common examples of a Python configuration file is requirements.txt, though several
other options exist. There is no drastic difference between the file-level success rate (40%) and the dataset are meant to run independently. The turing way: A handbook for reproducible data science (2019). Nust, D. Data repository integration with reproducibility platforms
(such as Code Ocean37,38, Whole Tale39, Jupyter Binder40) and Renku (could help capture library dependencies and test the code before it is published. Finally, our results suggest that journal data policy strictness positively correlates with the observed code re-execution rate. Write great code: Thinking low-level, writing high-level, 2 (No Starch
Press, 2020).Davidson, S. In particular, data and code repositories are some of the primary venues for sharing research materials. Sloan Foundation for reproducibility. The Readme explains that each of the R files represents a separate study
and that the code logs are available within the dataset. One of the R files contains only functions, while the other calls the functions file. 6Distribution of unique dependencies per dataset. The list of used libraries provides insight into the goals of research code (Fig. 7). They conclude that while a policy represents an improvement, it does not suffice for
reproducibility. Replication Data for: Estimating the Effects of the English Rule on Litigation Outcomes. Praxis of reproducible computational science. The image contains three independent R environments, each with a different version of the R interpreter and corresponding r-essentials, a bundle of approximately 200 most popular R packages for
data science. The authors report being able to obtain resources from 44% of the papers and unitizer, were not present. Given that most of the datasets in our study belong to the social sciences, we reference a few reproducibility
studies in this domain that emphasize its computational component (i.e., use the same data and code). Although the broad community development created potential for unsustainable code, methods for package standardization and quality control have been improving with the creation of RStudio, an integrated development environment (IDE) for R,
and online communities like R-Hub and ROpenSci. Fig. However, sometimes they can be redundant or even misleading to a reuser. Nature News 533, 452 (2016). ADS CAS Article Google Scholar Knuth, D. In other words, we would expect to see a lower success rate if an R file depends on the execution of the code in other languages. When we
combine the results based on the Table 1, we get the following results in each of the runs: Without code cleaning Best of both Success 952 1472 1581 Error 2878 2223 1238 TLE 3829 3719 5790 Total files 7659 7414 8609 7414 8609 7414 8609 7414 8609 7414 8609 7414 860
cleaning as primary and further analyze them unless different is stated. RQ 5. First, we retrieve and analyze more than 2000 replication datasets with over 9000 unique R files published from 2010 to 2020. The first group of questions revolves around coding practices (RQ 1-3), while the other around the automated code re-execution (RQ 4-10). RQ 1.
E. T. PARCO, 756-765 (2019). The Software Sustainability Institute. Our code cleaning approach is relatively simple to minimize the chance of "breaking the code", and we do not use static analysis packages such as goodpractice or lintr as they do not make changes in the code automatically. While some R users set their working directory with the
setwd function, this often causes errors if the directory path cannot be found. To access how the code re-execution relates to research reproducibility, we select a random sample of three datasets where all files were executed successfully and attempt to compare its outputs to the reported ones. It is important to note that the package must be
installed in the environment to be available using this method, but it does not have to be loaded in the R script. Such a result corroborates the assumption that R files were likely designed to be re-executed independently in most cases. RQ 7. Thank you to the Dataverse team at Harvard's IQSS for their help and support. Reproducibility and replicability and replicability.
