Linear Autoencoder ICP

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ECE 5258

Pattern Recognition

Fall 2021

Purpose

- Create a linear autoencoder
- Sample Covariance Matrix PCA
- Denoiseing

Theory

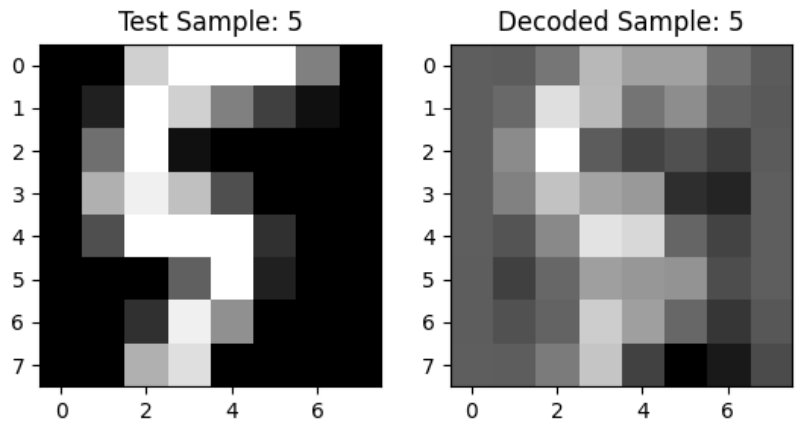
- Encoder
  - Sample Covariance Matrix PCA
  - Maps D to H dimensions
- Decoder
  - Maps H to D dimensions

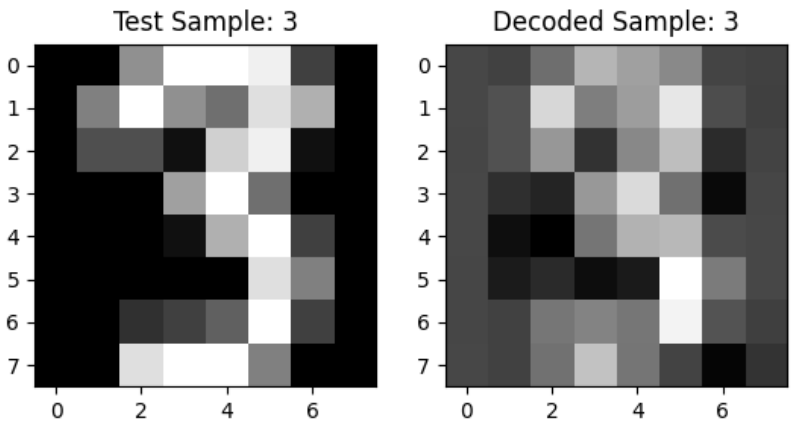
Data

- Three Data Sets
  - MNIST 8x8 Digits
  - MNIST 28x28 Digits
  - Yale Faces
- Sample
  - D-length vector
  - Dimensions value = Pixel strength

