Modern condition monitoring extensively employs signal processing and pattern recognition techniques. Signal processing is used for both signal enhancement (de-noising, separation, reconstruction, filtering etc.) and feature extraction (parametric models, two-dimensional plane representation).

In some cases, damage detection can be performed using simple rules, i.e., “if feature_value bigger than threshold than damage else undamaged” however when considering complex mechanical systems, especially in time varying conditions, the problem of classification of features becomes much more complicated. In such a case, feature selection procedures are proposed and advanced data classifiers are used. In this chapter, mentioned issues are addressed.