Data Article

Dataset for corruption risk assessment in a public administration

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A B S T R A C T

This data article describes a dataset of corruption approach and possible variables related, and this dataset was created by integrating eight different systems of Brazilian federal government and Federal District. We present real data from civil servants and militaries to comply with GDPR legislation, the attributes that could identify a person were removed, making the data anonymized.

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Specifications Table

| Subject                        | Information Systems and Management                                      |
|--------------------------------|--------------------------------------------------------------------------|
| Specific subject area          | Corruption, civil servant, logistic regression                            |
| Type of data                   | Table (csv file)                                                         |
| How data were acquired         | Data were acquired from eight different databases from The Brazilian Government with SAS Enterprise Guide |
| Data format                    | Mixed (raw and pre-processed)                                            |
| Parameters for data collection | This dataset corresponds to data available in November 2020 and refers to all civil servants and militaries in Federal District. |

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Value of the Data

- This dataset contains data from eight different databases from the Brazilian federal government and Federal District.
- This dataset benefits researchers working in the field of corruption risk assessment and also applied machine learning.
- Researchers working in the field of corruption risk assessment may find this dataset benefited and could also apply machine learning.
- The analysis of this dataset could help identify risk factors and assist in the definition of excessive planning on focus on the activities of the greatest risk for Public Administration, such as cases with a high probability of occurrence and a high financial or social impact.

1. Data Description

The dataset provided in this paper offers valuable information on public administration and allows research in the corruption area. A few datasets regarding corruption are available, Al-Jundi [1] presents a survey dataset on determinants of administrative corruption, Peerthum et al. [2] related to corruption in Mauritius, and Oguntunde et al. [3] deal with selected crime data in Nigeria, including corruption.

Literature was consulted to determine attributes for administrative corruption. Other researchers can reuse the dataset and can be easily downloaded from the Mendeley Data repository.1

The data in this article are composed of all civil servants from Federal District Government (Brazilian Public Administration), involve the reported cases of dismissal by corruption, and aggregate 26 attributes related to four domain areas extract from eight databases.

These four domains are related by sources provided and are:

- Corruption Domain (C) aggregate data corresponding to illegal acts committed by civil servants or militaries or companies that they are owners;
- Employment domain (E) provide servant’s registrations from Human Resources Management System like income and number of coordination roles;
- Political Domain (P) covers data related to political activities; and

1 https://data.mendeley.com/datasets/crpdknzswh/2.
• Business Domain (B) presents company features that civil servants and militaries are owners.

1.1. The descriptive statistics

The dataset is composed of 27 attributes, part of them are integer and numeric attributes (Table 2), other attributes are categorical (Table 3), and a few of them are Boolean (Table 4). All boolean attributes (Table 4) belong to Corruption Domain.

Table 3 presents categorical attributes from Political and Business Domains, and Table 2 shows the main statistic description from Employment and Business domains with integer or numeric attributes.

2. Experimental Design, Materials and Methods

This section gives Data Sources aggregated information; Related Literature to compose the dataset features, Descriptive Statistics, and the Preprocessing (Data Enrichment and Data Cleaning).

2.1. Data sources

The dataset was composed of eight different sources from Brazilian public administration. After consolidation, the attributes were classified by four domain areas for better understand, described by: corruption(C), Employment (E), political (P), and Business (B) that are related by sources.

The dataset was created after an ETL process collected from these different data sources:

• CGU-CEPIM - Private Non-Profit Entities Prevented from contracting with the Public Administration maintained by Office of the Comptroller General (Controladoria-Geral da União—CGU);
• CGU-CEIS - Registration of Unfaithful and Suspended Companies) maintained by Office of the Comptroller General (Controladoria-Geral da União—CGU);
• CGDF - Expulsion Registrations maintained by Comptroller General of the Federal District (Portal da Transparência DF);
• TCDF - Persons that by sanction are not allowed for the exercise commission position or a trust function within the scope of the Public Administration of the Federal District maintained by District Federal Court of Accounts–TCDF;
• SIAPE – Integrated Human Resources Administration System maintained by Federal Government;
• SIGRH - Integrated Resource Management System maintained by Federal District Government;
• TSE–Electoral Data maintained by Superior Electoral Court (TSE); and
• SRF/ME - Personal and Legal Data maintained by Secretariat of Brazil’s Federal Revenue (SRF/ME).

