MIXTURE OF GAUSSIANS

GROUP-2

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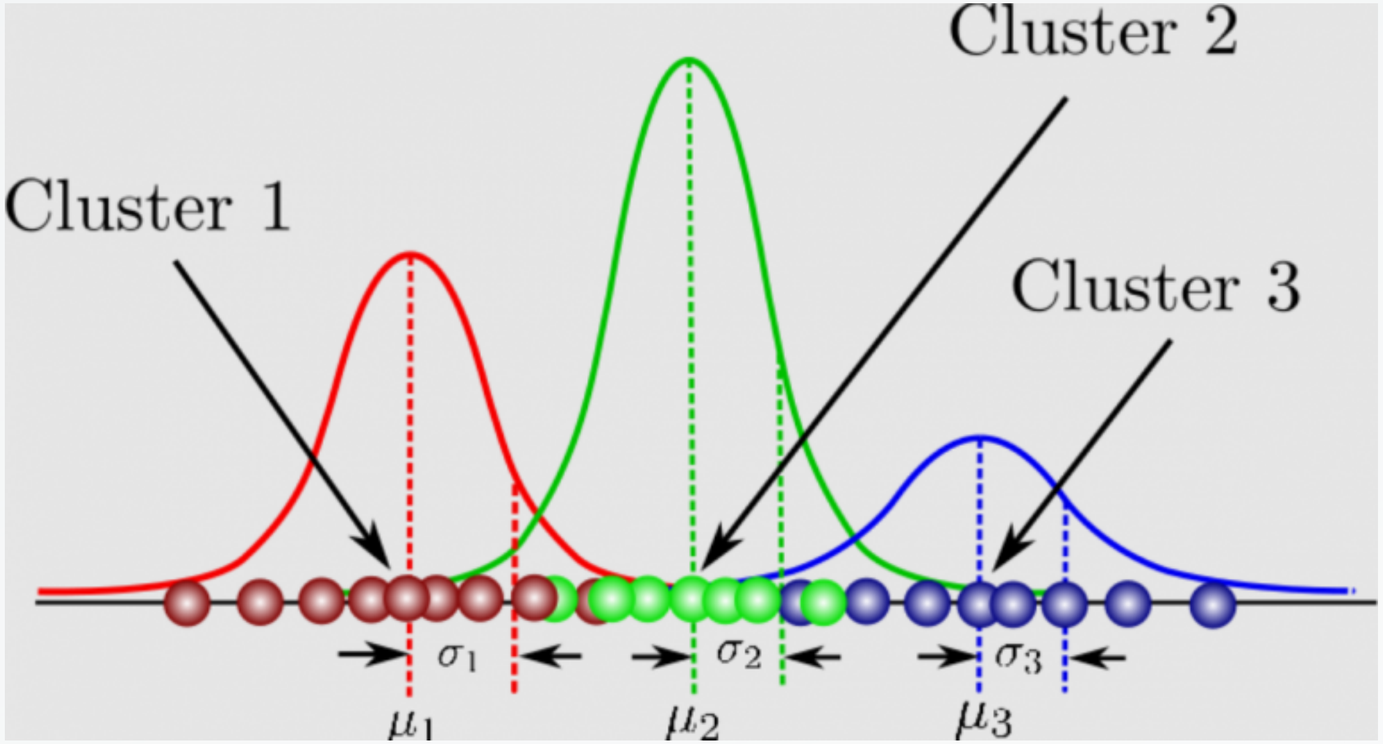
CONTENT