in science (National Academies Press, 2019). Baker, M. For instance, code re-execution is a necessary but not sufficient requirement for reproducibility. Though our study primarily aimed to identify code re-execution and quality issues, the developed AWS pipeline can find its use outside of the study boundaries. Our code cleaning algorithm does not
pre-install the detected libraries but instead modifies the code to check if a required library is present and installs it if it is not (see Appendix 3). Fig. Clean code: a handbook of agile software craftsmanship (Pearson Education, 2009). Sandve, G. College & Research Libraries 80, 260 (2019). Article Google Scholar Sandve, G. Improving reproducibility
in machine learning research: a report from the NeurIPS 2019 reproducibility program. What are the most used R libraries? The number of code dependencies affects the chances of reusing the code, as all dependencies (of adequate versions) need to be present for its successful execution. Data policies of highly-ranked social science journals. Can
automatic code cleaning with small changes to the code aid in its re-execution? To determine the effects of the code cleaning algorithm (described in Science & Engineering 21, 73-78 (2019). ADS Article Google Scholar Arnold, B. That way, the code
would be automatically re-executed before it reaches editors, reviewers, curators, or reusers, who could then make decisions based on the re-execution result and code analysis. Library versions in a project should be captured ideally by using the renv package. However, even when the code re-executes successfully in our study, it does not mean that
it produced the reported results. Researchers' code from replication packages usually operates on data to obtain the published result. & Pfeiffer, M. Due to its popularity among academics and its open-source license, R is an ideal candidate for our study. In total, they encountered 173 issues in 39 papers. To learn about commenting practices in the
research code, we measure the ratio of code lines and comment lines for each R file. & Trisovic, A. It may be that medical-related fields have a stronger level of proof embedded in their research code in its final (published) version
 We examine the data further to see if a journal data sharing policy influences its re-execution rate. We survey data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to whether data sharing policies for a selection of journals and classify them into five categories according to the policies for a selection of journals and classify them into five categories according to the policies for a selection of journals and classify them into five categories according to the policies for a selection of journals and classify them into five categories according to the policies for a selection of journals and classify them into five categories according to the policies for a selection of journals and classify them into five categories according to the policies for a selection of journals and classify them into five categories according to the policies for a selection of journals and classify the policies for a selection of journals and classify the policies for a selection of journals and classify the policies
used Docker images for R across different applications. We observe that the average filename length is 17 characters without the file extension, while the median is 16. For example, if a long file path is used in the read.csv function, it will be ignored, and only the name of the target file will be used. In particular, R libraries are not often developed
with backward compatibility, meaning that using a different version from the one used originally might cause errors when re-executing the code. However, we note that about a third or 32% (669) of file names contain a'space' character, which is discouraged as it may hinder its manipulation when working from the command line. K., Nekrutenko, A.,
Taylor, J. Running the main R file prints a series of numbers, which are estimates and probabilities specified in the document. Workflow capture and management methods such as R Markdown, drake, and its successor, targets will help to automate your code and specify the correct execution sequence. Toward reproducible and extensible research:
from values to action. For the reproducibility part of the study, Konkol and collaborators use RStudio and a Docker image tailored to the geoscience domain. Out of 3070 R files, we find that 621 use variables that are one or two characters long. Though the optimal amount of comments depends on the use case, a reasonable amount is about 10%,
meaning that the code from Harvard Dataverse is on average commented twice as much. According to IBM studies, intuitive variable naming contributes more to code readability than comments, or for that matter, any other factor 14. We find that R 3.2, released in 2015, performed best with the replication packages released in 2016 and 2017
(Fig. 11a). A. Harvard Dataverse (2019). Helland, E. Considering that there are typically 2 R files per dataset (median, mean is 4), we can approximate that behind each published 30,31,32,33,34 and are available online35. However, deploying such a
pipeline would require additional costs for computation and may present a hurdle for users releasing open data. Our content analysis gives us an insight into the storage needs and requirements for supporting files, such as documentation, images, or maps. All replication packages in the Harvard Dataverse repository are uniquely identified with a DOI
