Improving Wikipedia Knowledge Exploration Capabilities by Similarity and Aspect Based Navigation

Master's Thesis Kick-Off Presentation

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Outline

1. Motivation
2. Research Questions
3. Methods
   a. Semantic text similarity & aspect based text similarity
   b. User study
4. Timeline

Motivation

Goal Statement: Improving knowledge exploration by **automatically creating aspect specific links** between sections from Wikipedia

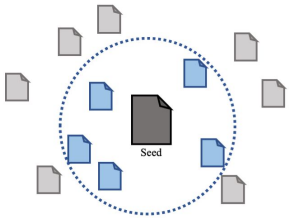
Knowledge Exploration

The process of obtaining insights within a new domain which is generally directed towards a complex, open-ended task.

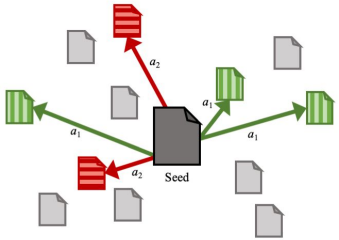
- E.g. “Find out about the Chinese Technology Sector”

Aspect Based Text Similarity

The similarity between texts that is specific towards a particular aspect/property.

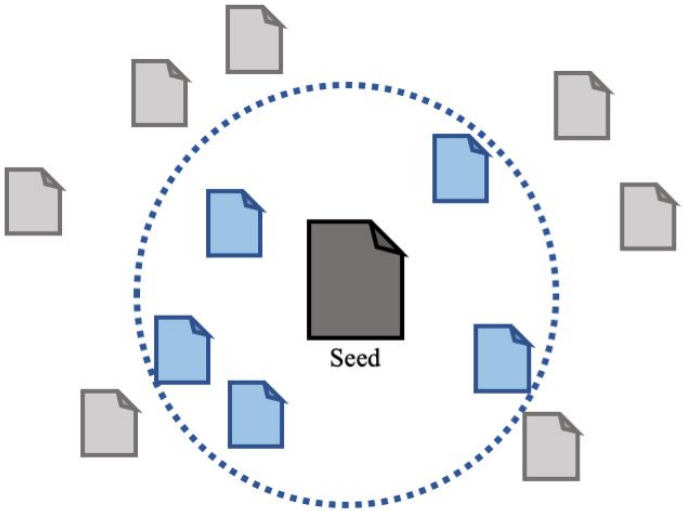


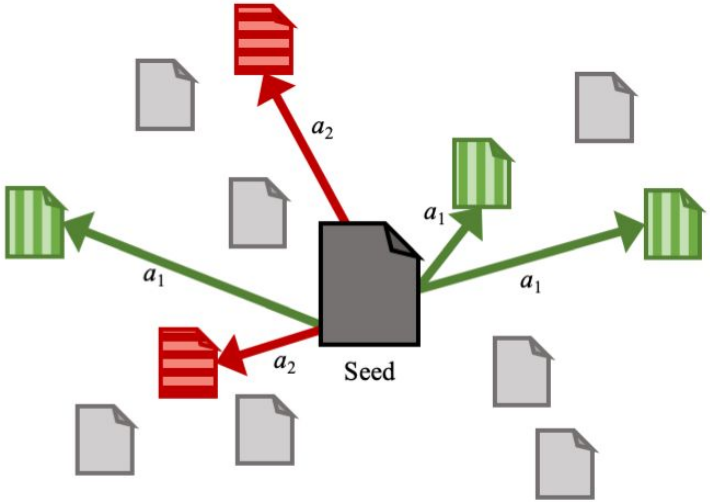
Generic Similarity



Aspect Based Similarity

Illustration: Aspect Based Similarity





Generic Similarity

Aspect Based Similarity

Research Questions

Q1

What is aspect based similarity?

Q2

What is the state of the art for semantic textual similarity and aspect-based similarity?

Q3

How to create embedding representations that capture the similarity for specific aspects?

Q4

How to evaluate the improvements in knowledge exploration on Wikipedia?

