Evaluating Web Search with a Bejeweled Player Model

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Information Retrieval

CentraleSupélec

Two methods for Web-search evaluation
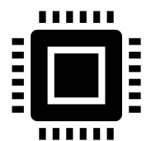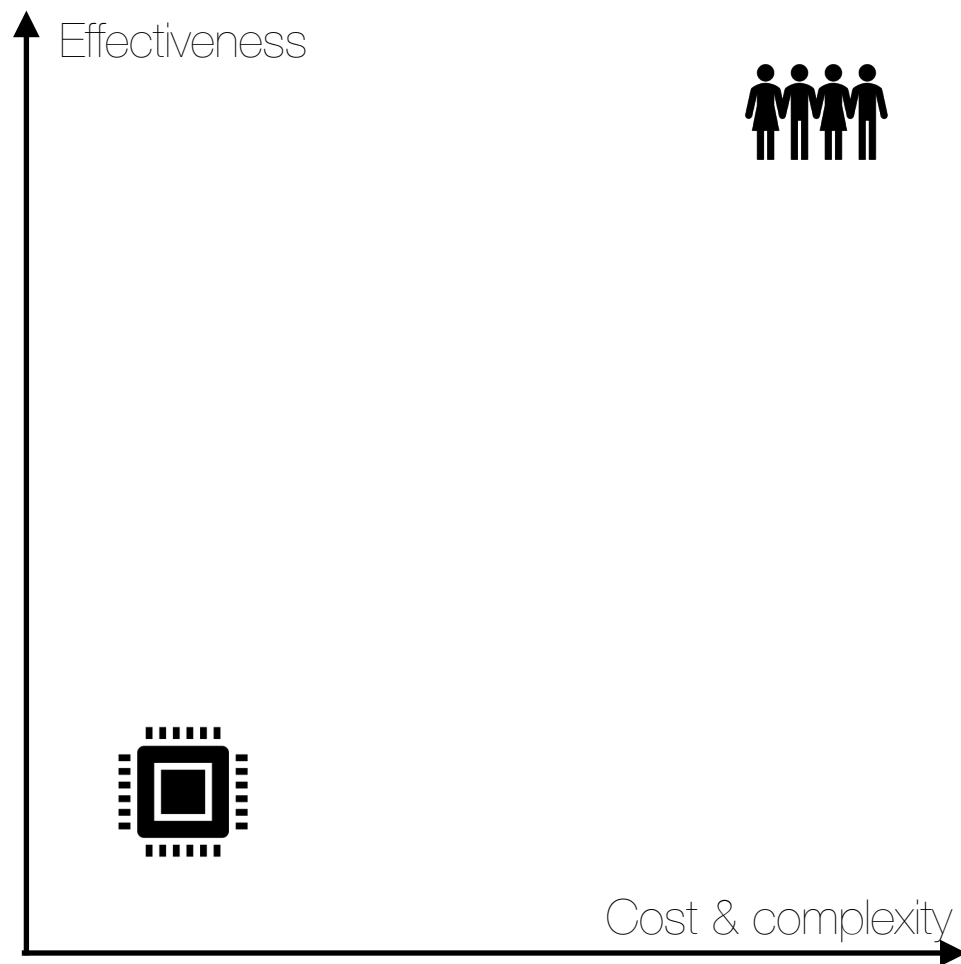
System-oriented studies

