DATA Lab

Laying foundations to quantify the "Effort of Reproducibility"

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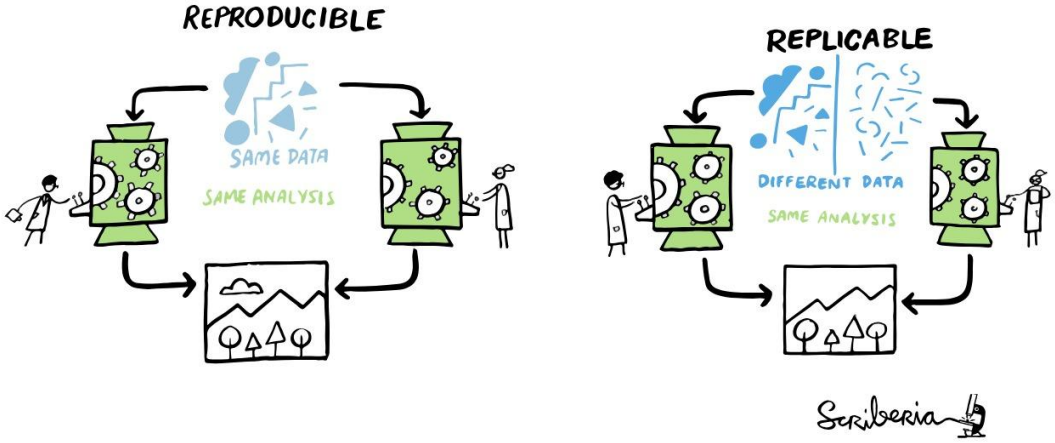
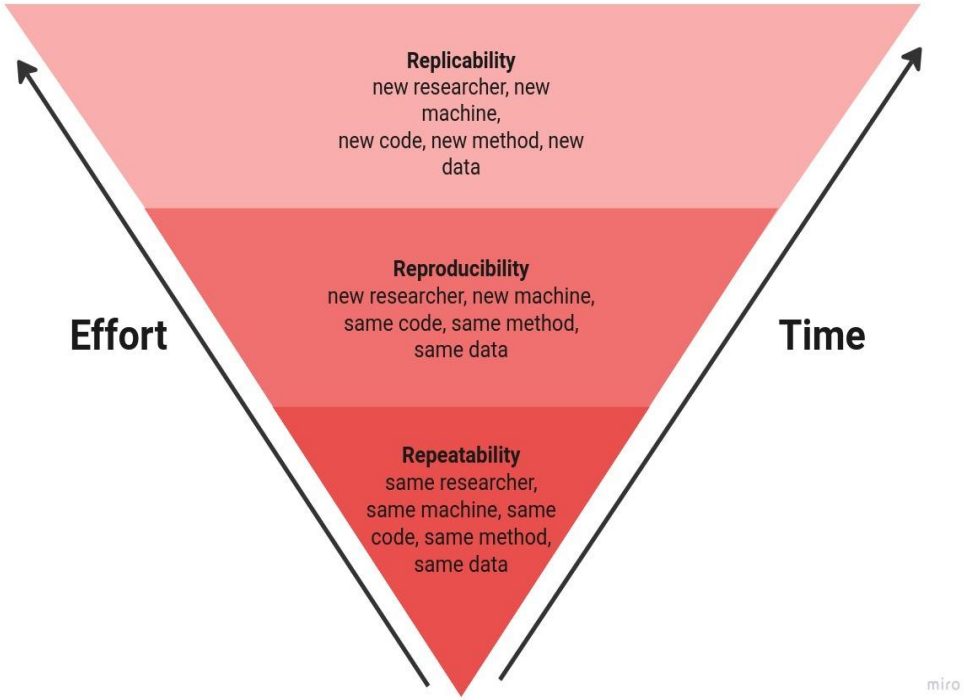
What is Reproducibility ?



Effort of Reproducibility



Based of an infographic from Essawy et. al, "*A Taxonomy for Reproducible and Replicable Research in Environmental Modelling*", 2020, https://doi.org/10.1016/j.envsoft.2020.104753.

