Deep Learning – Week 4

Common use cases of unsupervised learning:

* Find the most relevant features.
* Compress information (e.g. tke imges of faces, compress it into a few values that represent the face, transfer ito over the web, and reconstruct at the other end.).
* Retrieval of similar images.
* Generate new data -
* Explore high dimensional data –

Autoencoders

The general concept is to take data in some high dimensional space and project the data into a new space from which it can be accurately restored.

Encoder:

Decoder:

Imange2image: data -> convolutional later -> pooling -> dense representation -> unpooling -> convolutional layer -> date

Sparse autoencoder: Use L1 regularisation in representation layer on the activations leading to the features becoming sparse.

Redundant autoencoder: dropout on the feature representations to remove redundant features. Features cover for each other.

Denoising autoencoder: Perform dropout on the input data -this forces the model to extrapolate, i.e. guess what there must be in the image. This means cannot just run identity mapping – i.e. just copy the input. Stable for small distortions in data because can deal with missing parts in image.

Use an autoencoder for initialisation, i.e. pre-training a model. The encoder section of an autoencoder is similar to an image classifier network, one just needs to put a dense softmax layer.

Stochastic Neighbourhood Embedding that can embed the larger dimensional data into the small dimensional size in order to visualise.

Image morphing wit autoencoders: take an image in hidden representation and finfd vector that applies meaningful transformation, e.g. adding smile to face. Generative adversarial networks are the cutting-edge.

Natural Language Processing

1. Pre-processing/filtering: remove unnecessary elements.
2. Tokenisation: split text into tokens from a dictionary.
3. Extract features from text
   1. Bag of words: count the number of times a word is present. Extract a very large feature vector. This ignores word ordering.
   2. Batch representation for words which is more compact. Word embeddings/many-fold learning. NB. Embeddings map data into a lower dimensional space while preserving structure.

To Look Up:

* Gradient boosting
* Imagenet and Model Zoo
* Stochastic Neighbourhood Embedding
* Cross-entropy
* Generative adversarial netoworks
* Pixelwise Euclidean distance