

# The BTL Model

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## 1 The Standard BTL Model –

Base on the standard BTL model:

$$p(i \succ j|u) = \frac{u_i}{u_i + u_j}$$
$$p(i \prec j|u) = \frac{u_j}{u_j + u_i}$$

Suppose that there are  $K$  underlying aspects. for each pair,  $p(< w, v >) = p^k(w \succ v)$ . then the probability of generating a session observation  $d$  is defined as:

$$p(d|V, U) = \Pi_{w \in W^d, v \in L^d} \Pi_{k=1}^K \left[ \frac{u_k w_k}{u_k w_k + u_k v_k} \right] \quad (1)$$