



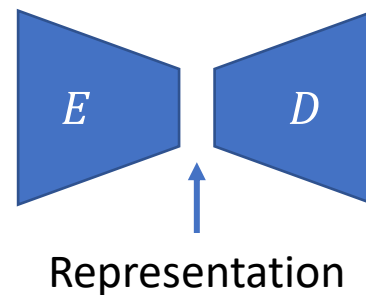
Autoencoders

CNN4N Journal Club

Amr Elsayy

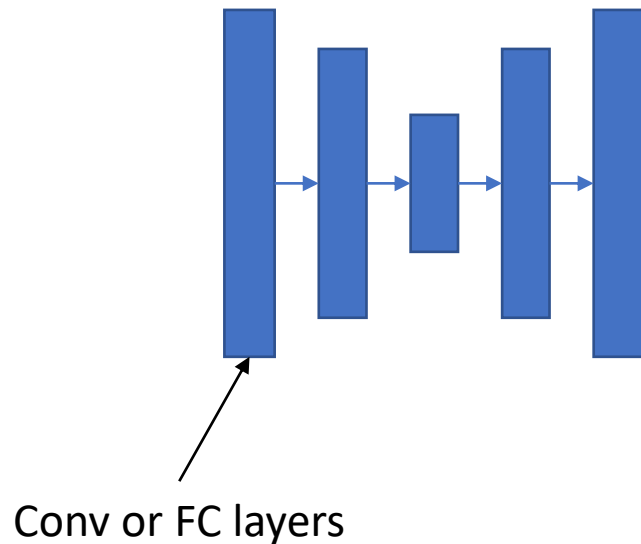
Autoencoders (AE)

- Encoding
- Auto means self-supervision where we do not need labels.
- AE consists of two parts
 - encoder, encoding path, contracting path 
 - decoder, decoding path, expanding path 



Cont.

- Think of E and D as two similar networks with D the inverse of E .
- AE represents an identity mapping that reconstructs data \tilde{x} from itself x .

