

Linear Algebra for Computer Science

Lecture 1b

Applications

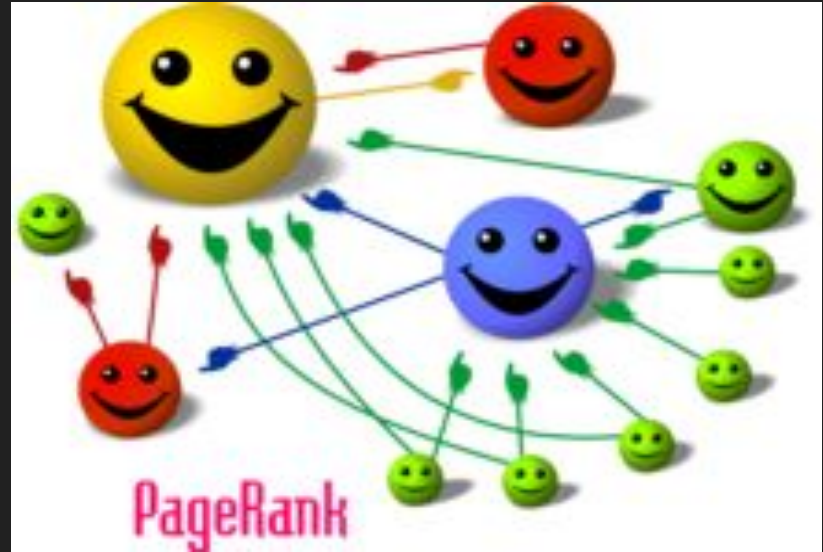
Pagerank



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Google

PageRank



Computer Graphics



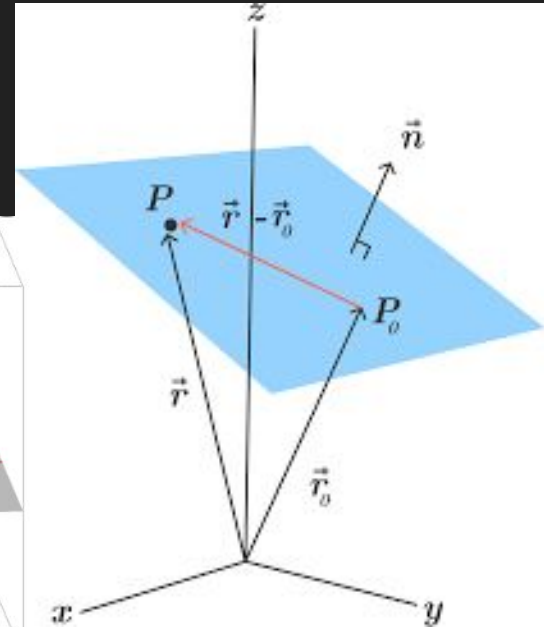
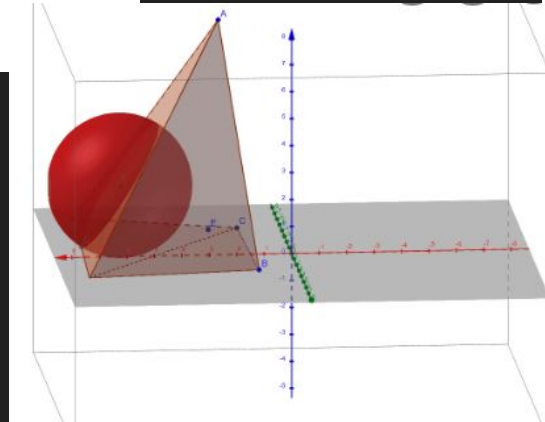
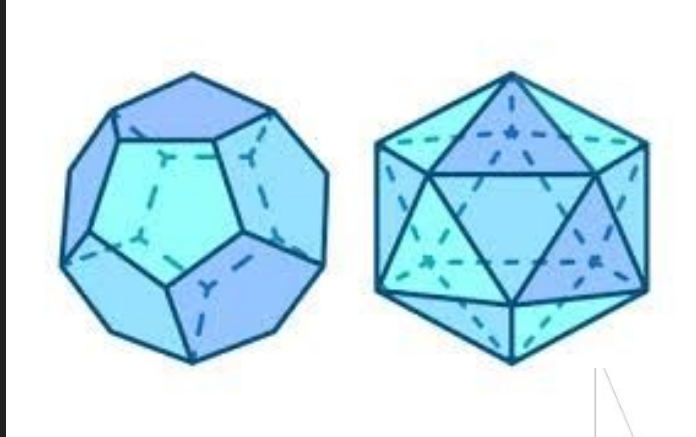
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Linear Algebra & Geometry



