

Artificial Neural Networks and Deep Learning

Week 7

Generative models

Generative models

Learning underlying patterns in data such as to *generate* new data

Two classes of machine learning

Supervised

When you **have** outcomes



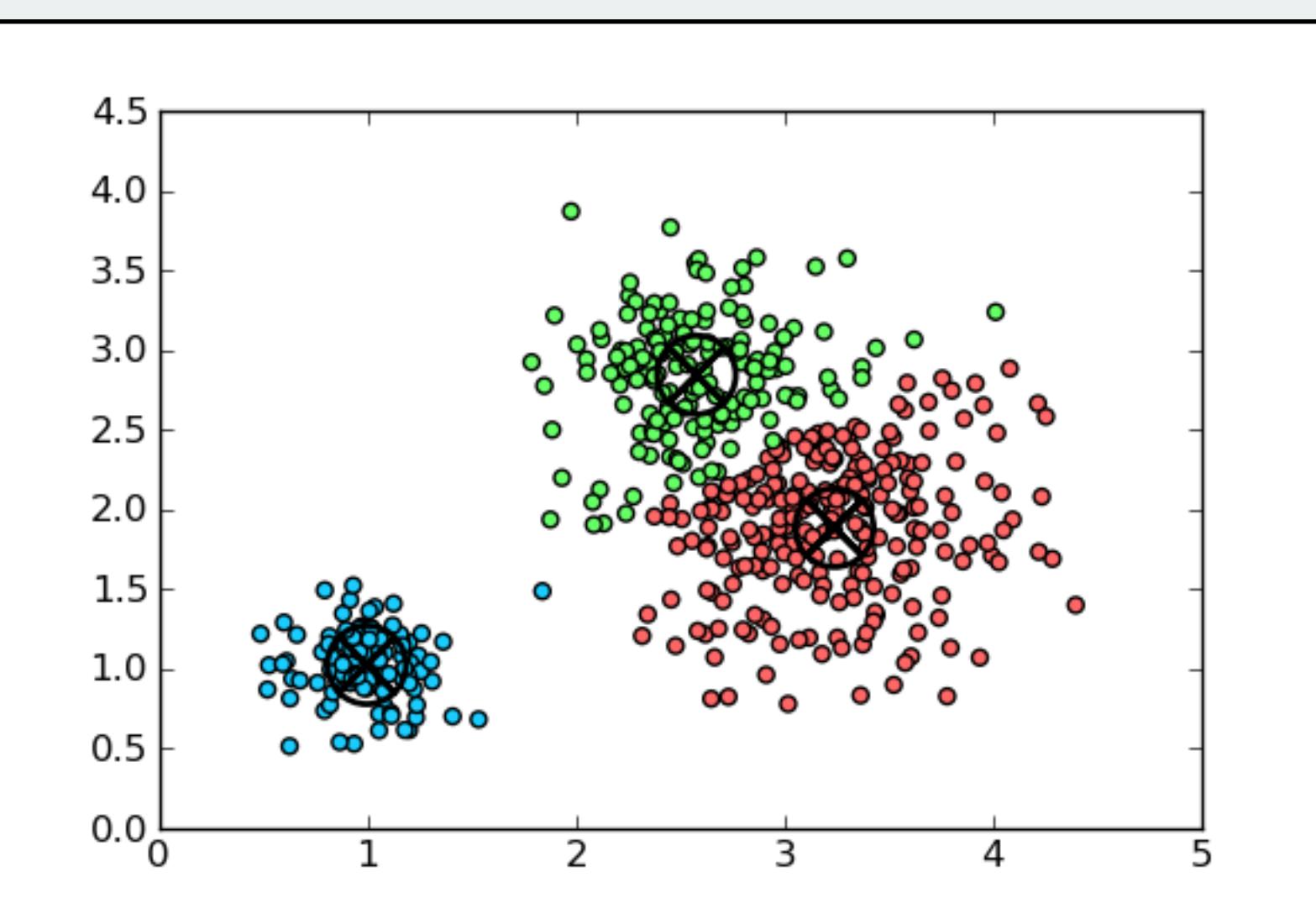
Unsupervised

When you **don't have** outcomes



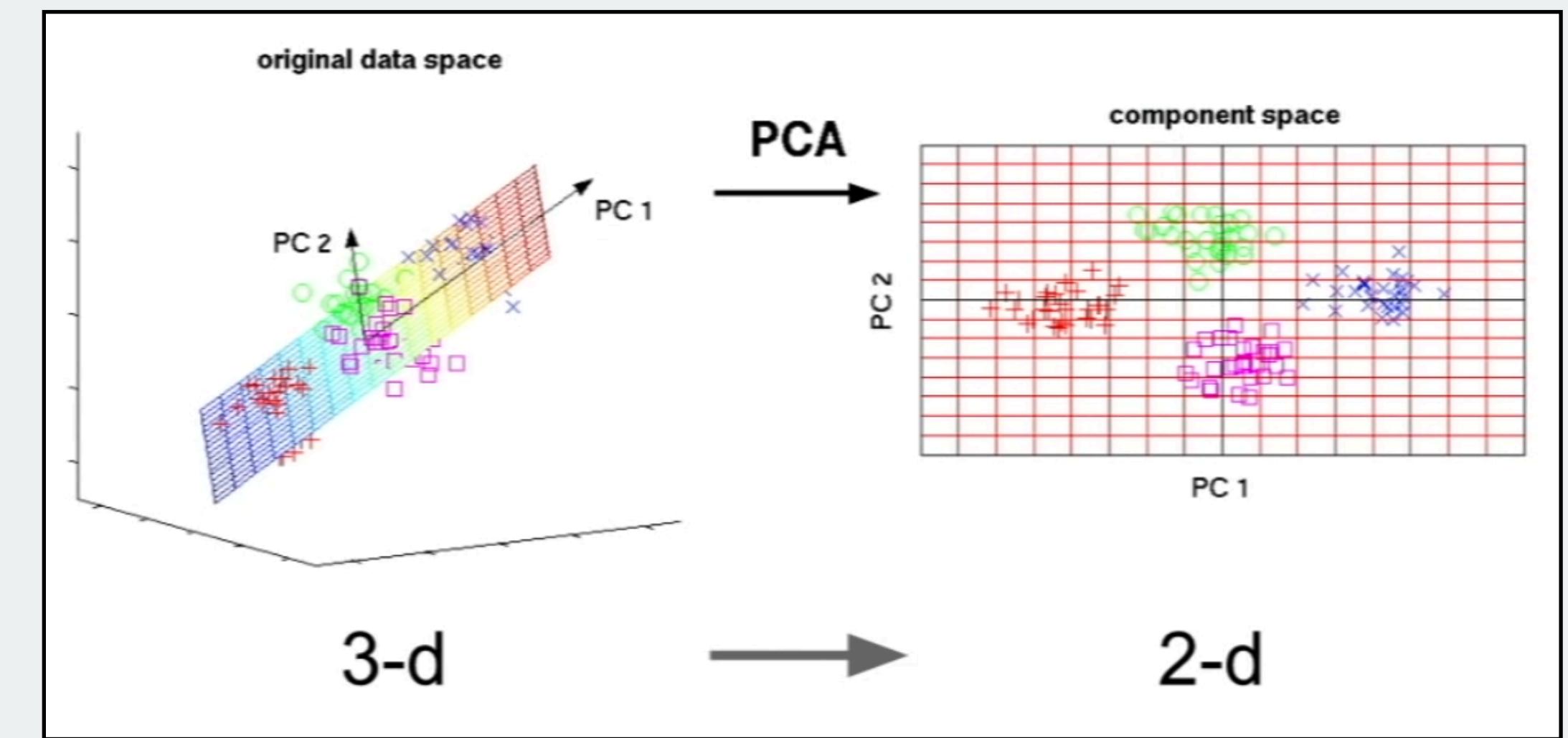
Unsupervised learning: learning **underlying patterns** in data