8x8 Digits

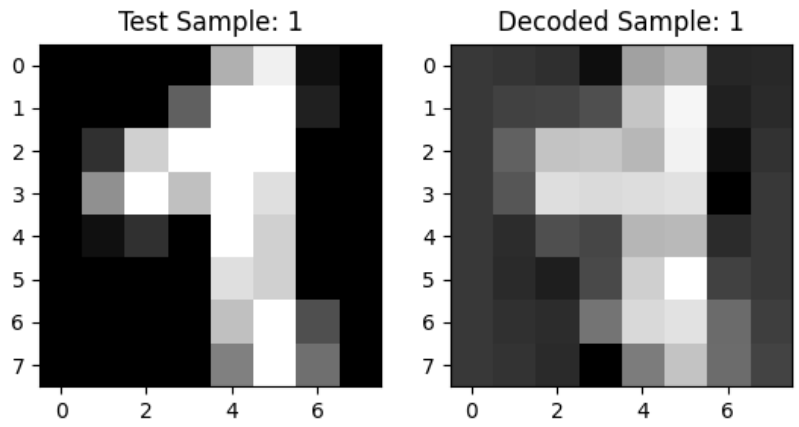
- P = 0.8
- H = 13

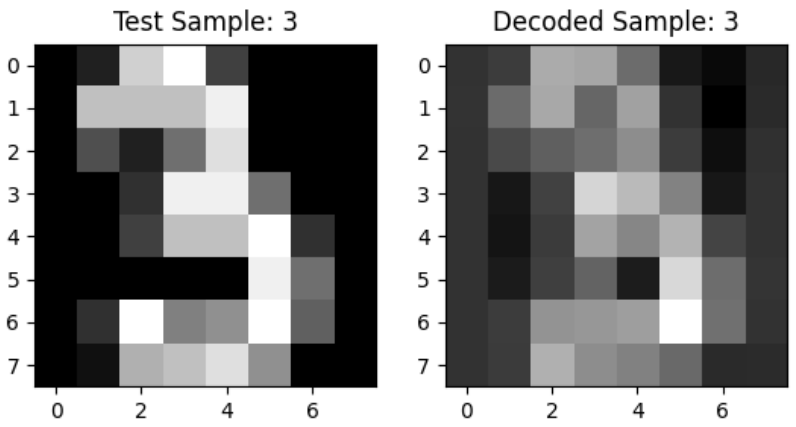




8x8 Digits

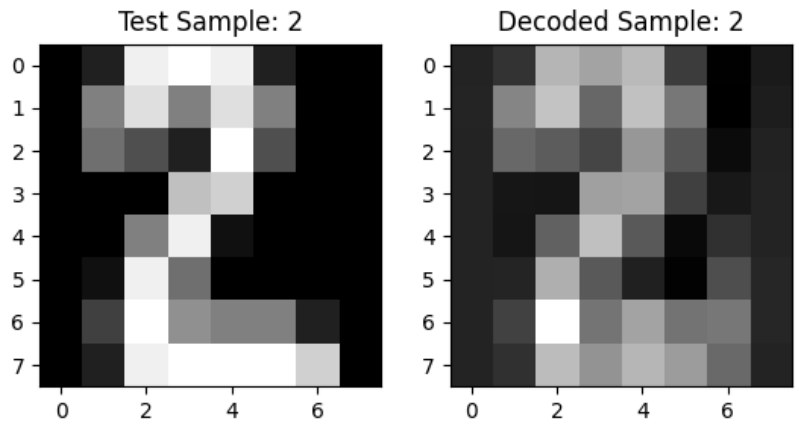
- P = 0.85
- H = 13

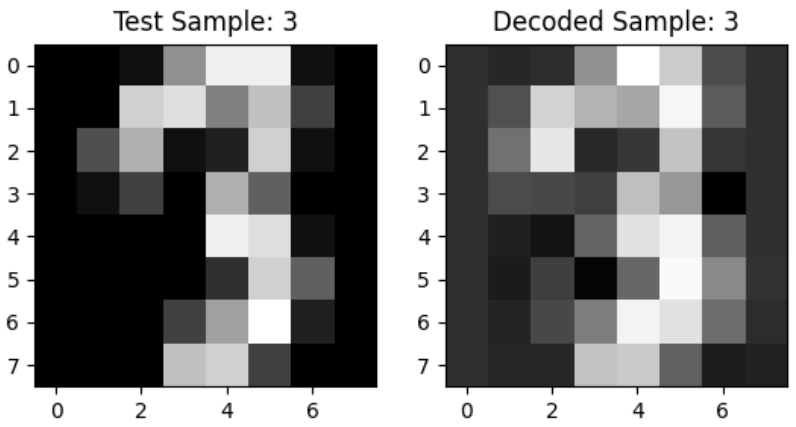




8x8 Digits

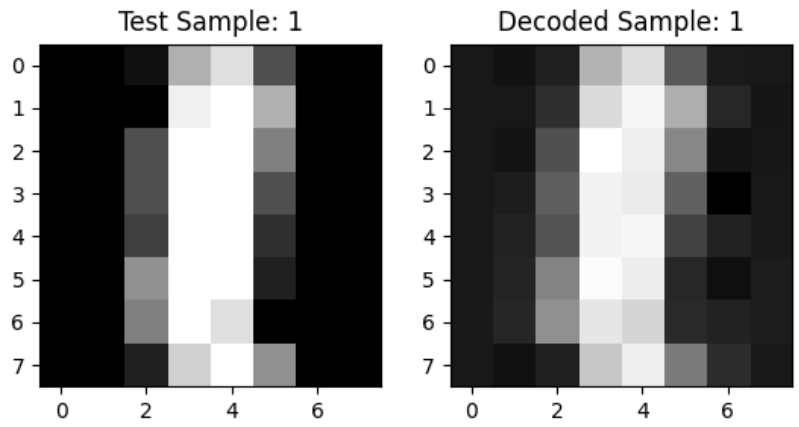
