Introduction to PlackettLuce

Kauê de Sousa

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Lecture

This lecture is available on Youtube

Rank-based model

Rank-based models

Rankings data arise in a range of applications, such as sport tournaments and consumer studies. In rankings data, each observation is an ordering of a set of items.

Classic models are Bradley-Terry (BT) and Plackett-Luce (PL). Both models depend on the Luce's axiom of choice (Luce 1959, 1977) which states that the probability that one item beats another is independent from the presence or absence of any other items in the set.

$$P(i \succ j) = \frac{p_i}{p_i + p_j}$$

where p_i is a positive real-valued score assigned to individual i. The comparison $i \succ j$ can be read as i is preferred over j

Difference between BT and PL

While the BT model is used for pairwise comparisons, the PL model is used for rankings of three or more items.

This makes possible to compare items across the entire rank permutation whereas BT model breaks the comparison into pairs.

Plackett-Luce model

Plackett-Luce model

The PL model determines the values of positive-valued parameters α_i (*worth*) associated with each item i.

These parameters α are related to the probability P that item i wins against all other n items. A non-logarithm *worth* values should sum to one. This makes each *worth* value α_i equal to the probability of item i outperforming all other items:

$$P(i \succ \{j, \ldots, n\}) = \frac{a_i}{a_1 + \ldots + a_n} = \frac{a_i}{1} = a_i$$

[1] Click here to read more about the Plackett-Luce model
[2] Click here to read the paper by Turner et al (2020)

Thank you!

@desousakaue

k.desousa@cgiar.org

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