**On the Impact of Programming Languages on Code Quality: A Reproduction Study**

**Summary**

The use of programming languages is a commitment that a given set of ideas will increase developers' capacity to create software that complies with its specifications. Methodological challenges arise when analyzing the advantages of one set of language characteristics over another. These trials are too expensive to be used in the real world because numerous teams of talented programmers produce the same application in different languages. Is the central question of Ray et alwork.'s presented at the 2014 (FSE) "Foundations of Software Engineering conference". The effort received enough positive feedback from the software engineering community to be named a CACM Research Highlight in the Communication of ACM. Based on data-based study of a number of (729 GitHub) projects developed in 17 programming languages, the results presented in the (FSE article) and future repetitive in follow-up efforts. that evaluated a piece of code's functionality, and writers identified, flagged, and matched contributions that were thought to be problem fixes. Examine the process of data analysis using the original text while breaking it into the three steps of monitoring: cleaning, data collecting, and modelling.

Our first goal in EXPERIMENTAL REPETITION is to replicate the analyses of the (FSE article) and to produce the same results. A repeat should ideally follow a straightforward process in which a draught produces effects that correspond to the final result of the published piece. Our example is the only part of the code that is necessary to generate the expected number of graphs and tables. RESULT The information is contained in two CSV files, the first of which is larger and contains one row and one commit per file, as well as the marks for bug fixes. The second file contains less merged rows and uses a similar commit and wording. We noted that there were 729 projects and 1.5 million commits in the records. We can find further 148 projects that lost from the original work without clarification. We choose that to ignore those projects whose data volume are not issued here.

REANALYSIS is our second goal, which involves reanalyzing RQ1 from the FSE article. Reanalysis differs from repetition in that it suggests various statistical analyses and data processing to highlight what we categorize as methodological flaws in the original work. METHODS of reanalysis include (a) Data Processing, which is the first way by which the activity of data gaining in the original work was more closely examined. Future was used in this step as quality control, not data change. We must create the software such that downloads happen automatically and project commits are compared to GitHub histories. 618 projects out of the 729 used in the FSE report have been downloaded. The other became private or deleted. The download projects had matched by name. Next, we use three data cleaning phases (1) Deduplication, (2) Removal of TypeScript, (3) Accounting for C and C++. (b) Statistical Modeling is the second methods in which reanalysis open some methodological faults in statistical analyses of original script. (1) Zero-sum Contrasts is the original document picked that code of programming languages with subjective differences. Such contrasts understand the coefficients of Negative Binomial Regression has deviations of bug-fixing commits in language from the regular of log-expected number that have bug-fixing commits in the database. (2) Multiplicity of Hypothesis Testing is a common error in data- obsessed software engineering is failed to justification for several hypothesis testing. When at once testing various hypotheses, certain p-values can decrease in the meaning range by random chance. (3) Statistical Significance versus Practical Significance is the FSE article that are focused on statistical significance of coefficients regression. This is quite limited, that the p-values mostly focused by the number of explanations in the dataset. When p-values are small not certainly suggest practically important relations. (4) Accounting for Uncertainty is the FSE analyses expected that the sums of bug-fixing commits have no error. Labeling of commits is focus to doubt the experimental used to able that commits have several false positives, which have been factored into the outcomes. A quite simple method to reach this relies on factor estimation by statistical procedure is called the bootstrap. OUTCOME Of the reanalysis unsuccessful to confirm most of the privileges of reference. The multiple phases of improved statistical modeling and data cleaning cancelled the consequence of 11 of 7 languages. Even when the suggestions are statistically major, the practical significance is small.

FOLLOW-UP WORK The validity of the main conclusions of the original script may be more challenged by a number of flaws that we have now noted. We are not skilled for their influence; instead, we direct that toward follow-up tasks. Regression Tests, Distribution of Labeling Errors, Project Selection, Project Provenance, Application Domain, Uncontrolled Influences, and Relevance to the RQ

BEST PRACTICES is the lessons from the work symbolize the challenges of reproduceable data science. While those lessons are not novel, they may be cost repeating utomate, Document, and Share, Apply Domain Knowledge, Grep Considered Harmful, Sanitize and Validate, Be Wary of P-values

CONCLUSION: Our research has identified multiple, significant methodological flaws in the FSE study that nullified its main finding. It is difficult to create statistical analysis software using large-scale code sources. There are numerous opportunities for errors to surface. Authors of relevant studies in the future, as well as those who evaluate such work, should support our study. We have been proven that the results of the CACM and FSE studies do not support when the data is cleaned, and a thorough reanalysis is performed. The fact that eleven computer languages have statistically significant relatives who have defects is not the case. Its only concluded precise re- confirmation of such study that the wider society may gain belief in these outcomes and get-well awareness into the difficulties and solutions related with such studies.