- P = 0.9
- H = 13

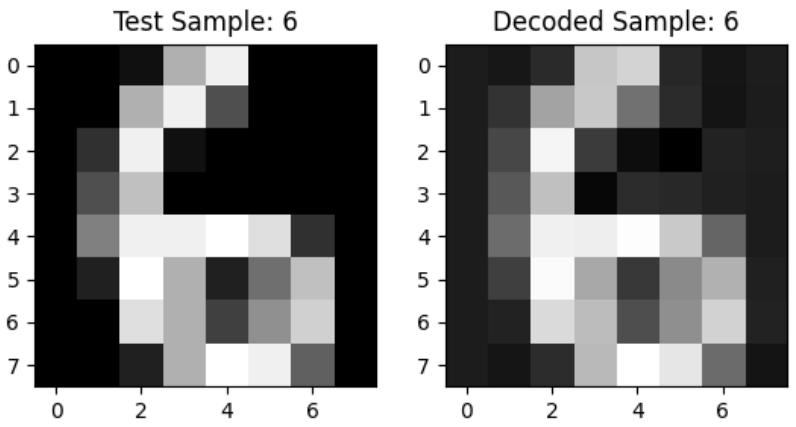




8x8 Digits

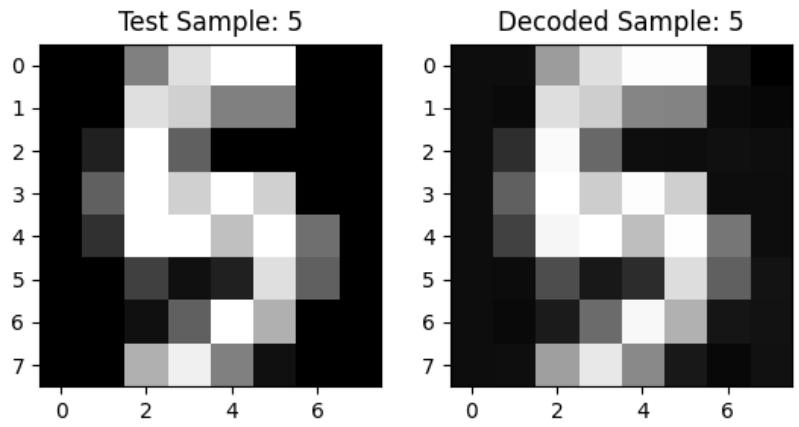
- P = 0.95
- H = 13

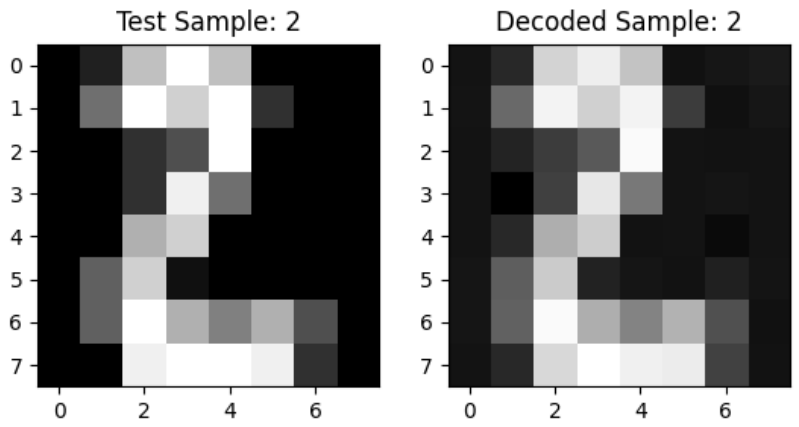




8x8 Digits

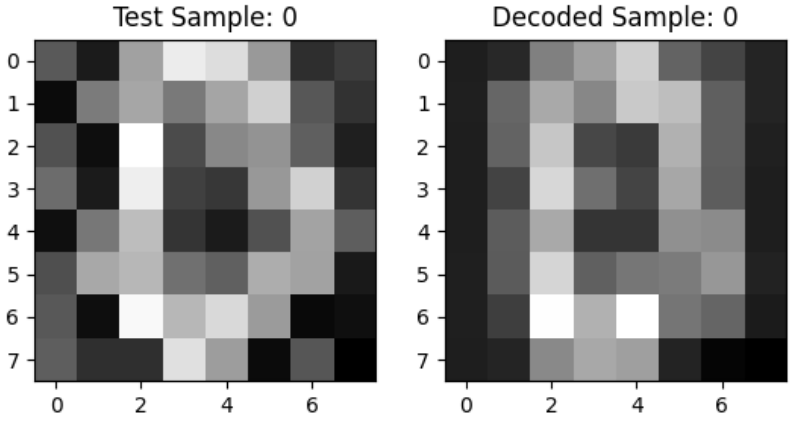
- P = 0.99
- H = 13