- Clustering



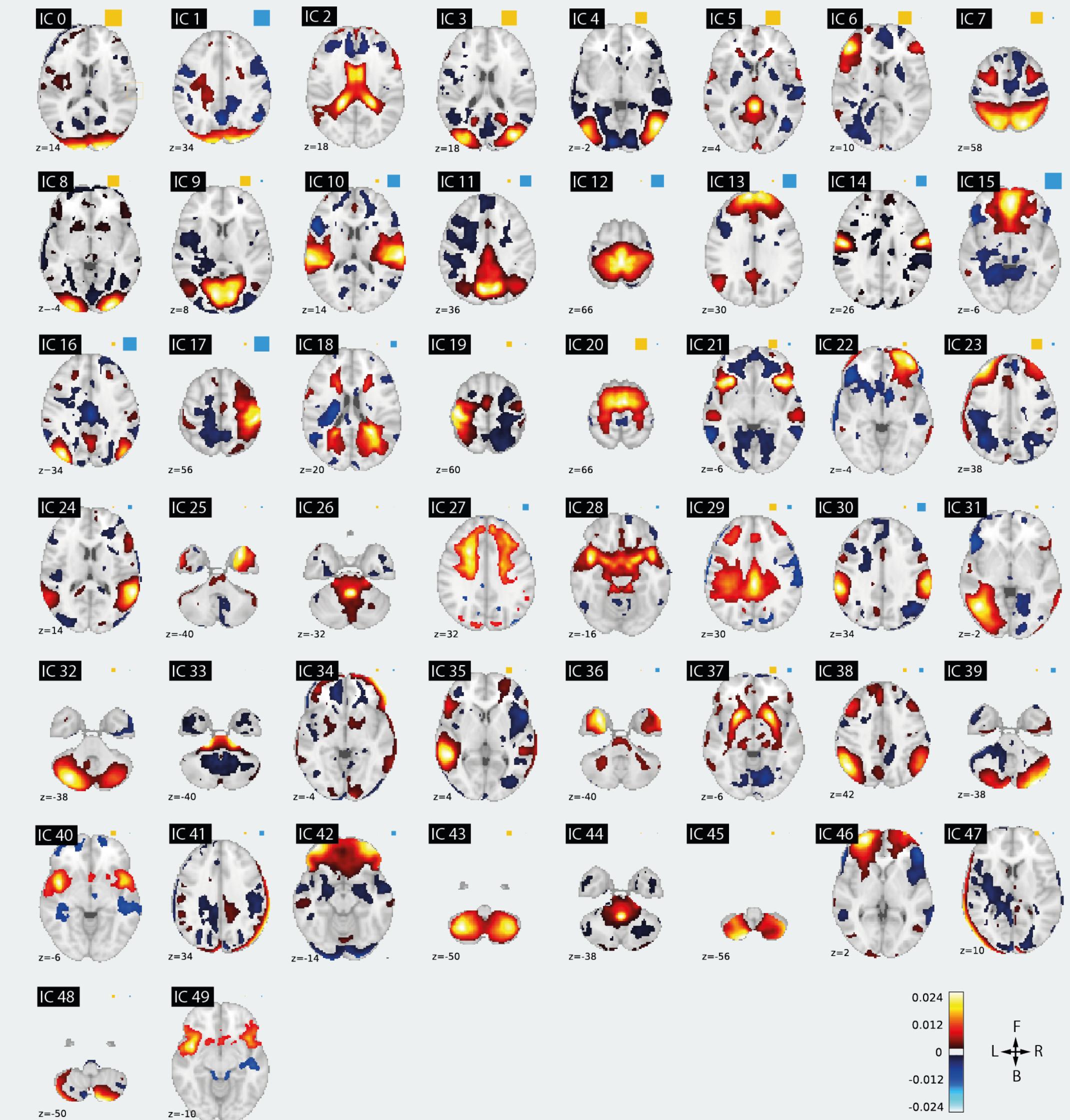
Unsupervised learning: learning **underlying patterns** in data

