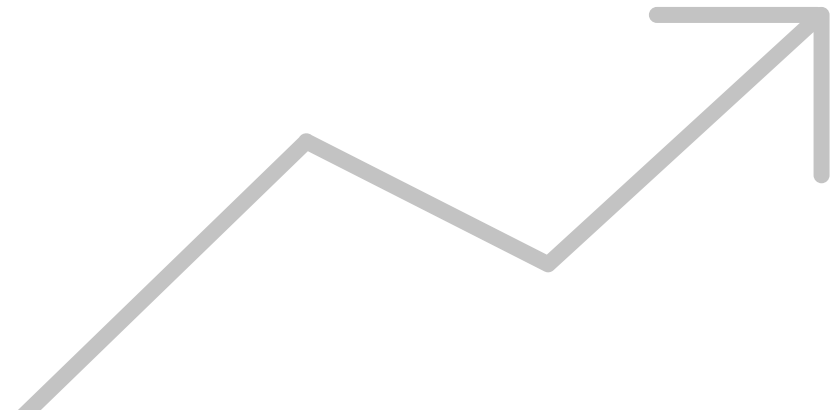


Workshop on Quality Aspects of Machine Learning

A short presentation for the ONS-UNECE Machine Learning Group 2022

October 2022



Background

- No quality-regulating market for official statistics
- Need for credible self-commitments regarding the quality of official statistics
- These do exist (e.g., Code of Practice and Quality Assurance Framework in Europe)

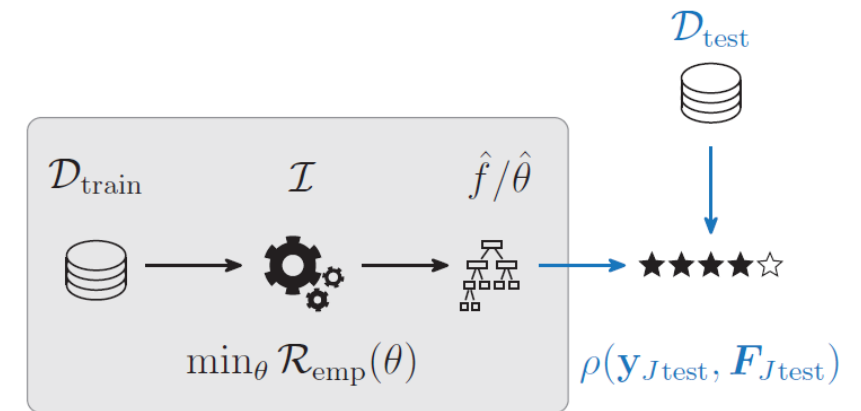


Background

- Frameworks do not take ML into account
- Resulting questions:

What can ML do to (better) meet the requirements of the frameworks?

What must ML be able to do and what must be taken into account when using ML in order to comply with the frameworks?

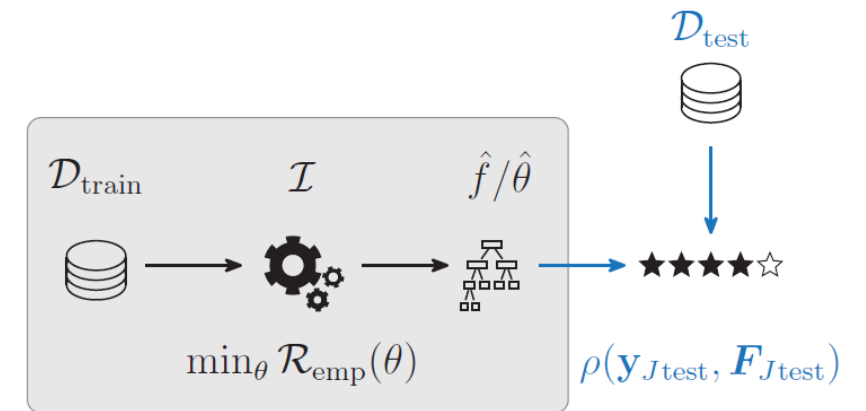


<https://arxiv.org/abs/2107.05847>

Background

Goal (at least for Germany):

Concretisation and supplementation of the Quality Assurance Framework for (the use of) ML in official statistics



Reference

Statistical Journal of the IAOS 38 (2022) 291–308
 DOI 10.3233/SJI-210875
 IOS Press

