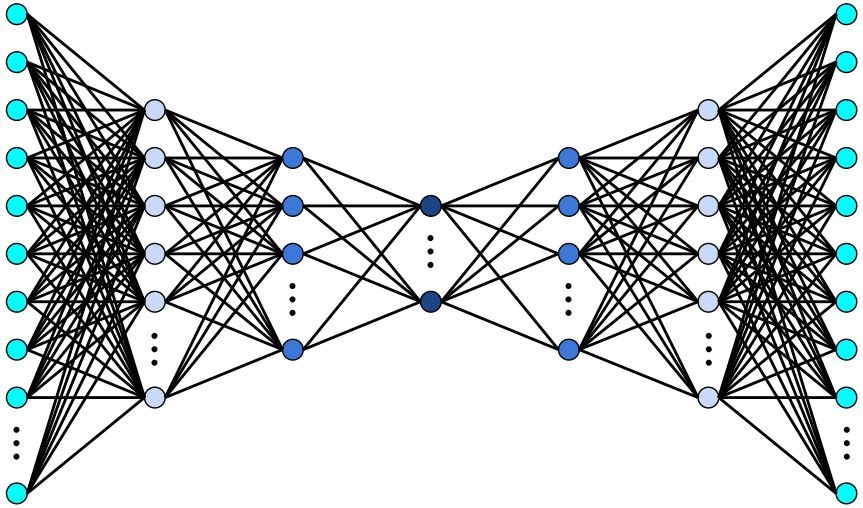
Autoencoders

CS344
Deep Learning

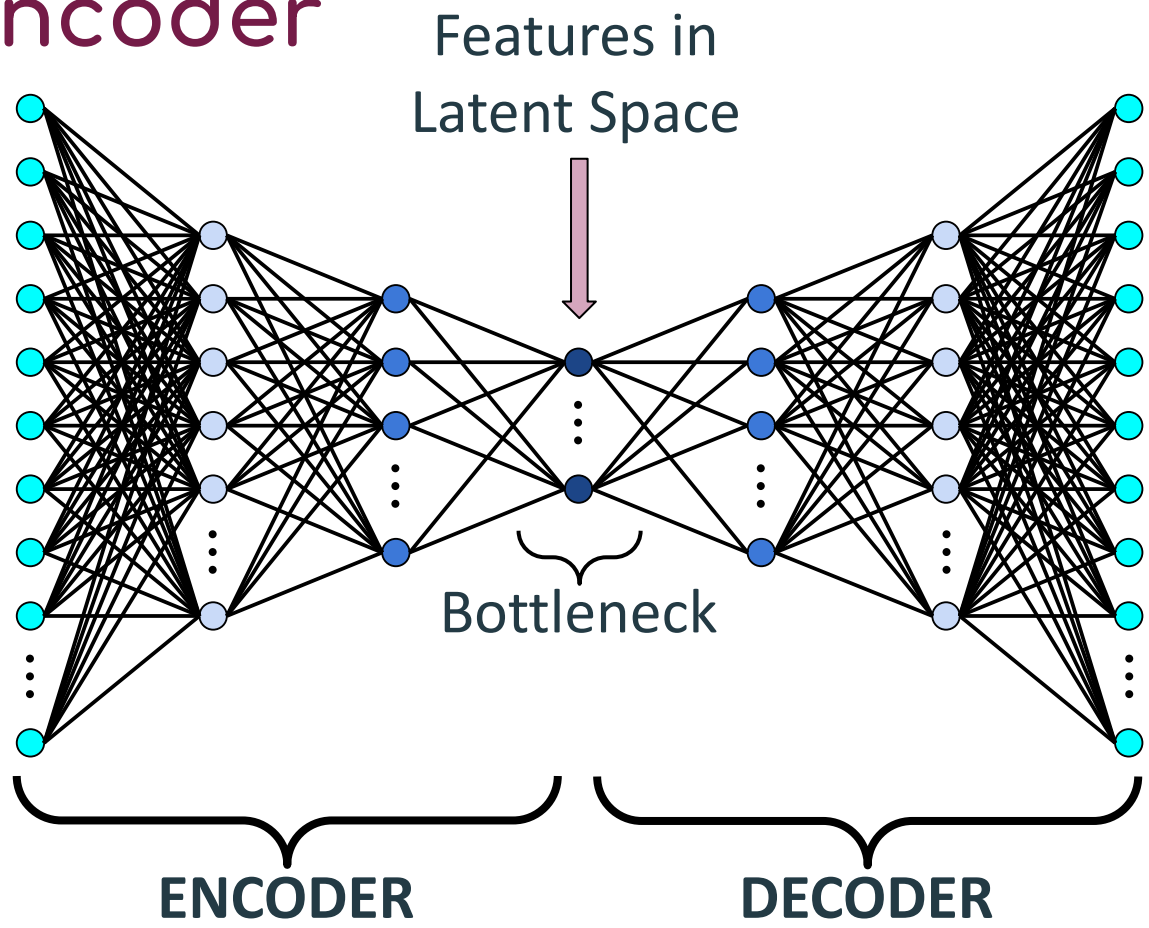
WELLESLEY

Autoencoder

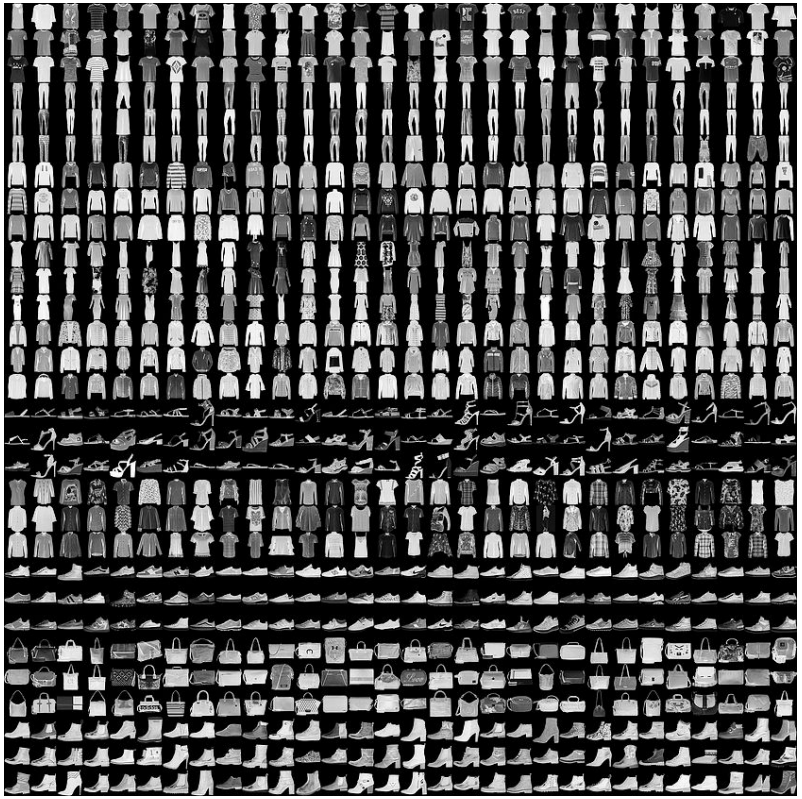


- Neural network
- Unsupervised
- Two components:
  - ★ Encoder - compresses data in latent space
  - ★ Decoder - uncompresses data to reconstruct original data