- Clustering
- Latent feature representation



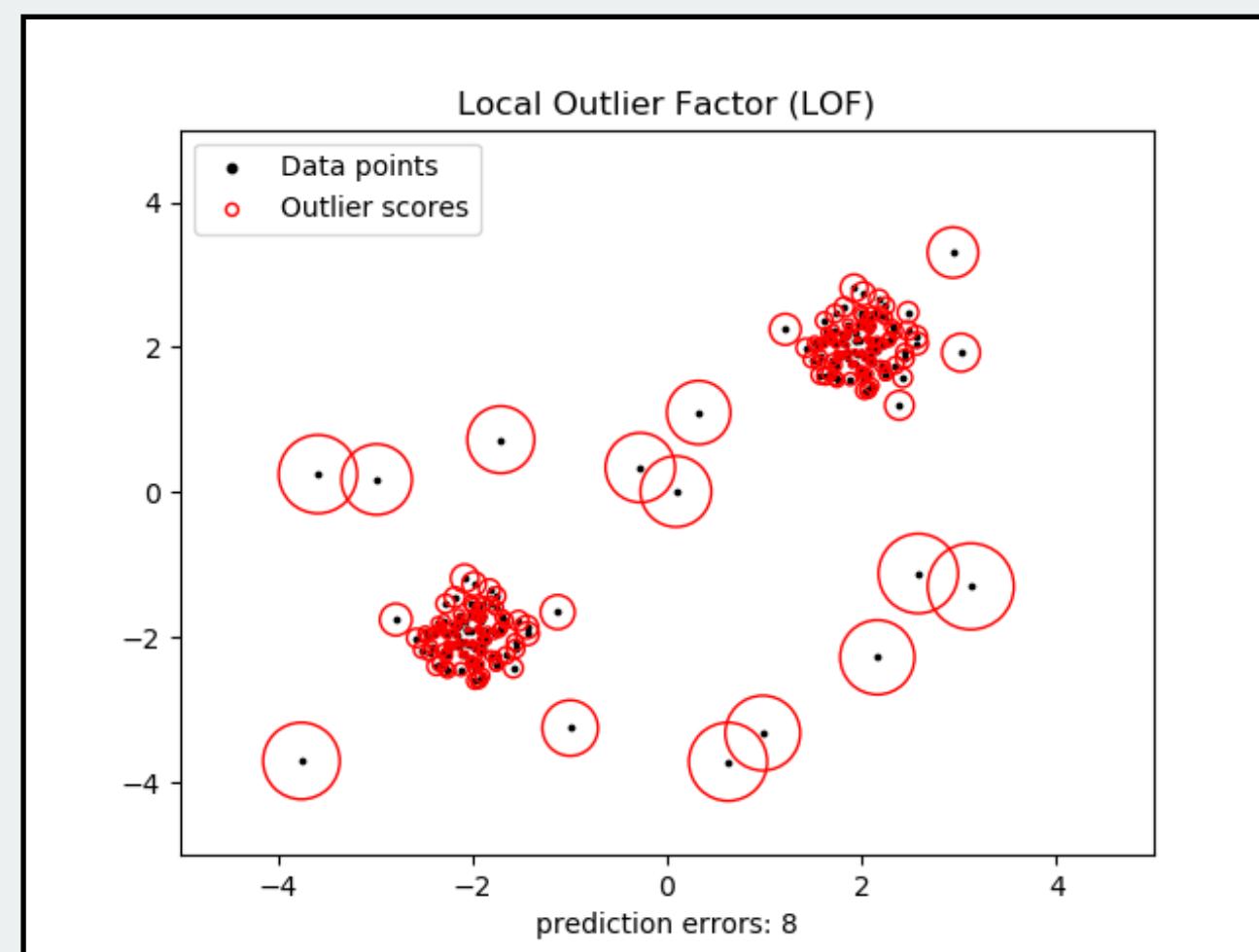
