A

α -nDCG

Tetsuya Sakai
Waseda University, Tokyo, Japan

Synonyms

[Alpha-nDCG](#)

Definition

α -nDCG is a variant of Normalised Discounted Cumulative Gain (nDCG). It is an evaluation measure for diversified search, where it is assumed that a topic q has multiple possible intents $\{i\}$, and that *intent probabilities* $Pr(i|q)$ and *per-intent relevance assessments* are available. For a given diversified ranked list, let $I_i(r) = 1$ if the document at rank r is relevant to intent i and let $I_i(r) = 0$ otherwise; let $C_i(r) = \sum_{k=1}^r I_i(k)$. For a given parameter α (typically set to 0.5), let the *novelty-biased gain* at r be $ng(r) = \sum_i I_i(r)(1 - \alpha)^{C_i(r-1)}$. This reflects the view that (a) the value of a document is basically given by the number of intents it covers; but that (b) for each intent, whenever a relevant document is found, the value of the next relevant document should be discounted (the *diminishing return* property). α -nDCG at *measurement depth* (or *document cutoff*) d is defined as:

$$\alpha\text{-nDCG} = \frac{\sum_{r=1}^d ng(r) / \log(r+1)}{\sum_{r=1}^d ng^*(r) / \log(r+1)}$$

where $ng^*(r)$ is the novelty-biased gain at rank r of an *ideal ranked list*. Unfortunately, finding the ideal list is an *NP*-complete problem, so a greedy approximation is used in practice.

Main Text

α -nDCG penalises retrieval of many relevant documents for the same intent, and thereby encourages retrieval of a few relevant documents for many intents. However, note that, unlike some other evaluation measures for diversified search (e.g., D-measure and ERR-IA), α -nDCG cannot utilise per-intent *graded* relevance assessments: the novelty-biased gain only considers whether each intent is covered by the document or not. Also, the above formulation of α -nDCG does not consider the intent probabilities $Pr(i|q)$, although there is a version of α -nDCG that does incorporate them just like D-measure and ERR-IA.

Cross-References

- ▶ [Advanced Information Retrieval Measures](#)
- ▶ [Discounted Cumulated Gain](#)
- ▶ [D-Measure](#)
- ▶ [ERR-IA](#)