Quantifying the ‘Effort of Reproducibility’

OBTAIN RAW DATA FROM ML REPRODUCIBILITY CHALLENGE

STEP 1

EXTRACT META INFORMATION FROM REPRODUCIBILITY REPORT

STEP 2

DISCOVER FACTORS THAT CONTRIBUTE TO EASINESS & DIFFICULTY

INDUCTIVE QUALITATIVE ANALYSIS

+

QUANTITATIVE ANALYSIS

STEP 3

Data Collection

OBTAIN RAW DATA FROM ML REPRODUCIBILITY CHALLENGE

YEARS: 2020, 2021

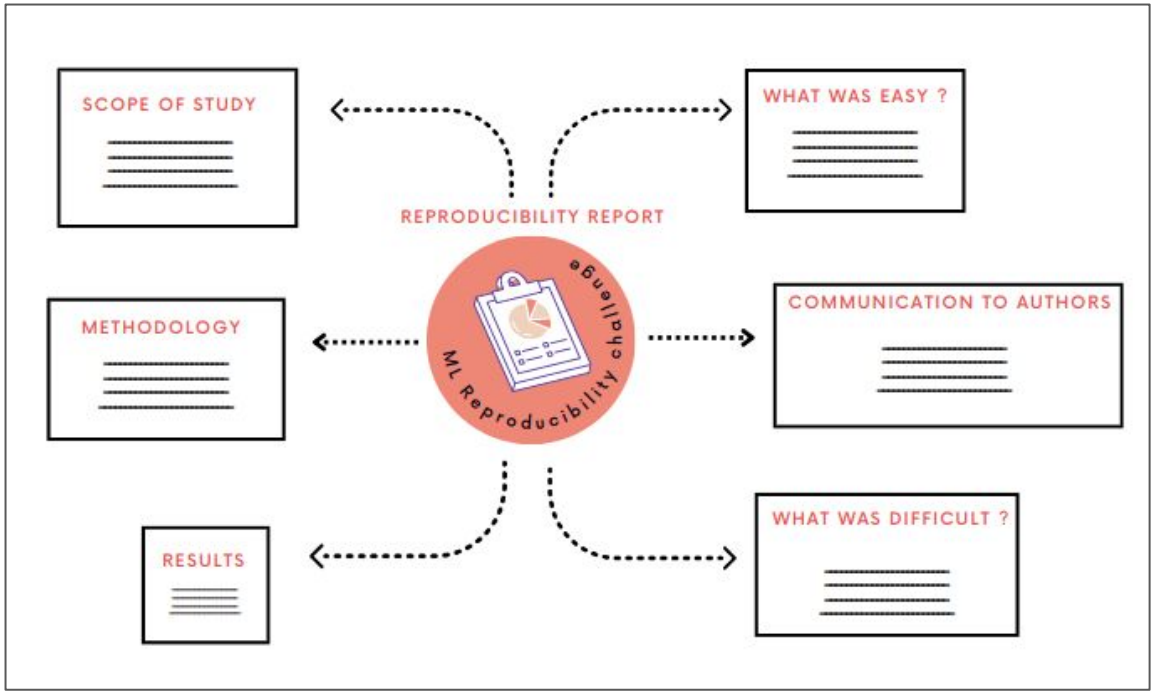
AUTHOR'S NAME, TITLE, DOI, CITATIONS
META INFORMATION ABOUT ORIGINAL WORK

AUTHOR'S NAME, TITLE, DOI, VOL, ISS
META INFORMATION ABOUT REPRODUCIBILITY REPORT