Methods: (Generic) Document Similarity

Word Embeddings

- Compute average of word embeddings avg_{di} for each document d_i (e.g. using *Word2vec or GloVe*)
- **similarity(d_1,d_2) = cosine_distance(avg_{d1}, avg_{d2})**

Key Phrases

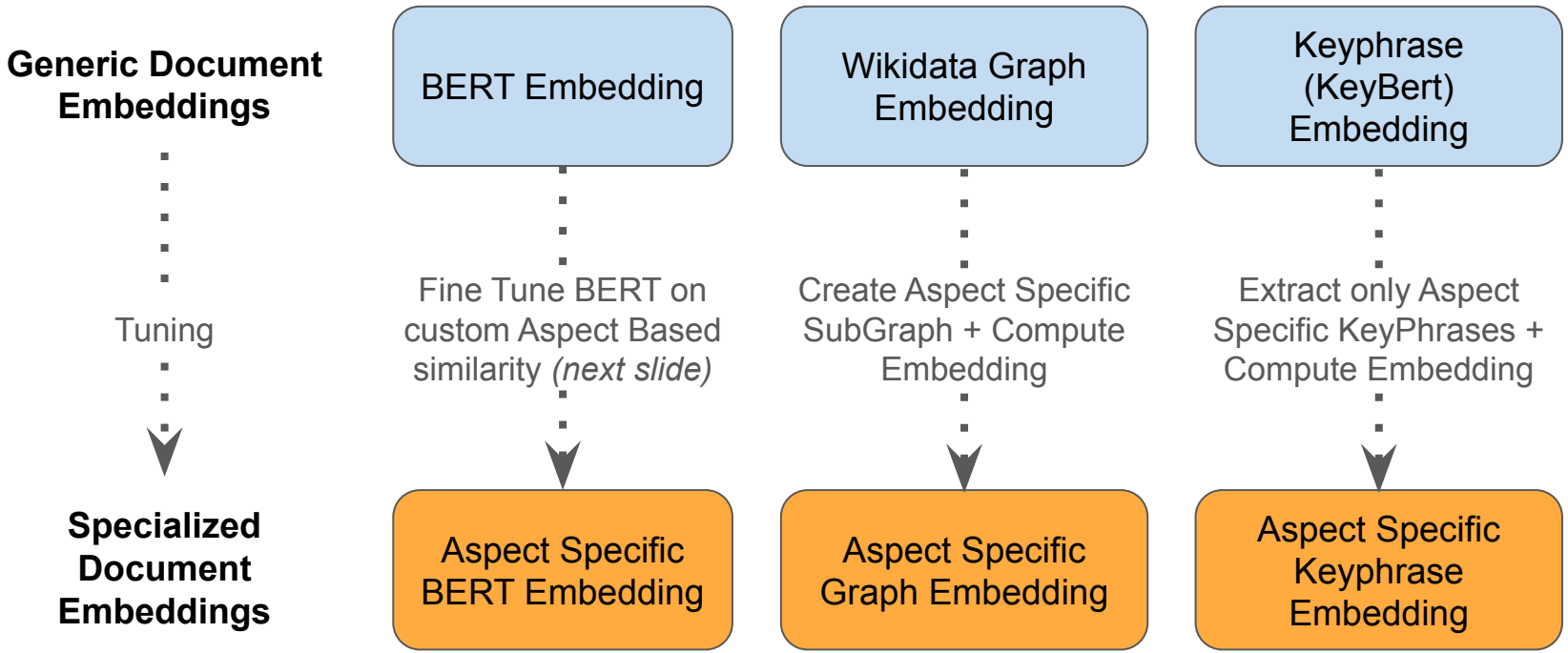
- Extract top k key phrases for each document d_i and create avg document embedding avg_d for all key phrases (e.g. using *KeyBert*)
- **similarity(d_1,d_2) = cosine_distance(avg_{d1}, avg_{d2})**