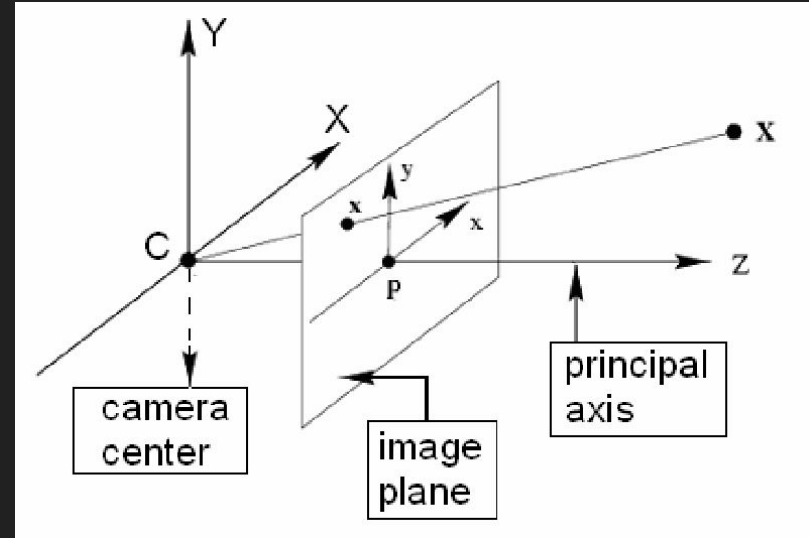
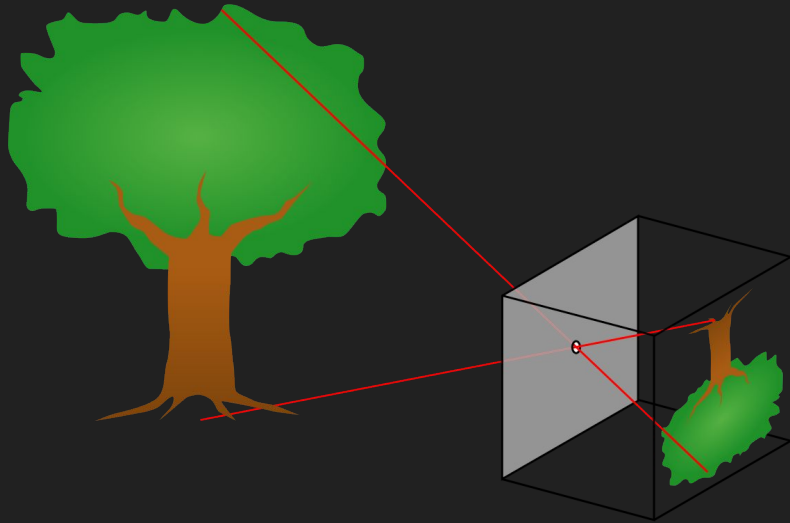
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Computer Vision: Camera Geometry



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$$\mathbf{x} \equiv \mathbf{P} \mathbf{X}$$