These data represent the information from civil servants, militaries, and pensioners of The Federal District, a Brazilian Public Administration, in total are 303,036. Federal District is a legal entity of internal public law, which is part of the political-administrative structure of Brazil, of a nature sui generis, because it is neither a state nor a municipality, but a special entity that accumulates the legislative powers reserved to the states and the municipalities, which gives it a hybrid nature of state and municipality.
Fig 1. Illustrates the pipeline of ETL process (extract, transform and load) from different data sources integrated into a dataset aggregated by four domains and was submitted to a pre-processing (Data Enrichment and Data Cleansing).

2.2. Domains

These four domains (Fig. 1) are:

- Corruption Domain (C) aggregates data corresponding to illegal acts committed by civil servants or militaries, or companies that they are owners.
- Employment domain (E) is composed of base integration of two payment databases that have information from Public Security workers (policemen and firefighters) in Integrated Human Resource Management System (SIAPE) and from other civil servants (Education, Health, and other areas in Resource Management System (SIGRH).
- Base integration work took place for the SIGRH, and SIAPE, since the same civil servant or military from the Federal District could be included in both databases due to the possibility provided by the Brazilian Federal Constitution to allow the accumulation of certain public offices.
- Political Domain (P) has information from TSE, The Brazilian Superior Electoral Court, and provides information about candidates like level of education, party, marital status.
- Business Domain (B) is composed of information from The Secretariat of Brazil’s Federal Revenue - SRF/ME, about companies whose owners are civil servants and militaries.

2.3. Related literature

The decision about which attributes to compose this dataset was defined considering studies carried out on corruption literature, and all of them were identified and classified by previous domains defined (Table 2).

It is essential to bring the concept of corruption adopted for this dataset and represented by the variable "C.CorruptionTG". It was described in Brazilian Law No. 8429/92, which defines corruption as an act of improbity that, under the influence or not of the position, causes illicit enrichment, causes or not mandatory, will be used to the purse or violate Public Administration principles [20] and is described on Table 1.

The data obtained from these sources (Fig. 1) provided by different public organizations were aggregated in SAS Enterprise. They were outlined by their attributes classified by the four domains defined.
Table 1
Attributes/features description.

| #  | Attribute name | Type    | Brief Description                                                                                     |
|----|----------------|---------|-------------------------------------------------------------------------------------------------------|
| 1  | C.CorruptionTG | Boolean | Cases of dismissal by corruption, this attribute could be a target for machine learning               |
| 2  | C.CEIS         | Boolean | Cases of individuals or legal entities with restrictions on the right to participate in tenders or to contract with the Public Administration by sanctions |
| 3  | C.TCDFrestriction | Boolean | Cases of person who are not qualified to exercise a position in a commission or a trust function within the Public Administration of the Federal District for a period of up to eight years due to serious irregularities found by the TCDF |
| 4  | C.CEPIM        | Boolean | Cases of private non-profit entities that are prevented from entering into new agreements, on lending contracts or partnership terms with the Federal Public Administration, depending on irregularities not resolved in agreements, on lending contracts or partnership terms previously signed |

