TRL: Training Loss

TSL: Testing/Validation Loss

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|  | 20 epochs | 40 epochs | 60 epochs |
| Vanilla Autoencoder | TRL: 0.0934  TSL: 0.0922  Features very less distinct  Encoded Mean: 8.958076 | TRL: 0.0928  TSL: 0.0917  Features slightly more distinct  Encoded Mean: 8.785289 | TRL: 0.0926  TSL: 0.014  Features even more distinct  Encoded Mean: 8.515391 |
| Sparse Autoencoder | TRL: 0.3331  TSL: 0.8663  Decoded images quite blurry, features more distinct than VAE  Encoded mean: 0.0491325 | TRL: 0.2982  TSL: 0.7205  Decoded images a little less blurry, features slightly more distinct  Encoded mean: 0.05058 | TRL: 0.3001  TSL: 0.6652  Decoded images slightly less blurry, features even more distinct  Encoded Mean: 0.0515 |
| Contractive Autoencoder | TRL: 0.1939  TSL: 0.1914  Decoded images quite blurry, even more than SAE at 20epochs, features have little to no info  Encoded mean: 0.8807 | TRL: 0.1667  TSL: 0.1650  Decoded images still blurry, more than SAE at 20 epochs, features improved but still negligible, can’t find out meaningful info  Encoded Mean: 0.8612 | TRL: 0.1443  TSL: 0.1416  Decoded images now resemble the input and are less blurry, but still it’s more than SAE and VAE  Encoded Mean: 0.7303 |

1. As the number of epochs increase, the features which are identified in the encoder start becoming more distinct.
2. Please refer to the features being displayed in the Colab Notebooks to compare. A final result of 200+ epochs has been done as well to show the increase in the distinctiveness of the features.
3. We lose a lot of detail in the VAE, which is shown by the encoded features.
4. In the case of SAE, the mean encoded value is quite less, but then the decoded images were blurry in the case of 20 epochs. With increasing number of epochs the blurriness reduced.
5. As opposed to the encoded features in VAE, we can somewhat discern patterns related to the handwritten digits in the encoded features of SAE.
6. The training loss in SAE is more than VAE due to the regularization loss and KL divergence term.
7. In the case of CAE, in 20 and 40 epochs, the decoded images were quite blurry, even more than those during the 20 epochs of SAE.
8. In 60 epochs of CAE the images are still blurry, but it has reduced considerably.
9. Meaningful results would be obtained in CAE on increasing epochs(In code, made one result for 200+ epochs).

Also, when input is some noisy image, the results aren’t satisfactory at all, the reason being that noisy images aren’t used as training set, and thus the network doesn’t know how to remove the noise. This can be done using denoising autoencoder.