Winged Horses with an Autoencoder

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Abstract

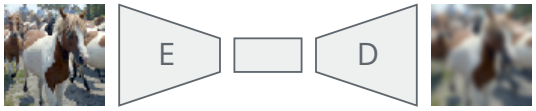
This paper proposes using an autoencoder to generate images that look like a Pegasus. I train an autoencoder, and condition it on birds and horses, identified by the annotated class labels for each image. This gives two latent codes via the encoder network which I linearly interpolate between to give the final outputs via the decoder network. This abstract should be short and concise, about 8-10 lines long.

1 Methodology

The method is to train an autoencoder [1], by minimising the squared L2 loss:

$$\mathcal{L}_{\text{AE}} = \mathbb{E}_{\boldsymbol{x} \sim p_{\text{data}}}[\, \|\boldsymbol{x} - D(E(\boldsymbol{x}))\|^2] \tag{1}$$

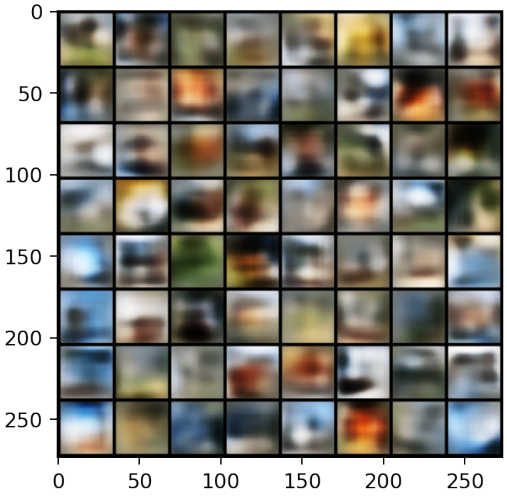
The methodology should be very concise and the mathematical notation should try to follow the ICLR conference guidlines. If you are not familiar with LaTeX, you can use this online LaTeX equation editor. You may want to include an architectural diagram:



The architectural diagram above was created using Inkscape and exported to a PDF. This was then uploaded to the figures directory on the left.

2 Results

The results look very blurry, where the best batch of images looks like this:



From this batch, the most Pegasus-like image (with quite a stretch of the imagination) is:

3 Limitations

It's very difficult to see anything that looks like a Pegasus. In the future, this could be improved by training for more than 10 epochs, although this was not possible due to the time constraints.

Bonuses

This submission has a total bonus of +3 marks (a penalty), as it is trained with STL-10 at the full 96x96 pixels, and the Pegasus has a dark body colour.

References

[1] Mark A Kramer. "Nonlinear principal component analysis using autoassociative neural networks". In: *AIChE journal* 37.2 (1991), pp. 233–243.