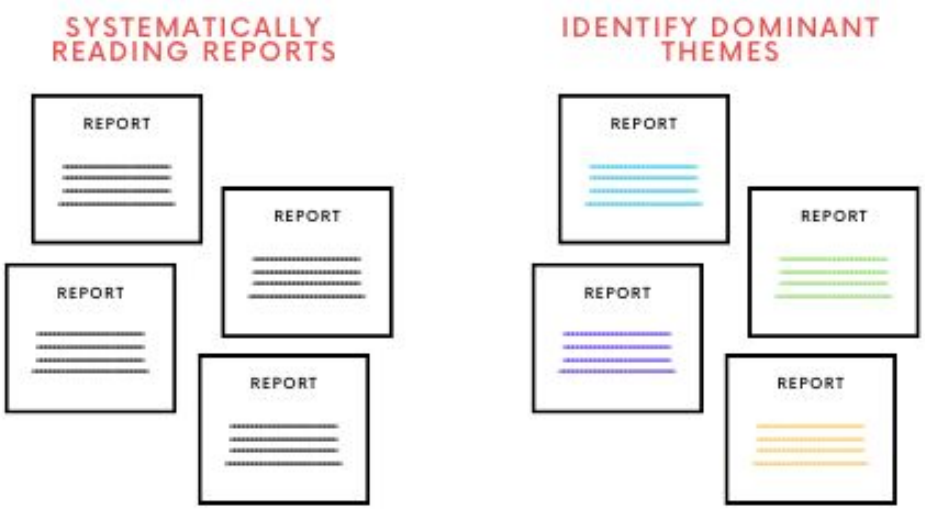
OPENREVIEW, PDF'S, CODEBASE
DIGITAL ARTIFACTS

SAMPLE SIZE: 87

Information Extraction



Inductive Analysis



Scope of reproducibility

[RE] ORIGINAL WORK

RESEARCHERS REPRODUCING JUST THE ORIGINAL WORK

[RE] ORIGINAL WORK + EXTENSION

RESEARCHERS REPRODUCING THE ORIGINAL WORK AND ADDING A MINOR EXTENSION

[RE] MULTIPLE WORKS TO PRODUCE NEW WORK

RESEARCHERS REPRODUCING MULTIPLE ORIGINAL WORKS TO CREATE NEW WORK

ORIGINAL ARTICLE

SEMI-SUPERVISED CLASSIFICATION WITH GRAPH CONVOLUTIONAL NETWORKS