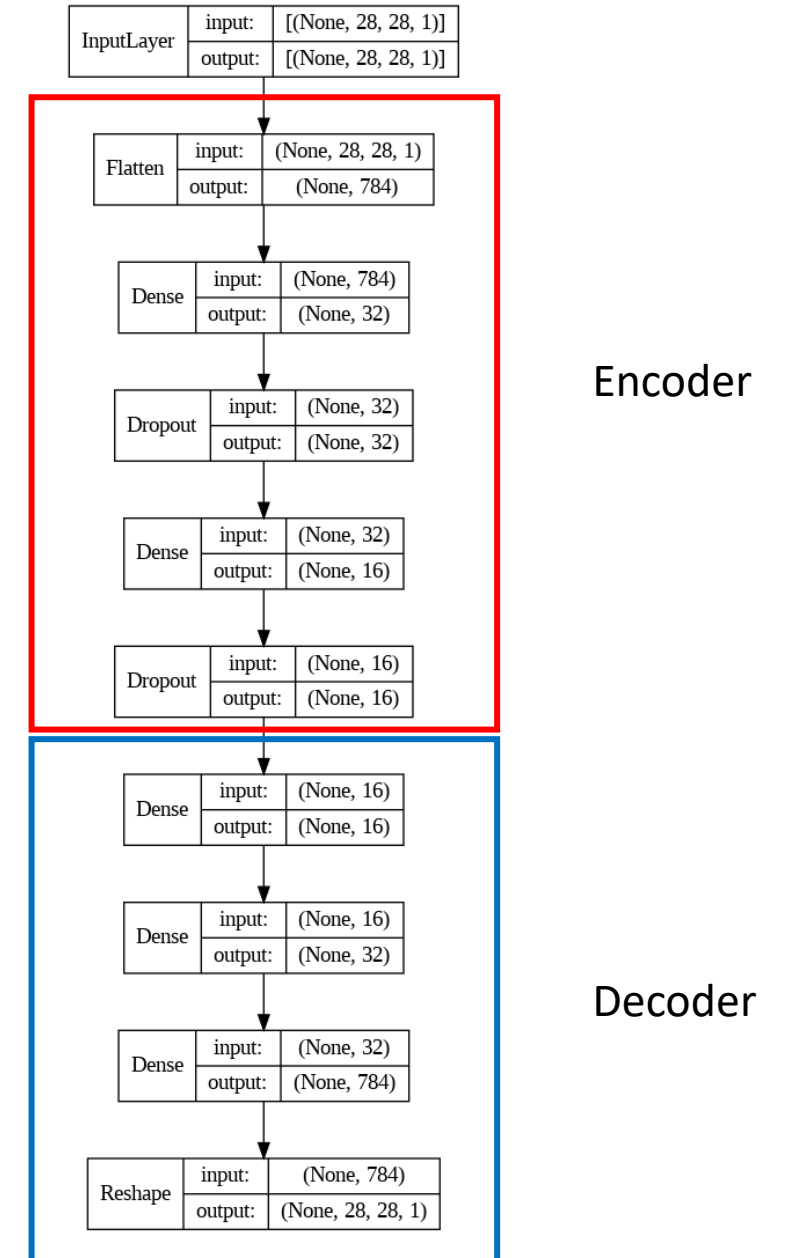
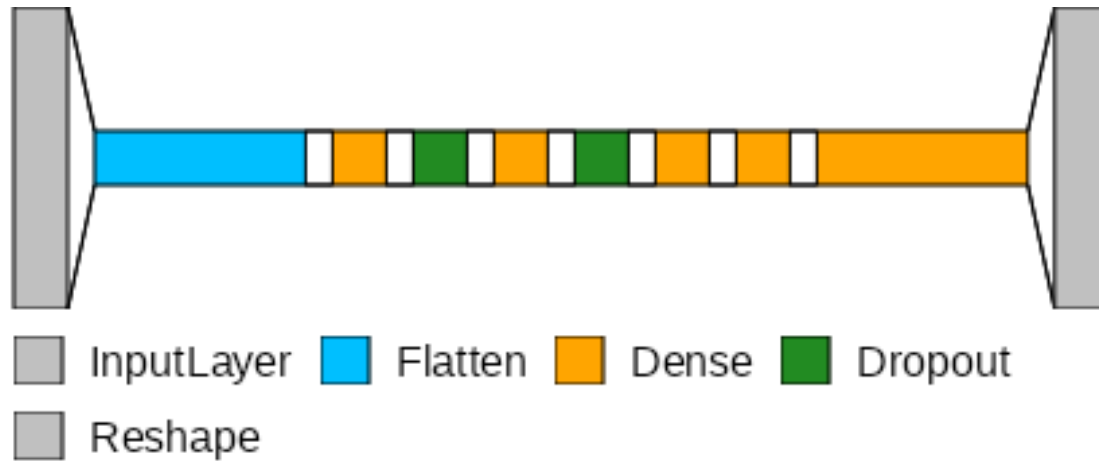


$$D(E(.)) \rightarrow I$$

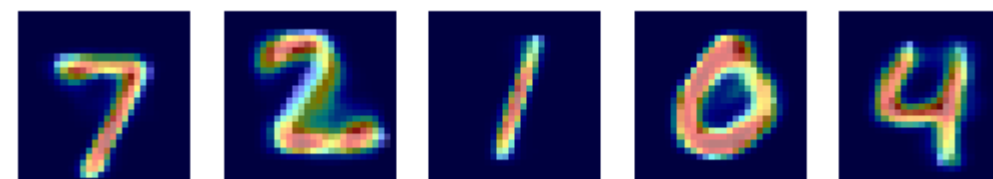
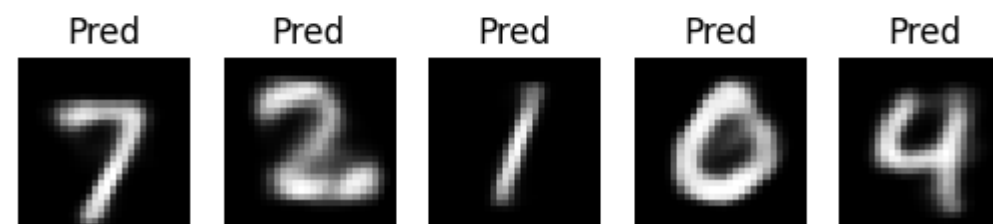
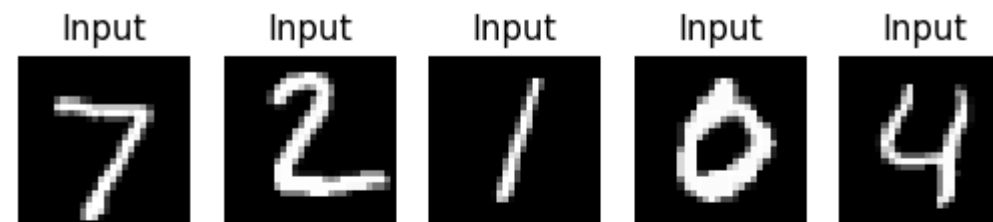
$$\tilde{x} = D(E(x))$$



