Context Aware Chat-bot

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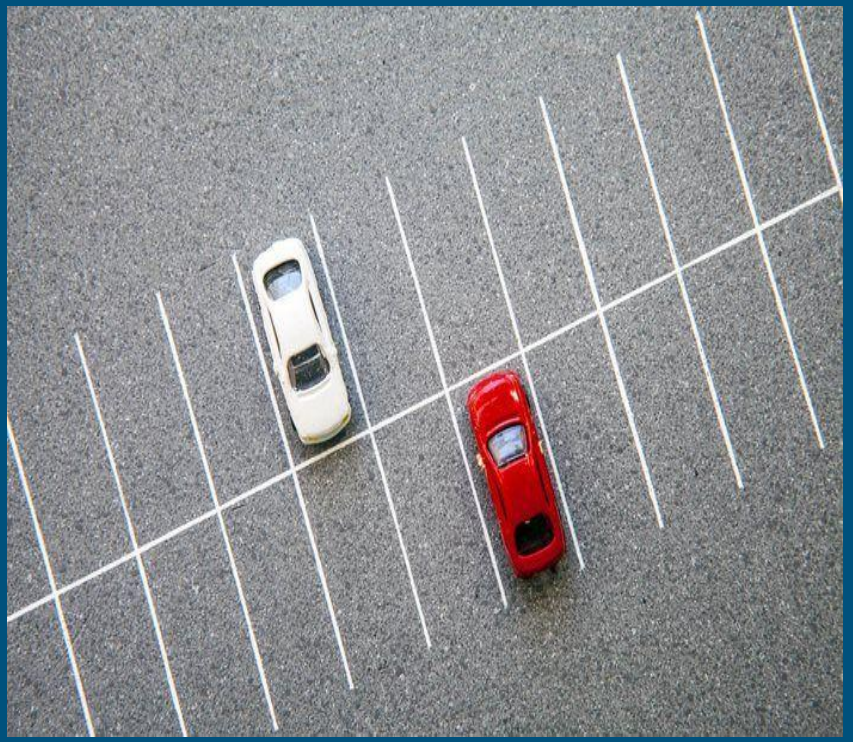
Problem Description

- **Problem:**
  - Inputs given to a chatbot can have multiple meanings.
  - How do we resolve the true meaning
- **Goal:**
  - Create a system that enables a chatbot to respond relevantly to user given prompts that may contain semantic ambiguity
- **Example Prompts:**
  - What does a watch look like?
  - In this case “watch” is a homograph

Homographs
Examples
In Statements

Park

Want to go the park.



Python

Is python popular?

Bat

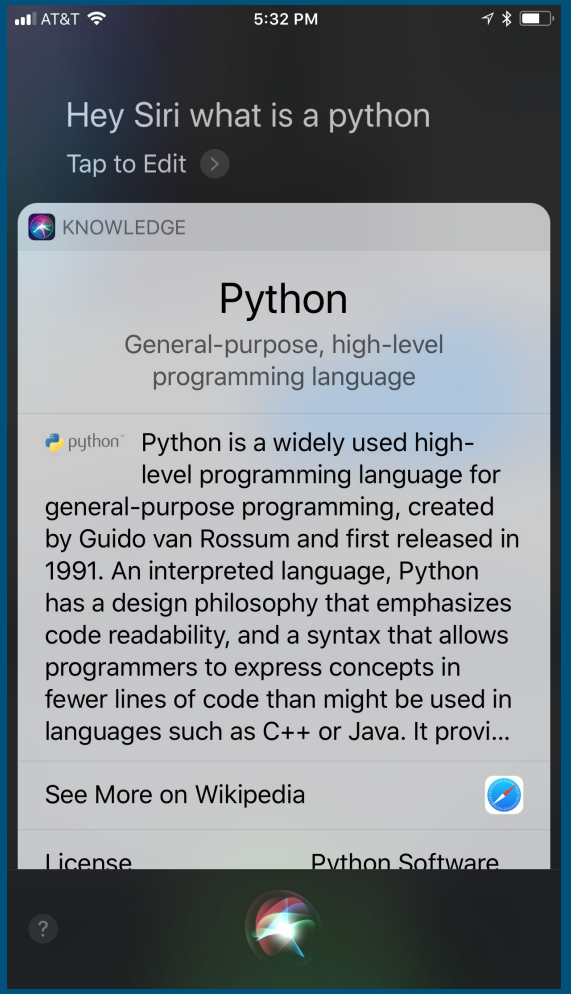
How much for that bat?