Augmented Reality



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Augmented Reality



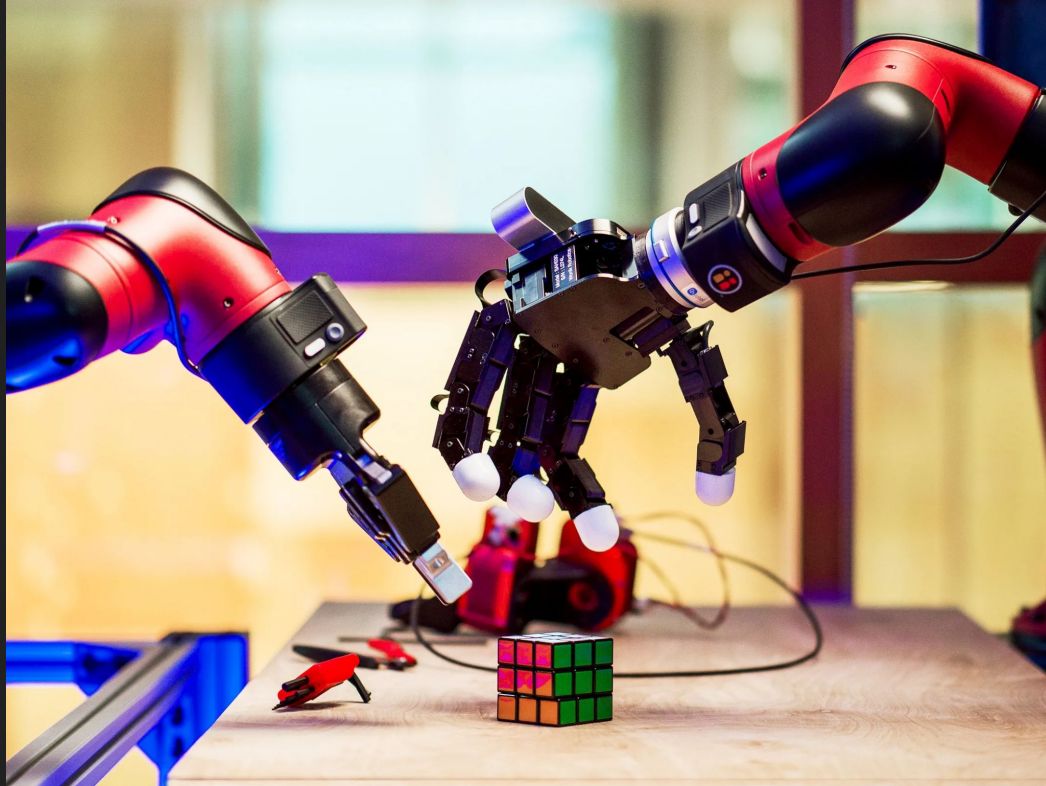
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Robotics



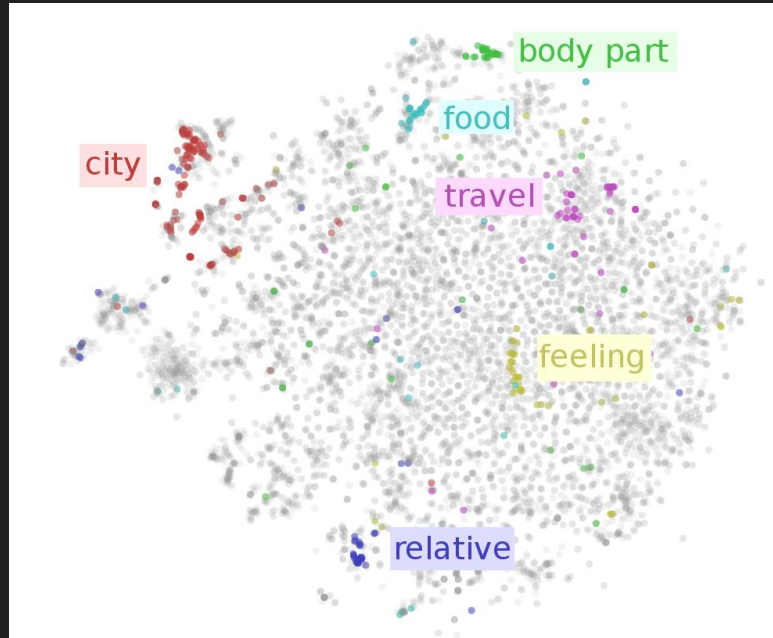
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Word Embedding