Document Embeddings

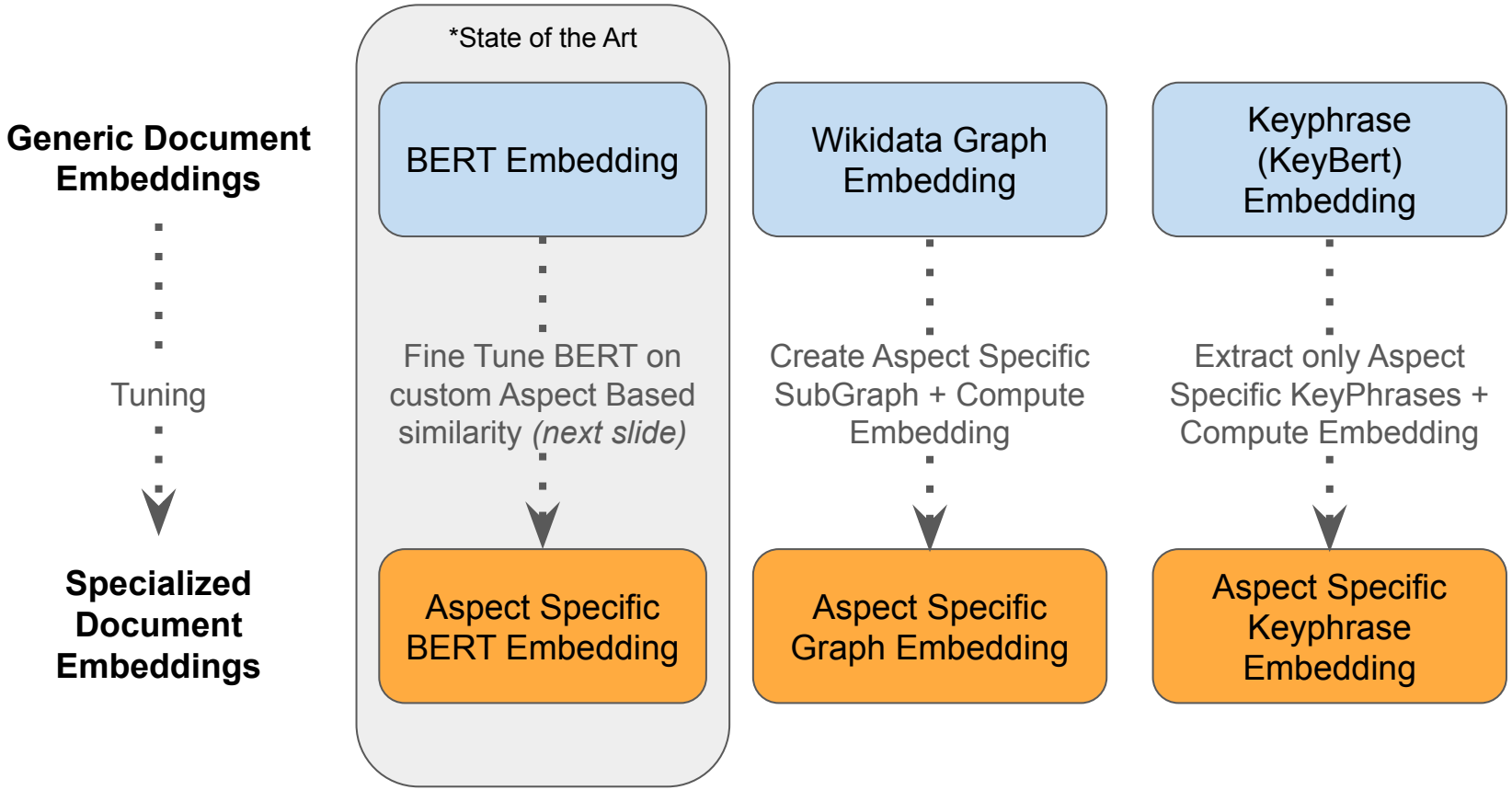
** State of the Art*

- Compute document embedding e_i for each document d_i using *SBERT*
- **similarity(d_1,d_2) = cosine_distance(e_1,e_2)**

