2.2 Customer Pair-Wise Matrix-Based Algorithm

This procedure iterates on a set of customers denoted as set S. S is initially set as a sorted list of customers in descending order of R_i. In the process of iteration, a customer is considered ideal if it has the maximum R_i in set S and it is not in any of the existing cluster α ($\alpha = 1,2 \ldots C$).

Step 1: Initiation:

(i) Set S
(ii) Set C ($\alpha = 1,2 \ldots C$)
(iii) Set t_j

Step 2: Assignment:

(i) Find customer i with maximum relation index Ri, ($i \in I$) to serve as candidate ideal customers for size group α
(ii) For $i \neq k$, find maximum value of r_{ik} ($say\, r_{ik} = 1$) , assign all customer k with $max\ (r_{ik})$ into cluster α
(iii) Compute percentage degree of fit for cluster α: $h_\alpha = \frac{\sum_{i=1}^{g\alpha} \sum_{k=1}^{g\alpha-1} 100 r_{ik}}{n_\alpha(n_\alpha - 1)}$
(iv) For $I > 1$, repeat (ii) – (iii) and select i as ideal customer for cluster α, if $h_\alpha^i = \max\,(h_\alpha^1, h_\alpha^2 \ldots\ldots h_\alpha^I)$. Else, go to step 3

Step 3: Updating

(i) Eliminate i and k assigned to cluster α from set S.
(ii) Update $\alpha = \alpha + 1$
(iii) Update set S
(iv) If $\alpha < C,$ go to step (2). Otherwise, go to step (4).

Step 4: Centering

Find a new ideal customer for each cluster($\alpha = 1,2 \ldots C$), which is the customer whose dimensions minimize the total distance or loss of fit to other customers.

Step 5: Re-Assignment

Given all new ideal customer (cluster center), re-assign customers into nearest cluster.

Step 6: Stopping

If the overall percentage degree of fit for the system : $H_\alpha = \sum_{\alpha=1}^{C} \frac{h_\alpha}{C}$ is improved, go to step 4. Else stop.

Step 7: Output

Compute percentage degree of fit and aggregate loss for each cluster $\alpha = 1,2 \ldots . C$

Percentage degree of fit: $h_\alpha = \frac{\sum_{i=1}^{g\alpha} \sum_{k=1}^{g\alpha-1} 100 r_{ik}}{n_\alpha(n_\alpha - 1)}$

Aggregate loss **:** $\frac{\sqrt{(\sum_{k=1}^{n_\alpha} \sum_{j=1}^{m} (x_{ij} - x_{kj})^2)}}{n_\alpha}$