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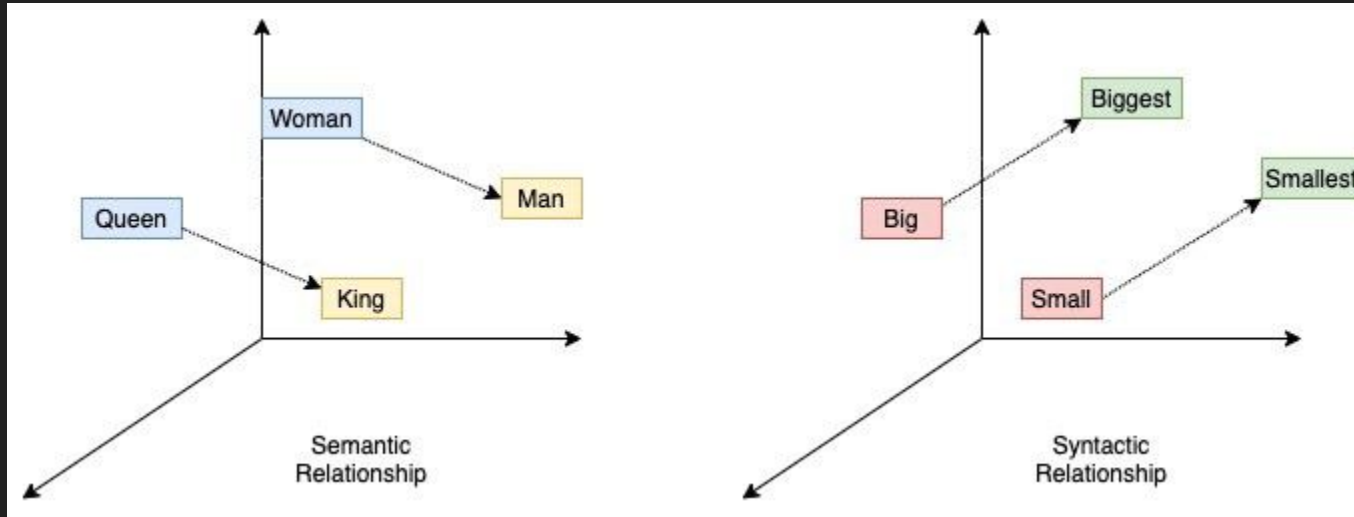


<https://ruder.io/word-embeddings-1/>

Word2Vec



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<https://towardsdatascience.com/word2vec-research-paper-explained-205cb7eccc30>

