Concentric circles fitting is a challenge task since the nonlinear fitting problem needs to find out the implicit relationship between the noisy measurement data points and the unknown parameters, circles center and radii, to be estimated. For most of the concentric circles estimators, they require the knowledge of the number of circles and the data points belonging to the different circles. However, this information is often not available in practice. In this thesis, we shall try to solve these two problems.

When the number of concentric circles is available, we propose and compare three classification methods, the K-Means method, the Distance Division method and the Naive Bayes classifier, to assign the data points to the circles. If the number of concentric circles is not known, the non-parametric data clustering methods, such as the Mean Shift method and the Distance Threshold method, are developed in this thesis to estimate the number of circles for the estimate later.

A new method is proposed to combine the Mean Shift method and the Naive Bayes classifier to improve the joint estimation of the number of circles and classification of data points. The performances of the proposed solutions are supported by the simulations using synthetic data.