Master's Thesis

Towards Data Privacy: Evaluating different synthetic data approaches with the data from Covid-19 Trends and Impact Surveys

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Supervised by Dr. Anna-Carolina Haensch

Abstract

To be completed...

Contents

1 Introduction

Bishop (2006) introduced this and that. Another statement that needs a reference, but the authors are not named directly (Bishop, 2006). Another statement where the reference is just one possible source (see, e.g., Bishop, 2006).

2 Related Work

In this chapter, general definition of data privacy and the necessity to maintain data privacy are described. Furthermore, in order to keep data privacy, this chapter also presents an overview of methods to achieve the goal of privacy preserving data analysis and publication, which have been adopted in several domains. Here, we want to emphasize the use of synthetic data and one of its most popular applications, i.e., differentially private synthetic data, that are able to prevent disclosure in the process of synthetic data generation.

2.1 Data Privacy

It is well-acknowledged that we have entered a data-driven world and data are often regarded as significant constituents for our society. At the same time, an open society can also learn from these data so as to develop feasible and practical policy guidelines (Evans and King, 2021). Especially during the outbreak of coronavirus disease 2019 (COVID-19), more and more increased concerns are raised that it is essential for a society to utilize such data, which are widely-spread in the population and analyzed with regard to various perspectives, to advance sophiscated planning and develop more concrete social welfare benefits for the citizens. Consequently, both seen from the public health perspective and the economy perspective, the on-going COVID-19 global pandemic serves as a rigid reminder that detailed data are urgently needed to assist in decision making, damage control scenarios. Regardless of prevalent consensus reached to leverage more microdata, the inappropriate use of such information can cause harm in data confidentiality and privacy as sometimes the attacks from an intruder may result in the leakage of an individual's sensitive information, e.g., identity, address and salary, etc.
On the premise of possible outcomes brought by the misuse of microdata, it is crucial that we encourage proper and legal use of the collected datasets. Holding this motivation, researchers have developed a variety of strategies aiming to avoid the disclosure of sensitive records while revealing these specific information to the public (Duncan et al., 2011). In the early times, several traditional methods have been proposed to limit data disclosure with strategies like top-coding, swapping or data suppression. Nevertheless, with increased computing power and more data access demanded by the public, the risks of data disclosure are often seen as underestimated using simply these traditional protection strategies, where instances of privacy breaches can be found in the public and private sectors (De Montjoye et al., 2015).

3 Synthetic Data and Differential Privacy

Bishop (2006) introduced this and that. Another statement that needs a reference, but the authors are not named directly (Bishop, 2006). Another statement where the reference is just one possible source (see, e.g., Bishop, 2006).

4 Evaluation of Utility and Risk Assessment of Remaining Disclosure

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5 Evaluating Different Synthetic Datasets generated from CTIS

Additional material goes here

6 General Discussion

A concise summary of contents and results

7 Conclusion

A concise summary of contents and results

A Appendix

Additional material goes here

B Electronic appendix

Data, code and figures are provided in electronic form.

References

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