The Average Nearest Neighbor ratio is given as:

$$ANN = \frac{\bar{D}_O}{\bar{D}_E} \tag{1}$$

where $\bar{D}_O$ is the observed mean distance between each feature and its nearest neighbor:

$$\bar{D}_O = \frac{\sum_{i=1}^{n} d_i}{n} \tag{2}$$

and $\bar{D}_E$ is the expected mean distance for the features given in a random pattern:
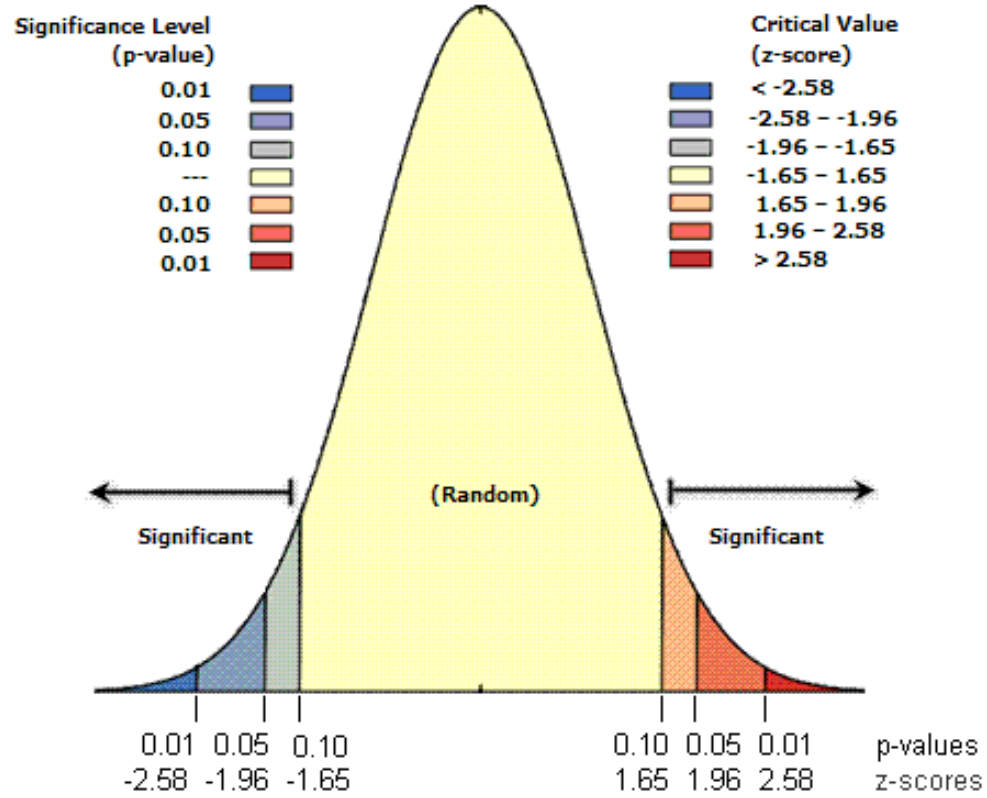
$$\bar{D}_E = \frac{0.5}{\sqrt{n/A}} \tag{3}$$

In the above equations, $d_i$ equals the distance between feature $i$ and it's nearest neighboring feature, $n$ corresponds to the total number of features, and $A$ is the area of a minimum enclosing rectangle around all features, or it's a user-specified Area value.

The average nearest neighbor z-score for the statistic is calculated as:

$$z = \frac{\bar{D}_O - \bar{D}_E}{SE} \tag{4}$$

where:

$$SE = \frac{0.26136}{\sqrt{n^2/A}} \tag{5}$$

| z-score (Standard Deviations) | p-value (Probability) | Confidence level |
|---|---|---|
| < -1.65 or > +1.65 | < 0.10 | 90% |
| < -1.96 or > +1.96 | < 0.05 | 95% |
| < -2.58 or > +2.58 | < 0.01 | 99% |