Employment Domain (E)

| 5  | E.Salary       | Numeric | Salary (Brazilian currency - Real) of the civil servant or military that included the salary received by any of the bases (SIGRH and SIAPE) or the sum of salaries in the case of civil servants who accumulate public positions as permitted by the Federal Constitution |
| 6  | E.SalaryMinusTax | Numeric | Salary with several discounts and obtained in a similar way to the "Salary" (SIGRH and SIAPE bases) |
| 7  | E.QtySIGRHOff  | Int     | Quantity of positions that the civil servant or military held until Nov/2020 into the SIGRH determined only with the SIRGH base. |
| 8  | E.QtySIAPEOff  | Int     | Quantity of positions the civil servant or military held in Public Security until Nov/2020 at SIAPE (Public Security, SIAPE) |
| 9  | E.QtySIGSIPOff | Int     | Quantity of positions that the civil servant or military held until Nov/2020 in these two databases (SIGRH and SIAPE) |
| 10 | E.QtySIGRHfunc | Int     | Quantity of functions that the civil servant occupied until Nov/2020 in the SIGRH (Servers, except Public Security, SIGRH) |
| 11 | E.QtySIAPEfunc | Int     | Quantity of functions that the civil servant or military occupied until Nov/2020 in SIAPE (SIAPE Public Security) |
| 12 | E.QtySIGSIpfunc | Int     | Quantity of functions that the civil servant or military occupied until Nov/2020 in these two databases (SIGRH and SIAPE) |

Political Domain (P)

| 13 | PElectivePosition | Categorical | Type of electoral position that the civil servant disputed (president or vice, governor or vice, mayor, senator, councilor, federal deputy, state deputy, or district deputy) |
| 14 | P.CodParty        | Categorical | Code of the party in which the server was registered for the election |
| 15 | P.CandElectiveSt | Categorical | Candidate's registration status, which can assume the values 'Apt' (candidate able to go to the ballot box); 'Unfit' (candidate unfit to go to the ballot box); 'Registered' (registration of candidacy carried out, but not yet judged by the electoral body) |
| 16 | P.CandEducation  | Categorical | Candidate's level of education can be defined as: non-disclosable, reads and writes, incomplete or complete elementary school, incomplete, or complete high school, and incomplete or complete higher education |
| 17 | P.CandMaritalSt  | Categorical | The civil status situation of the candidate civil servant: single, married, non-disclosable, widowed, legally separated or divorced |
| 18 | P.CodRoundSt     | Categorical | This attribute identifies the candidate's totalization situation in the turn that can be (elected, elected by average, elected by the electoral quotient, unelected, alternate, or null) |

(continued on next page)
2.4. Pre-processing (Data Enrichment and Data Cleansing)

The data preparation is the stage in which the data must be processed and prepared in a way that can demonstrate the understanding of the business, in this case for corruption. Integrating different data sources could be a challenge because, in general, the data comes from sources of transactional systems or measurements or also from real-world situations, and the data set obtained must converge to understand the business.

Data cleaning and construction of attributes were carried out to generate treated and adequate data to enable the development of predictive models.
Table 3
Categorical attributes.

| Dim | Attribute              | Number of Categories | N° of examples |
|-----|------------------------|----------------------|----------------|
| P   | ElectivePosition       | 8                    | 1317           |
| P   | CodParty               | 32                   | 1317           |
| P   | CandElectiveStatus     | 5                    | 1317           |
| P   | CandEducationLevel     | 6                    | 1317           |
| P   | CandMaritalStatus      | 5                    | 1317           |
| P   | CodRoundStatus         | 7                    | 1317           |
| B   | TypeOfOwnership        | 2                    | 86,058         |
| B   | CodFirmActivity        | 976                  | 86,058         |
| B   | CodFirmLegal           | 33                   | 86,058         |
| B   | CodFirmStatus          | 5                    | 86,058         |
| B   | CodFirmSize            | 3                    | 86,058         |
| B   | CodFirmTaxOption       | 5                    | 86,058         |

Table 4
Boolean attributes.

