A Variational Autoencoder to Generate Winged Horses

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Abstract

This paper proposes using a convolutional variational autoencoder to generate winged horse (Pegasus) images. To achieve this a variational autoencoder is trained on a images of horses and birds to learn a distribution over the data that permits sampling. The experiments performed suggest that this approach is poor at producing these images and produces blurry images that slightly resemble winged horses.

1 Methodology

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

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

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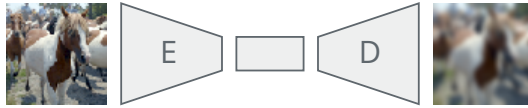
The architectural diagram above was created using Inkscape and exported to a PDF. This was then uploaded to the figures directory on the left.

2 Results

The results look very blurry, where the best batch of images looks like this:
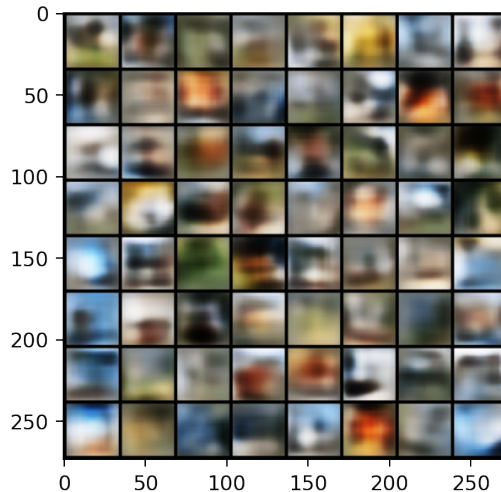
From this batch, the most Pegasus-like image (with quite a stretch of the imagination) is:

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 -4 marks (a penalty), as it is trained only on CIFAR-10, 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.