Set of relevance judgments to compare the quality of ranked result list in response to a **fixed set of queries**
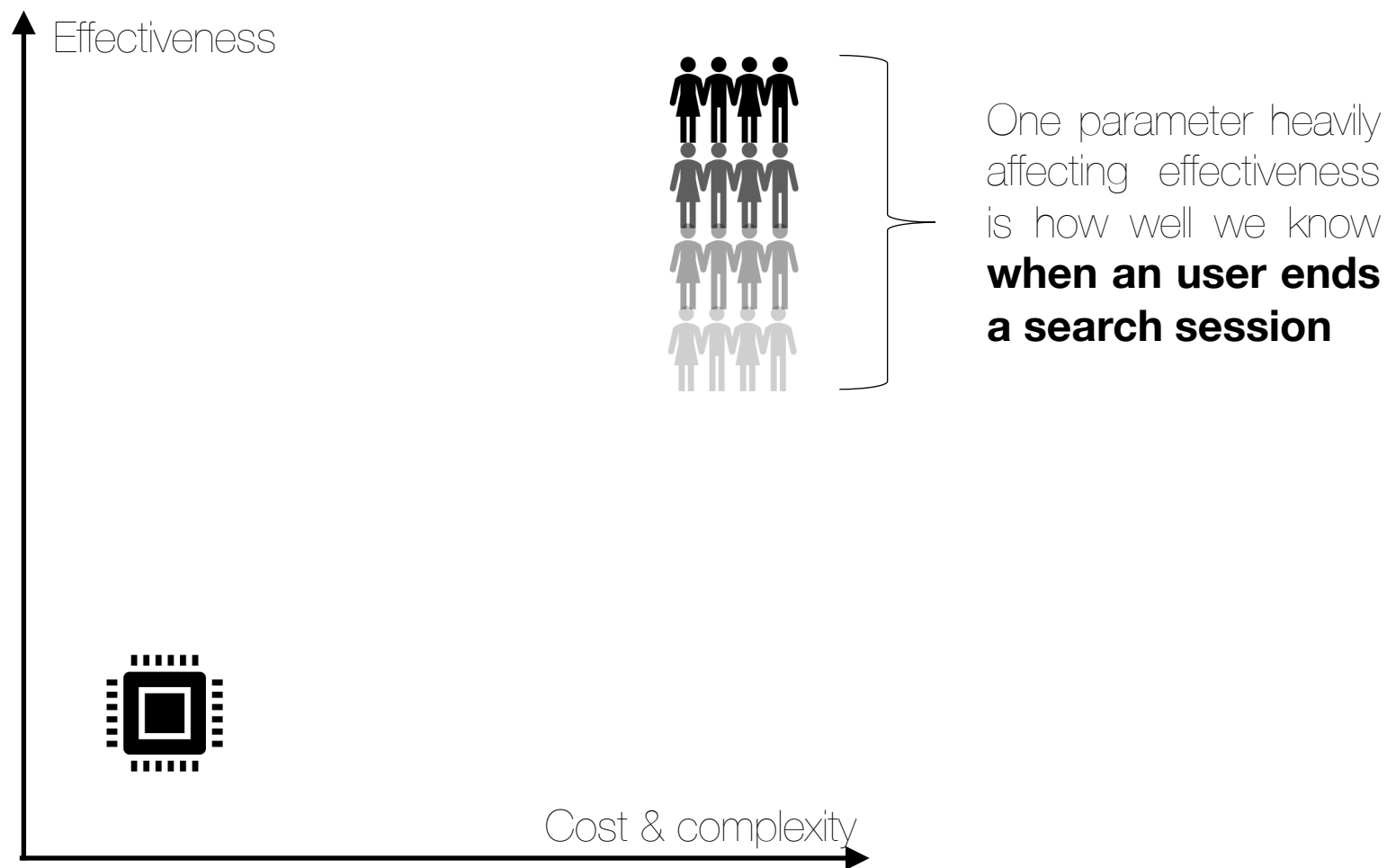
User-oriented studies

Actual user behaviors during retrieval sessions to measure effectiveness of systems

Two methods for Web-search evaluation

Two methods for Web-search evaluation

Effectiveness

Cost & complexity

One parameter heavily affecting effectiveness is how well we know **when an user ends a search session**

Some important vocabulary

Benefit

The **amount of information** on the studied subject that one can gain from the document

Cost

Temporal and cognitive efforts in processing, reading and understanding documents

Current models for stopping point determination

Benefit

Reciprocal Rank (RR)