| Dim | Attribute     | True  | False |
|-----|---------------|-------|-------|
| C   | CorruptionTG | 428   | 302,608|
| C   | CEIS          | 132   | 302,904|
| C   | TCDFrestriction | 274 | 302,762|
| C   | CEPIM         | 0     | 303,036|

Table 5
Literature related to corruption.

| DOMAINS | LITERATURE |
|---------|------------|
| Corruption (C) | Hanna and Wang [5], Carvalho and Carvalho [6], Carvalho [7] |
| Employment (E)  | Gans-Morse et al. [8], Liou et al. [9], Carvalho [7] Padula and Albuquerque [10], Poocharoen and Brillantes [11], Carvalho and Carvalho [6] López-valcárcel et al. [12] |
| Political (P)   | Pedersen and Johannsen [13], Bersch et al. [14], Meyer-Sahling and Mikkelsen [15], Moro [16], Carvalho et al. [17], Carvalho [7] Lassou and Hopper [18], Treisman [19], Gans-Morse et al. [8] |
| Business (B)    | Carvalho [7] |

Data cleansing is the process of attempting to fill in missing values, smooth out noise while identifying outliers, and correct inconsistencies in the data [21]. It aims to alleviate two critical problems of data acquisition processes: the existence of missing values and the existence of noisy values (noise values).

The missing values occur when for the attributes of a dataset there is no determined value for some specimens or when a data set does not have values for an attribute of interest or even presents aggregated values concerning that attribute.

As a solution to the missing values, it was possible to remove observations with this characteristic, manually fill in values, or auto-fill.

The noisy values refer to changes from the original values and, therefore, consist of measurement errors or values considerably different from most of the other values in the data set, known as outliers. For example, we can mention cases that should be positive and negative values occur or a change in the behavior of the values of an attribute without explanation. Few observations were removed by specialist decision.

For the solution of noisy values, there is the inspection with the manual correction or automatic identification and cleaning implemented by algorithms that soften or cancel noise.

Data enrichment is the process of enhancing collected data with relevant context obtained from additional sources [22].
This dataset aggregates information from different databases that could benefit from a holistic approach. In addition, some features were elaborated in a specific way to provide information for business understanding.

The feature construction allows the elaboration of features that can generate relevant information according to the understanding of the business from the original data.

In this scenario, a feature construction was the transformation of categorical attributes into counting attributes.

This procedure was performed because the attribute, when expressing quantity, has meaning in the context of business understanding, while the categorical value does not express benefit in the context of corruption. For example, a categorical attribute that means the positions that the civil servant or military man/woman occupied in Public Administration has no meaning for this investigation. However, many positions he/she had occupied could inform that this one does not have a stable condition and could represent an anomaly.

It was applied for W.QtySIGRHOff, W.QtySIAPEOff, W.QtySIGSIPOff, W.QtySIGRHfunc, W.QtySIAPEdfunc, and W.QtySIGSIFfunc from the Employment domain.

For machine learning research, it is essential to address the data imbalance problem. The relevant feature for research that should be the independent variable of this investigation (C.CorruptionTG) presents in the class of interest 428 records and in the dominant class 302,608 records, a relation that keeps the proportion of 1: 707, in percentage terms 0.14% of the class of interest in the population.

C.CorruptionTG is a dichotomous variable and is an important variable that has to be analyzed from other variables available for identifying risk factors that could be addressed to mitigate corruption in public administration.

Possible ways of dealing with this scenario are explained by Zhu et al. [23] that suggests solving the problem of learning on imbalanced datasets with two possible solutions: data-level solutions and algorithm-level solutions.

It is vital to inform that to comply with the GDPR legislation, the attributes that could identify a person were removed, making the data anonymized.

Ethics Statement

The authors declare that they have observed all ethical requirements for publication in Data in Brief.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

CRediT Author Statement

Marcelo Oliveira Vasconcelos: Conceptualization, Methodology, Software, Data curation, Writing – original draft, Visualization; Luís Cavique: Supervision, Writing – review & editing.

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