

# Mapping User Intent in Web Search Queries to Types of Commonsense Knowledge

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## 1. Background

What is commonsense?

Can be easily acquired by human.  
Helps human make sense of everyday situations<sup>1</sup>.  
"A dog **is** a mammal"  
"Plants **can** release oxygen during the day"  
"The Netherlands **is located in** Northwestern Europe"  
.....

What knowledge types can FindItOut<sup>2</sup> game collect?

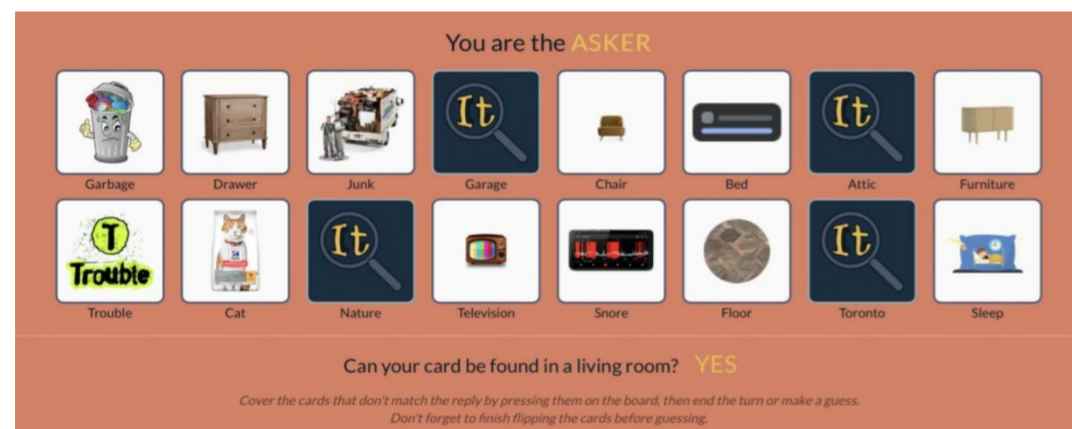


Figure 1: The Player Receiving The Answer to A Question in FindItOut Game

Positive-generative: + <teapot, UsedFor, making tea>  
Negative-generative: - <rabbit, Can, fly>  
Positive-discriminative: +<dog, fish, IsA, mammal>  
Negative-discriminative: -< wheel, IsPartOf, a car >



Which one is a mammal, fish or dog?

Figure 2: A Web Query With Informational User Intent in Google<sup>3</sup>

## 2. Research Questions

- How do we map web search queries to knowledge types?
- What associations are there between user intents and the classification of knowledge types?

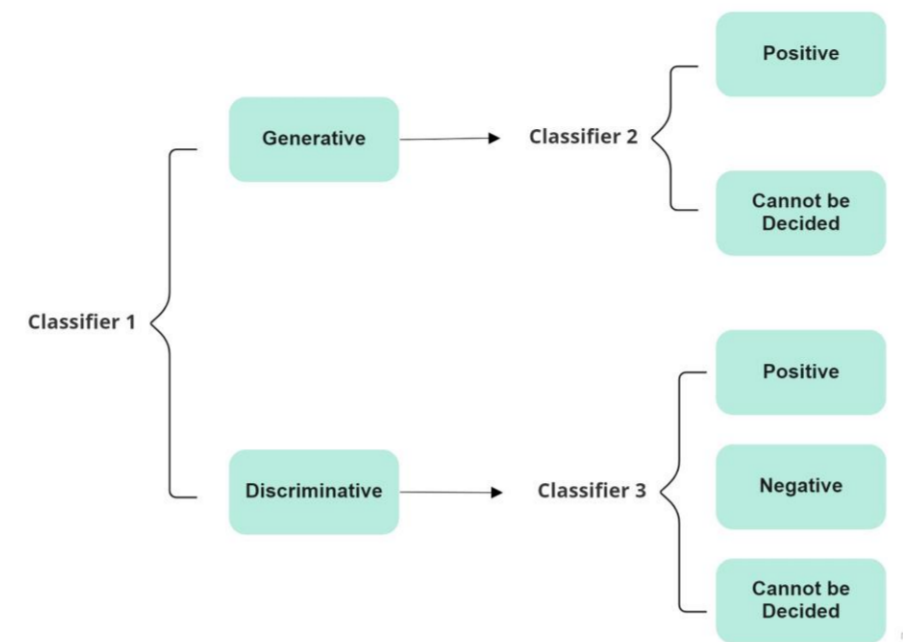


Figure 3: The Hierarchical Classifiers

## 3. Methods

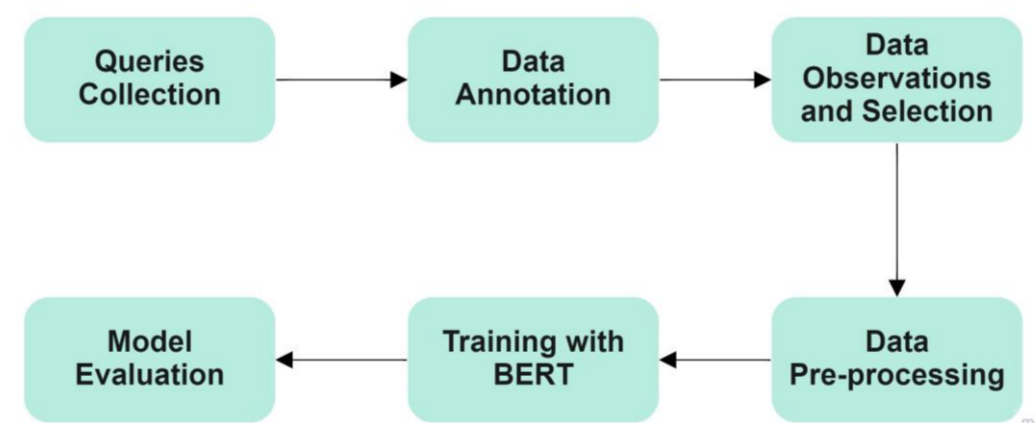


Figure 4: 1: The Process of Experiments

### Data Observations

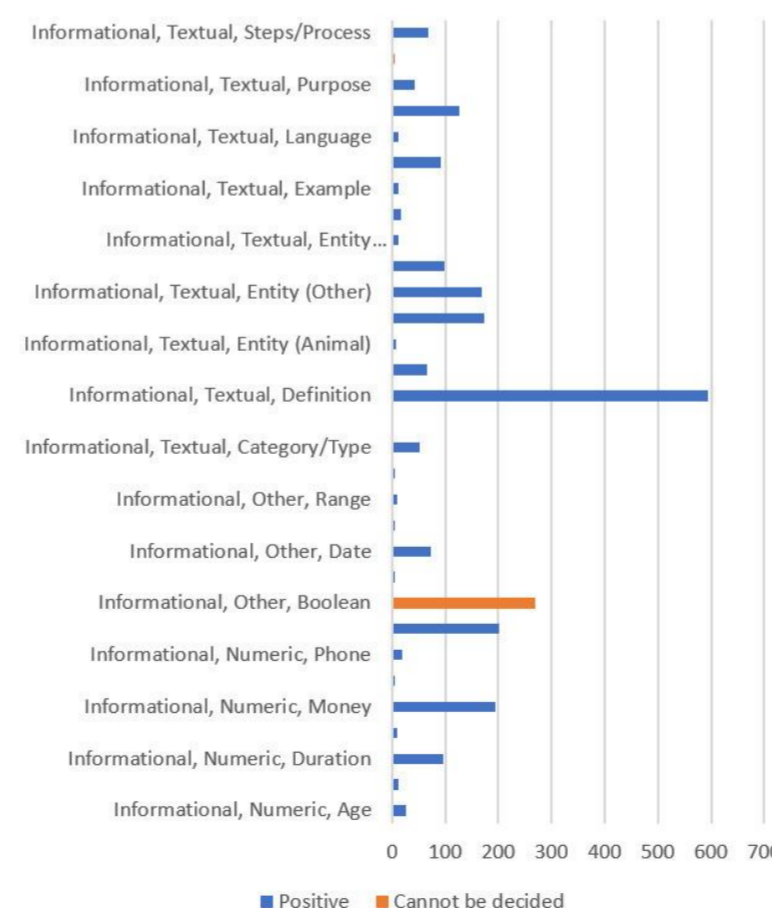


Figure 5: Number of Generative Queries That Are Positive or Cannot Be Decided in Each Category

## Model Evaluation

Table 1: Accuracy Scores of Models with User Intents and without User Intents of A Smaller Dataset for Classification of Generative or Discriminative Knowledge Types

Dataset	With User Intents	Without User Intents
Fold 1	0.9732	0.9732
Fold 2	0.9643	0.9640
Fold 3	0.9732	0.9554
Fold 4	0.9732	0.9550
Fold 5	1.000	0.9820
Average	0.9768	0.9659
Test Set	0.9677	0.9516

## 4. Conclusions

- The accuracy of knowledge type classification reached around 0.99 for three classifiers.
- With user intents, the performance of knowledge type classification is generally better than not having them.

## 5. Future Work

- Extend the dataset and make it more balanced and diverse.
- Try out more combinations of parameters for more accurate classification.

### References

- Filip Ilievski, Alessandro Oltramari, Kaixin Ma, Bin Zhang, Deborah L McGuinness, and Pedro Szekely. Dimensions of commonsense knowledge. KnowledgeBased Systems, 229:107347, 2021.
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