MIXTURE OF GAUSSIANS

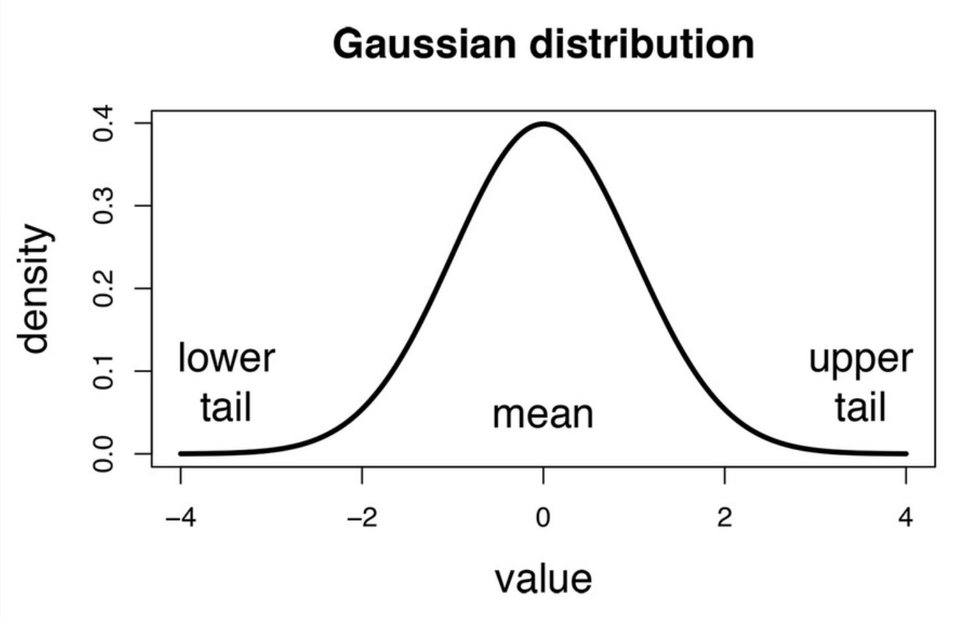
A Gaussian mixture model is used for clustering, which is the task of grouping a set of data points into clusters.

Gaussian mixture model can be used to find clusters in data sets where the clusters may not be clearly defined. Additionally, It can be used to estimate the probability that a new data point belongs to each cluster.
Gaussian mixture models are also relatively robust to outliers, It means that they can still yield accurate results even if there are some data points that do not fit neatly into any of the clusters. This makes gaussian mixture model flexible and powerful tool for clustering data.

The Gaussian mixture model can be understood as a probabilistic model where Gaussian distributions are assumed for each group and they have means and covariances which define their parameters. GMM consists of two parts – mean vectors (μ) & covariance matrices (Σ).
Here is a picture of Gaussian mixture models:



GAUSSIAN DISTRIBUTION



- Gaussian distribution is a common statistical model used in computer vision to describe the probability of pixel values, noise, blurring, and edge detection.
- It is also referred to as the normal distribution or the bell curve distribution for its bell-shaped density curve.
- It is defined by two parameters: mean and variance.

Some examples of computer vision algorithms that use Gaussian distribution are:

- Difference of Gaussians: a method which is useful for detecting edges at different scales.
- Gaussian blur: a type of image-blurring filter that uses a Gaussian function to smooth the image

Expectation-Maximization (EM) Algorithm in Computer Vision:

The Expectation-Maximization (EM) algorithm is a statistical iterative method used to estimate parameters of probabilistic models, particularly when dealing with missing data or latent variables. It is often applied in computer vision to solve problems involving clustering, segmentation, and probabilistic modeling.

Example:

In image segmentation, the EM algorithm can be utilized to partition an image into different regions or objects based on color, texture, or other features. It can help assign pixels to different classes or clusters, even when there is uncertainty or ambiguity due to noise or complex patterns in the image.

Application of GMMs

GMMs can be used for a variety of applications, such as:

- Clustering: GMMs can be used to cluster data points into groups.
- Classification: GMMs can be used to classify data points into different classes.
- Dimensionality reduction: GMMs can be used to reduce the dimensionality of data.

CONCLUSION

A Gaussian mixture model (GMM) is a probabilistic model that assumes that the underlying data is generated from a mixture of several different normal distributions, rather than just a single normal distribution.

This allows the model to capture more complex patterns in the data and to handle cases where the data may be multimodal (i.e., it has more than one “peak”). GMMs are commonly used in a variety of applications, including density estimation, clustering, and classification.

They are particularly useful when the data has a complex or non-linear structure, and when it is not clear which distribution is the best fit for the data. GMMs are also relatively simple to implement and can be easily extended to handle large datasets.

THANK'S FOR LISTENING