DSA5105 LEC13

Recap

1. supervised learning ⟶ learn the oracle

2. unsupervised learning ⟶ learn the dataset structure

Task: ① Dimensionality Reduction

② Clustering

③ Density Estimation

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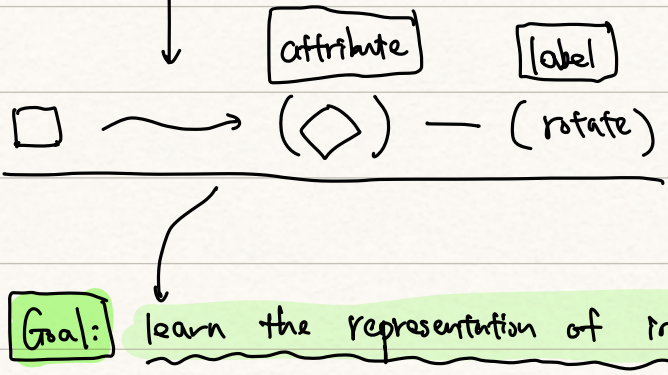
3. Self-supervised Learning

This Lecture

{ Dataset: without labels

Task: Classification / Regression

Idea: generate the label by some transformation



Goal: learn the representation of inputs

4. Semi-supervised Learning (through self-supervised learning)

(small part of data, say 1%) ⟷ since labelled data is expensive

{ Part of dataset: labelled

Another part of dataset: unlabelled (say 99%)

Idea: Dataset = A (labelled, 1%) + B (unlabelled, 99%)

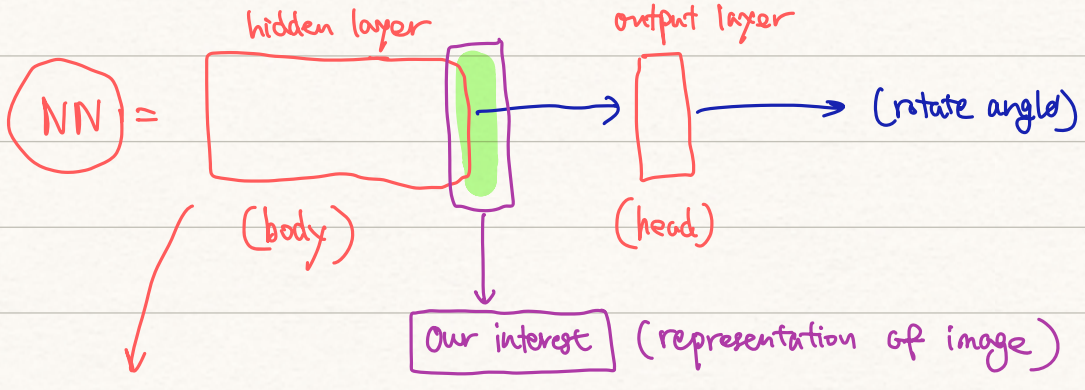
Self-supervised Learning

① for each image in B, apply some random rotation, and then record the rotated image + rotate angle

→ C ⇝ labelled dataset w.r.t rotation angle

② train a classifier to predict rotate angle from C

Example: Classifier = NN (depth 2)

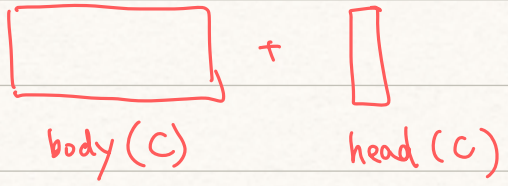


→ ③ Intuitively, NN can learn some representation of images in order to predict 'rotation angle'

the output of 'body' ⟷ representation / embedding

(input of 'head')

④ After training on C, we have the trained NN:

→ NN_C =  +

body (C) head (C)

Create a new NN:

$NN_{classifier}$ = body (C) + head (new)

we freeze the body (C) and just train head (new) with

Dataset A

Summary:

① Dataset = A (labelled) + B (unlabelled)

② B → C = (rotate "B", rotation tag)

C → Labelled

idea: use large dataset to generate 'embedding' to avoid overfitting problem

⇒ use this large 'labelled dataset' to generate 'feature extractor'

③ Architecture of fine-tuning