Information Retrieval Evaluation in Knowledge Acquisition Tasks (WEPIR 2021)

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Overview

- What is a Knowledge Acquisition Task?
- Why is it challenging to evaluate a system designed for that task?
- Possible Evaluation Approaches.

Knowledge Acquisition Task and Knowledge Delta

What is a Knowledge Acquisition Task?

Answer:

- Tasks aimed at acquiring knowledge (Learning Task [Vakkari, 2018])

There are different levels of familiarity with the topic => Different resources path

Knowledge Acquisition Task and Knowledge Delta

Background Knowledge

Linear Algebra
Information Retrieval

User 1

Learning Goal

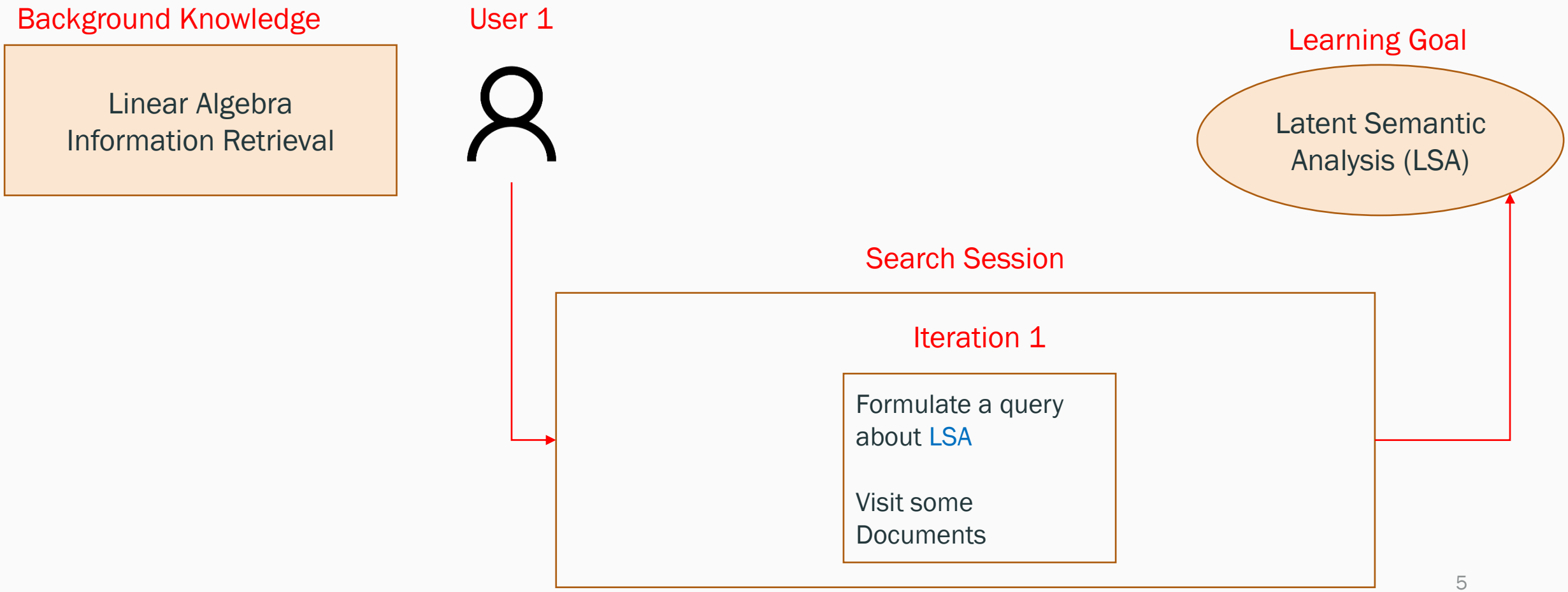
Latent Semantic Analysis (LSA)

