

Refining $P(R=1 | Q,D)$: Generative models

- Basic idea
 - Define $P(Q,D | R)$
 - Compute $O(R=1 | Q,D)$ using Bayes' rule

$$O(R=1 | Q,D) = \frac{P(R=1 | Q,D)}{P(R=0 | Q,D)} = \frac{P(Q,D | R=1)}{P(Q,D | R=0)} \frac{P(R=1)}{P(R=0)} \leftarrow \text{Ignored for ranking D}$$

- Special cases
 - Document “generation”: $P(Q,D | R) = P(D | Q,R)P(Q | R)$
 - Query “generation”: $P(Q,D | R) = P(Q | D,R)P(D | R)$