User will stop once they find a perfect document

Upper limit for benefit

Measures satisfaction

Cost

Precision@N

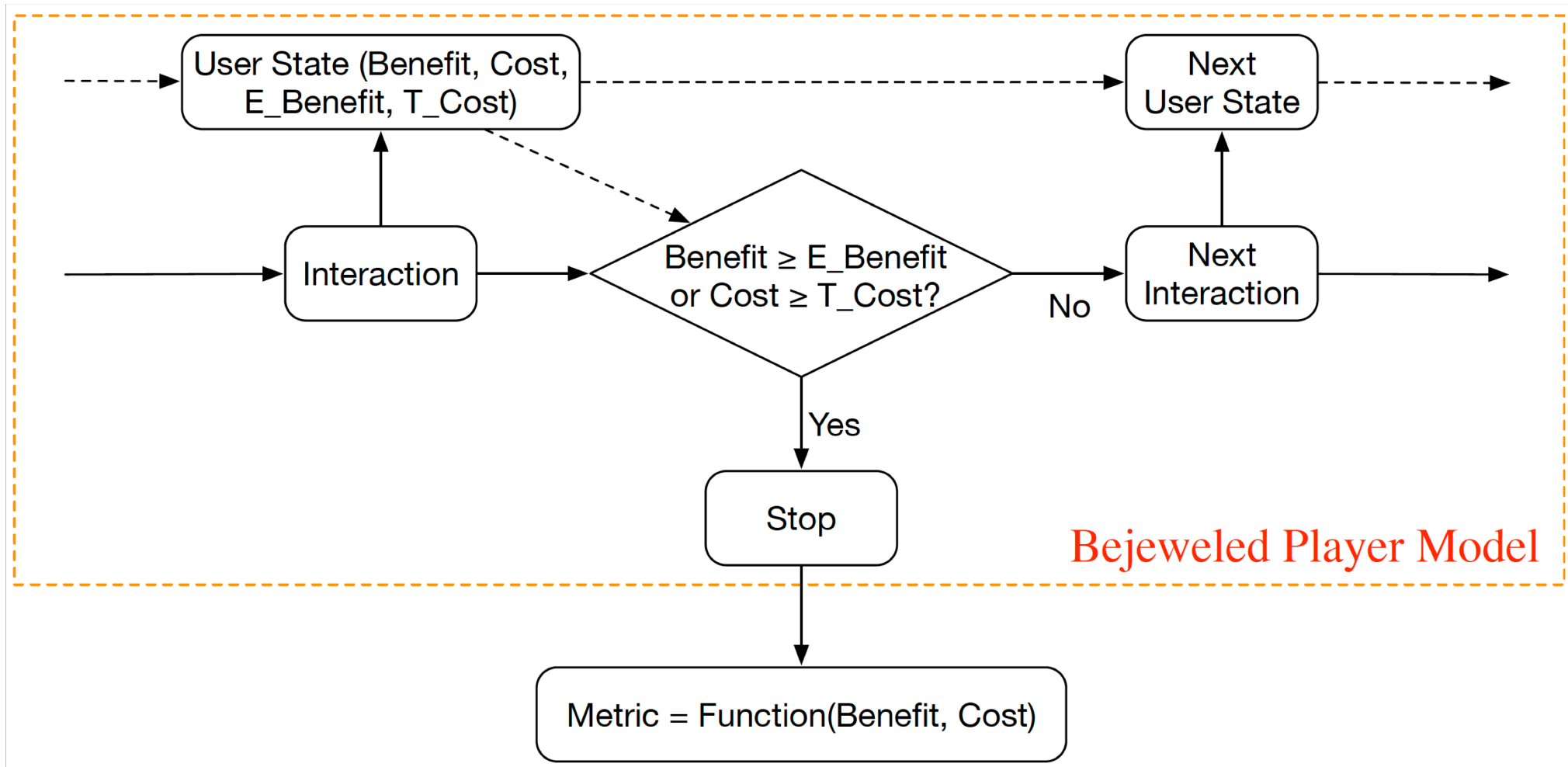Percentage of relevant documents in top-N results

Upper limit for cost

Measures frustration

The Bejeweled Player Model

The bar empties
Game is over
(player loses)
↓
Frustration

The bar fills
Game is over
(next level)
↓
Satisfaction

The Bejeweled Player Model

The Bejeweled Player Model

$$M = \sum_{k=1}^{\infty} Function(Benefit_k, Cost_k) * P(k)$$

An adapted choice of the different parameters can simulate both Benefit-oriented and Cost-oriented models currently used

The BPM allows for model-abstraction
It is a "meta-model"

The Bejeweled Player Model

$$E\_Benefit_k = \textcolor{red}{\alpha_B} * (2^{rel_{max}} - 1) + \textcolor{red}{h_B} \sum_{i=1}^{k} (benefit_i - benefit_{median})$$

$$T\_Cost_k = \textcolor{red}{\alpha_C} + \textcolor{red}{h_C} \sum_{i=1}^{k} \left(\frac{benefit_i}{benefit_{median}} - 1 \right)$$

where: $benefit_i = 2^{rel_i} - 1$

The Bejeweled Player Model

New model

Can fit existing
models

Has better results with
carefully chosen parameters