Segmentation in Feature Space:

- **Intentional Image Acquisition:** Selection of medical imaging techniques intentionally captures pixel or voxel values covering more semantics regarding object class membership than in photography.
- **Classification in Feature Space:** Segmentation can be viewed as classification in feature space, where image intensities serve as features.
- **Dimensionality and Sample Size:** Feature space typically has low dimensionality but a high number of samples characterizing object classes.
- **Classifier Functionality:** Classifiers estimate likelihood functions from samples and compute posterior probabilities for each object class.

Clustering in Feature Space:

- **Clustering Definition:** Grouping scene elements into clusters when it's not known a priori how many and which classes they belong to.
- **Assumption:** Elements from the same object have more similar features than those from different objects.
- **Methodology:** Generic methodology applicable to any feature type, with techniques differing based on feature space dimensionality and density.
- **Interactive Clustering:** In low-dimensional feature space, clustering can be done interactively by displaying the 2D distribution and delineating clusters.

Partitional Clustering and K-means Clustering:

- **Partitional Clustering:** Divides data into non-overlapping clusters, where each data point belongs to exactly one cluster.
- **K-means Clustering:** Popular partitional clustering method that partitions data into K clusters by iteratively updating cluster centroids.

Mean Shift Clustering:

- **Objective:** Identifies all possible cluster centers in feature space without prior knowledge of the number of clusters.
- **Method:** Shifts markers toward local maxima using a gradient ascent algorithm, labeling each location and its corresponding cluster.

Kohonen’s Self-organizing Maps:

- **Definition:** Artificial neural network trained using unsupervised learning to produce a two-dimensional representation of the input space, called a map.
- **Functionality:** Useful for classification and visualizing low-dimensional views of high-dimensional data.
- **Similarity to Biological Systems:** Resembles biological systems like the human cortex, where multi-dimensional sensory input spaces are represented by two-dimensional maps.
- **Topology-preserving Map:** Imposes a topological structure on the nodes in the network, preserving neighborhood relations during mapping.