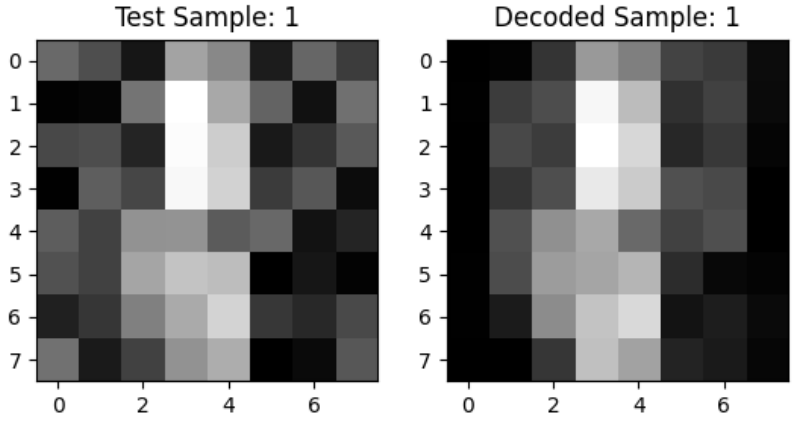


8x8 Digits with Noise

P = 0.9

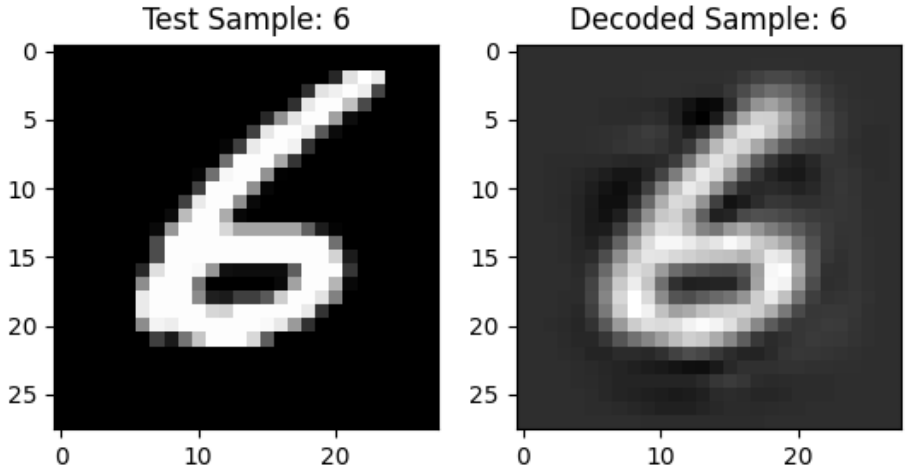


P = 0.95



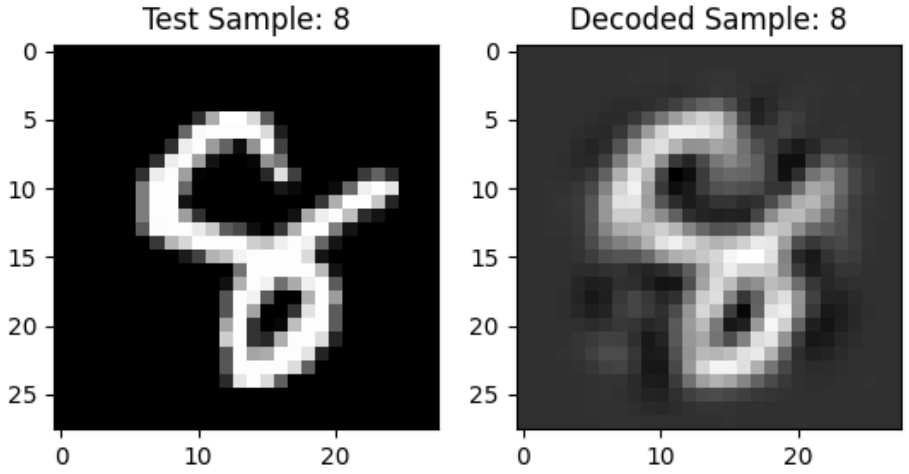
28x28 Digits

- P = 0.8
- H = 44



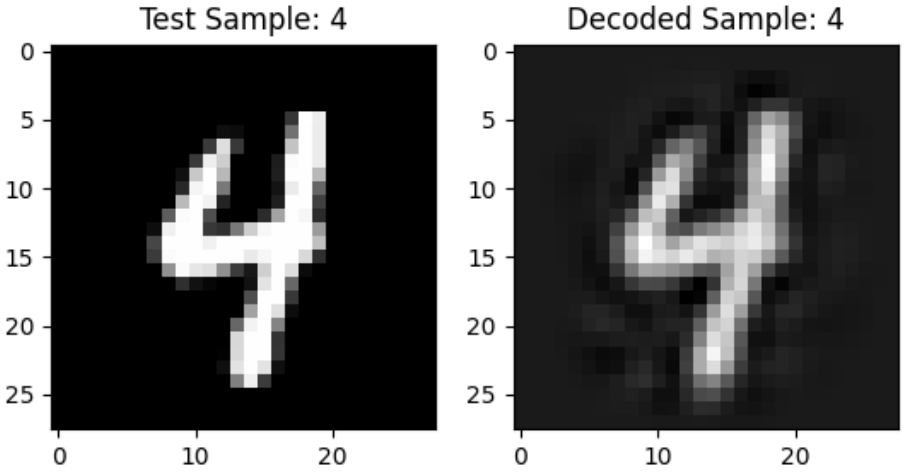
28x28 Digits

- P = 0.85
