Permutation tests

Permutation tests are non-parametric methods used to test the significance of an observed test statistic by comparing it to the distribution (of the statistic) under rearranged data.

Let $T(x)$ be a statistic computed from a sample $X_1, \ldots, X_n$ and $T_{obs} = T(X)$. M test statistics $T_1, \ldots, T_M$ are then generated by permuting the data. The p-value of the test is then given by:

$$ p = \sum_{i=1}^{M} \mathbb{1}(T_i \geq T_{obs}) \Big/ M $$

and is thus compared to a chosen significance level, usually denoted α.

Advantages : easy to implement, suitable for small samples, flexible and do not require assumptions about the underlying distribution of the data

See : • Permutation tests : A practical guide; P. Good ; 1994
• A Review on Permutation tests; Önder et al. ; 2017