VulRepair Replication Package

Dear Reviewers of the Artifact Evaluation Track,

This replication package is used to replicate all of the experimental results presented in our paper “VulRepair: A T5-Based Automated Software Vulnerability Repair”.

This package is documented using the README file in the main directory which can be viewed here (**https://github.com/awsm-research/VulRepair**). Users may follow the instructions to reproduce accordingly.
Specifically, the **README file** consists of **7 sections**:

1. The **welcome section** that showcases the performance of our proposed approach on real-world data with logo and animation.
2. The **table of contents section** with hyperlinks to guide the user to specific sections
3. The **how to replicate section** that consists of 5 subsections. This is the main section that includes all of the instructions for reproducing the experiment.
    a. The **environment setup section** includes all software dependencies.
    b. The **dataset section** introduces the format of our experimental dataset.
    c. The **model section** describes specification of pre-trained models with access instruction.
    d. The **VulRepair replication** section describes how to replicate our proposed VulRepair
    e. The **experiment replication** section describes how to replicate each RQ presented in our paper. (including our proposal with all baseline approaches)
4. The **appendix section** that presents our experimental results for each RQ.
5. The **acknowledgements section** that appreciates previous related works.
6. The **license section** that presents our license **(MIT)**
7. The **citation section** that includes the citation in bib format of our work.

In our paper, we empirically evaluate different NMT-based models for the vulnerability repair task. Thus, we include 10 different models that were evaluated in our paper, where each model is stored in its own folder named with the convention such as “M1_VulRepair_PL-NL”.

In the following paragraph, we present a **Quick Start Guide** of how to reproduce our experiments to make the artifact evaluation process easier.

Quick Start Guide

Step 1.
Open this address (**https://github.com/awsm-research/VulRepair**) to view our README.md file.

Step 2.
Head to the “About the Environmental Setup” section and follow the instructions to download python dependencies. A requirements.txt is also available, so the user can run “pip install -r requirements.txt” to set up as well.

We also include three reference links (1) the installation guide for the “torch” library, (2) recommended python version (typically, the package can be run under python 3.6-3.9, however, 3.9 is recommended as 3.9 was tested), and (3) installation guide for CUDA library (optional - for GPU user only)

Step 3.
Head to the “About the Models” sections to check which RQ and model you are interested in reproducing. As an example, I decided to reproduce VulRepair which is tagged as M1.

Step 4.
Head into the folder based on the selected tag ID. For example, our ID selected in Step 3 is M1, therefore, I will do **“cd M1_VulRepair_PL-NL”** in my console.

Step 5.
Open the README.md file
(also available here: **https://github.com/awsm-research/VulRepair/tree/main/M1_VulRepair_PL-NL**)
in the current folder (i.e, M1_VulRepair_PL-NL) and you will find two prepared command line codes, the one above is used to reproduce the results (inference only), and the one below is to re-train the model from scratch (training only). Select one based on your need, simply copy and paste it to the console and the script will start running.

All experimental results can be reproduced by following the above 5-step process.
We appreciate your detailed feedback and evaluation and wish you a lovely day.