Autoencoder

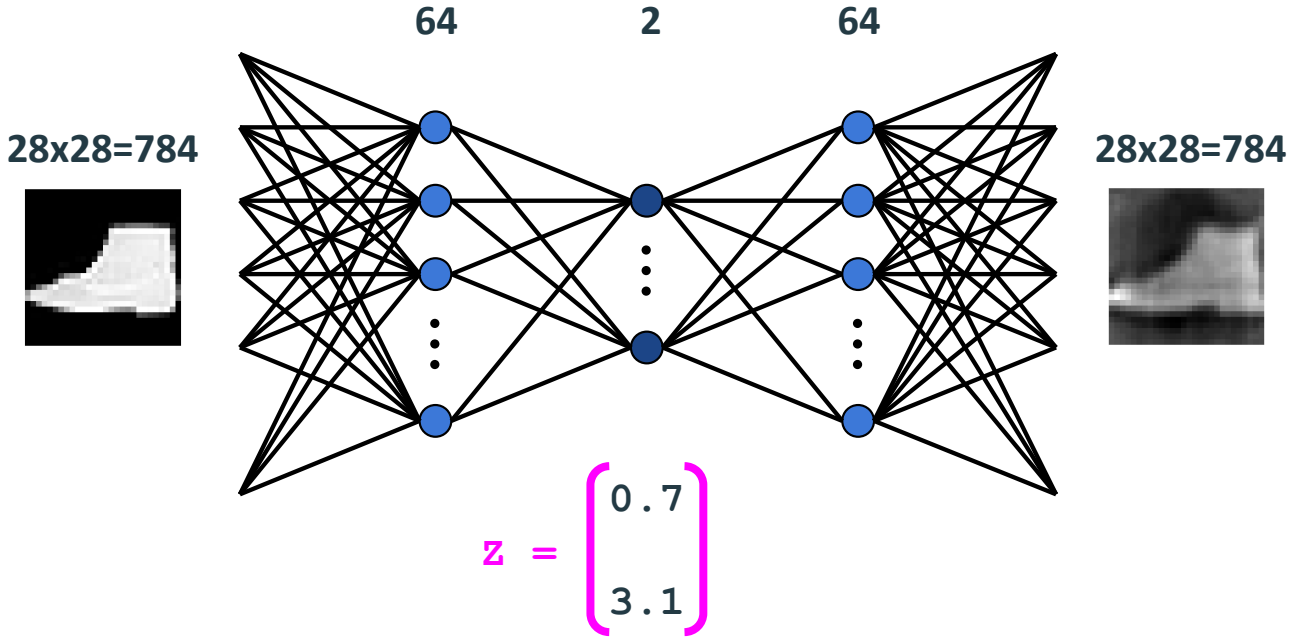


Fashion Dataset



Autoencoder

```
model = MLPRegressor(hidden_layer_sizes=(64,2,64))
model.fit(X, X)
X_reconstructed = model.predict(X)
```