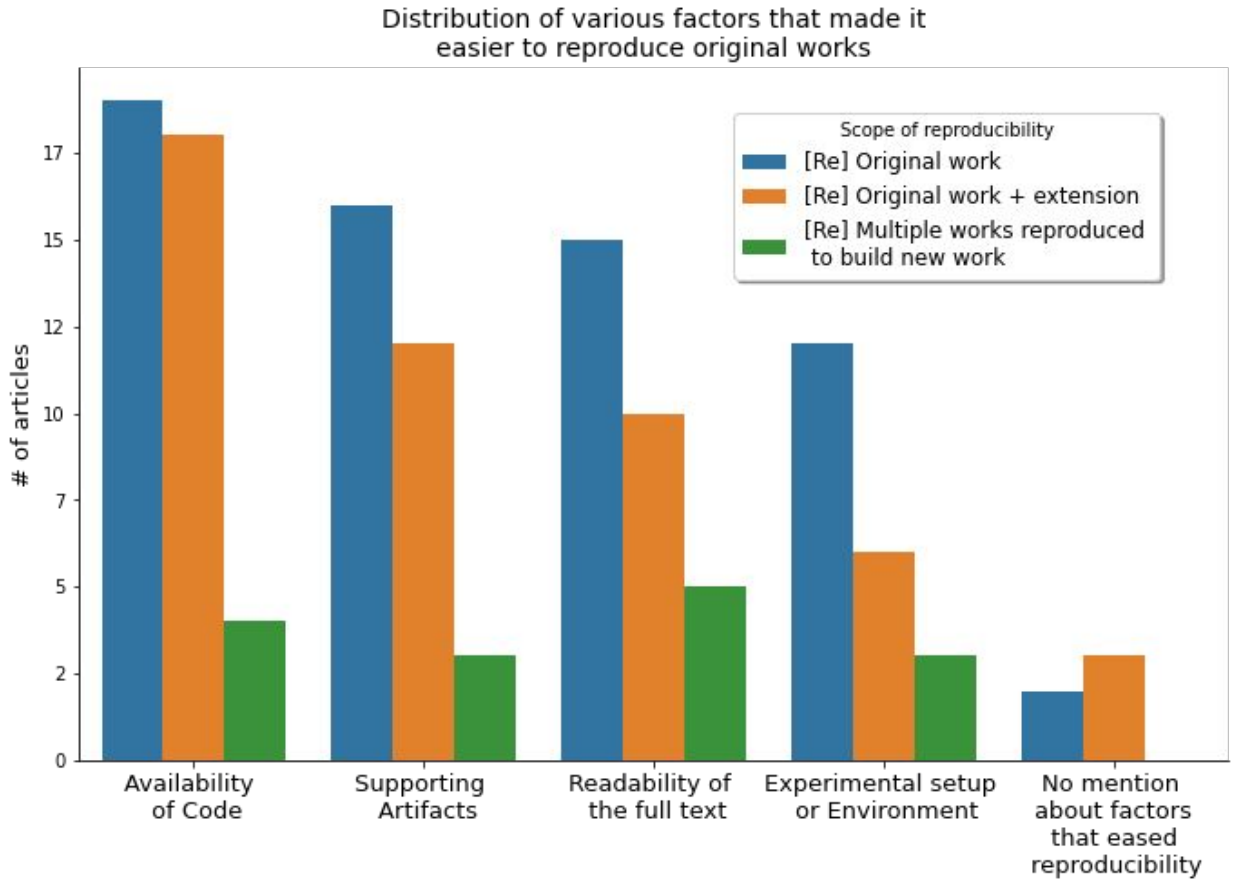
[RE] SEMI-SUPERVISED CLASSIFICATION WITH GRAPH CONVOLUTIONAL NETWORKS

[RE] SEMI-SUPERVISED CLASSIFICATION WITH GRAPH CONVOLUTIONAL NETWORKS

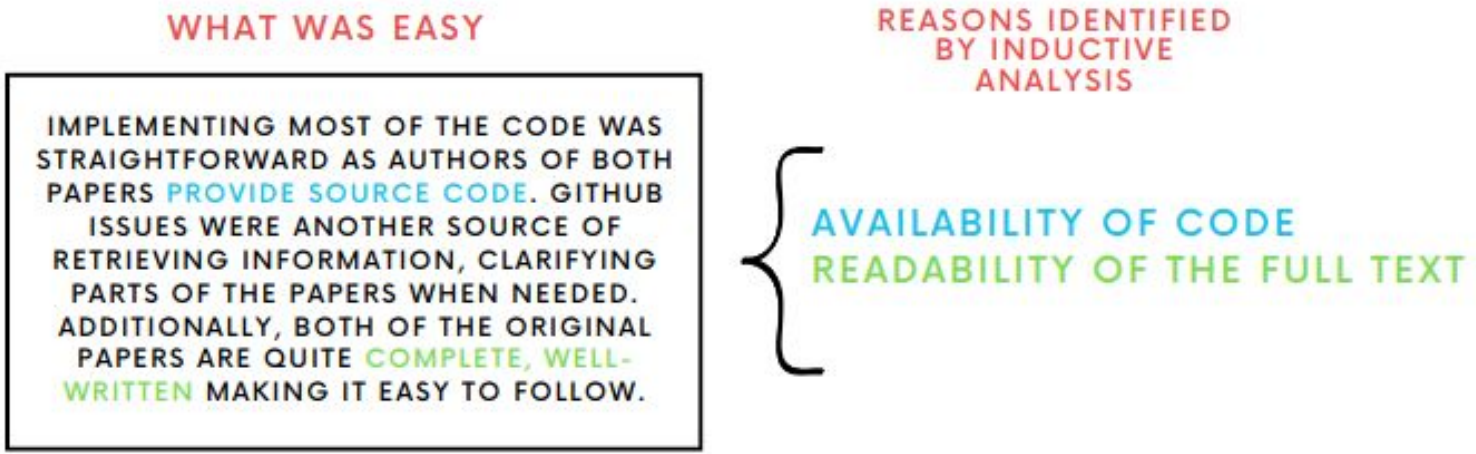
+ HYPERPARAMETER TUNING

[RE] SEMI-SUPERVISED... + [RE] OTHER WORK

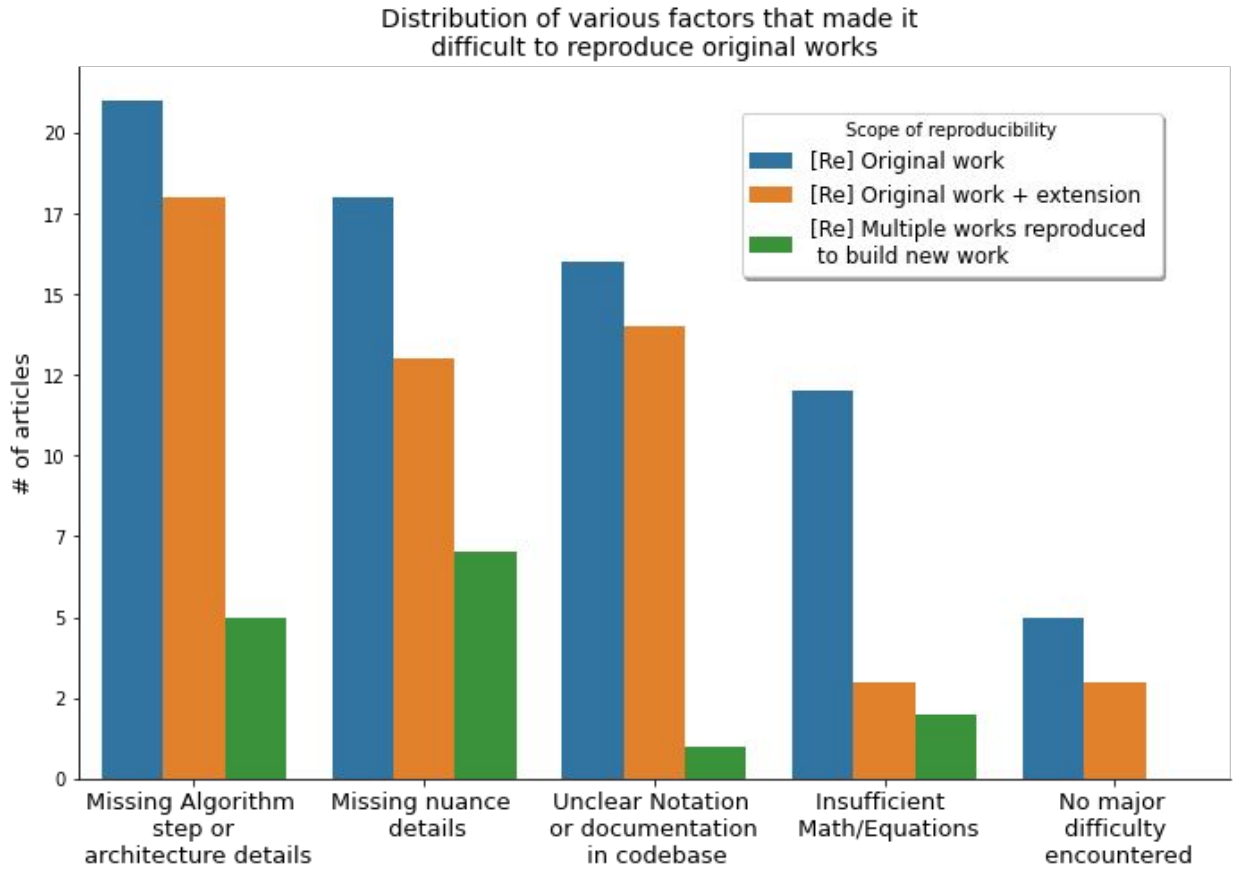
Reasons that made it easy



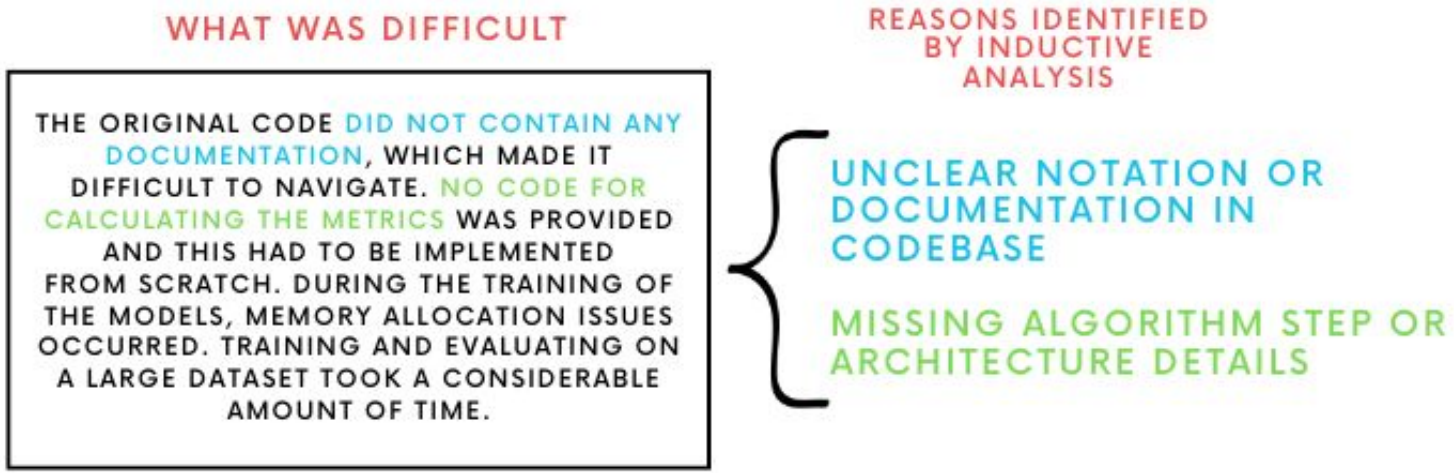
Reasons that made it easy



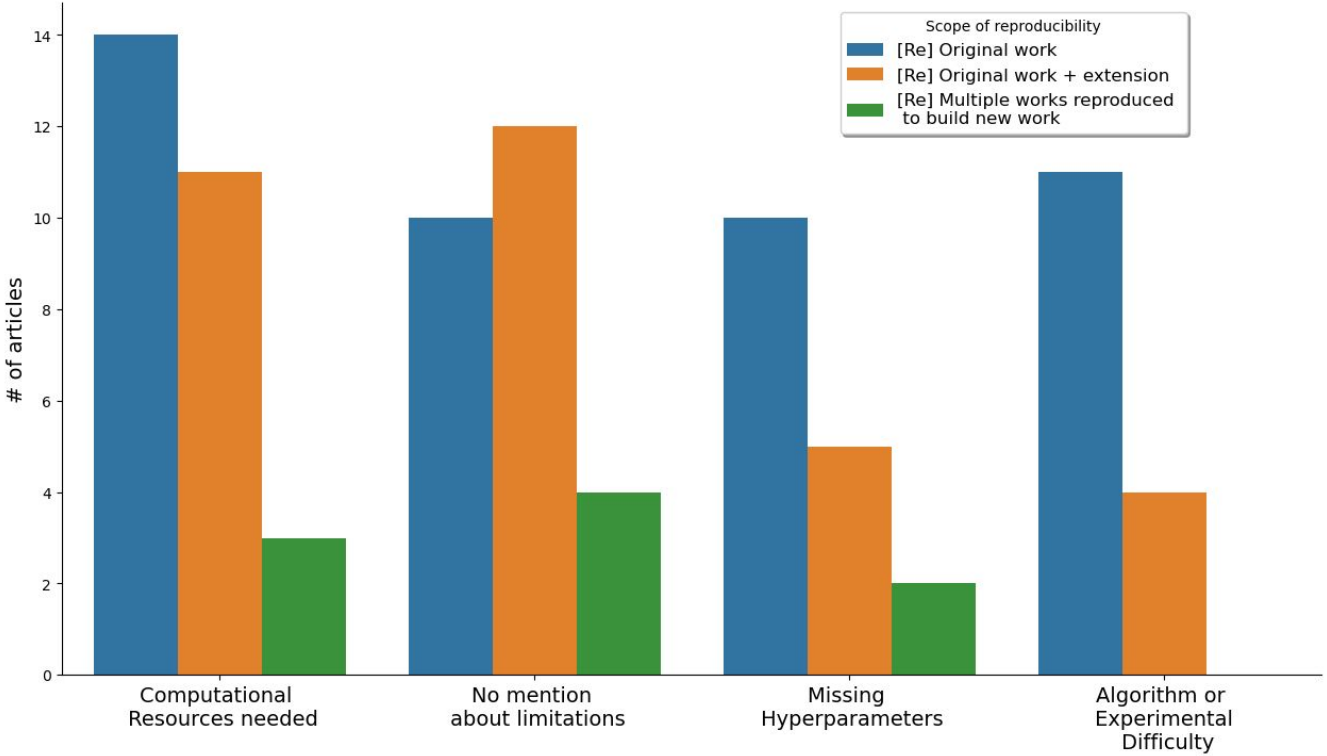
Reasons that made it difficult



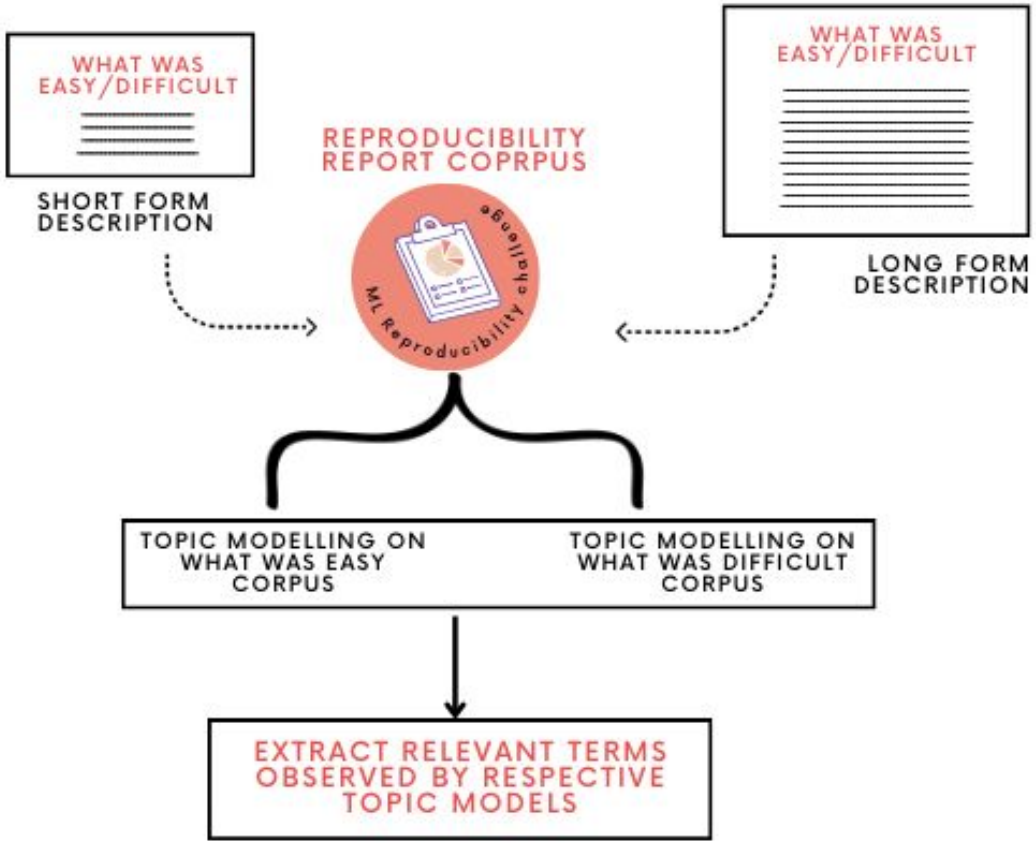