Vectorized Code



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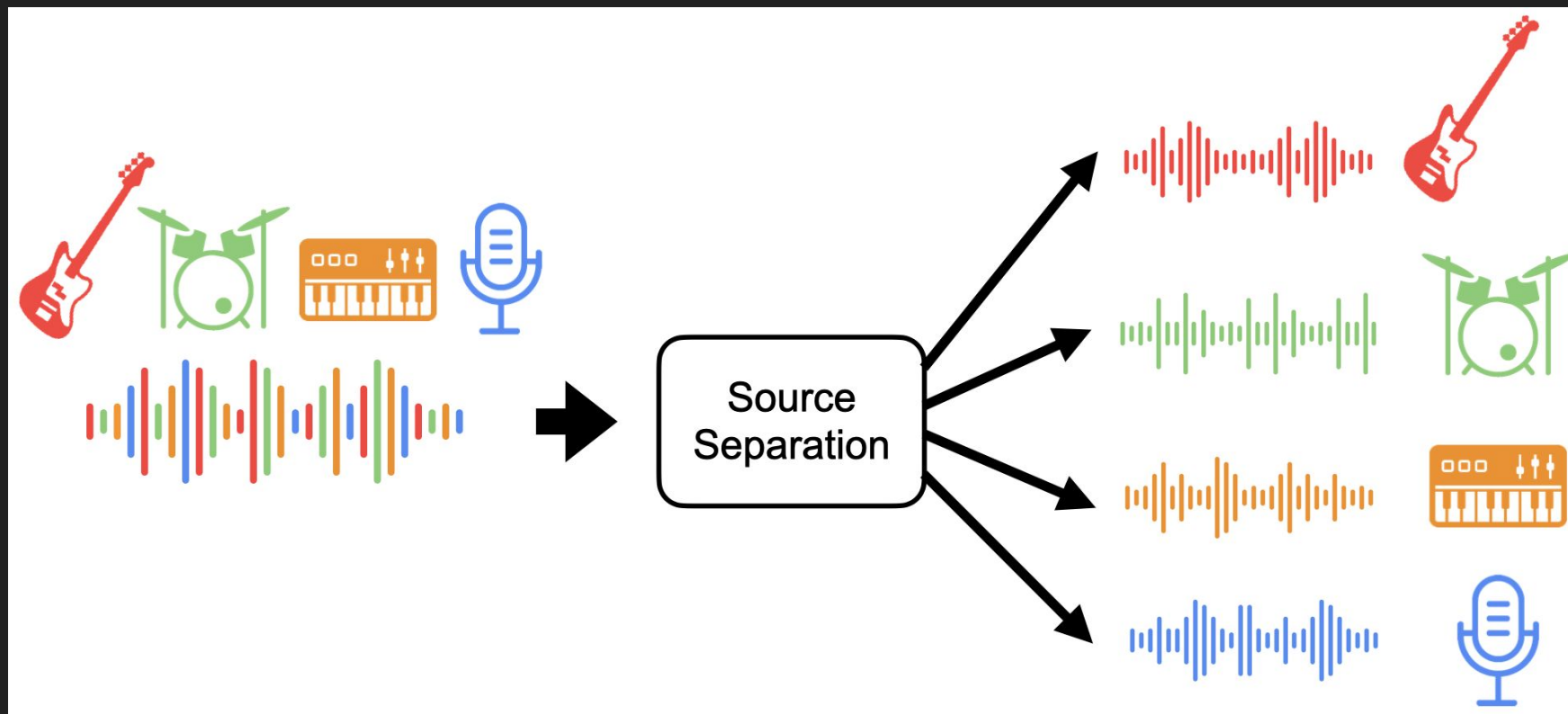
A: m by n matrix

```
C = np.zeros ( (m,m) )  
for i in range (n) :  
    C += A[:,[i]] @ A[:,[i]].T
```



```
C = A @ A.T
```

Source Separation



Source Separation



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<https://youtu.be/n7y2rLAnd5I>