Autoencoder

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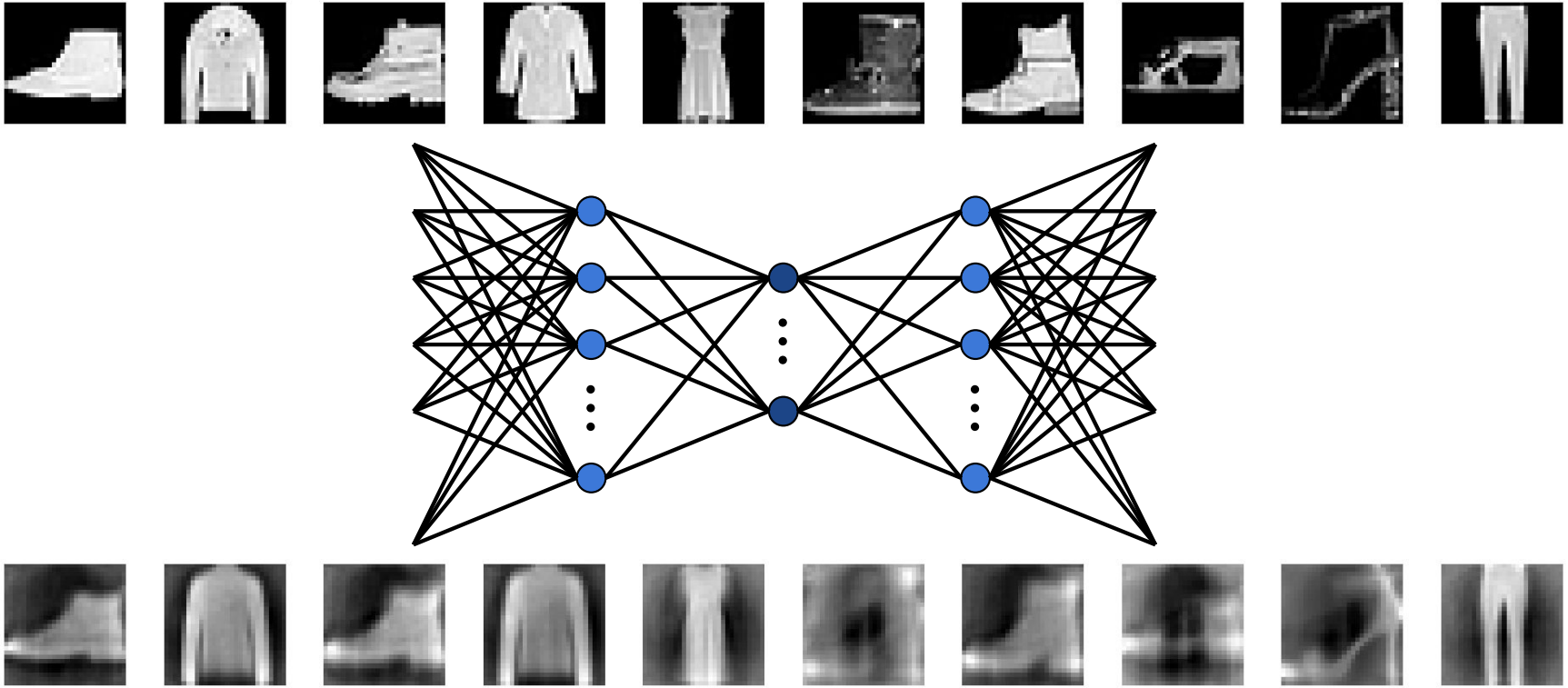
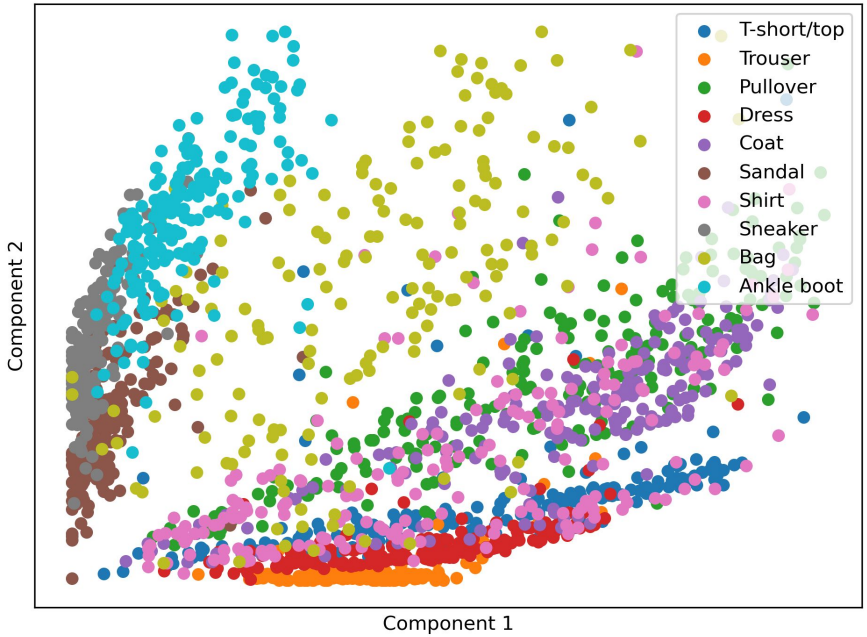