- H = 59



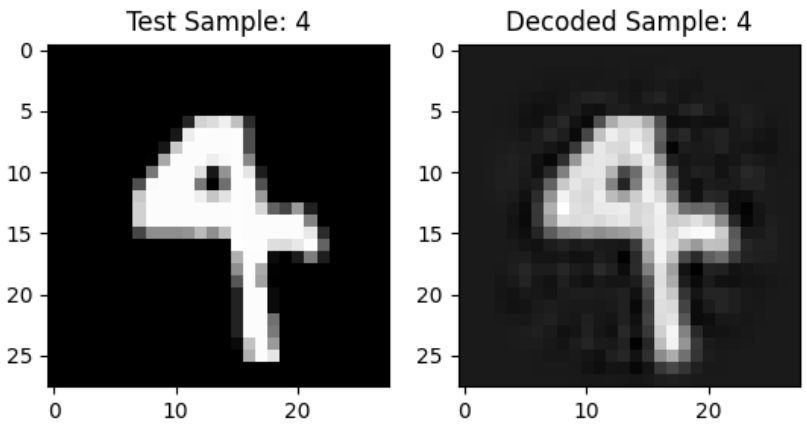
28x28 Digits

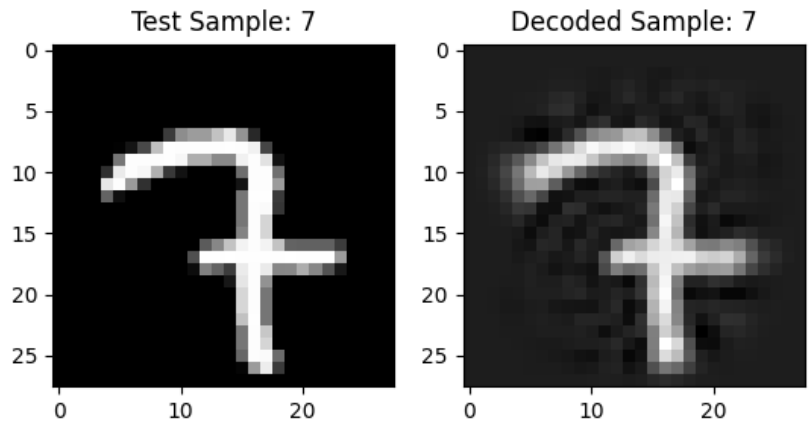
- P = 0.9
- H = 87



28x28 Digits

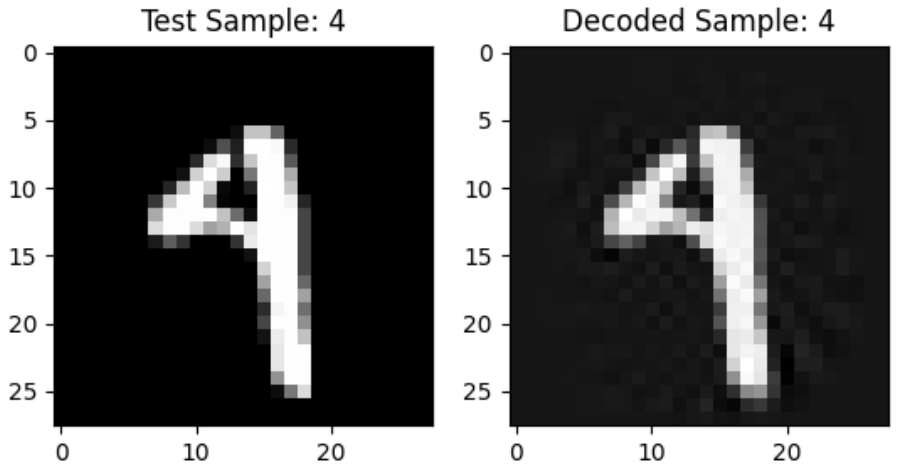
- P = 0.95
- H = 154

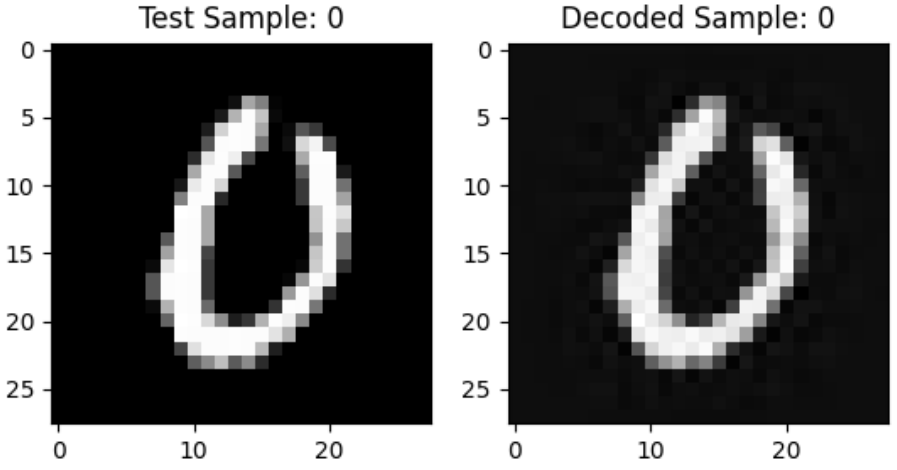