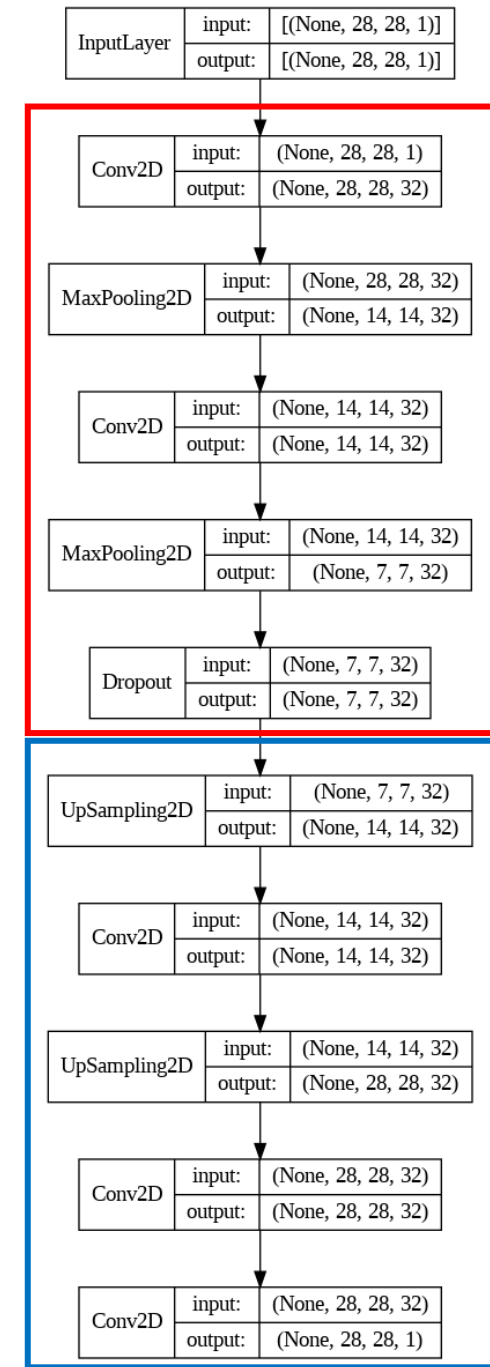
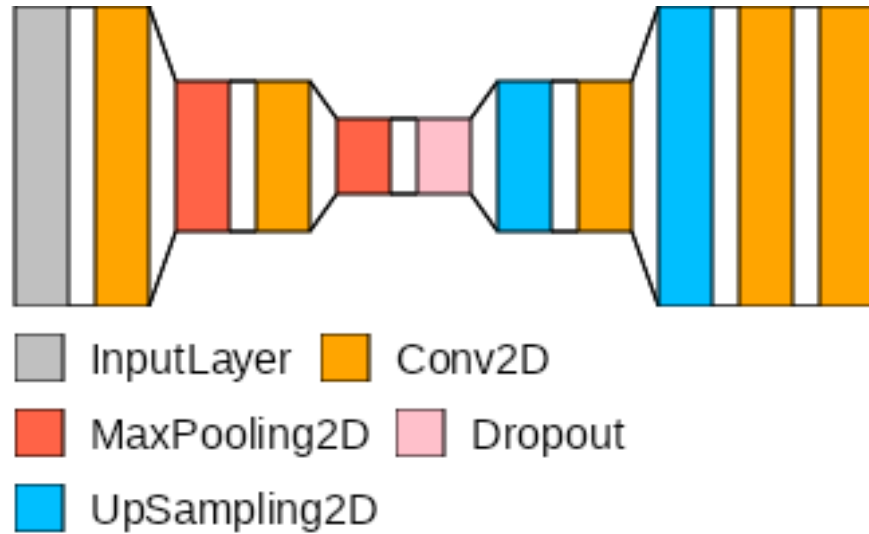
Fully Connected AE (FAE)