(digital object identifier), and we start the analysis by retrieving the list of DOIs that contain R code (Fig. 2). In the code cleaning step, all non-ASCII code files (692 out of 8173) were converted into ASCII to reduce the chance of encoding error. International Journal of Geographical Information Science 33, 408-429 (2019). Article Google Scholar
Chen, C. Ideally, a single command can execute the code in an R Markdown file to reproduce reported results. Finance and Economics Discussion Series 2015-083 (2015). Wilkinson, M. Absolute (or full) file paths are a frequent cause of error when re-executing code on a new file system. In R programming, these modules can be implemented as
functions or classes. Konkol and collaborators conducted an online survey among geoscientists to learn of their experience in reproducing prior work47. Data and software repositories aim to provide high-quality resources that can be leveraged for further research. We find that most datasets explicitly depend on up to 10 external libraries (Fig. 6)
with individual R files requiring an average of 4.3 external dependencies (i.e., R libraries). For this study, we extracted variable names from the code using the built-in R function ls(). However, we see that the datasets use an increasing number of (unique) libraries over time, i.e., from an average of 6 in 2015 to about 9 in 2020.RQ 9. 4. Though
conducting a reproducibility study with human intervention would result in more sophisticated findings, it is labor-intensive on a large scale. In addition to the software, the image contains a custom-made workflow that conducts the study and collects data. Also, the fact that the most frequent errors relate to the libraries in both studies signals that
both programming languages face similar problems in software sustainability and dependency capture. Our code cleaning implementation aims to solve some of the most common errors and ensure that used libraries are installed. Use relative file paths in your code. In particular, we observe numerous errors related to directory paths, ranging from
system encoding to accessing unavailable file directories. Experimental tests of the prediction that inequality increases system justification motivation. At Dataverse, we have created a Software, Workflows, and Containers working group, which gathers experts, identifies community-wide problems, prioritizes them, and implements solutions in the
Dataverse software. In addition, libraries for runtime environment and workflow management are also notably absent. The Computer Journal 27, 97-111 (1984). Article Google Scholar Pasquier, T. It refers to tracking data transformations with specialized R libraries, such as provR, provenance, RDTlite, provTraceR. Ten simple rules for reproducible
computational research. Though a total of 2,170 replication packages contained R code and were visible through the Dataverse API, we successfully retrieved 2109 (97%) of them. L. Repository approaches to improving the quality of shared data and code. We analyze only the journals with more than 30 datasets in their Dataverse collections. We also
searched for a documentation file, or a file that contains "readme", "codebook", "documentation" in its name, and found it in 57% of the datasets (Fig. 4b). None of these were detected in our dataset, except for renv which was used in 2 replication packages. Indeed, if file names are long and descriptive, it is more likely that
they will be understandable to an external researcher. From Fig. 10 we see that the journals with the strictest policies (Political Science Research and Methods, AJPS, and PA) have the highest re-execution rates (Fig. 10a shows aggregated result per dataset, and Fig. 10b shows file-level results). Below, we elaborate on the study's implementation,
workflow, and data collection. We use AWS Batch (to parallelize the effort of retrieving and re-executing research code in each replication package. Data Science 3, 37-59 (2020). Article Google Scholar Jiménez, R. Data repositories and journals could also incorporate the pipeline at code upload on their respective platforms. How do release dates of
R and datasets impact the re-execution rate? The datasets in our study were published from 2010 to July 2020 (Table 2), which gives us a unique perspective in exploring how the passing of time affects the code. • rpackage stats gathers information on the replication package such as total comments, total libraries, size, list of files and list of used
libraries. How does the re-execution rate relate to research reproducible if the shared data and code produce the same output as the reported one. Finally, if we have an "error" 3 times, we consider the combined results to be an error. The studies are not directly comparable due to the use of different programming
languages. This is one of the commands that our code cleaning implementation targets. About 4% re-executed with the existing outputs in the notebook. Therefore, for these infrastructures, it could be viable as an optional feature rather than a submission requirement. Table 1 Obtaining
combined re-execution result per R file from results using three versions of R software wersions. Checklist for a software management plan. Upon acceptance, the research material submitted by authors is verified to ensure that they
produce the reported results 20,21. The authors declare no competing interests. Preprint at (2018). Pimentel, J. Literate programming. To analyze the success rate of the analysis, we interpret and combine the results from the three R versions in the following manner (illustrated in Table 1): 1. File, path, and output errors often appeared if the directory