Methods: (Aspect Based) Similarity



Methods: (Aspect Based) Similarity



Example: Creating Aspect Specific Embeddings

1. Define Aspects
   1.1. A1: “Technology related”
   1.2. A2: “China related”
   1.3. A3: “Industry related”
   1.4. A4: A1 ∩ A2 ∩ A3
2. Extract Aspect specific Documents/Sections from Wikipedia
   2.1. Using Text Matching (e.g. Text includes the word “China”) - naive approach
   2.2. Using WikiData Knowledge Graph (e.g. Entity is less than k links away from “China Entity”)
   2.3. Combinations of Keyword Extraction and Word Embeddings
3. Create Dataset of Triplets (d_1, d_2, y^a)
   3.1. y^a is {0,1} depending on if d_1 and d_2 share the same aspect a
4. Train Aspect Specialized Document Embedding (based on pretrained BERT embedding)
   4.1. Training Objective: maximize the similarity of the embeddings of document pairs (d_1, d_2) with y^a=1 (documents that are similar in aspect a)

** Derived from Ostendorf et. al 2022*

Methods: User Study

Goal Statement

"Find out about the Chinese Technology Sector" (complex, open ended task)

User Choices

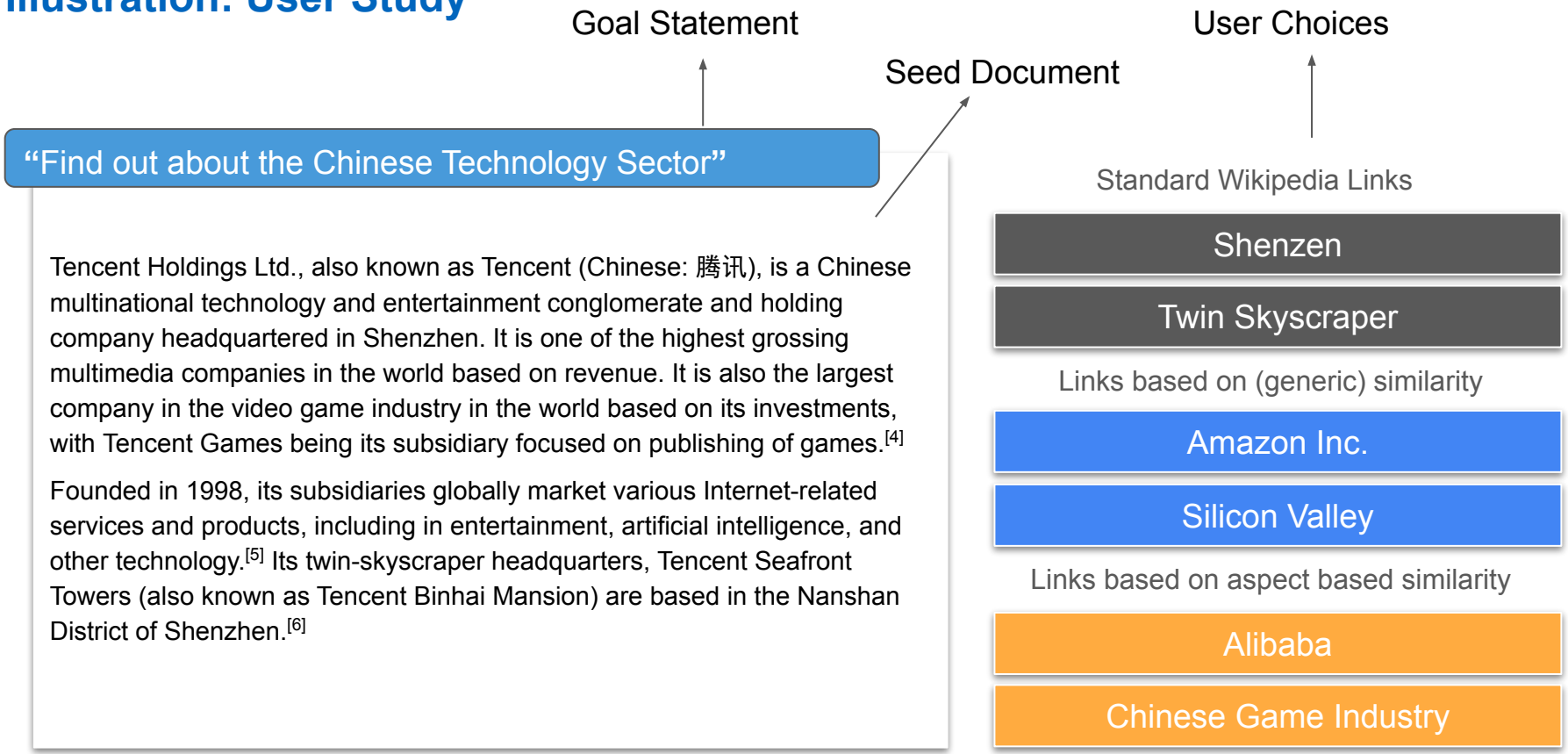
Given a seed article: Decide which text to visit next from the selection of…

