Nowadays, fault detection, identification, and classification seem to be the most difficult challenge for gear systems. It is a complex procedure because the defects affecting gears have the same frequency signature. Thus, the variation in load and speed of the rotating machine will, inevitably, lead to erroneous detection results. Moreover, it is important to discern the nature of the anomaly because each gear defect has several consequences on the mechanism’s performance. In this article, a new intelligent fault diagnosis approach consisting of Autogram combined with radial basis function neural network is proposed. Autogram is a new sophisticated enhancement of the conventional Kurtogram, while radial basis function is used for classification purposes of the gear state. According to this approach, the data signal is decomposed by maximal overlap discrete wavelet packet transform into frequency bands and central frequencies called nodes. Thereafter, the unbiased autocorrelation of the squared envelope for each node is computed in order to calculate the kurtosis for each one at every decomposition level. Finally, the feature matrix obtained from the previous step will be the input of the radial basis function neural network to provide a new automatic gear fault diagnosis technique. Experimental results from the gearbox with healthy state and five different types of gear defects under variable speeds and loads indicate that the proposed method can successfully detect, identify, and classify the gear faults in all cases