Background Knowledge

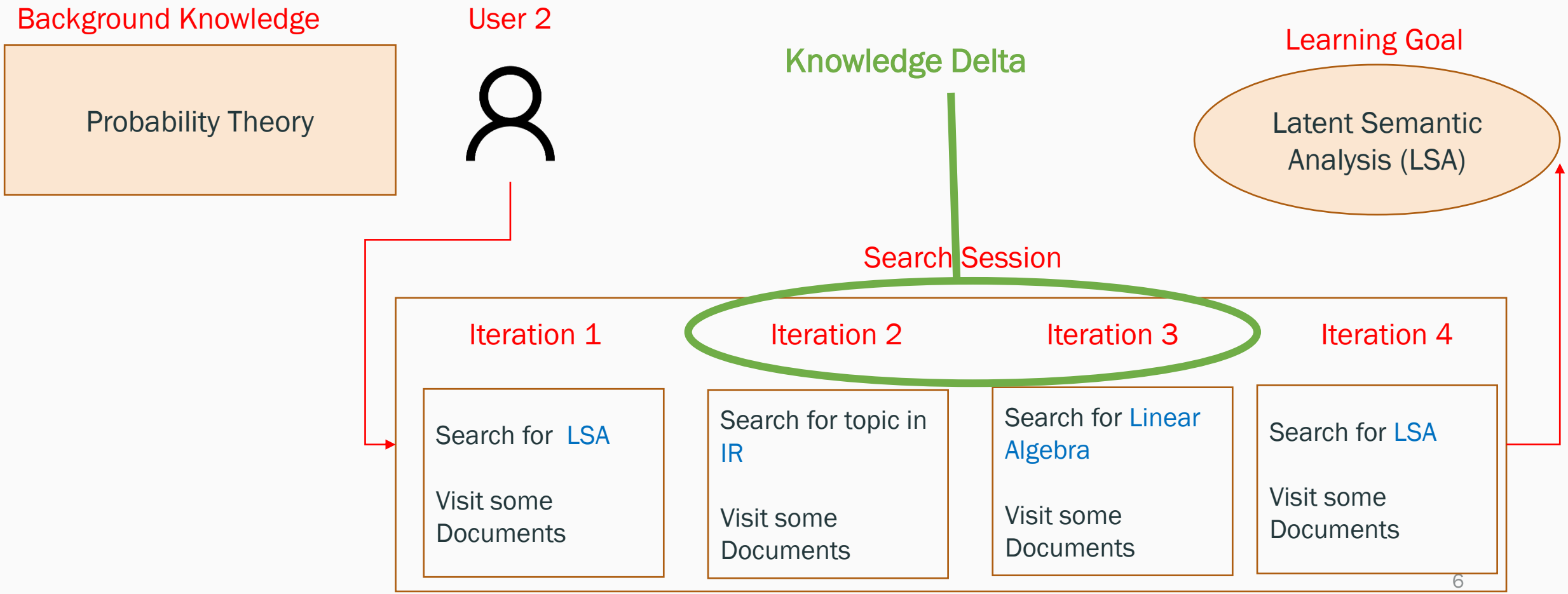
Probability Theory

User 2

Knowledge Acquisition Task and Knowledge Delta

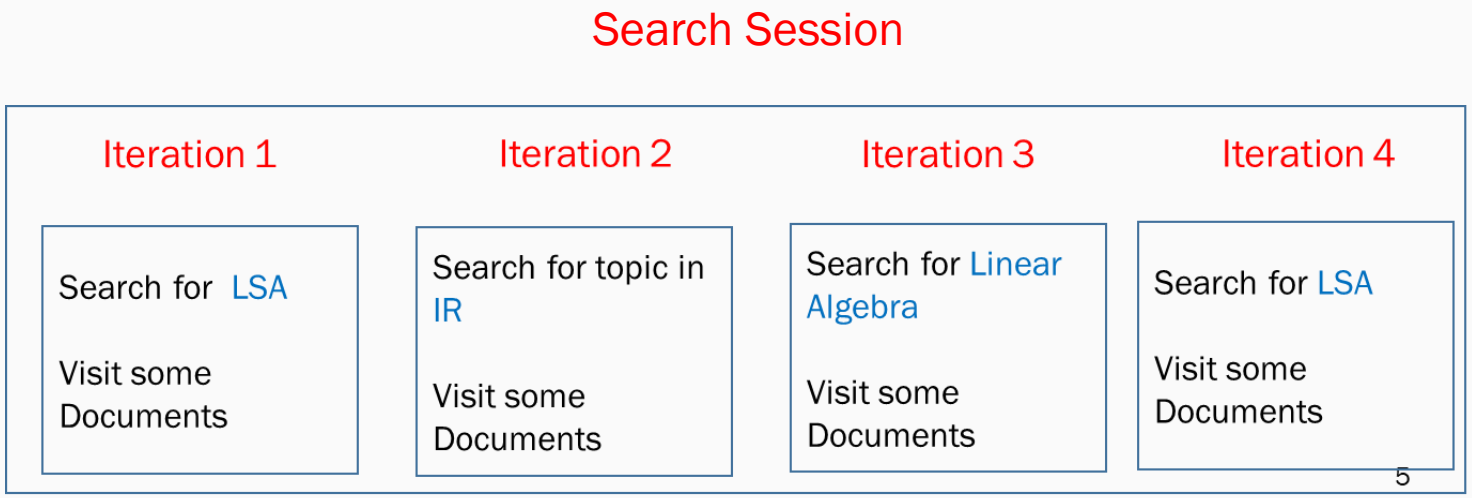


Knowledge Acquisition Task and Knowledge Delta



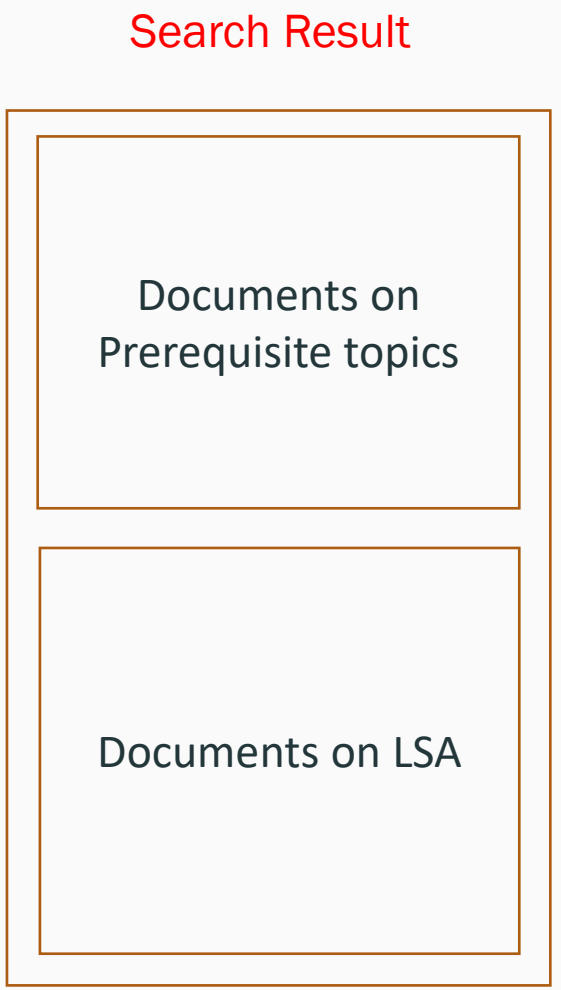
Gist of the previous scenario

- Document utility assessment goes beyond topical relevance => Context comes into play



Systems for Knowledge Acquisition

- Taking Personal Context into Account
- Domain Knowledge of the User
- Personalization with interest differs with personalization with Knowledge



Overview

- What is a Knowledge Acquisition Task?
- Why is it challenging to evaluate a system designed for that task?
- Possible Evaluation Approaches.

Evaluation Challenges

- Evaluation within the Canfield Paradigm
  - Test Collection, Topics, Relevance Judgment
- Shortcomings for evaluating a system for knowledge acquisition task
  - Not incorporating user context (Other efforts to overcome this issue e.g [Pasi, 2017])
  - Independent evaluation of iterations (i.e for each query)

Overview

- What is a Knowledge Acquisition Task?
- Why is it challenging to evaluate a system designed for that task?
- Three Possible Evaluation Approaches.

1. Online Evaluation

Use Online evaluation measures (e.g Clickthorugh rate)

Disadvantages:

1) Comparability
2) large space of parameter testing not possible
3) Subject to bias and perceived relevance [Guo, 2012]

2.Prerequisite-labeled relevance judgements approach.

- Provide a test-bed for offline evaluation
- Depend the ground truth on another parameter: familiarity with the domain knowledge
- A ground truth such that:

Query Topic	Document Topic	Background Knowledge Topics	Relevance
