AVERTING IRREGULARITIES IN PUBLIC CONTRACTS USING MACHINELEARNING TECHNIQUES

GENILSON SALUSTIANO DA SILVA
UNIVERSIDADE DE BRASÍLIA (UNB)

HERBERT KIMURA
UNIVERSIDADE DE BRASÍLIA (UNB)

AVERTING IRREGULARITIES IN PUBLIC CONTRACTS USING MACHINELEARNING TECHNIQUES

Introdução

Machine learning techniques are becoming increasingly used in the public sector. Our study explores artificial intelligence, through machine learning algorithms, to assess potential irregularities in public contracting. More specifically, we analyze classification problems related to non-performing suppliers of products and services for the federal government.

Problema de Pesquisa e Objetivo

Problems in public contracting can lead to economic and social loss, due to inadequate investments and to insufficient benefits for the population. The study aims at exploring how machine learning can prevent irregularities in public contracts, by exploring explanatory variables that could lead to better prediction of non-performing suppliers.

Fundamentação Teórica

In the context of procurement and contracting in the public sector, on many occasions, managers need to decide between continuing and discontinuing a contract that has a high risk of default. According to Bloomfield et al. (2019), cases such as these can be better understood when analyzing the main components of contractual risk, namely: (i) representation risk; (ii) performance risk; (iii) financial risk; (iv) contract risk.

Metodologia

We use a dataset of 12,376 suppliers, interconnecting information from three federal government sources: (i) ComprasNet/SIASG, CEIS/CGU and CNPJ/RFB. We use traditional statistical classification techniques such as (i) Discriminant Analysis and (ii) Logistic Regression as well as machine learning algorithms such as (i) k-Nearest neighbors, (ii) Bayesian networks, (iii) Support Vector Machines, (iv) Decision trees, (v) Random forests, (vi) Bagging, (vii) Gradient Boosting, and Artificial Neural Networks.

Análise dos Resultados

The results of our study suggest that Random Forests, Gradient Boosting, and Bagging ensemble learning methods outperform other models. The results showed that the ensemble techniques can be used as important decision support tools to prioritize suppliers to be more carefully inspected aiming at preventing irregularities and illegalities in public contracts.

Conclusão

Although incipient, the use of artificial intelligence tools in the public sector is gaining traction. In particular, exploring machine learning algorithms to prevent fraud or problems in public contracting have social and economic impacts. We apply machine learning models in a dataset of suppliers of the Brazilian federal government. As Brazil has an open data policy that make available thorough datasets, the use of artificial intelligence models can drastically impact social and economic benefits in the country.

Referências Bibliográficas

HOODA, Nishtha; BAWA, Seema; RANA,Prashant Singh. Fraudulent firm classification: a case study of an external audit. Applied Artificial Intelligence, Taylor & Francis, v. 32, n. 1, p.48–64, 2018. KLABI, Hichem; MELLOULI, Sehl; REKIK,Monia. A reputation based electronic government

procurement model. Government Information Quarterly, Elsevier, v. 35, n. 4, s43–s53, 2018. KU, Chih-Hao; LEROY, Gondy. A decision support system: Automated crime report analysis and classification for e-government.Government Information Quarterly, Elsevier, v. 31, n. 4, p. 534–544, 2014.