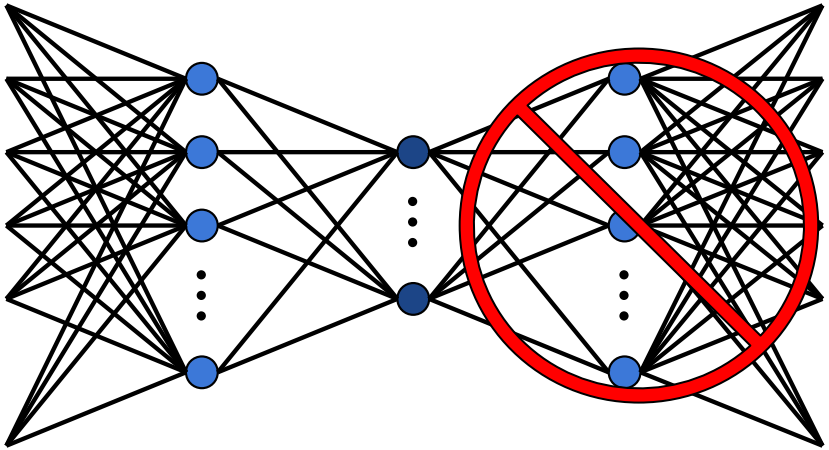
Encode

```
print(X.shape)
Z = model.encode(X)
print(Z.shape)
```




```
(70000, 784)
(70000, 2)
```

Shape of compressed data Z

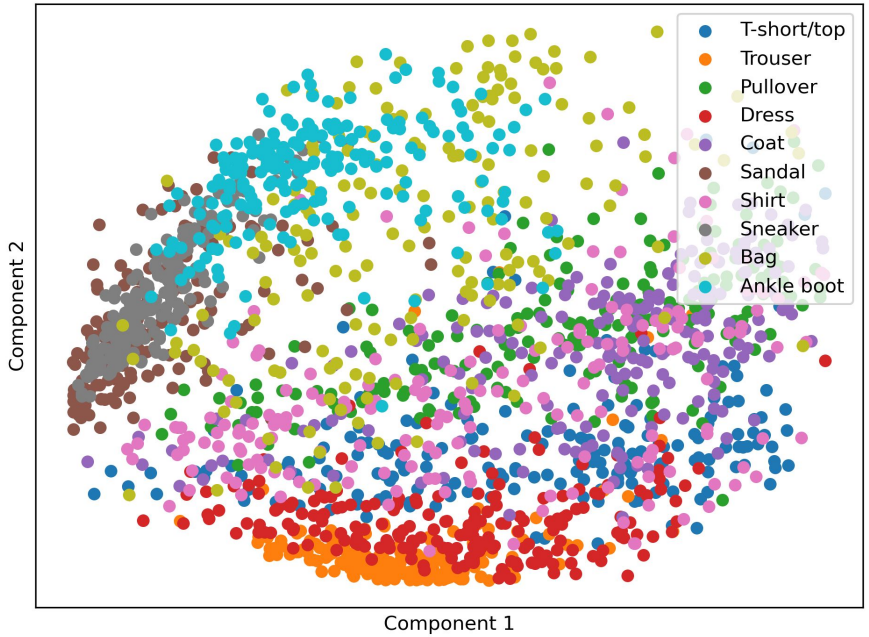


PCA

```
print(X.shape)
pca = PCA(n_components=2)
Z = pca.fit_transform(X)
print(Z.shape)
```