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A quality framework for statistical algorithms

Wesley Yung^{a,*}, Siu-Ming Tam^b, Bart Buelens^c, Hugh Chipman^d, Florian Dumpert^e, Gabriele Ascari^f, Fabiana Rocci^f, Joep Burger^g and InKyung Choi^h

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^dDepartment of Mathematics and Statistics, Acadia University, Canada
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^hUnited Nations Economic Commission for Europe

Abstract. As national statistical offices (NSOs) modernize, interest in integrating machine learning (ML) into official statisticians' toolbox is growing. Two challenges to such an integration are the potential loss of transparency from using "black-boxes" and the need to develop a quality framework. In 2019, the High-Level Group for the Modernisation of Official Statistics (HLG-MOS) launched a project on machine learning with one of the objectives being to address these two challenges. One of the outputs of the HLG-MOS project is a Quality Framework for Statistical Algorithms (QF4SA). While many quality frameworks exist, they have been conceived with traditional methods in mind, and they tend to target statistical outputs. Currently, machine learning methods are being looked at for use in processes producing intermediate outputs, which lead to a final statistical output. Therefore, the QF4SA does not replace existing quality frameworks; it complements them. As the QF4SA targets intermediate outputs and not necessarily the final statistical output, it should be used in conjunction with existing quality frameworks to ensure that high-quality outputs are produced. This paper presents the QF4SA, as well as some recommendations for NSOs considering the use of machine learning in the production of official statistics.


Keywords: Machine learning, official statistics, explainability, reproducibility

DESTATIS
 Statistisches Bundesamt

Quality Framework for Statistical Algorithms

ML2022 Meeting, Star Wars Day 2022

Wesley Yung, Siu-Ming Tam, Bart Buelens, Hugh Chipman, **Florian Dumpert**, Gabriele Ascari, Fabiana Rocci, Joep Burger and InKyung Choi



doi.org/10.3233/SJI-210875

Reference

5 quality dimensions:

- accuracy
- explainability
- reproducibility
- timeliness
- cost effectiveness

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Keywords: Machine learning, official statistics, explainability, reproducibility

Workshop on Quality Aspects of Machine Learning

- From 6th to 8th September 2022 in Munich
- Goal: Bring together the already built-up empirical knowledge from the practice of official statistics with the findings of science
- To promote future joint (research) work



Quality Aspects of Machine Learning - Official Statistics between Specific Quality Requirements and Methodological Innovation

CALL FOR PAPERS

On the one hand, machine learning methods offer new possibilities for analysis and insight – not only but also against the background of new types of data (sources), some of which are immense in scope – and thus enable higher-quality statistics and can contribute to efficiency improvements in the processes of official statistics. On the other hand, it has not yet been generally clarified whether and how the typically prediction-oriented, non-model-based approach of machine learning methods can be reconciled with the special quality requirements and framework conditions of official statistics. Keywords here are, for example:

- legal requirements regarding sample sizes, characteristics to be surveyed, or publication deadlines to be met;
- requirements for the accuracy of estimates to be achieved;
- frequent use of complex sample designs;
- requirements for transparency of processes and methods.

Workshop on Quality Aspects of Machine Learning

Some contributions ...

