Deep Generative Models/Advanced Computer Vision
Assignment 1 (100 points)

Deadline : until May. 6, 23:29

- Please download the data using the link below:

https://drive.google.com/drive/folders/12XsnhJXwbmYPPVljtF59X1jis6Ag4e4e?usp=sharing

Inside the folder, three types of datasets are shown: bottle, capsule and toothbrush. They have train/test datasets and segmentation ground-truth masks, respectively.

- Please use the data in the `train’ folder as the training data when training your model (e.g. in Problem 2) while using the data in the `test’ folder as the testing data for evaluating your model (e.g. in Problem 1 and 2).

- Please download the network architecture, *.py and weight file(*.pth), contained in the link below:
https://drive.google.com/drive/folders/1tmNtiuh0VIxGIHqp8ZtfWafwIy9XBPOg?usp=sharing

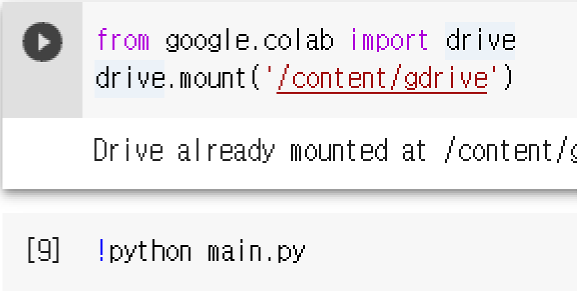
  If you are not using the CoLab, accompanying `requirements.txt’ (or `environment.yaml’) is required with your submission. You can have the penalty if your code is not executable in the evaluator’s PC, due to the environmental difference etc. Please use the CoLab to prevent this.

- If you have any questions, please post it on the blackboard/discussion/Q&A board.

- You can write reports either in Korean or English.

1. **[35 points]** We provided the `Tester’ class in main.py that initializes the abnormal detection network with the weights `model.pth’ provided. Please do the following things for this problem.

- Please upload datasets in your own environment (google drive is recommended).
- Please upload .pth files in your own environment (google drive is recommended).
- Please upload .py files in your local colab environment.
- Please confirm the folder path and settings in main.py.

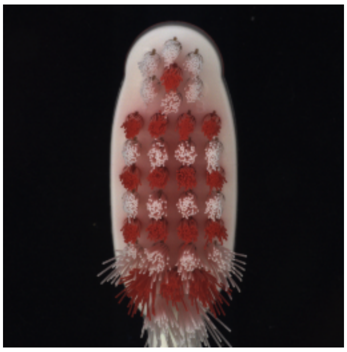
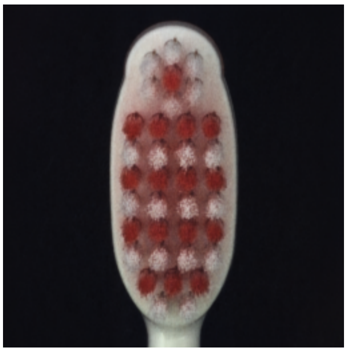
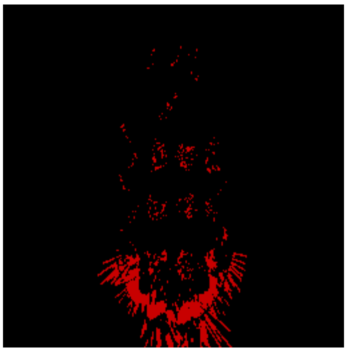


```
from google.colab import drive
drive.mount('/content/gdrive')
```

```
Drive already mounted at /content/g
```

```
[9]  !python main.py
```

- You can use above codes for mounting the google drive and running the main.py. If you set all the things correctly, you can obtain the visualization as below images for original/generated/diff images (abnormal detected).

		
Original image	Generated image	|Original - Generated|

- Please attach plots for 001.png through 010.png located in the test folder of the toothbrush object in the report file. **[15 points]**

- Please describe the logic behind how this method is working for the abnormal detection in the report file. **[20 points]**

2. **[60 points]** Please implement the `train' method of the `Trainer' class for training your abnormal detection network on the training data provided, when called from the main() function as follows:

```
trainer = Trainer(epochs, batchSize, learningRate)
trainer.train()
```

   a. Input and output of the VAE network are same and training images are come from the `good' examples.
   b. Please train the VAE network using the `vae_loss' method for calculating the loss function.
   c. Please properly tune your learning rate, batchSize and # of epochs etc. to properly train your network.

- Please attach plots for 001.png through 010.png located in the test folder of the toothbrush object in the report file using weight files obtained at 10 epoch and at 500 epoch, respectively. **[20 points]**

- Please train the model for `bottle’ and `capsule’ objects. Then, test it for below images and attach the results in the report: **[20 points]**

bottle/test/broken_large/001.png
bottle/test/broken_small/004.png
bottle/test/contamination/007.png
capsule/test/crack/001.png
capsule/test/crack/010.png
capsule/test/poke/000.png
capsule/test/squeeze/000.png

- Please analyze the effect of the constant for combining the reconstruction loss and KL divergence loss in vae_loss implemented in the Trainer class:

```
recon_loss + 0.000001 * kldivergence
```

How the generated images are changed as we increase or decrease it from the initial value `0.000001’? **[15 points]**

Please discuss the possible reasons for that. **[5 points]**

3. **[5 points]** Please note and apply the below details.
    a. Send all files(.zip) via **Blackboard**.
    b. In **20200401_seungryulbaek_ass1.zip** file, you need to include the main.py and trained weights (.pth) and report files.
    c. Please provide a report document summarizing answers and execution method for your program for each problem in the form of ‘report.pdf’ or ‘report.docx’.
    d. You also need to attach trained weights obtained from Problem 2 with the name of `model_<objects>_<epoch>epoch.pth’. Please contain codes for all problems in main.py while setting it executable for problem 2 by commenting out codes.

<Example>

```
20200401_seungryulbaek_ass1.zip
|
|--- model_toothbrush_10epoch.pth, model_toothbrush_500epoch.pth
|--- model_capsule_500epoch.pth, model_bottle_500epoch.pth
|--- main.py
|--- report.pdf or .docx
```

<Tip>

Maximum keeping time for one session in the CoLab is 12 hours when you use GPU mode, but if you remain in your CoLab session without typing anything over 90 mins, the session would be automatically shut down. So, please use the code below to prevent it. https://naenjun.tistory.com/18