Watch

I built a watch over the summer.

Motive

- Interacting with computers naturally
- Current bots don’t always understand
- Chatbots highlight this problem well



Solution - Intuition

Some approaches to this problem:

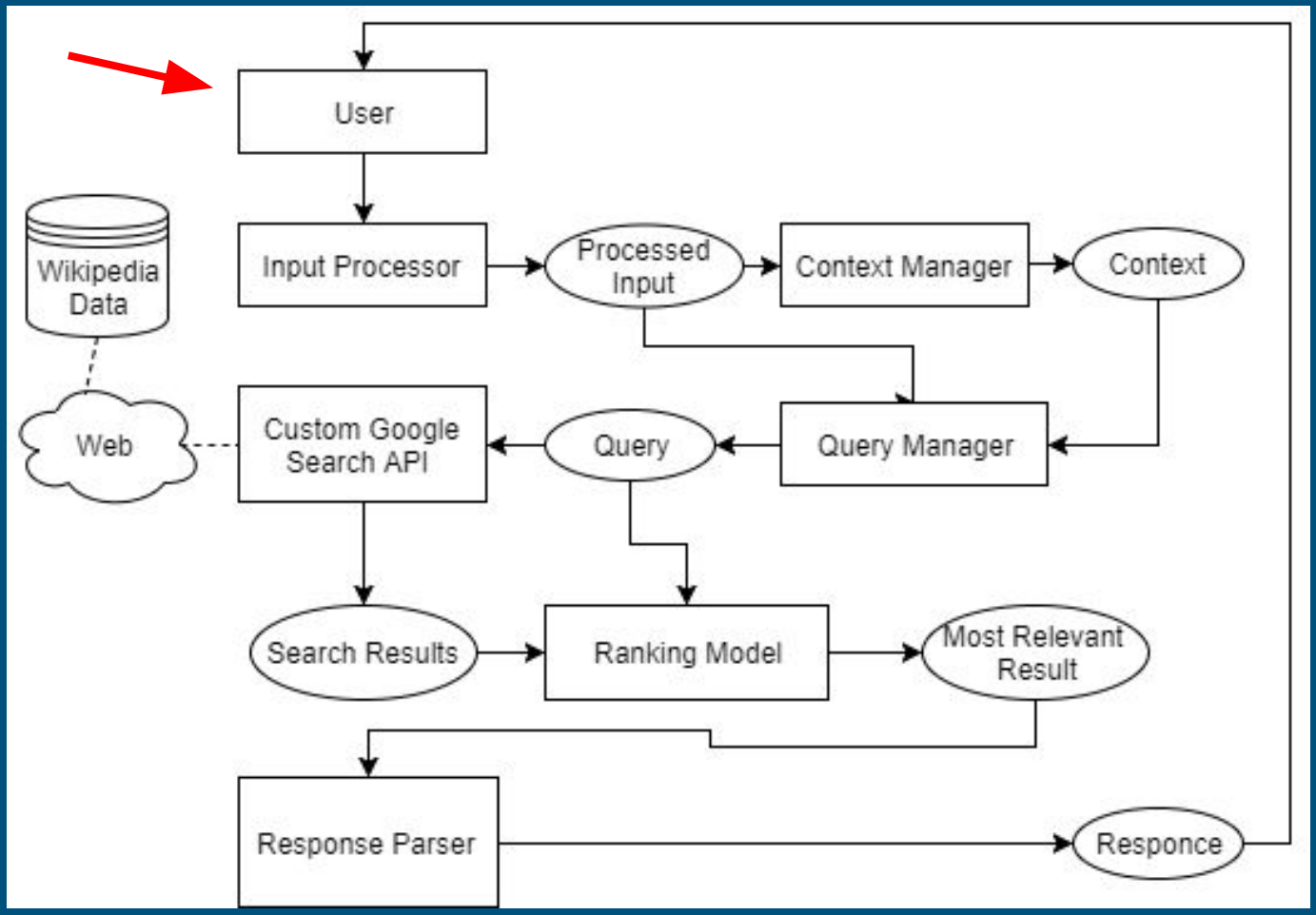
- Part of speech (POS)
  - Does not always work
- Constrict the domain
  - Not general
- Interview the user
  - Not automated
- Resolve domain through context
  - Requires multiple inputs

```
Moc User Input:

>>> When were castles
first used?

>>> What  does a watch
look like?
```