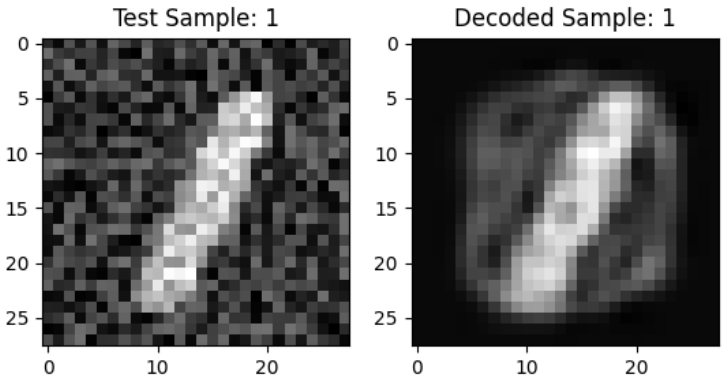


28x28 Digits

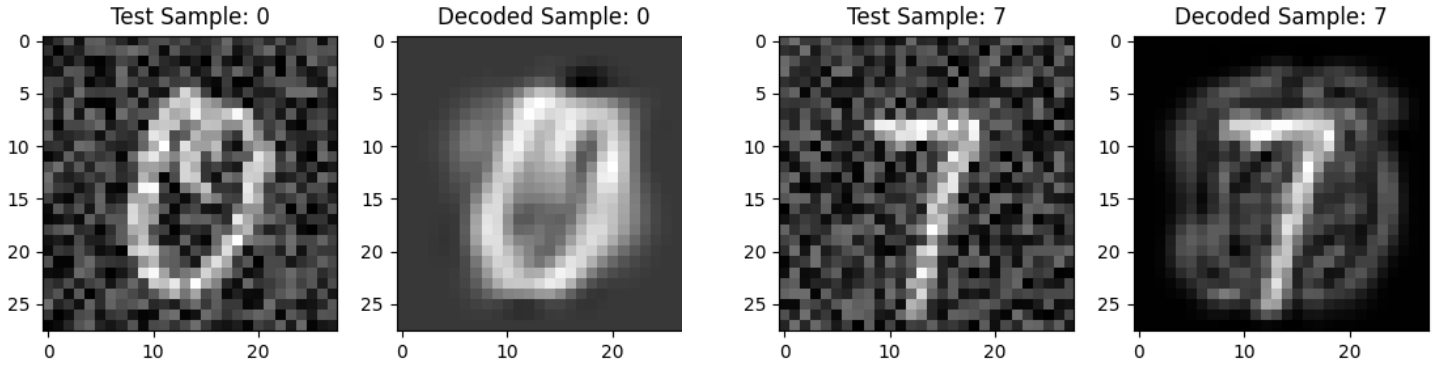
- P = 0.99
- H = 331





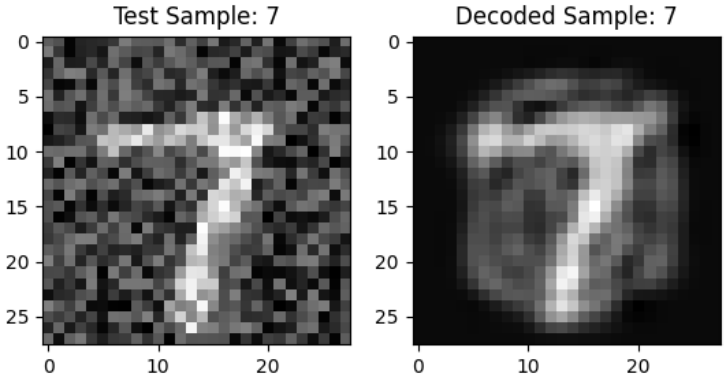


p = 0.9



p = 0.8

p = 0.95



p = 0.9

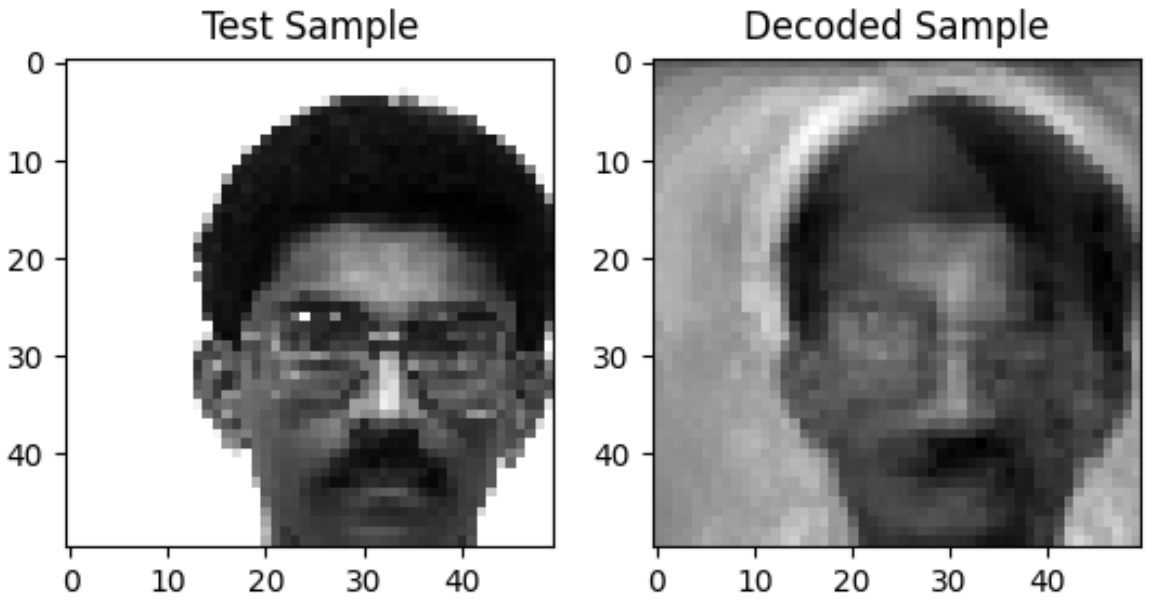
28x28 Digits with Noise

Yale Faces

