



Graduation Project – 2022 – Press Release
PCS – Department of Computer Engineering and Digital Systems

Computer Engineering

Subject: Machine Learning Applied to Card Payment Fraud Detection

São Paulo, December 07, 2023

Contact: Poli-USP, PCS

+55 (011) 3091-5583

pcs.secretaria.poli@usp.br

It is with great honor that I announce that I will be presenting my graduation project entitled **Machine Learning Applied to Card Payment Fraud Detection** on December 20 and 21 at the Polytechnic School of the University of São Paulo. The event will be organized by the PCS (Department of Computer Engineering and Digital Systems) where final-year Computer and Electrical Engineering students will present their graduation projects.

According to two studies, one published by [Statista](#) and other by [NilsonReport](#), 468 billion bank card transactions were made in 2020 and the estimate is that \$408.6 billion will be due to bank card payment fraud in the next 10 years. Thus, the financial risks involved in card payment fraud are enormous besides being a field where performance and real-time decision making are primordial.

Historically, anti-fraud systems were based on a pre-programmed set of rules that highlights a payment as fraudulent. However, with e-commerce, fraudsters have much more flexibility when it comes to fraud, making these single ruleset systems weak to detect frauds.

The advancement in computational processing in recent decades allowed technologies such as Machine Learning to enter the domain of bank card fraud detection. In this type of system, a ML model analyzes historical data and learns the main fraud patterns from it. Some benefits of this type of system are speed in detection, management of large amounts of data, and especially adaptation to the changing behavior of fraudsters.

In this way, provided with an imbalanced tabular dataset with millions of card payment transactions labeled as fraudulent or not, this project trained, validated, tested and compared Gradient Boosted Decision Trees (GBDT) and Neural Network models in order to show if the new Deep Learning approaches for tabular data could outperform the GBDT, the state-of-art algorithms for this type of data. In addition, it discussed several techniques to compensate the data imbalance and proposed a model with relevant results for the fraudulent payment detection domain.

Student: Pedro Henrique Carvalho dos Reis

Advisor Professor: Prof. Dr. Reginaldo Arakaki
