Dataset for file fragment classification of textual file formats

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Abstract

Objectives: Classification of textual file formats is a topic of interest in network forensics. There are a few publicly available datasets of files with textual formats. Therewith, there is no public dataset for file fragments of textual file formats. So, a big research challenge in file fragment classification of textual file formats is to compare the performance of the developed methods over the same datasets.

Data description: In this study, we present a dataset that contains file fragments of five textual file formats: Binary file format for Word 97–Word 2003, Microsoft Word open XML format, portable document format, rich text file, and standard text document. This dataset contains the file fragments in three different languages: English, Persian, and Chinese. For each pair of file format and language, 1500 file fragments are provided. So, the dataset of file fragments contains 22,500 file fragments.

Keywords: Classification, File formats, File fragments, Textual file formats

In this study, we present a dataset that contains file fragments of five textual file formats: Binary file format for Word 97–Word 2003 (DOC), Microsoft Word open XML format (DOCX), portable document format (PDF), rich text file (RTF), and standard text document (TXT). This dataset includes the file fragments in three different languages: English (EN), Persian (FA), and Chinese (CH).

Data description

First, the whole set of textual files are gathered. These files are in three different languages: English, Persian, and Chinese. The English textual files are in four different formats: DOC, DOCX, TXT, and RTF. These files are gathered from the freely available forensic research data collected by Garfinkel et al. [8]. We have converted a subset of English DOC files to obtain the set of English PDF files. So, we have textual files in five formats: DOC, DOCX, TXT, PDF, and RTF.

For the Persian and Chinese languages, we have searched for DOC files in google.com with many different keywords and phrases. Then, we have converted different subsets of these DOC files into the other four formats: DOCX, RTF, TXT, and PDF. TXT files in all three languages are saved in Universal Transformation Format-8.
UTF-8) format. It should be noted that regardless of file format, the content of any pair of files is not the same. In other words, when we convert a file from a specific format to another format, the original file is removed from the set of files.

For each pair of file format and language, we have collected 300 different files. So, totally we have 4500 files. Each of these files is segmented into 1 Kbyte (i.e. 1024 bytes) fragments. Then, five fragments are randomly selected among the fragments of each file. Before randomly selecting the fragments, 12.5% of the initial fragments and 12.5% of the final fragments of each file are discarded. This is to ensure that the fragments do not contain the file headers or trailers.

For each pair of file format and language, we have 1500 file fragments. So, the dataset of file fragments contains 22,500 file fragments. The dataset is partitioned according to 15 different pairs of file format and language. Each partition is represented by an individual data file shown in Table 1. For example, data file 6 (i.e. DOC-FA.dat) contains 1500 fragments of DOC files in the Persian language. Data files are provided in a generic binary data file format with .dat file extension. Data file 16 (i.e. ReadFragments.m) is a script in MATLAB language that reads all the fragments from a specific data file. This script is written specifically to accompany this dataset. By running this script and selecting a data file, the fragments contained in this dataset are read and stored in a variable name Dataset. Variable Dataset is a MATLAB structure array with only one field named fragments. Dataset(j).fragments (j = 1,2, ...,300) is a cell array with length 5 that contains five fragments of the jth file in the selected data file.

**Limitations**

- There are other formats of textual files such as HyperText Markup Language (HTML) format and Cascade Styling Sheets (CSS) format that are not included in the dataset.
- Multi-language documents and documents in other commonly used languages such as German, Italian, Spanish, and French are not considered for the construction of the dataset.
- The size of the fragments is considered to be fixed and equal to 1024 bytes.

**Abbreviations**

CH: Chinese language class; DOC: binary file format for Word 97–Word 2003; DOCX: Microsoft Word open XML format; EN: English language class; FA: Persian language class; HTML: hypertext markup language; PDF: portable document format; RTF: rich text file; TXT: standard text document; UTF-8: Universal Transformation Format-8.

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**Authors' contributions**

MT designed the study. FMH collected the data. MT and FMH wrote the code. MT wrote the original draft of the manuscript. Both authors read and approved the final manuscript.

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Availability of data materials
The data described in this Data note can be freely and openly accessed on OSF at https://doi.org/10.17605/OSFIO/4N8RT [9]. Please see Table 1 and reference list for details and links to the data.

Ethics approval and consent to participate
No human subjects were part of this study and permission was thus not required according to the Institutional Review Board guidelines of author one.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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References
1. McDaniel M, Heydari MH, eds. Content based file type detection algorithms. In: 36th annual Hawaii international conference of system sciences. IEEE, 2003.

2. Calhoun WC, Coles D. Predicting the types of file fragments. Digit Investig. 2008;5:S14–20.
3. Fitzgerald S, Mathews G, Morris C, Zhulyn O. Using NLP techniques for file fragment classification. Digit Investig. 2012;9:S44–9.
4. Beebe NL, Maddox LA, Liu L, Sun M, Sceadan: using concatenated N-gram vectors for improved file and data type classification. IEEE Trans Inf Forensics Secur. 2013;8(9):1519–30.
5. Chen Q, Liao Q, Jiang ZL, Fang J, Yiu S, Xi G, et al., eds. File fragment classification using grayscale image conversion and deep learning in digital forensics. In: 2018 IEEE security and privacy workshops (SPW. IEEE), 2018.
6. Bhat K, Lam JT, Zulkernine F, eds. Content-based file type identification. In: 2018 10th international conference on electrical and computer engineering (ICECE). IEEE, 2018.
7. Grajeda C, Breitinger F, Baggili I. Availability of datasets for digital forensics—and what is missing. Digit Investig. 2017;22:594–105.
8. Garfinkel S, Farrell P, Roussev V, Dinolt G. Bringing science to digital forensics with standardized forensic corpora. Digit Investig. 2009;6:S2–11.
9. Mansouri Hanis F, Teimouri M. Textual file fragments dataset and code. OSF. 2019. https://doi.org/10.17605/OSFIO/4N8RT.

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