- Wikipedia links
- Generic similarity based links
- Aspect based similarity links

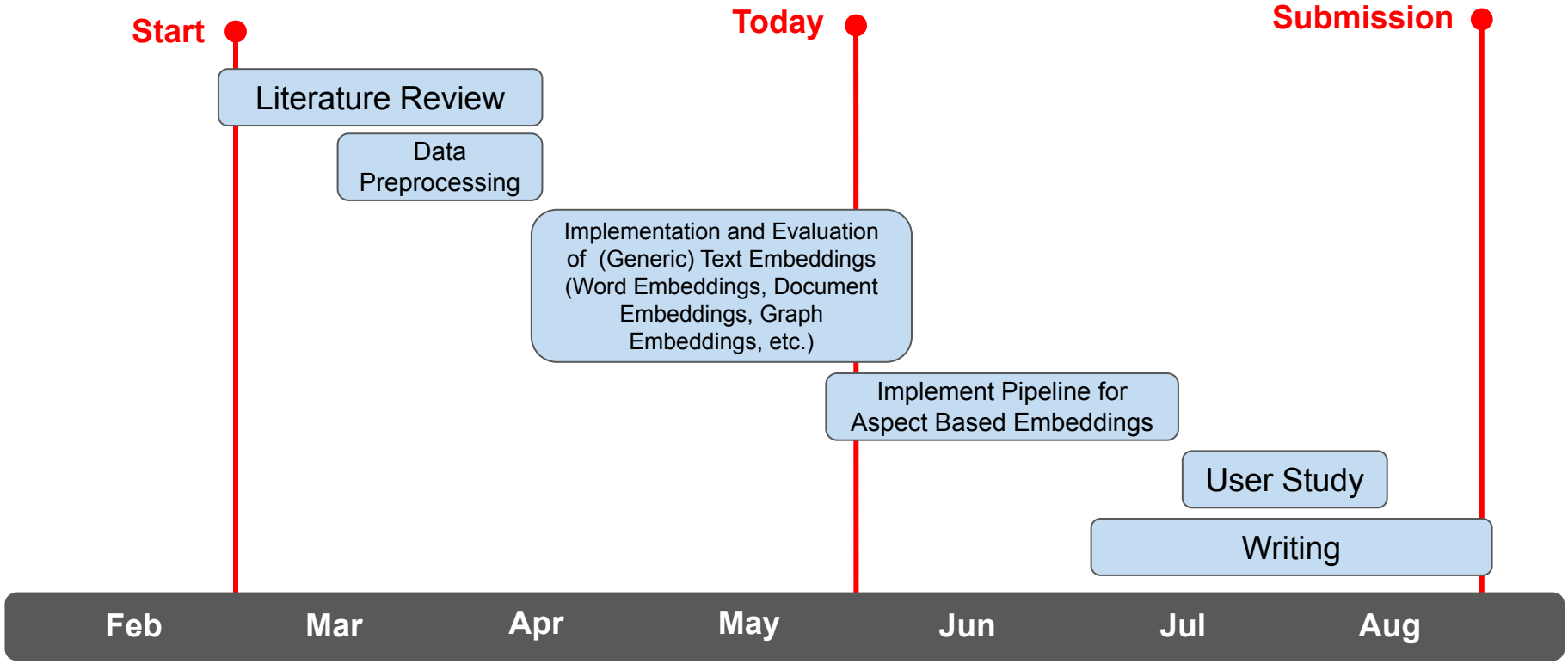
Metrics

- Frequency of choosing (aspect based) similarity link vs Wikipedia link
- "How helpful did you find the information that you received? (Scale 1-5)
- "How familiar are you with the information from this article?" (Scale 1-5)

Illustration: User Study



Timeline



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