Results



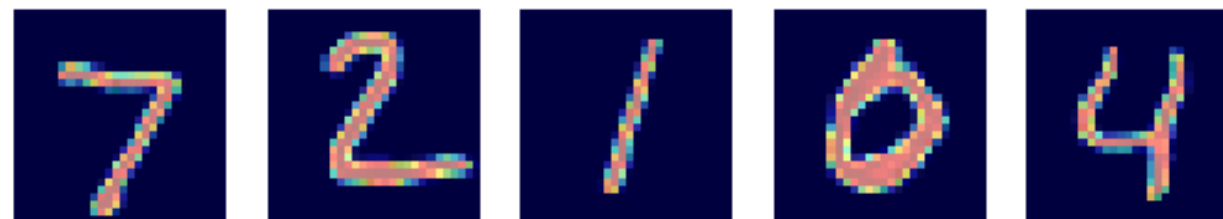
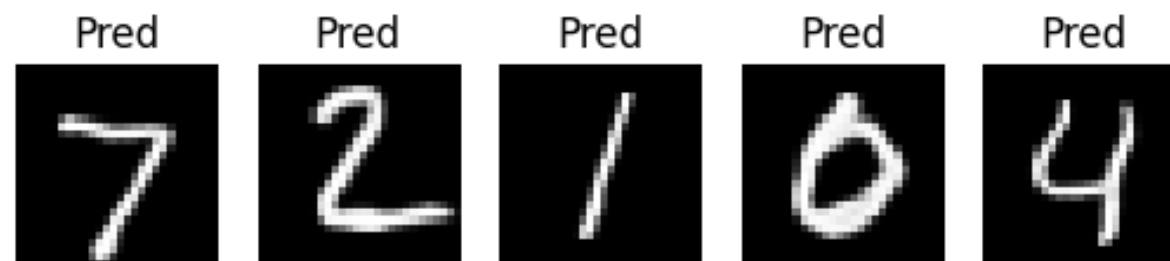
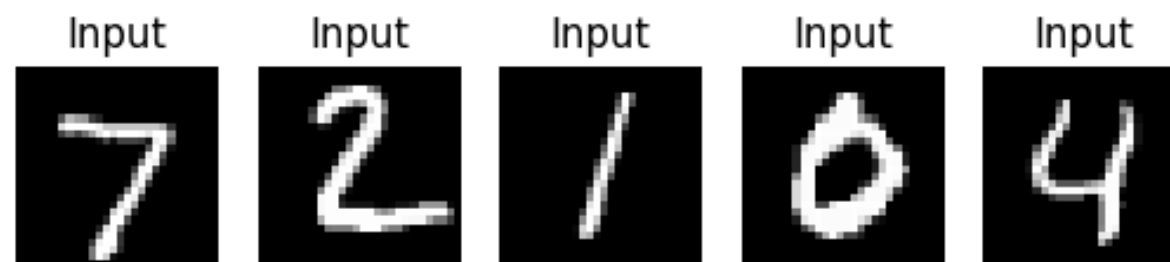
Conv AE (CAE)



Encoder

Decoder

Results



Denoising Conv AE (DAE)