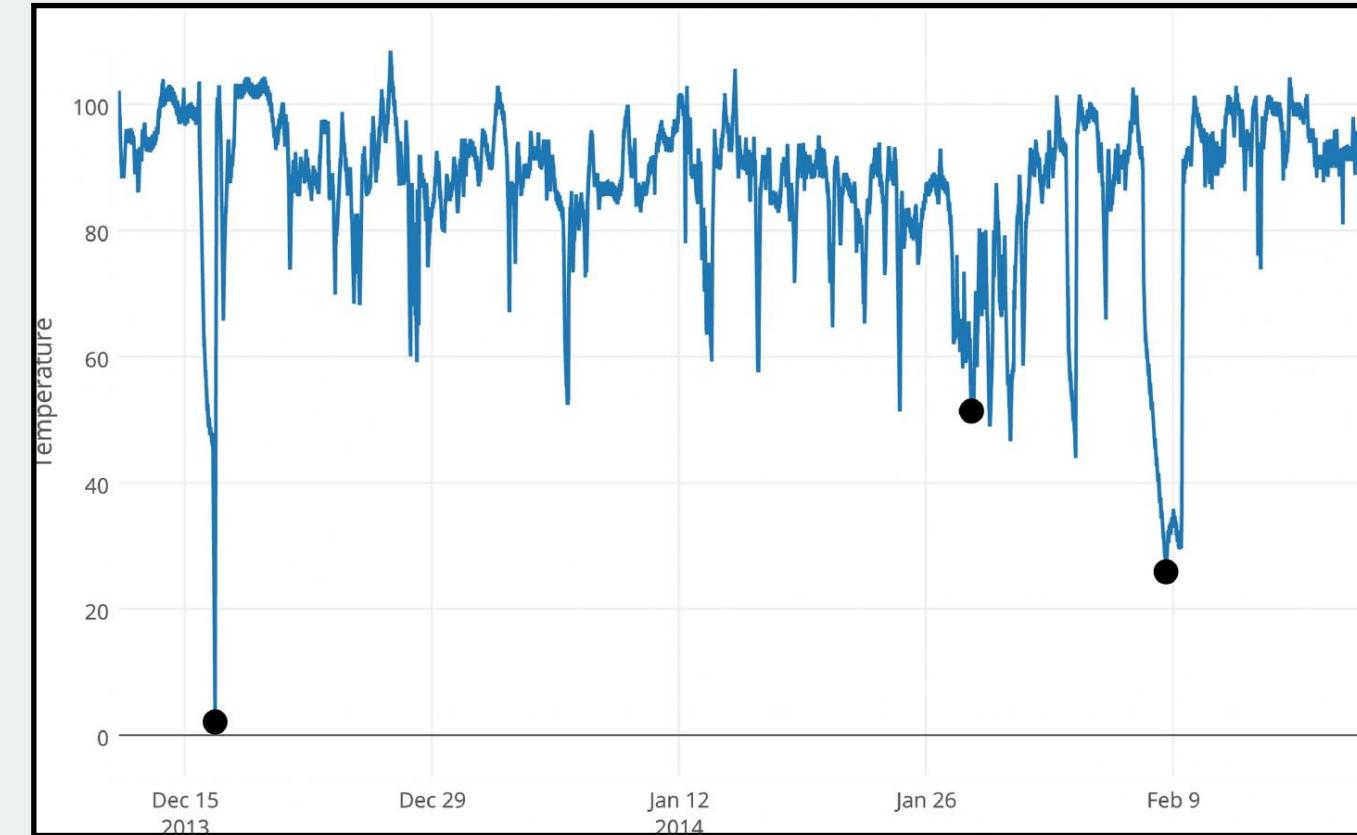
Unsupervised learning: learning **underlying patterns** in data

