**State-of-the art about similar problems and data collection (for training and testing)**

1. **Introduction:**

Quality is a key factor for modern food industry because the high-quality of product is the basis for success in today’s highly competitive market. In the food industry, the quality evaluation still heavily depends on manual inspection, which is tedious, laborious, and costly, and is easily influenced by physiological factors, inducing subjective and inconsistent evaluation results. To satisfy the increased awareness, sophistication and greater expectation of consumers, it is necessary to improve quality evaluation of food products (Brosnan & Sun, 2004). If quality evaluation is achieved automatically, production speed and efficiency can be improved in addition to the increased evaluation accuracy .

Learning techniques have been applied increasingly for food quality using computer vision, which include artificial neural network, statistical learning, fuzzy logic, genetic algorithm, and decision tree. Artificial neural network (ANN) and statistical learning (SL) remain the primary learning methods in the field of computer vision for food quality evaluation. Among the applications of learning algorithms in computer vision for food quality evaluation, most of them are for classification and prediction, however, there are also some for image segmentation and feature selection

1. **Case of study :**

Almonds are one of the most nutritious of all nuts. They have the highest protein content of any nut and are packed with vitamin E, calcium, iron, magnesium, phosphorus and zinc. As products with high nutrition are advantageous, Iranian nuts (pistachios, almonds, etc.) are considered as one of the valuable nonoil exportable products. Iran had about 87,700 ha of land under almond cultivation in 2011. According to FAO (Food and Agriculture Organization) statistics, Iran with production of over 110,000 tons/year of almond was ranking as the world third biggest almond producer after the United States and Spain (Food and Agriculture Organization 2011).

There are numerous factors such as product variety, dif- ferent steps of planting, growing and harvesting that play a role in promoting the quality of agricultural products. One of the most important postharvest processing operations, directly related to improving quality of the products, is grading or sorting operation. Increasing the quality of almond product by means of a new and reliable technique is a key factor in exporting and economic profitability of the final product. For implementing such operations, both human vision (HV) and computer vision (CV) are being used. However, the human-based vision methods are becoming less attractive due to their high costs, low speeds, requiring experienced staffs for grading of the product and low accuracies. In recent years, the application of advanced techniques based on CV for grading different agricultural products due to its high accuracy, low cost and high speed has become more widespread (Du and Sun 2004; Cakmak and Boyaci 2011; Kumar-Patel *et al*. 2012; Poonnoy *et al*. 2014).