

DL Lab7: Anomaly Detection

Lab Objective:

In this assignment, you will need to implement Variational Autoencoder (VAE), and use VAE to detect anomaly products.

Rules:

- (1) This assignment should be done individually. Plagiarism is strictly prohibited. Once the T.A. finds plagiarism, you will receive a score of **0** on this assignment.
- (2) Only **PyTorch** frameworks are allowed in this lab, beyond that you can only use numpy, matplotlib, and other Python standard library.
- (3) The assignment format and files are not in accordance with the regulations, the report **score $\times 0.9$** .
- (4) If the assignment is missing or incomplete training for any item, the assignment score will be deducted proportionally to the incompleteness.
- (5) If you submit your assignment late, your score will be **multiplied by 0.9 for each day of delay**.

Submission:

- (1) Please write your code on Jupyter notebook.
- (2) **Only allowed to use the specified model according to each task.** Otherwise, no points will be awarded.
- (3) The report can only be handed in **Six A4 pages** at most. You should explain all the implications of all the programs you write and post them in the report, and if you compare any different results, please present the changes and their effects in the report, but it is strictly forbidden to post the entire code.
- (4) Upload the compressed file (**.zip**) of “the report (**.pdf**), all program files (**.ipynb**), and all the best weight of model which you wrote.” to the E3 platform. The file name is **A7_studentID_studentName.zip**.
- (5) Sample submission format: A7_studentID_studentName/
| A7_studentID_studentName.pdf
| vae.ipynb

Deadline: 2024/12/2 (Mon.) 9:00

Requirements:

- (1) In this assignment, you have to finish following task:

Task: Detect defective product by using VAE.

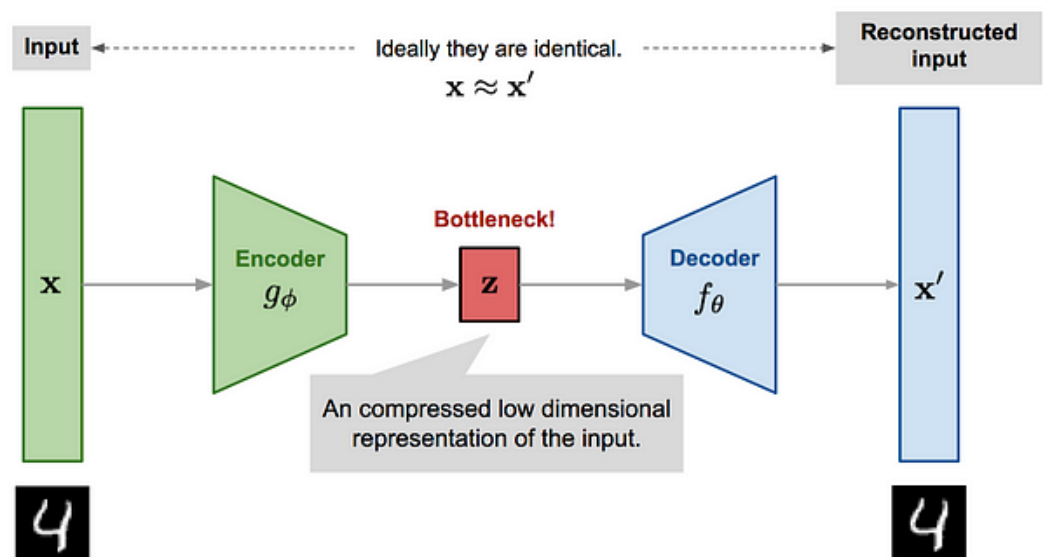
In this task, it is required to implement a **Variational Autoencoder (VAE)**, including different model **except “example model”, but you can modify it**, and try different way to detect defective product.

- (2) **Plot the training loss of VAE** during training. And in each of model you should calculate the accuracy of good product and different product.
- (3) **Compare performance** changes due to different parameters, model structures and different way, **and write them into reports**.
- (4) Set “**torch.manual_seed(12)**” and “**torch.backends.cudnn.deterministic = True**” in your code for model’s training reproducibility.
- (5) In the report, use a table to record the accuracy of each dataset and “**calculate the average of all scores**”. This average will serve as your final score.

Descriptions:

(1) Model Architecture

i. VAE



(2) Dataset

i. Task RGB: MVTEC

(3) Bonus

- i. Using different ways to detect defective product, and compare accuracy between different ways.

Reference

- (1) <https://arxiv.org/pdf/1312.6114>
- (2) <https://github.com/AntixK/PyTorch-VAE>

Assignment Evaluation:

- (3) Code & model performances (60%)
- (4) Report (40%)
- (5) Bonus (10%)

Please contact TA if you have any questions.

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