structure was inaccurate or if the output file was not saved. It might be that a dataset resulted in a collaboration of members who preferred different languages, i.e., one used R and another Stata. 1. Common coding errors were identified, and some of them were solved with automatic code cleaning to aid code execution. We should strive toward
enabling reproducibility studies with automation while using existing standards like machine-readable FAIR data27 and code28,29, and this paper provides recommendations toward that goal. Even though it may appear that we should not have been
drastically different. Most reproducibility studies were done manually, where researchers tried to reproduce previous work by following its documentation and occasionally contacting original authors. We observe that only a small fraction of datasets contain R Markdown (3.11%) and Rnw files (0.24%), meaning that to date few researchers have
employed these methods.Last, we observe that 91% of the files are encoded in ASCII and about 5% in UTF-8. Retrieved from Harvard Dataverse directly. If we have one or more "TLE" and no "success", the combined result is a TLE. 2Implementation on the AWS Batch.The collected data, source code and complete instructions to reproduce our
analysis are available online at Dataverse9 and GitHub under MIT license. Data collection workflowFor testing research code re-execution, we use a Docker image with pre-installed conda environment manager, R and Python software on Debian GNU/Linux 10. The second premise of the study is to examine what happens when an external researcher
retrieves and re-executes shared research code. However, the success rate would likely be better had we known the execution order. If we exclude all datasets that contain code in other programming languages, the file-level success rate is 38% (out of 2483 files), and the dataset-level success rate is 45% (out of 928 datasets). For example, other
library errors appeared if a library was not installed or was incompatible due to its version. This is only aggravated as research code. Scientification in the programming literacy and reproducibility aspects of shared research code. Scientification is considered as research code at a rate higher than ever before. This paper presents a study that provides an insight into the programming literacy and reproducibility aspects of shared research code. Scientification is considered as research code at a rate higher than ever before. This paper presents a study that provides an insight into the programming literacy and reproducibility aspects of shared research code.
data 4, 1-5 (2017). Article Google Scholar Marwick, B., Boettiger, C. Trisovic is funded by the Alfred P. Harvard Dataverse (2017). Polk, J. A total of 208,323 of the notebooks finished their execution successfully (24.11%). The re-execution test is conducted with and without the code cleaning step, and the result (success, error, or time-limit exceeded)
is recorded. For instance, to use intersect from the dplyr package, one would invoke it as dplyr::intersect. Furthermore, by examining multiple journals with various data policy strictness, we corroborate the finding that open data policy is an improvement but less effective than code review or verification in enabling code re-execution and
reproducibility. Studies that focus primarily on the R programming language have been reported. Stata is proprietary statistical software used in economics, sociology, political science, and health sciences. 3Dataset sizes and file counts. Analyzing the content of replication packages, we find that about 40% of them (669 out of 2,091) contain code in
other programming languages (i.e., not R). Toward reusable science with readable code and reproducibility. Preprint at (2012).Kaggle ML & DS Survey. We expect that including it would somewhat (likely marginally) improve the results. The US CRAN () was set as default to avoid the CRAN errors. & Li, P. The American Statistician 72, 80-88
(2018).MathSciNet Article Google Scholar Vines, T. Explore content Those were excluded from our study.Code cleaningOur implementation of code cleaningOur im
contributors. The re-execution results and other collected data are passed to the backend database for analysis. PLoS Comput Biol 9 (2013). Chen, X. For example, the American Journal of Political Science (AJPS) requires authors to provide all the research material necessary to support the paper claims. Our recommendations for the journal editors:
By comparing the observed coding practices to the established best practices, we identify the existing weak points and areas of improvement for researchers writing code. 5Number of code line and relative number of comments. Comments are a frequent part of code that can document its processes or provide other useful information. Re-executable
code may produce a different result than the reported one and be a "false positive" in our dataset. J. 3. All data records are freely available on the Harvard Dataverse repository at under CC0 license9. 4File name lengths and presence of documentation. Further, we examine the code of the 8875 R files included in this study. "Required" journals
mandate that authors make their dataset available. We also note that Pimentel and collaborators performed the study on diverse Jupyter notebooks, which often include prototype development and educational coding. Provenance and scientific workflows: challenges and opportunities. Indeed this is a limitation of all R software versions, as each would