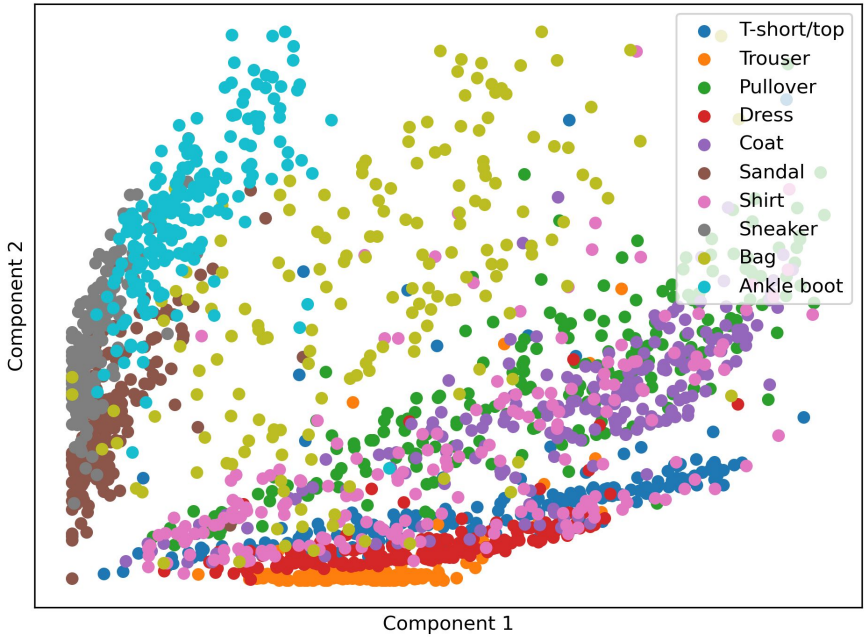
```
(70000, 784)
(70000, 2)
```

Shape of compressed data Z

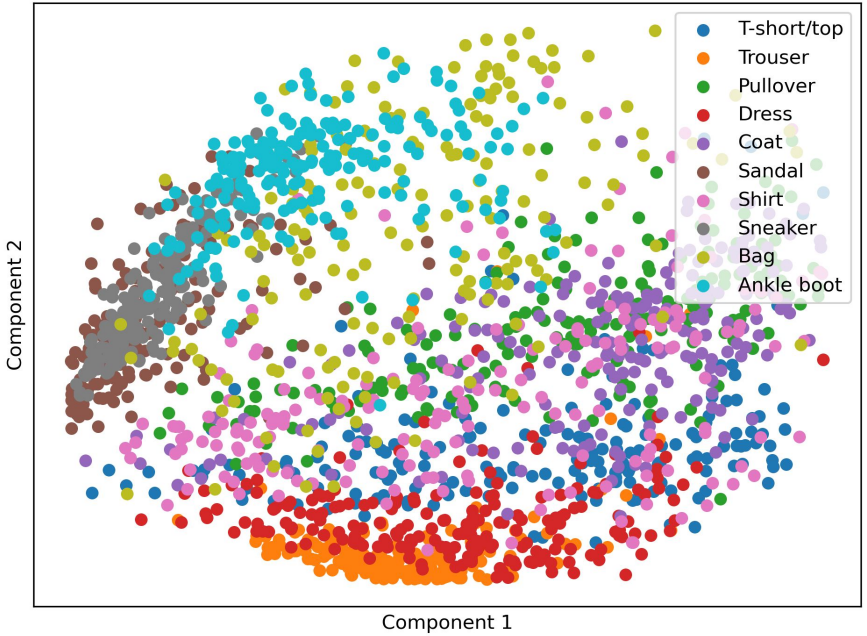


Embeddings - 2D

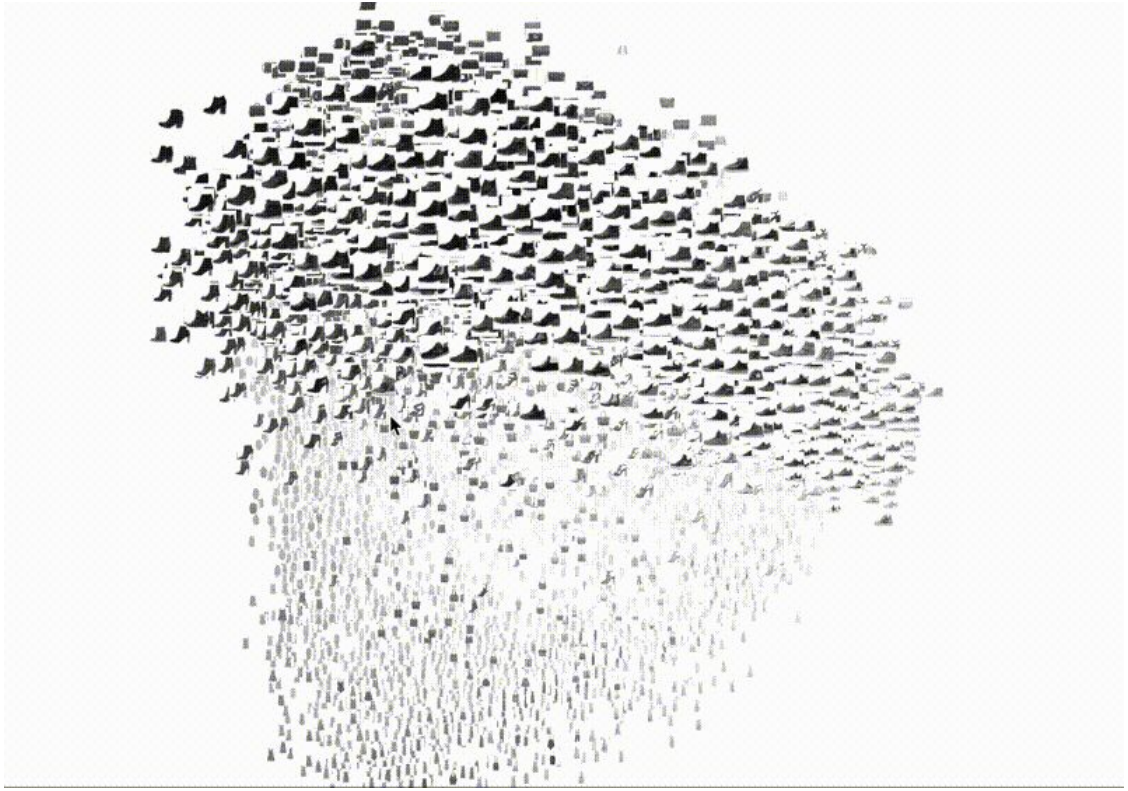
Autoencoder

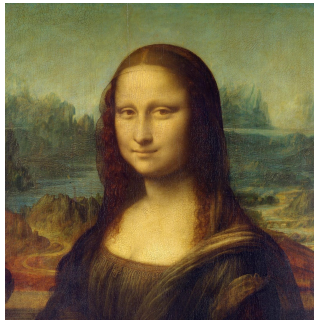


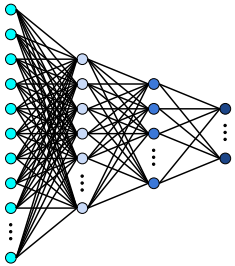
PCA



Embeddings - 3D

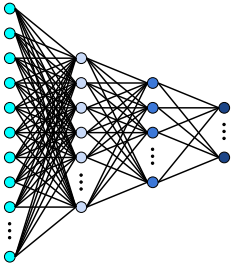






$$\begin{pmatrix} 1.4 \\ 7.5 \\ 2.9 \\ . \\ . \\ . \\ 4.1 \end{pmatrix}$$

$+$



$$\begin{pmatrix} 8.3 \\ 0.8 \\ 5.2 \\ . \\ . \\ . \\ 3.7 \end{pmatrix}$$

$=$

$$\begin{pmatrix} 9.7 \\ 8.3 \\ 8.1 \\ . \\ . \\ . \\ 7.8 \end{pmatrix}$$