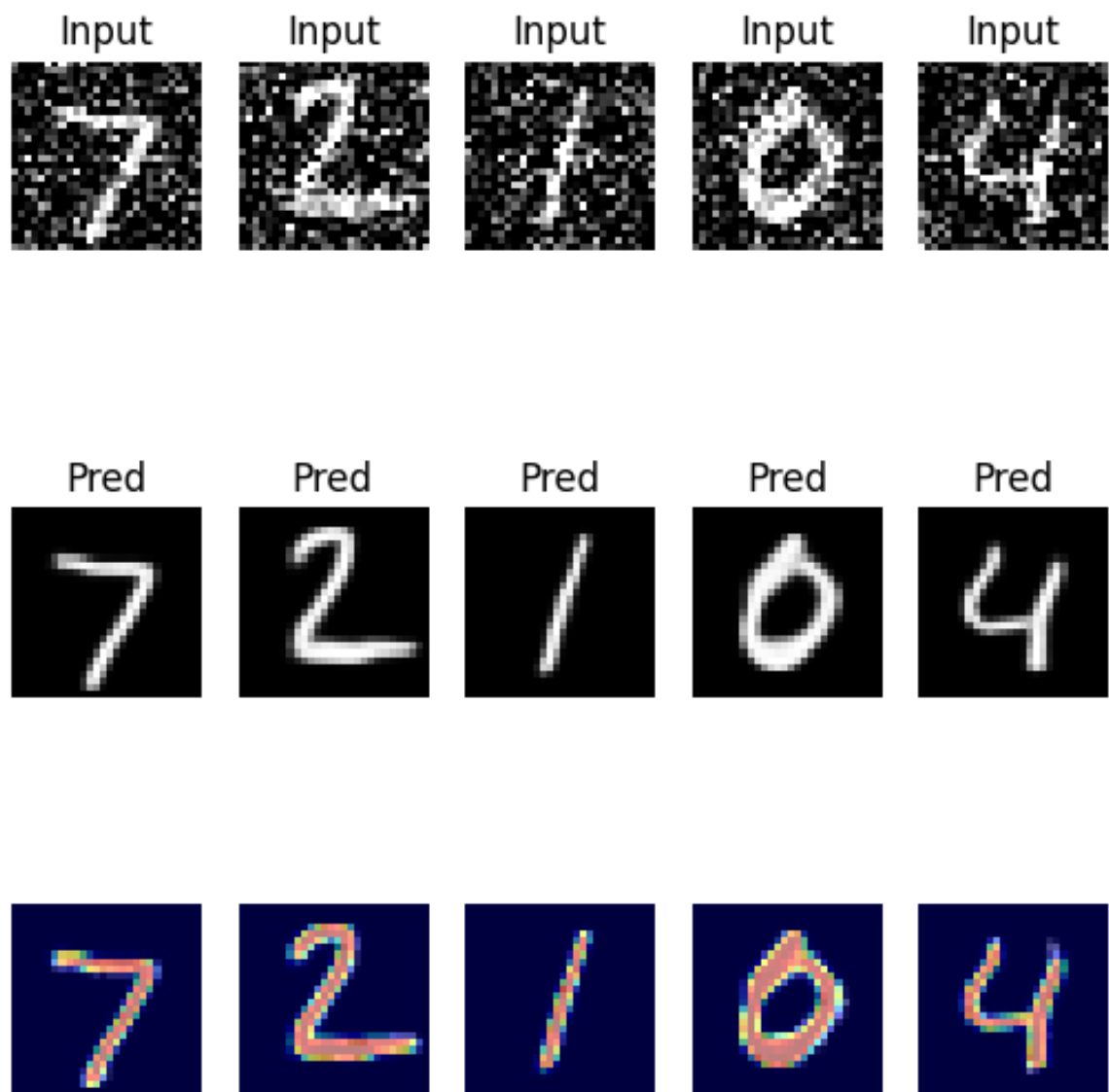
- Think of *DAE* as reconstructing the data \tilde{x} from the noisy data $x + \epsilon$.
- Interestingly, we do not have to change the architecture.
- Just change the input data.

$$\tilde{x} = D(E(x + \epsilon))$$



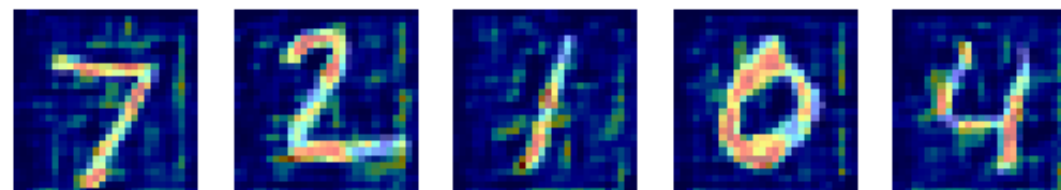
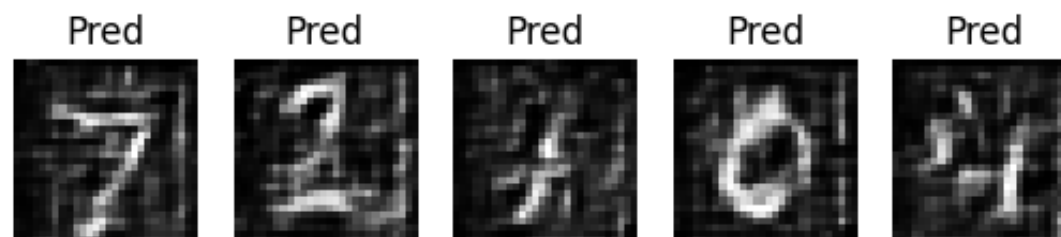
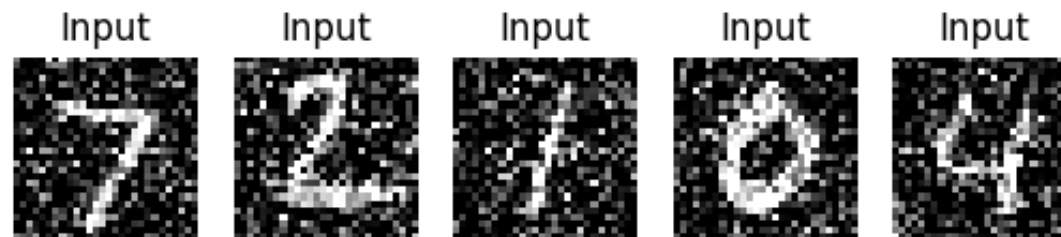
If AE and DAE have the same architecture, so what is the difference?

