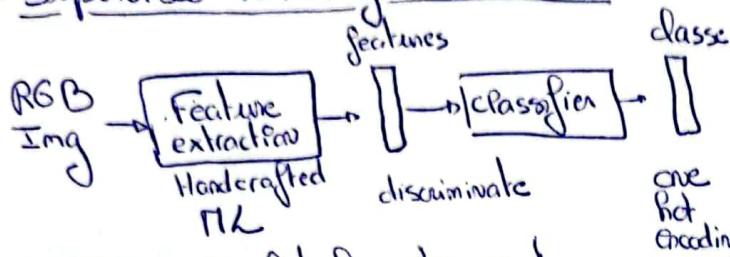


11) Explain 3 main concepts of feature extraction based on supervised learning, auto encoding and self-supervised learning. Give the examples of usage of these features.

Supervised Learning architecture



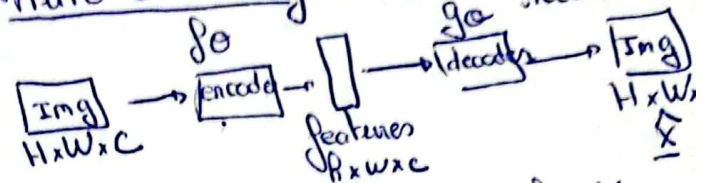
We have the labels $\{x_i, y_i\}$ Used for classification

- Feature space may be very good discriminative space that can distinguish between real and fake, dogs and cats or even do transfer learning.
- ⇒ make prediction (estimate pdfs)

eigenvalue decomp ⇒ square matrix
SVD ⇒ any matrix

Normalized data.
PCA is linear

Auto encoding, (unsupervised)

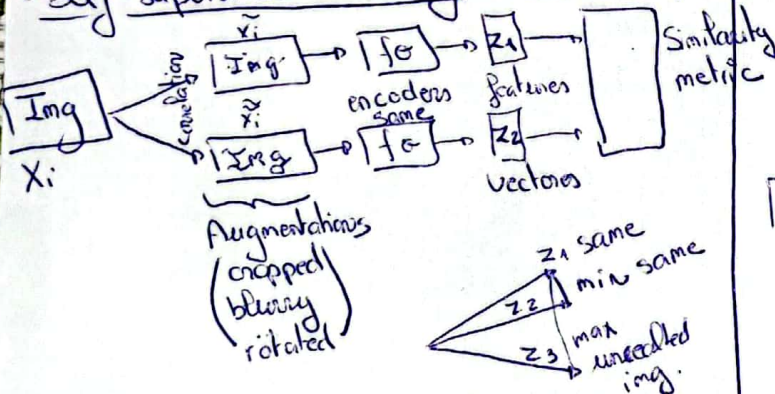


We don't have the labels, only X_i .
Used for compression.

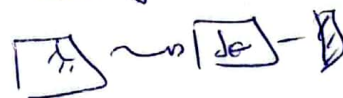
Goal: learn param that minimize the loss between \underline{x} and $\hat{\underline{x}}$ i.e. $\|\underline{x} - \hat{\underline{x}}\|_2^2$

⇒ same
⇒ Goal: reveal structure of the data
* encoder, decoder pair

Self supervised Learning (No Labels)

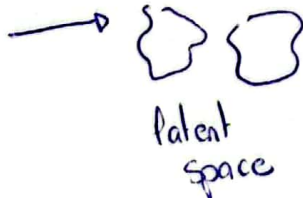


role of z_3 is to contrast push away
 z_3 need to be same that is not in the same class of z_1, z_2



- 2 encoders
- euclidean distance (or inner product) of the two feature vector should be as close as possible.

$$\min \|\underline{z}_1 - \underline{z}_2\|_2^2 - \|\underline{z}_1 - \underline{z}_3\|_2^2$$



in lower dim space we can clearly see the cluster

(obj recognition / any classification)