Source Separation



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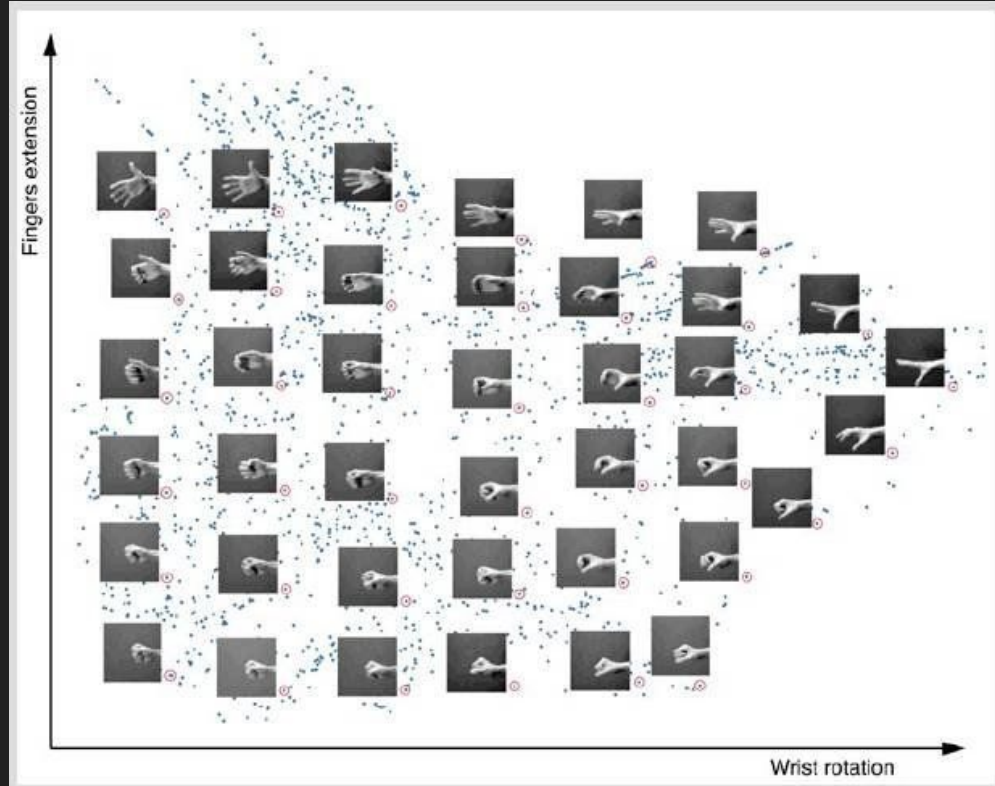
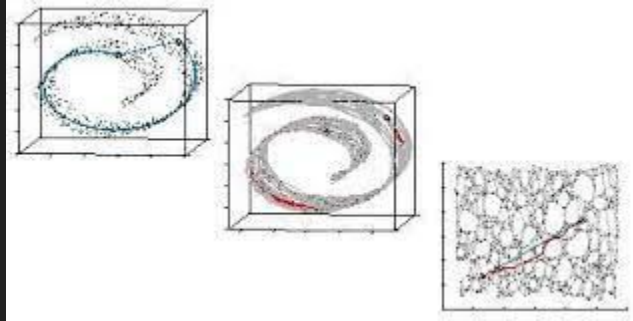


<https://www.youtube.com/watch?v=tkkm6zVUDXo>

Manifold Learning



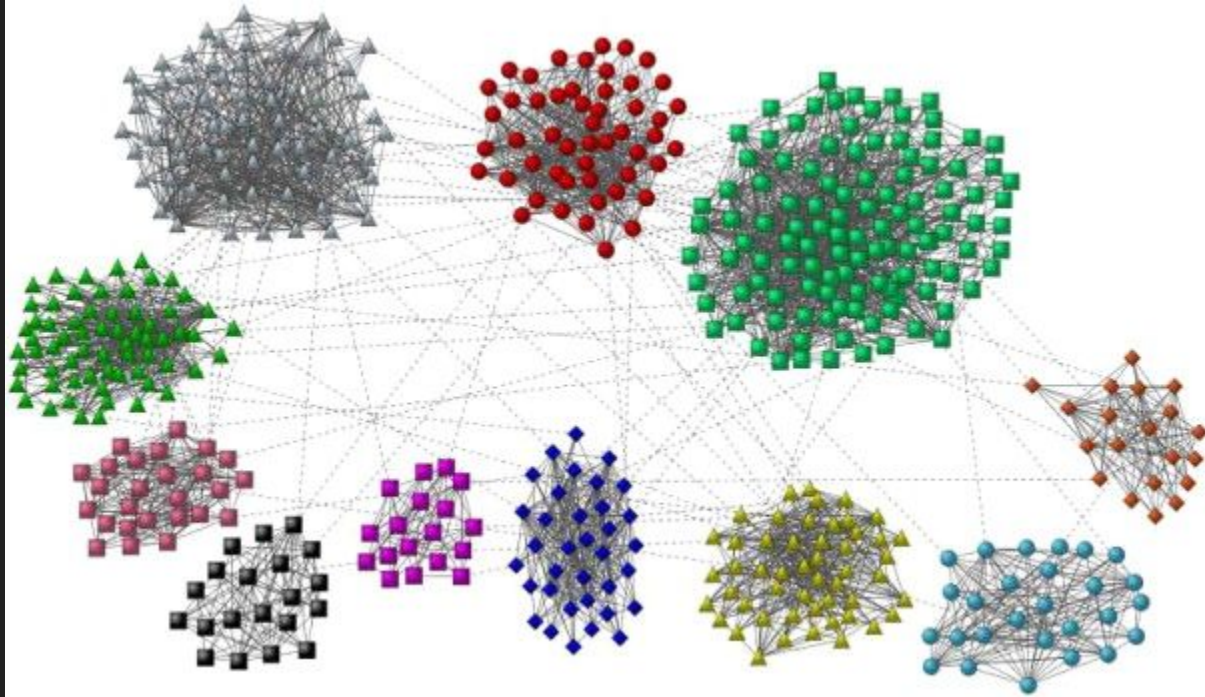
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Graph Clustering



