10910COM526000 Deep Learning

Homework 2: Convolutional Autoencoder

Announced: **November 5 at 03:00 pm**
Deadline: **November 23 at 11:59 pm (iLMS)**
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Introduction:

An autoencoder is used to learn recoverable data coding in unsupervised manner. In this homework, you need to implement autoencoder trained on wafer dataset using PyTorch.

Rules:

- Please properly comment your code to let us understand your train of thought.
- Discussions are encouraged, but plagiarism is strictly prohibited and punishable!

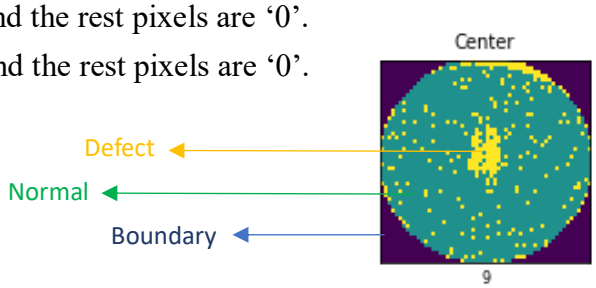
Submission:

You should compress your code, data, report (hw2report_studentID.pdf) and readme.txt (explain how to run your code) into a ZIP file (hw2_studentID.zip), and submit it on iLMS before the due date.

Data:

The wafer map data is a semiconductor dataset which consists of 1281 samples as well as their labels. There are nine classes: *Center* (0), *Donut* (1), *Edge-Loc* (2), *Edge-Ring* (3), *Loc* (4), *Near-full* (5), *Random* (6), *Scratch* (7) and *None* (8).

All wafer images are stored in data.npy as one numpy array whose size is (1281, 3, 26, 26). In first channel, '1' denotes boundary and the rest pixels are '0'. In second channel, '1' denotes normal region and the rest pixels are '0'.
In third channel, '1' denotes defect and the rest pixels are '0'.

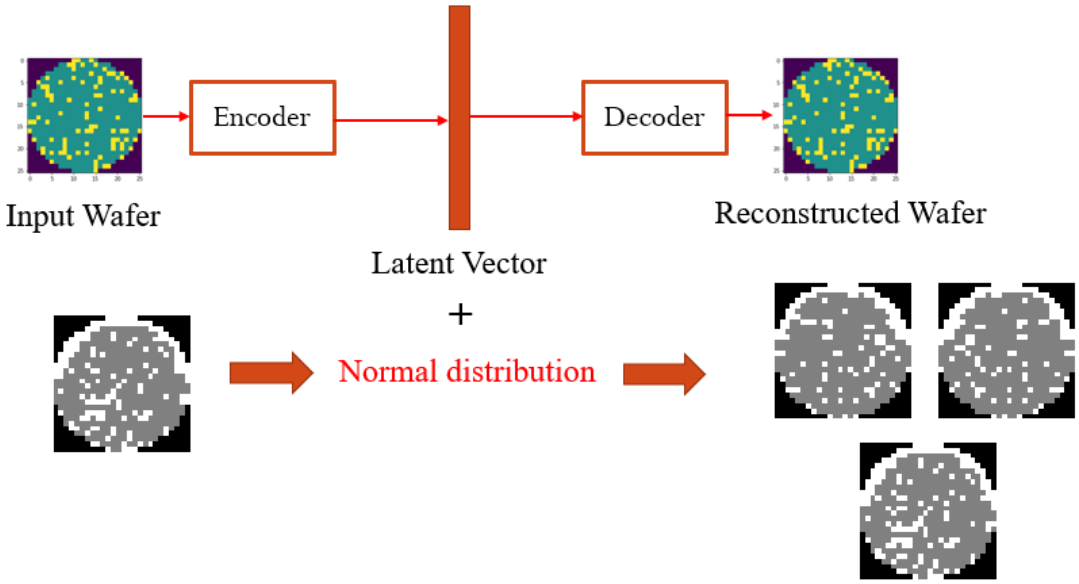


Implementation (PyTorch) [80%]

1. Design your own encoder and decoder (hint: Conv2D, ConvTranspose2D), the dimension of latent code should be less than input and make sure that the size of output image is (26, 26, 3).

2. Train the autoencoder on all 1281 images using reconstruction loss.

3. Generate another 6405 new samples from original 1281 samples by adding Gaussian noise into the latent code (Generate 5 samples from one sample) and store them into gen_data.npy. (And don't forget gen_label.npy)



Report [20%]

The format is not limited, but the following matters must be discussed in your report:

1. Show your model architecture and loss function. (MSE or …)
2. Plot training loss.
3. Visualize 5 generated samples for each class like this: