



Enhancing Knowledge Selection via Multi-level Document Semantic Graph

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1. Introduction

2. Challenges

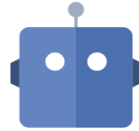
3. Multi-level Document Semantic Graph


4. Experiments



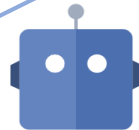
 : I can be quite forgetful.

Forgetting is the process of losing information already stored in the memory.



 : Yes, Forgetting and memory loss is one of life's most painful things.

It's a gradual process where one is **unable to call up the older memories.**



...

...

...

Topic: Forgetting

Forgetting or disremembering is the apparent loss or modification of information already encoded and stored in an individual's long-term memory.

It is a spontaneous or gradual process in which old memories are unable to be recalled from memory storage.

Forgetting also helps to reconcile the storage of new information with old knowledge.....



✘ Most previous research divide documents into isolated sentences

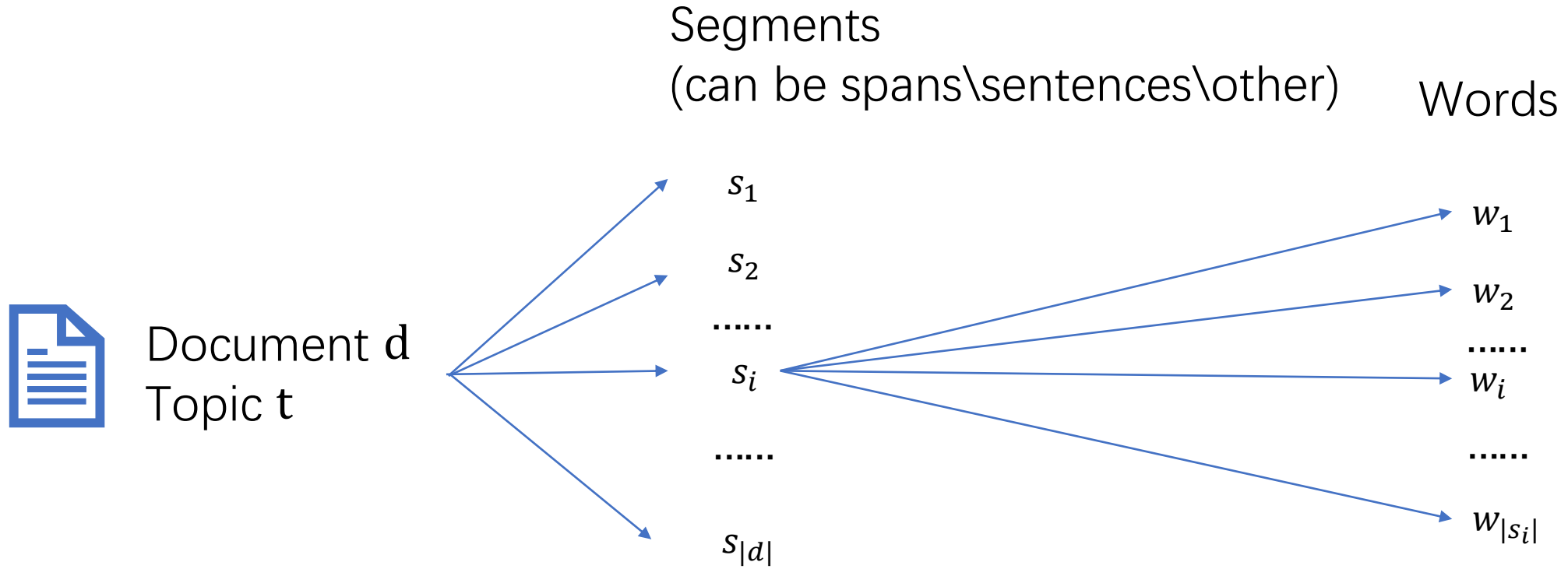
→ Graph based methods

→ Ours: Multi-level Document Semantic Graph



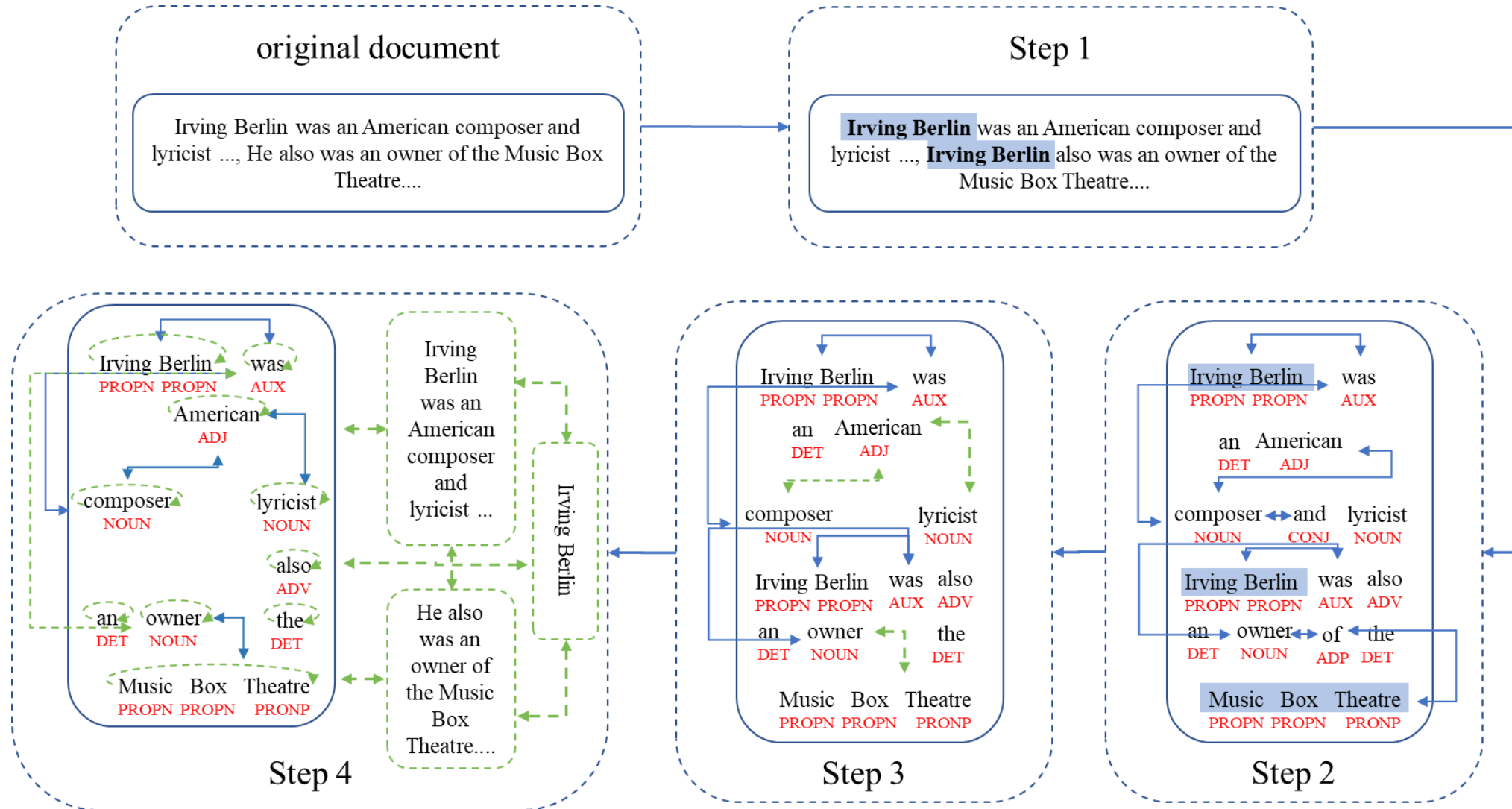
Multi-level Document Semantic Graph

Document Structure



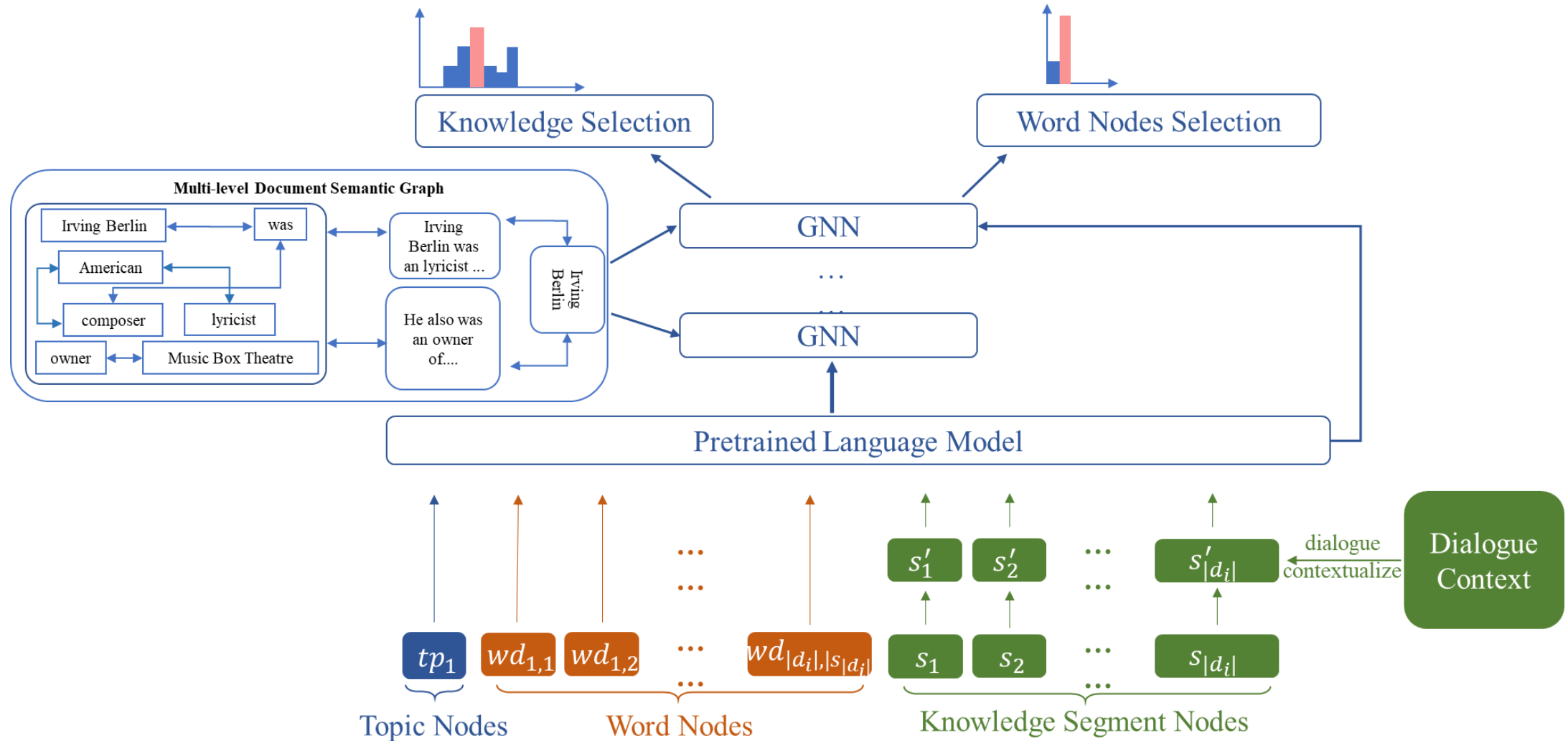
Multi-level Document Semantic Graph

Graph Construction



Multi-level Document Semantic Graph

Knowledge Selection



Main Results

| Method | WoW(Test Seen) | WoW(Test Unseen) | Holl-E |
|---|----------------|------------------|-------------|
| Transformer MemNet(Dinan et al., 2018) | 22.5 | 12.2 | - |
| Transformer MemNet + Pretrain(Dinan et al., 2018) | 24.5 | 23.7 | - |
| SKT(Kim et al., 2019) | 26.8 | 18.3 | 29.2 |
| DIALKI(Wu et al., 2021) | 32.9 | 35.5 | - |
| Document Semantic Graphs(Li et al., 2022b) | 29.4 | 30.8 | 37.7 |
| CorefDiffs(Xu et al., 2022) | 42.4 | 41.4 | 40.9 |
| GenKS(Sun et al., 2023) | 34.2 | 36.6 | 37.9 |
| SPI(Xu et al., 2023) | 36.5 | 34.8 | 38.3 |
| Ours | 45.0 | 41.8 | 36.0 |



Ablation Study

| Method | Test Seen | Test Unseen |
|------------------------|-------------|-------------|
| Baseline | 40.1 | 33.9 |
| + Graph | 44.5 | 40.7 |
| + \mathcal{L}_{word} | 45.0 | 41.8 |

Table 2: Ablation study on WoW. The results are reported in percentage(%). Baseline refers to the model that pretrained language model + MLP. Graph, \mathcal{L}_{word} represent multi-level document semantic graph + residual and word node selection respectively.

| Method | Test Seen | Test Unseen |
|-----------------|-------------|-------------|
| Ours | 45.0 | 41.8 |
| w/o topic nodes | 44.5 | 40.7 |
| w/o word nodes | 45.0 | 41.8 |

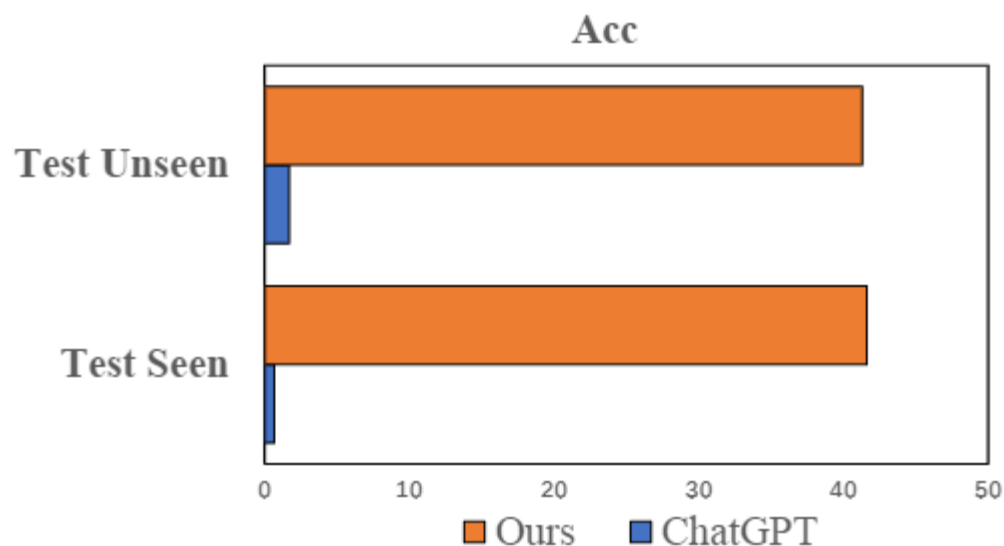
Table 3: Ablation study of the multi-level document semantic graph on WoW. The results are reported in percentage(%).



Experiments



V.S ChatGPT

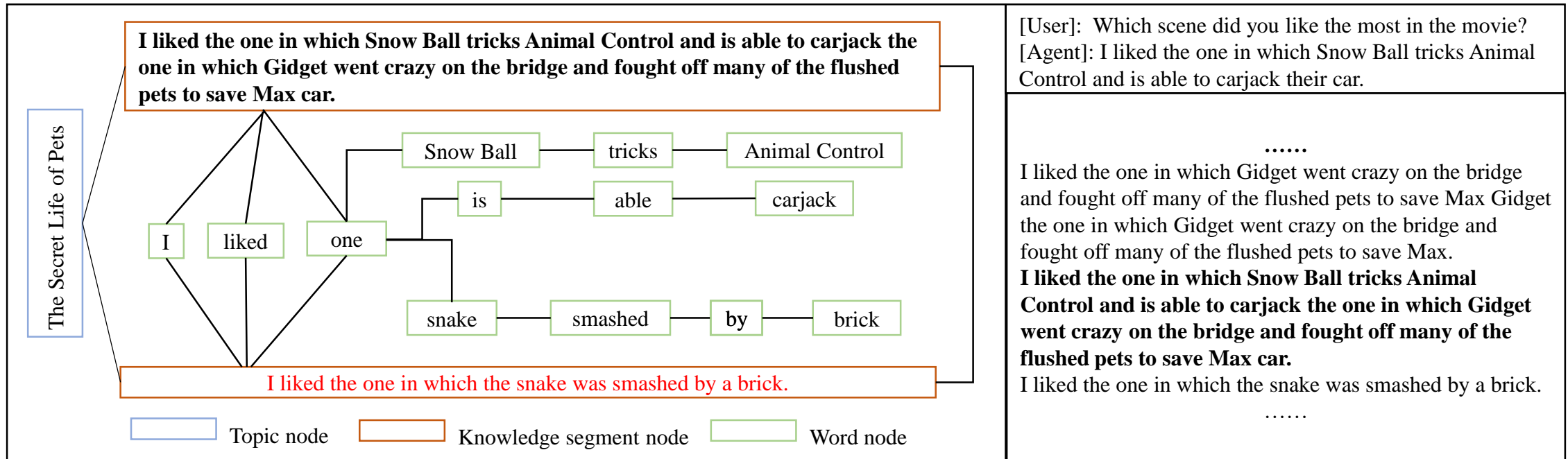


Document Length

| Document length (Num of knowledge segments) | Test seen | | | | | Test unseen | | | | |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | ≤ 40 | ≤ 45 | ≤ 50 | ≤ 55 | > 55 | ≤ 40 | ≤ 45 | ≤ 50 | ≤ 55 | > 55 |
| DIALKI(Wu et al., 2021) | 65.0 | 50.6 | 44.2 | 23.8 | 23.6 | 66.8 | 55.2 | 38.2 | 30.8 | 28.8 |
| Ours | 62.8 | 48.8 | 46.8 | 41.6 | 35.4 | 42.4 | 40.2 | 39.6 | 38.2 | 42.4 |



Case Study



[User]: Which scene did you like the most in the movie?
[Agent]: I liked the one in which Snow Ball tricks Animal Control and is able to carjack their car.

.....
I liked the one in which Gidget went crazy on the bridge and fought off many of the flushed pets to save Max Gidget the one in which Gidget went crazy on the bridge and fought off many of the flushed pets to save Max.
I liked the one in which Snow Ball tricks Animal Control and is able to carjack the one in which Gidget went crazy on the bridge and fought off many of the flushed pets to save Max car.
I liked the one in which the snake was smashed by a brick.
.....





THANK YOU

Thank you for your time and attention!

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