- 200 x 200
- Down sampled by 4
- D = 2500

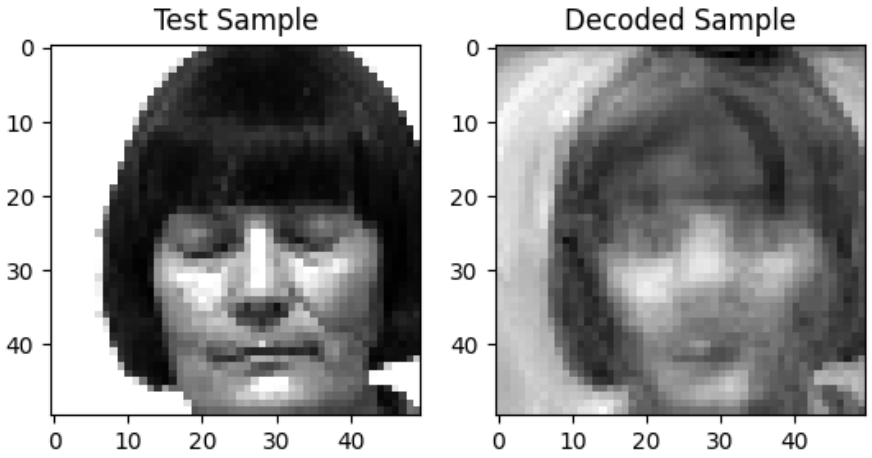
Yale Faces

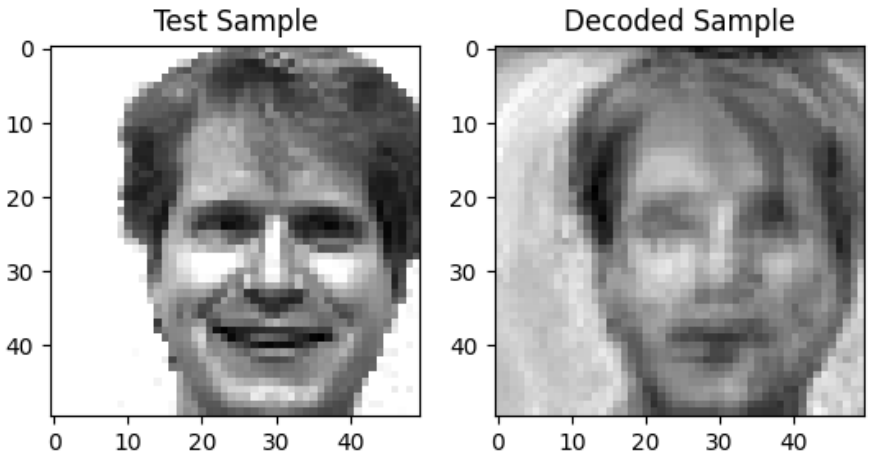
- P = 0.8
- H = 11



Yale Faces

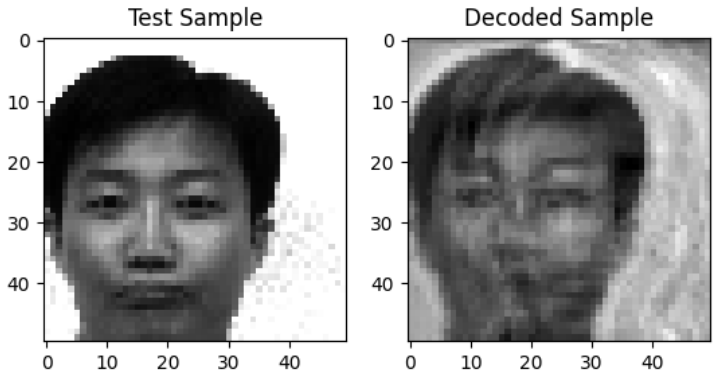
- P = 0.85
- H = 17

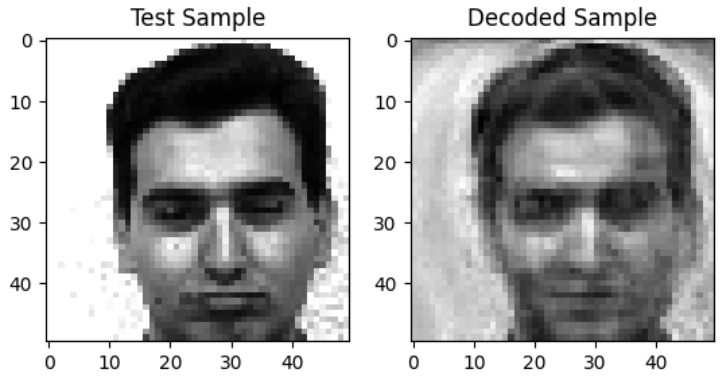


