Aegis: Mitigating Targeted Bit-flip Attacks against Deep Neural Networks

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A Artifact Appendix

A.1 Abstract
We teach you how to run our experiments in this appendix. If you have any questions, please let us know.

A.2 Description & Requirements

A.2.1 Security, privacy, and ethical concerns
None.

A.2.2 How to access
https://github.com/wjl123wjl/Aegis.git
The GitHub hash is:
95ded45588bf358ce5122a6e3f920db25525186

A.2.3 Hardware dependencies
You need GPUs to train or run models.

A.2.4 Software dependencies
None.

A.2.5 Benchmarks
Datasets. Our source code could automatically download the datasets, i.e., CIFAR-10, CIFAR-100, STL-10. For TinyImageNet, please download it by yourself.
Models. Our source code could train all models, and you can directly run the scripts to train the models.

A.3 Set-up

A.3.1 Installation
We list the python packages and the corresponding versions to install. Note other versions may work as well, but we haven’t tried it.
(1) Please install python 3.6.9.
(2) Please install pytorch 1.7.0.
(3) Please install torchvision 0.8.1.
(4) Please install tensorboardX 2.5.
(5) Please install matplotlib 3.3.4.
(6) Please install tqdm 4.60.0.
(7) Please install pandas 1.1.5.
(8) Please install numpy 1.18.5.

A.3.2 Basic Test

A.4 Evaluation workflow

A.4.1 Major Claims
(C1): Aegis could effectively mitigate TBT attacks, and adaptive TBT attacks.
(C3): Aegis could effectively mitigate ProFlip attacks, and adaptive ProFlip attacks.

A.4.2 Experiments
Before conducting experiments, you need to train all models.

- CIFAR-10: train resnet32.
  (1) cd cifar10/resnet32
  (2) Train the base model: sh train_CIFAR.sh.
  (3) After finishing training the base model, then train the enhanced model: sh train_finetune_branch.sh
• CIFAR-10: train vgg16.
  (1) cd cifar10/vgg16
  (2) Train the base model: sh train_CIFAR.sh.
  (3) After finishing training the base model, then train the enhanced model: sh train_finetune_branch.sh

• CIFAR-100: train resnet32.
  (1) cd cifar100/resnet32
  (2) Train the base model: sh train_CIFAR.sh.
  (3) After finishing training the base model, then train the enhanced model: sh train_finetune_branch.sh

• CIFAR-100: train vgg16.
  (1) cd cifar100/vgg16
  (2) Train the base model: sh train_CIFAR.sh.
  (3) After finishing training the base model, then train the enhanced model: sh train_finetune_branch.sh

• STL-10: train resnet32.
  (1) cd stl10/resnet32
  (2) Train the base model: sh train_STL.sh.
  (3) After finishing training the base model, then train the enhanced model: sh train_finetune_branch.sh

• STL-10: train vgg16.
  (1) cd stl10/vgg16
  (2) Train the base model: sh train_STL.sh.
  (3) After finishing training the base model, then train the enhanced model: sh train_finetune_branch.sh

• Tiny-ImageNet: train resnet32.
  (1) cd tinyimagenet/resnet32
  (2) Train the base model: sh train_tinyimagenet.sh.
  (3) After finishing training the base model, then train the enhanced model: sh train_finetune_branch.sh

• Tiny-ImageNet: train vgg16.
  (1) cd tinyimagenet/vgg16
  (2) Train the base model: sh train_tinyimagenet.sh.
  (3) After finishing training the base model, then train the enhanced model: sh train_finetune_branch.sh

(E1): For TBT attacks.
  (1) First enter a folder to attack the target model, e.g., cd ./Aegis/TBT/resnet32-cifar10/
  (2) If you want to conduct the TBT attack, run the instruction: python3 TBT_noadaptive.py. Then, you can observe the ASR.
  (3) If you want to conduct the adaptive TBT attack, run the instruction: python3 CSB_nonadaptive.py. Then, you can observe the ASR.

  (1) on cifar10 and resnet32, run the instruction: sh ./attack_reproduce_k=50_resnet32_cifar10.sh
  (2) on cifar10 and vgg16, run the instruction: sh ./attack_reproduce_k=50_vgg16_cifar10.sh
  (3) on cifar100 and resnet32, run the instruction: sh ./attack_reproduce_k=50_resnet32_cifar100.sh
  (4) on cifar100 and vgg16, run the instruction: sh ./attack_reproduce_k=50_vgg16_cifar100.sh
  (5) on stl10 and resnet32, run the instruction: sh ./attack_reproduce_k=50_resnet32_stl10.sh
  (6) on stl10 and vgg16, run the instruction: sh ./attack_reproduce_k=50_vgg16_stl10.sh
  (7) on tinyimagenet and resnet32, run the instruction: sh ./attack_reproduce_k=50_resnet32_tinyimagenet.sh
  (8) on tinyimagenet and vgg16, run the instruction: sh ./attack_reproduce_k=50_vgg16_tinyimagenet.sh

(E3): For ProFlip attacks.
  (1) First enter a folder to attack the target model, e.g., cd ./Aegis/ProFlip/resnet32-cifar10/
  (2) If you want to conduct the ProFlip attack, run the instruction to generate a trigger: python3 trigger_nonadaptive.py. Then, run the instruction to attack: python3 CSB_nonadaptive.py. Then, you can observe the ASR.
  (3) If you want to conduct the adaptive ProFlip attack, run the instruction to generate a trigger: python3 trigger_adaptive.py. Then, run the instruction to attack: python3 CSB_adaptive.py. Then, you can observe the ASR.

A.5 Notes on Reusability
None.

A.6 Version
Based on the LaTeX template for Artifact Evaluation V20220926. Submission, reviewing and badging methodology followed for the evaluation of this artifact can be found at https://secartifacts.github.io/usenixsec2023/.