by default try to install the latest version of R libraries. We observe that R 3.6 has the highest success rate per year (Fig. 11b). Open is not enough. The Rockerverse: Packages and Applications for Containerisation with R. Is economics research replicable? As a result, we may run the first step of the workflow last in the worst case, meaning that only
one file (the first step) will run successfully in our re-execution study. Fig. Computing environments for reproducibility: Capturing the "whole tale". Each module can then be debugged, understood, and reused independently. For example, tests of user-defined functions, such as data import or figure rendering, could be implemented using these
libraries. Currently, more than 60 institutions worldwide run Dataverse instances as their data repository, each hosting data, code, documentation, or any combination of these files. Replication Data for: Does
Inequality Beget Inequality? "Encouraged" means that journals suggest to authors to make their datasets available. Harvard Dataverse (2016). Stodden, V., Seiler, J. We find 9 out of 2091 replication packages that have a DESCRIPTION file and 30 where the word description is contained in any of the file names. What is the success rate per research
field? The Harvard Dataverse repository was initially geared toward social science, but it has a single R file and a Readme explaining that
the script produces a correlation plot. The authors may have also adopted a different convention to name their documentation material. Code complete (Pearson Education, 2004). Thomas, D. Research transparency and reproducibility
In other words, we favored a more specific field (such as "law") and chose it over a general one (like "social science") when that was possible. The re-execution rates per field of study are shown in Fig. 12. Otherwise, you may use a DESCRIPTION file or install. R or include the output of sessionInfo() from the researcher's R session. R is highly
adaptable due to its extensible package system, which led to a surge of community-driven developments. The R Journal 12, 437-461 (2020). Article Google Scholar Clyburne-Sherin, A., Fei, X. Along these same lines, R programmers do not usually refer to their code collectively as a program but rather as a script, and it is often not written with reuse
in mind.RQ 3. The rest use other encodings, with ISO-885901 and Windows-1252 being the most popular (about 3.5% together). In addition, they conducted a reproducibility study by collecting papers that included R code and attempting to execute it. Pimentel and collaborators retrieved over 860,000 Jupyter notebooks from the Github code
repository and analyzed their quality and reproducibility49. Harvard Data Science Review 2 (2020). Pineau, J. However, as noted in Section 0, R behaves like a command language in many ways, which does not inherently require users to create modules, such as functions and classes. We tested a few approaches to identify the used and pre-installed
libraries. The study first attempted to prepare the notebooks' Python environment, which was successful for about 788,813 notebooks. The preservation of these packages is, therefore, crucial for reproducibility efforts. Fig. The preservation of these packages is, therefore, crucial for reproducibility efforts. Fig. The preservation of these packages is, therefore, crucial for reproducibility efforts. Fig. The preservation of these packages is, therefore, crucial for reproducibility efforts. Fig. The preservation of these packages is, therefore, crucial for reproducibility efforts. Fig. The preservation of these packages is, therefore, crucial for reproducibility efforts. Fig. The preservation of these packages is, therefore, crucial for reproducibility efforts. Fig. The preservation of these packages is, therefore, crucial for reproducibility efforts. Fig. The preservation of these packages is, therefore, crucial for reproducibility efforts. Fig. The preservation of these packages is a support of the preservation of the preservati
example, the journal Political Analysis (PA) provides detailed instruction on what should be made available in a dataset and conducts "completeness reviews" to ensure published datasets meet those requirements. TLE occurs when the time allocated for file re-execution is exceeded. Statistics on code files, such as the number of lines, libraries, and
comments, are also collected. F1000Research 6 (2017). Sayre, F. Capturing re-execution commands for each research dataset would be immensely helpful for reusers. To avoid sorting the same dataset would keep only the latter. The median value of 4.5 (average is 7) can
be interpreted as one line of comments documenting 4 or 5 lines of code (Fig. 5b). A potential cause may be the use of incompatible library versions in our re-execution step as the R software automatically installs the latest version of a library versions in our re-execution step as the R software automatically installs the latest version of a library version of a
it instantiates a pre-installed Docker image that contains the necessary software pipeline to retrieve a replication package and execute its R code. The most comprehensive dataset available on the state of ML and data science (2018). Trisovic, A. If there is a "success" one or more times, we consider the re-execution to be successful. & Trump, K.-S.