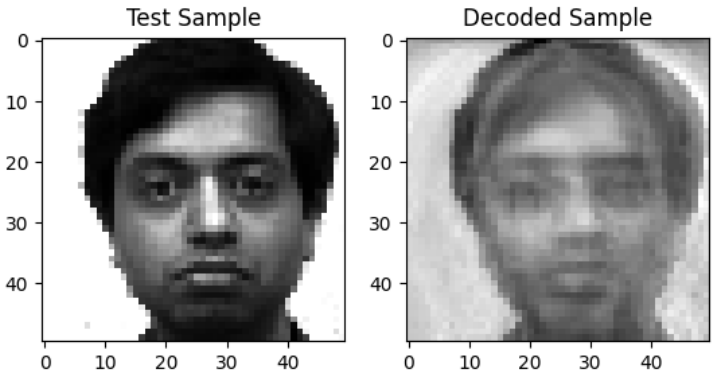


Yale Faces

- P = 0.9
- H = 26

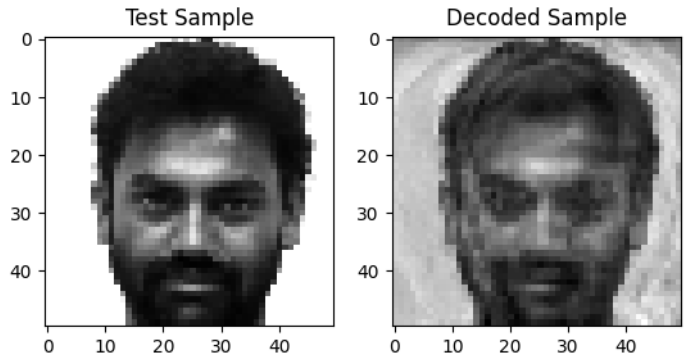


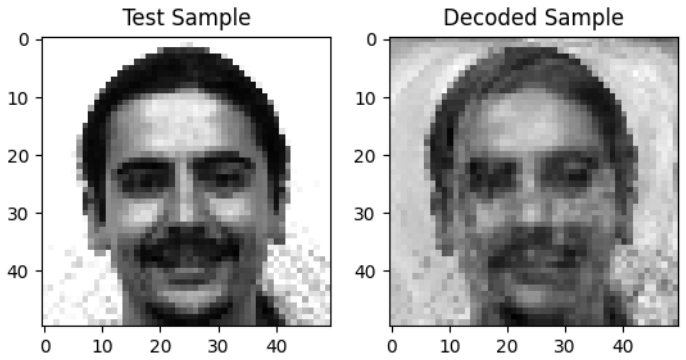


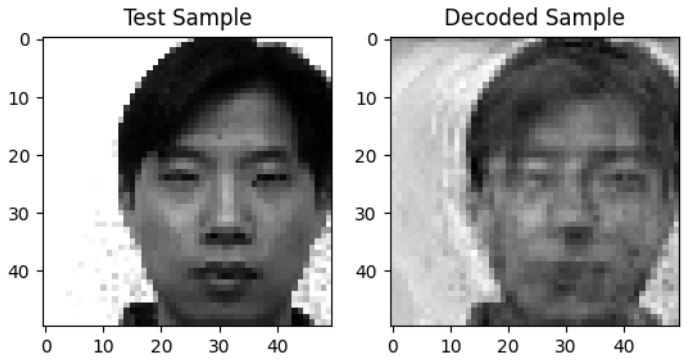


Yale Faces

- P = 0.95
- H = 50







Yale Faces

- P = 0.99
- H = 106