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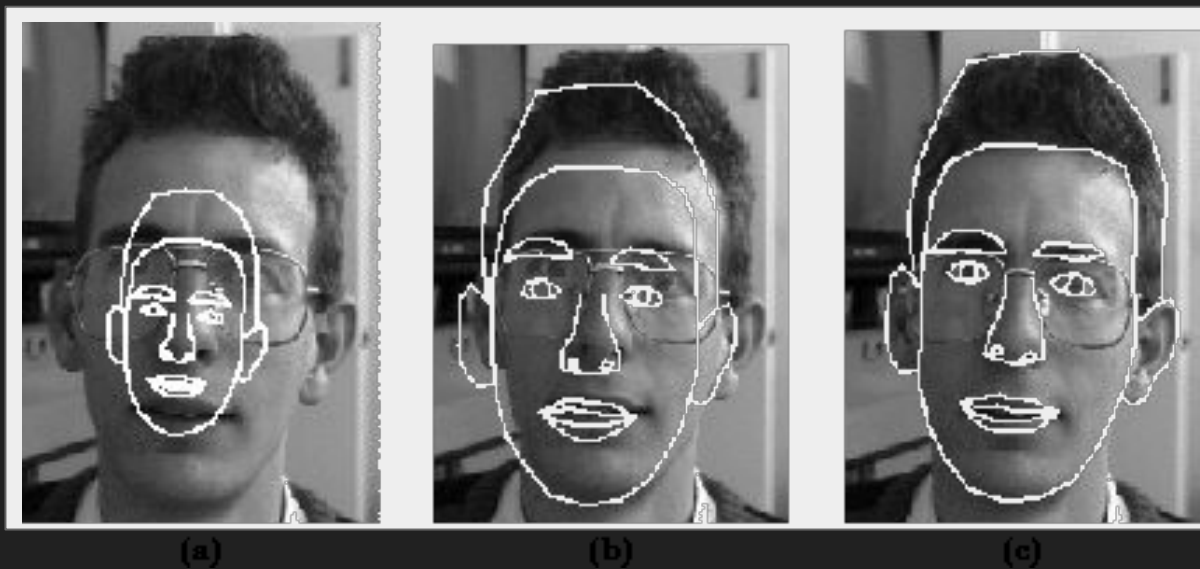


<https://www.sciencedirect.com/science/article/abs/pii/S0370157309002841>

Active Shape Models



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Active Shape Models



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<https://www.youtube.com/watch?v=kJPRCLhTEPg&t=36s>

Motion Segmentation



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