Q1~LSA	D1~LSA	IR, Linear Algebra	1
Q1~LSA	D1~LSA	Basic Probability	0

2.Prerequisite-labeled relevance judgements approach.

A slight extension: Taking Advantage of graded relevance judgment

Query Topic	Document Topic	Background Knowledge Topics	Relevance
Q1~LSA	D2~ IR, Linear Algebra	Basic Probability Theory	2
Q1~LSA	D1~LSA	Basic Probability Theory	1
Q1~LSA	D3~ Other topics	Basic Probability Theory	0

2.Prerequisite-labeled relevance judgements approach.

Advantages:

1) Fair Comparison

2) Different parameter settings

Disadvantage:

- labor-intensive

1) import domain knowledge in the relevance judgments (access to background knowledge)

2) relevance level of documents change with the growth of knowledge

3. Session-based evaluation approach.

- A system that leads users through the shortest number of iterations

- Minimizing cost of coping with knowledge delta during the session
  1) formulating and running the query (c1)
  2) scanning through the list of documents (c2)
  3) consuming a seemingly relevant document (c3).

$f(c1, c2, c3)$

References

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2. Vakkari, P. 2010. Exploratory searching as conceptual exploration. Proceedings of HCIR, 24-27.
3. Qi Guo and Eugene Agichtein. 2012. Beyond dwell time: estimating document relevance from cursor movements and other post-click searcher behavior. In Proceedings of the 21st international conference on World Wide Web. 569–578.
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Contributions

- Reflected on the shortcomings of current evaluation approaches in the context of knowledge acquisition tasks

- Suggested 3 possible directions for research on evaluation of systems designed to help overcoming knowledge delta