USENIX Security '24 Artifact Appendix
"I just hated it and I want my money back": Data-driven Understanding of Mobile VPN Service Switching Preferences in The Wild

Rohit Raj
IIT Kharagpur
rrohit2901@gmail.com

Mridul Newar
IIT Kharagpur
mridulnewar2000@gmail.com

Mainack Mondal
IIT Kharagpur
mainack@cse.iitkgp.ac.in

A Artifact Appendix

A.1 Abstract

This appendix contains data and codes for our Usenix Security '24 paper (read full paper here), which presents an in-depth understanding of *why* end users switch their mobile VPNs. In the paper, we developed models for (i) detecting if a review text (on a mobile VPN app) hints at switching VPN apps and (ii) identifying the reasons for such switching. In this appendix, we present a repository containing scripts to set up an inference framework from our best-performing models for the downstream tasks of "Review Classification" and "Theme Identification from reviews". The "Review Classification" model aims to classify a given mobile app review into classes, "Actual switch", "Potential switch", and "Irrelevant", while the "Theme Identification" model aims to identify themes (regarding reasons for VPN switching) from a given review.

In order to aid future academic studies, we have also documented the method of procuring blogs and review datasets in the repository. We have not released the data publicly due to privacy concerns.

A.2 Description & Requirements

The artifact contains scripts (and models) to set up inference frameworks from our best-performing models on "Review Classification" and "Theme Identification from reviews" tasks as noted in our paper.

We also describe instructions for procuring the full dataset for academic research purposes. The review dataset contains VPN app reviews (with anonymized usernames) of 20 mobile VPN apps from the Google Play Store and Apple App Store, while the blog dataset contains VPN-related blog articles collected from VPN recommendation websites.

A.2.1 Security, privacy, and ethical concerns

Our artifact is non-destructive, and there is no security or privacy risk when running the inference models. While the review dataset, if made public, can pose a risk to the anonymity of reviewers, we have decided not to make the data available for everyone on any publicly hosted platform, with a provision to procure it for academic research purposes.

A.2.2 How to access

Our artifact can be accessed using the following stable URL:
`https://github.com/Mainack/switch-vpn-datacode-sec24/tree/c9c2e77d9bb5a0f402137b7fd557ad9ecf316dbc`.

The stable url will lead to a Github repository with multiple sub-directories. We are describing the sub-directories of the repository below.

- **Review classification model and scripts** are available from Review classification github sub directory.
- **Theme identification model and scripts** are available from Theme identification github sub directory
- **Description of the review and blog dataset** and instructions to procure them is available from Dataset github sub directory.

A.2.3 Hardware dependencies

For standardisation, we have evaluated all our models on Google Colab. The CPU specifications can be found here, and for GPU we have used Tesla T4 provided by Google Colab whose specifications can be found here. We have compared the execution times of both models in Table 1. Our artifact has no additional hardware requirements and is compatible with both CPU and GPU.

Model	CPU Time	GPU Time
Review Classification (DeBERTa model)	0.142 sec	0.022 sec
Theme Identification (BART model)	5.628 sec	0.343 sec

Table 1: Comparison of model inference time on CPU and Tesla T4 GPU.

A.2.4 Software dependencies

To download the artifact, the user can either use the "git clone" command if they have access to GitHub software or download the folder as a zip file and extract the contents. There is no dependency on the Operating System used by the user. To run the inference codes, the user needs access to Python 3 (above 3.8), and the following Python packages must be installed to run the models.

- torch
- transformers
- nltk
- emoji

A.2.5 Benchmarks

The model provided for the "Review Classification" task is the DeBERTa model, which achieved validation accuracy of 85% after fine-tuning. Similarly, the model provided for the "Theme Identification" task is the BART model, which was able to predict 81% of themes correctly on the validation set.

A.3 Set-up

A.3.1 Installation

1. Download the artifact repository from GitHub either by using Git Software (using the "git clone" command) or by downloading the zip file and extracting the contents.
2. Install required Python packages mentioned in A.2.4.
3. Download model weights from here and place the folders so that directory structure is as shown in Figure 1 and 2.

To get access to our full dataset comprising of collected reviews and blogs, follow the instructions mentioned in agreement.txt.

A.3.2 Basic Test

To run the models, replace "WRITE_YOUR_INPUT_HERE" with the review for which results have to be generated and run the command "python3 {MODEL_NAME}_Inference.py". This will print the output on the console.

```
ReviewClassification
|   README.md
|   DeBERTa_Inference.py
|
└── DeBERTa
    |   config.json
    |   generate_config.json
    |   ....
```

Figure 1: Directory structure for setting up the Review Classification model.

```
ThemeIdentification
|   README.md
|   BART_Inference.py
|
└── bart-base
    |   config.json
    |   generate_config.json
    |   ....
```

Figure 2: Directory structure for setting up the Theme Identification model.

A.4 Notes on Reusability

We built this repository with the goal of providing a tool for researchers to extend our study on reviews from different platforms and for benchmarking purposes on similar studies. The theme identification model can ease the manual effort required to study text contents (ex. reviews, tweets, blogs) on VPNs and related privacy enhancing tools. Its creative commons license puts almost no restrictions on non-commercial use. The full dataset can also be used for future studies around Mobile VPN reviews and VPN recommendation blogs.

A.5 Version

Based on the LaTeX template for Artifact Evaluation V20231005. Submission, reviewing and badging methodology followed for the evaluation of this artifact can be found at https://secartifacts.github.io/usenixsec2024/.