Reasons that made it difficult



Limitations



Quantitative Analysis



Relevant terms - ‘What was easy’ corpus

Topic	Most relevant terms
1	*describe, straightforward, understand, documented*
2	*codebase, repository, source, instructions*
3	*datasets, training, scripts, experiments*
4	*results, ideas, evaluation, architecture*
5	*correspondence, addressed, peer-review, copyright*

Relevant terms - ‘What was difficult’ corpus

Topic	Most relevant terms
1	*dataset, algorithm, implementation, method*
2	*training, loss, accuracy, learning*
3	*models, network, training, time*
4	*difficult, challenges, evaluation, claim*
5	*methods, features, performance, parameters*

Conclusion

- We have laid the groundwork to analyze and identify factors that encapsulate the effort required to reproduce scientific articles.
- We found "**Availability of Code**" as one of the most important factors that made it easy to reproduce the original work.
- We found "**missing algorithm steps or architectural details**" as one of the most important factors that made it difficult while reproducing the original work.
- Studies under the scope "*[Re] Multiple works reproduced to build new work*" never mention "**Algorithm or Experimental difficulty**" as a subjective factor for limitation.
- Our Topic model found "**Communication with the original authors**" as an additional factor that can ease the effort of reproducibility.
- Quantifying the effort required to reproduce a study provides a valuable framework for future research in this area.

Artifacts

https://reproducibilityproject.github.io/effortly

Acknowledgement

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