**2016- Unsupervised learning using generative adversarial training and clustering**

Unsupervised learing approach by two components-

1. a deep hierarchical feature extractor
2. a more traditional clustering algorithm (k-Means clustering)

3 data sets are used- CIFAR-10, CIFAR-100 and STL-10.

To overcome the difficulties of labelling large amounts of training data, effort has gone into the development of semi-supervised and unsupervised learning techniques (Unsupervised learning techniques helps to learn representations that are interpretable, easily transferable to novel tasks, etc. purely from the unlabelled data).

k-Means clustering is a simple method that groups input features into different clusters.

GAN: - Generative Adversarial Networks (2014) are composed of two components; the generator, G(.), and the discriminator, D(.). The generator maps a latent encoding to the data space, while the discriminator distinguishes between samples generated by the generator and real data. The generator is trained to fool the discriminator, while the discriminator is trained to not get fooled by the generator.

InfoGAN: - InfoGAN has the ability to group data into multiple groups automatically.

Unsupervised learning with k-Means ++ {we trained InfoGAN to automatically group the CIFAR-10 images into 10 categories, we found that while InfoGAN was able to group the images into different groups, the groups did not correspond to object category-level groupings.} (image in Research paper fig.2)

Conclusion: - In situations where there are limited amounts of labelled training data and large amounts of unlabelled data, adversarial training has the potential to outperform supervised learning.