Solution - High Level Flow

Core components:

- Context of the conversation
- Web Search
  - Google Search API
  - Wikipedia database
- Result Ranking Model
- Response Parser



Dataset & Experiments

- Currently the chatbot only uses the Wikipedia corpus

Test Cases:

1. Proof of Concept Test
2. Accuracy test
    - List of Homographs , 50 words
    - Human judgers - results are correct?

Results Analysis and Evaluation: Proof of concept

```
You:
What is your favorite pet animal?
Cahtbot:
Jellyfish.
++++++++++
----------
Search Results:
Pet
b"A pet or companion animal is an animal kept primarily for a
r pets are often noted for their attractive appearances, and
None
https://en.wikipedia.org/wiki/Pet
Queen Victoria's pets
b'Queen Victoria and her close family kept numerous pet anima
h \xe2\x80\x93 a Cavalier King Charles spaniel\nEos \xe2\x80\
el\nGoats \xe2\x80\x93 The Shah of Persia presented Queen Vic
ndsor.'
None
https://en.wikipedia.org/wiki/Queen_Victoria%27s_pets
Islam and cats
b'The domestic cat is a revered animal in Islam. Admired for
t" by Muslims.'
None
https://en.wikipedia.org/wiki/Islam_and_cats
====================
```

1 | 2

```
https://en.wikipedia.org/wiki/Queen_Victoria%27s_pets
Islam and cats
b'The domestic cat is a revered animal in Islam. Admired for its cleanlir
t" by Muslims.'
None
https://en.wikipedia.org/wiki/Islam_and_cats
====================

You:
I like python.
Cahtbot:
Aww thanks me too .////.
++++++++++
----------
Search Results:
Burmese python
b'The Burmese python (Python bivittatus) is one of the five largest speci
a large area of tropical South and Southeast Asia.'
None
https://en.wikipedia.org/wiki/Burmese_python
Reticulated python
b"The reticulated python (Python reticulatus) is a species of python four
snakes."
```

Results Analysis and Evaluation: Experiments

Accuracy:

93 %

Failures Analysis:

- **POS tagger failures**
- **Really subtle meanings**
  i.e. , Rock n.
  - an unintelligent person

Cons & Pros

Advantages:

- Real time response
- Up to date knowledge
- Easy to plug into existing applications

Limitations:

- Cold start problem
- 100 queries/day - for free API we use
- Rapid changes in context - Context Change Detection

Conclusions & Future Work

- It works.
- Everyone learns a lot.

Future Work

- More Task-oriented
- Combine the results with Google Search Trend
- Generating Human Friendly Answers
- Connect with voice recognition techs, Better UI

References

1. List of Homographs - wiki https://en.wikipedia.org/wiki/List_of_English_homographs
2. List of Homographs https://www.dailywritingtips.com/homograph-examples/
3. Simsim API http://developer.simsimi.com/api
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   https://developers.google.com/custom-search/json-api/v1/using_rest
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6. Learning Symmetric Collaborative Dialogue Agents with Dynamic Knowledge Graph Embeddings
   https://nlp.stanford.edu/pubs/he2017collaborative.pdf
7. BUILDING INTELLIGENT AGENTS THAT LEARN TO RETRIEVE AND EXTRACT INFORMATION
   http://ftp.cs.wisc.edu/machine-learning/shavlik-group/eliassi-rad.thesis.pdf