Results



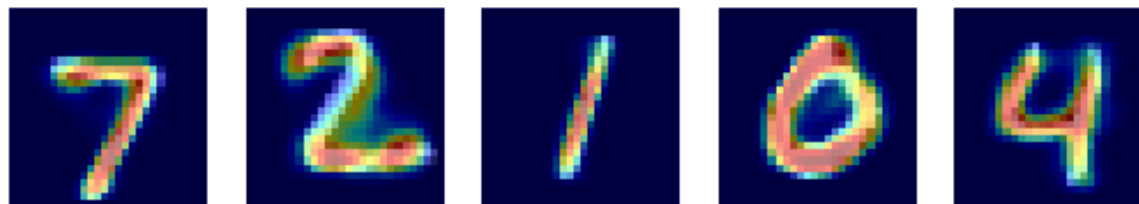
Cont.

What do you think of this?

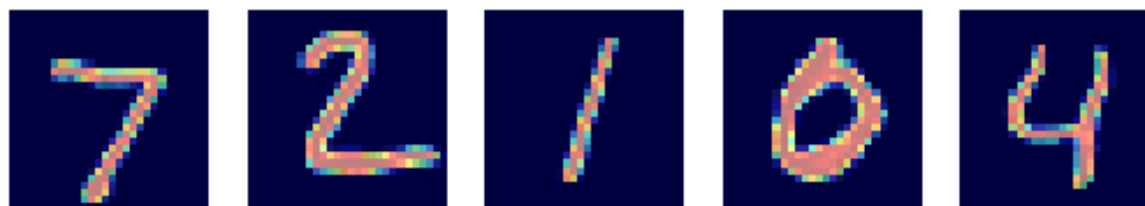


Comparison

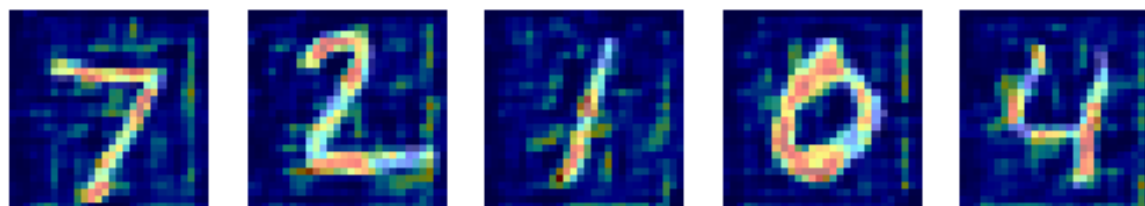
FAE



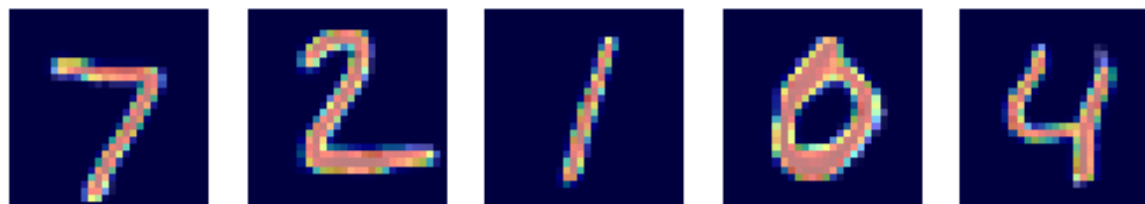
CAE



CAE



DAE



Further Reading

[1] <https://keras.io/examples/vision/autoencoder/>

Thanks 😊