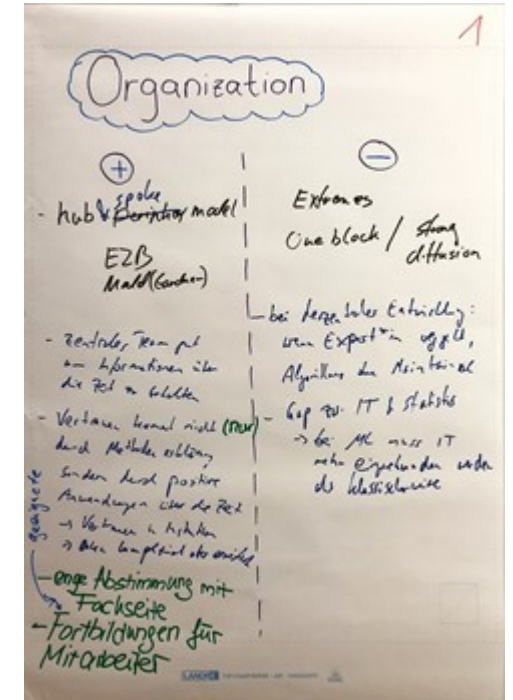
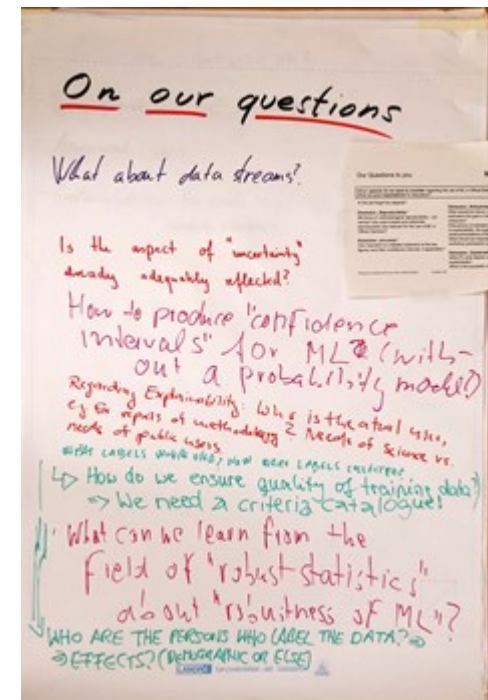
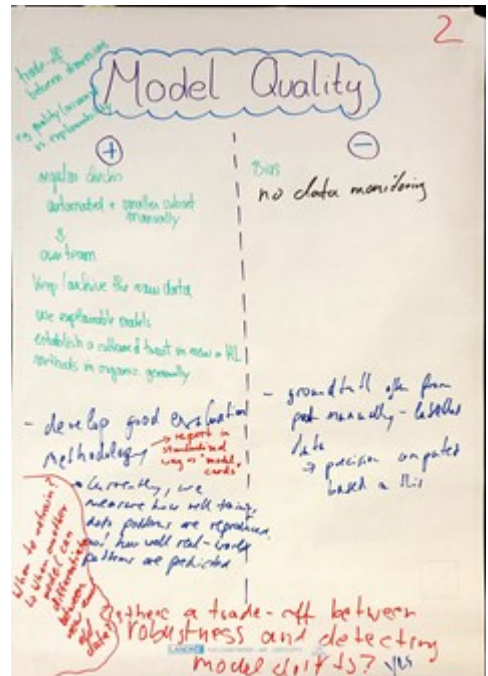
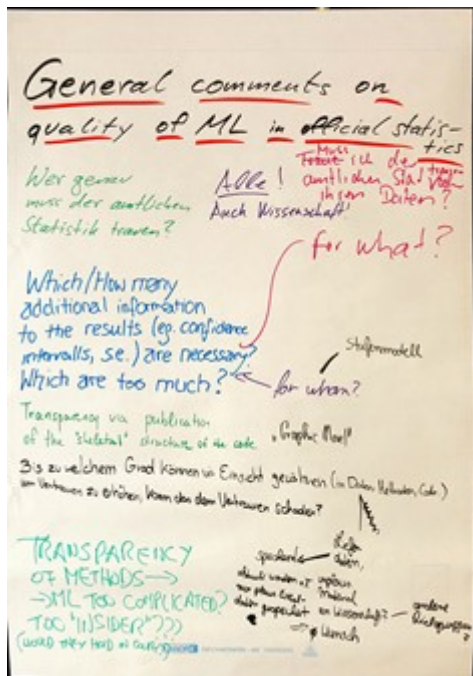
- German statistical offices: Current version of the above mentioned concretisation and supplementation of the Quality Assurance Framework
- CBS (Arnout van Delden, Joep Burger, Marco Puts): Ten propositions on machine learning in official statistics
- ONS (Joni Karanka, Eleanor Law): Challenges and solutions adopting ML & AI in organisations

Workshop on Quality Aspects of Machine Learning

Some more contributions ...

- Fair ML
- ML-assisted strategies for coding
- Analyses with Text Mining
- Collecting More Accurate Labels
- ...

Workshop on Quality Aspects of Machine Learning



What's next?

- We will continue to work on the issue
- We will make the presentations and the posters available to all participants
- We will publish a special issue in a journal of the German Statistical Society on this topic
- We will bring the topic into further (UNECE) events in 2023



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