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Risk assessment in Machine Learning security - a framework for risk measurement

Masterthesis

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Contents

Abstract

Acknowledgements

1 Introduction

Machine Learning (ML) is a constantly growing field and is essential for many modern applications such as highly-automated and autonomous driving. Resulting from this, there is an increased need to maintain security. This thesis concentrates on risk measuring in context of ISO 27001 which will be discussed in 2. Risk measuring is a part of risk assessment to help where investments are needed to defend a system against attackers.

This thesis explains and discuss' a conceptual and technical framework to measure risks which is called Security-Measuring-Framework (SMF).

1.1 Motivation

2 Related Work

This chapter presents the relevant background knowledge and show approaches from other scientific paper.

2.1 ISO 27004

This present thesis use the requirements of the ISO 27004. ISO 27004 is a security standard from the ISO [3] 27000 family which guides on continious basis evaluation methods. The present ISO can be related with ISO 27001 or used as a standalone standard. The ISO 27004 standard specifies what to be measured, when the measurement is needed and types of measurement [2]. The effectivness measurement is the type of measurement for the SMF.

2.2 Security risks in context of Machine Learning

Xiao et. al [6] evaluate the security risks in deep learning for common frameworks i.e. TensorFlow. Xiao et. al uses the framework sample applications along the frameworks. One statement of Xiao et. al is that the named frameworks TensorFlow, Caffe and Torch are implemented with many lines of code which make them vulnerable for many security vulnerabilities i.e. heap overflow or integer overflow.

2.3 Risk assessment in context of Machine Learning

Paul Schwerdtner et. al [5] present in their work a framework to evaluate ML model by input corrupted data. This thesis discuss this paper as an approach to estimate where the SMF could be used for.

2.4 Adversarial-Robustness-Toolbox

For this present thesis the technical framework Adversarial-Robustness-Toolbox (ART) [4] is a main component.

2.5 Approaches

Jakub Breier et. al [1] propose in their paper different proposals to measure risks with different aspects.

3 The conceptual framework

Test

4 The technical framework

Test

5 Evaluation

Test

References

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Selbständigkeitserklärung

Ich erkläre hiermit, dass ich die vorliegende Arbeit selbständig verfasst und noch nicht für andere Prüfungen eingereicht habe. Sämtliche Quellen einschließlich Internetquellen, die unverändert oder abgewandelt wiedergegeben werden, insbesondere Quellen für Texte, Grafiken, Tabellen und Bilder, sind als solche kenntlich gemacht. Mir ist bekannt, dass bei Verstößen gegen diese Grundsätze ein Verfahren wegen Täuschungsversuchs bzw. Täuschung eingeleitet wird.

Berlin, den December 2, 2021 .....