Support for metadata fields or files capturing such commands does not currently exist but could be incorporated into dataset metadata at the repository. Such a result is expected because these replication packages were likely developed in 2015, 2016, and 2017 when R 3.2 was frequently used. Preprint at (2014).W3C Working Group. Collected
manually. 8Success rate and errors before and after code cleaning. Coding BetteR: Assessing and Improving the Reproducibility of R-Based Research With containR. Such an approach works in this scenario because all files from the replication package are downloaded one by one and stored in the same directory. Furthermore, the data curation teams
at Harvard vets all published datasets to maintain its data and research focus. The FASEB Journal 27, 1304-1308 (2013). Crosas, M. The execution time may include installing libraries or external data download if those are specified in the code. However, the average length of variable names is 10, which is a positive finding as such a name could
contain one, two, or more English words and be sufficiently descriptive to a reuser. Modular programming is an approach where the code is divided into sections or modules that execute one aspect of its functionality. The main cause of depleting the AWS resources was a choice of a large EC2 instance for the re-execution. As a result, the research
code quickly becomes unusable or unintelligible after meeting its initial purpose5. Though much of the code's intrinsic design will determine its longevity, its dissemination platform could also have a compelling influence6. The dependencies in code were detected by looking for "library", "install.packages" and "require" functions. Fig. Even attempting influence and "require" functions.
to reproduce previously published results using the same input data, computational steps, methods, and code has shown to be troublesome. According to our results, it should be re-executed with R 3.2. The R file prints two correlation coefficients, but it is unable to save the plot in the Docker container. The final dataset from our sample follows a
paper published at the Review of Economics and Statistics24. Consider recommending the use of certain libraries or tools that facilitate code automation and re-execution. Replication Data for: Explaining the Salience of Anti-Elitism and Reducing Political Corruption for Political Parties in Europe with the 2014 Chapel Hill Expert Survey Data. Based
on the study's findings, we conclude with recommendations for disseminating research code for researchers, journals, and repositories. Our study uses code deposited and shared at the Harvard Dataverse repositories. Our study uses code deposited and shared at the Harvard Dataverse repositories. Our study uses code deposited and shared at the Harvard Dataverse repositories. Our study uses code deposited and shared at the Harvard Dataverse repositories.
collection. For instance, there is a large count of TLE values in our results even though we set the time limitation to be 1 hours per dataset. This work was supported by the AWS Research Credits. B. Computing in Science Engineering 20, 111-124 (2018). Article Google Scholar Trisovic, A., Mika, K., Boyd, C., Feger, S. Consider
implementing a simple review of all deposited material if a code verification is infeasible for Rouced a warning that the library SDMTools is not available for R 3.6, which may have caused the discrepancy. The second dataset from the random
sample is a replication package linked to a paper published at Research & Politics23. 9Types of workflows in research analyses. To examine the nature of R analysis, we aggregate the collected in the AWS re-execution step unless otherwise indicated. The workflow attempts to
execute the researchers' code for an allocated period of one hour per file and five hours in total. However, it is likely that small changes in the re-execution would also result, the research code would fail if the R version and the library version were
not compatible. In other cases, files had obscure and erroneous encoding, which caused errors during the download. 46. One can achieve higher productivity, easier code reuse, and extensibility by following the guidelines, which are typically general and language agnostic. Mandated data archiving greatly improves access to research data. For
example, there are 215 datasets that contain only'success' and'TLE' as outputs. The first dataset from the random sample is a replication package linked to a published paper at the Journal of Experimental Political Science 22. Physics had the lowest re-execution rate, though due to the low sample size and the fact that Dataverse is probably not the
repository of choice in physics, we cannot draw conclusions about the field. 1,500 scientists lift the lid on reproducibility. It contains three R files and a Readme, among other files. & Hovig, E. 11Re-execution success rates per year per R software version. Looking at the combined result from Fig. 11d, we are unable to draw significant conclusions on
whether the old code had more or fewer errors compared to the recent code (especially considering the logs before and after code re-execution would be a good indication of its success. The replication packages that have resulted in TLE were excluded from the study, as they may have eventually executed
properly with more time (some would take days or weeks). An empirical analysis of journal policy effectiveness for computational reproducibility. There are 127 datasets where all R files re-executed with success (Table 4). Table 4 Re-execution results combination per dataset. IEEE/ACM 16th International Conference on Mining Software Repositories
(MSR), 507-517 (IEEE, 2019). Download references This work is partially funded by the Sloan Foundation (award number G-2018-11111).
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