- Clustering
- Latent feature representation
- Signal separation



Unsupervised learning: learning **underlying patterns** in data

- Clustering
- Latent feature representation
- Signal separation
- Anomaly detection



Unsupervised learning: learning **underlying patterns** in data

- Clustering
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Lots of applications
with neural networks

Unsupervised learning: learning **underlying patterns** in data



→ $[-0.92, 0.97, -0.99, 0.42, \dots, -0.46]$

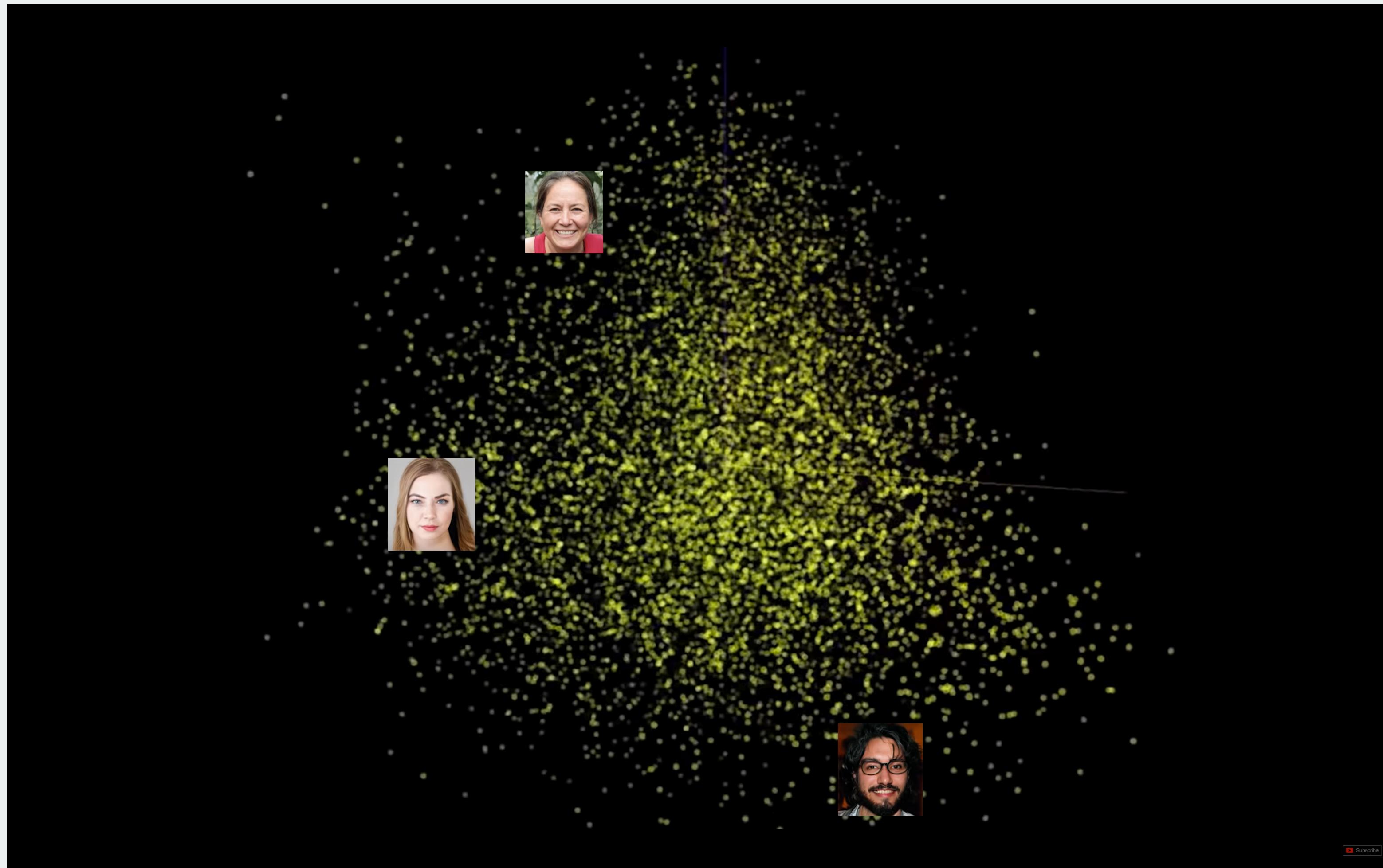


→ $[0.56, -0.42, -0.03, -0.33, \dots, 0.03]$

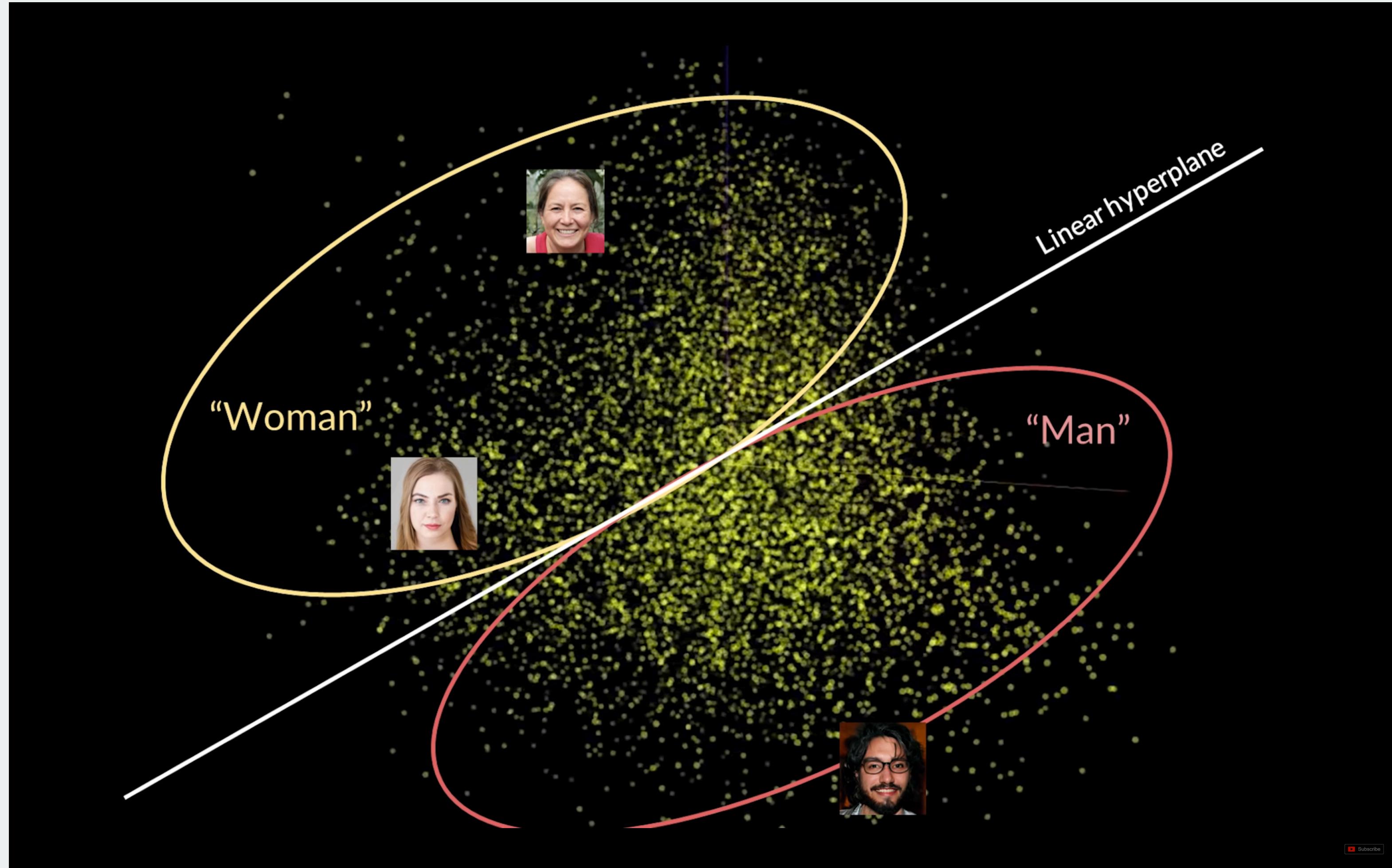


→ $[-0.18, 0.86, -0.96, 0.83, \dots, -0.63]$

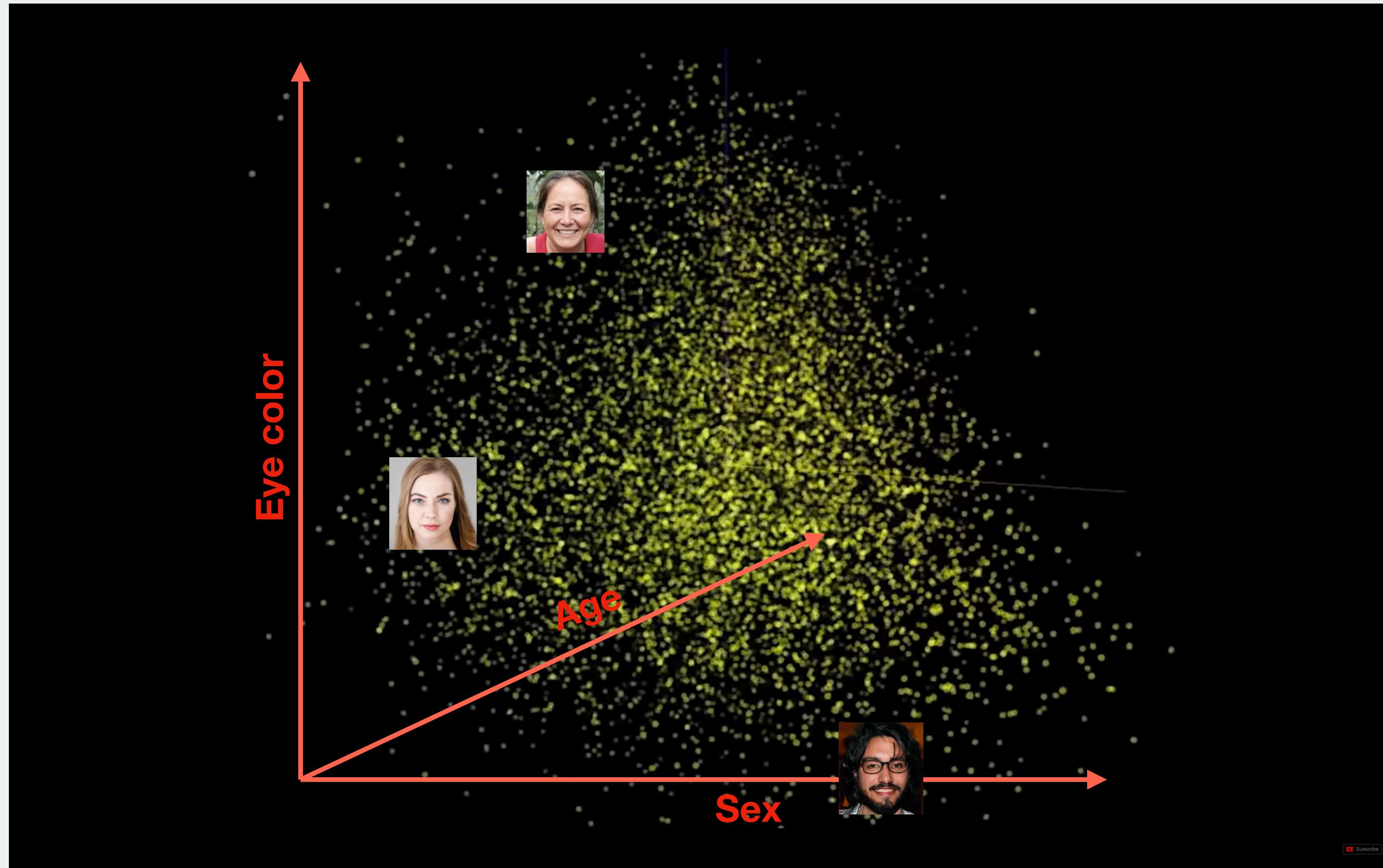
Unsupervised learning: learning **underlying patterns** in data



Unsupervised learning: learning **underlying patterns** in data



Unsupervised learning: learning **underlying patterns** in data



And now you can educate yourself

"Variational Autoencoders"

15 minutes

"Learn how to morph faces with a
Generative Adversarial Network!"

25 minutes

Stuff I haven't told you about

- Convolutional RNN
- Graph CNN
- Bidirectional LSTM
- Object detection
- Image segmentation
- Embeddings (word, face, etc.)
- Reinforcement learning
- One shot learning
- Multitask-learning
- Attention
- Neural style transfer
- DeepDream
- Visualization
- ...