Data mining is a prominent interdisciplinary field, which is a confluence of database technology, machine learning, statistical analysis, and other related areas together in order to extract the valuable information from data. Clustering is one of the essential data mining techniques. It discovers the groups (or clusters) of data objects based on the similarity features of objects. Various distance metrics are used in clustering for finding the similarity between the objects. Clustering is widely used in various applications such as pattern recognition, image segmentation, speech recognition, video-analysis, and outlier detection.

The clustering methods are broadly categorized into Partition based methods [62] and Hierarchical methods [63]. Some clustering methods require the prior knowledge on number of clusters (called clustering tendency) in order to identify the clustering result while the other algorithms do not depend on the clustering tendency. The present work considers the clustering methods which require the clustering tendency and the main aim is to improve the clustering quality of such methods by finding the number of clusters well in advance using data visualization methods.

The k-means clustering and graph-based clustering methods have been widely used in many applications and they have been considered as the top 10 clustering algorithms [126] in the literature. Further, k-means and graph-based clustering methods require the prior knowledge of number of clusters ‘k’ for deriving the clusters effectively. In the assessment of clustering tendency, the data visualization method, i.e., Visual Access Tendency (VAT) [8] method plays an indispensable role. It visualizes the clusters of dataset in the form of square-shaped dark blocks. The VAT is a visual technique and is extensively used for assessment of clustering tendency. Not only VAT but there are other methods SpecVAT [107] and iVAT [46] are used for assessment clustering tendency. For complex datasets, the SpecVAT data visualization method outperforms with respect to
the visual assessment of clustering tendency. However, some datasets are path-based; in such cases, iVAT is an efficient method for assessing the number of clusters.

The thesis proposes two hybrid methods to improve the clustering quality of k-means and graph-based clustering methods by finding clustering tendency using data visualization techniques. The proposed hybrid methods are 1) \textit{VAT-based-k-means clustering} which is the combination of k-means and VAT, and 2) \textit{VAT-based-MST-clustering} method, which is the combination of Minimum Spanning Tree (MST), based clustering and VAT. Empirically it is proved that both the proposed hybrid methods are efficient.

Finally, the thesis proposes a novel visualized clustering approach (VCA). This VCA is proposed for assessment of clustering tendency as well as to derive the explicit clustering results from VAT instead of using expensive hybrid methods. The crisp partition matrix in VCA accomplishes the clustering results. Further, the proposed work entails enhancing the VAT using a cosine metric with either a single viewpoint or multiple viewpoints \textit{(or different origins)}. It is evident that the cosine metric is more robust in the dissimilarity features computation. Experimentally it has been proved that the enhanced VAT methods and related VCA approaches outperforms the conventional clustering methods in terms of clustering quality considering various datasets including benchmark datasets (face dataset, gene datasets, and speech datasets) as well as synthetic datasets.