BUILDING CHATBOTS IN PYTHON

# Virtual assistants and accessing data

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## Virtual assistants

- Common chatbot use cases:
  - Scheduling a meeting
  - Booking a flight
  - Searching for a restaurant
- Require information about the outside world
- Need to interact with databases or APIs

## Basic SQL

| name | pricerange | area | rating |
|---|---|---|---|
| Bill's Burgers | hi | east | 3 |
| Moe's Plaice | low | north | 3 |
| Sushi Corner | mid | center | 3 |

```
SELECT * from restaurants;
```

```
SELECT name, rating from restaurants;
```

```
SELECT name from restaurants WHERE area = 'center' AND pricerange = 'hi';
```

## SQLite with Python

```
In [1]: import sqlite3

In [2]: conn = sqlite3.connect('hotels.db')

In [3]: c = conn.cursor()

In [4]: c.execute("SELECT * FROM hotels WHERE area='south' and pricerange='hi'")
Out[4]: <sqlite3.Cursor at 0x10cd5a960>

In [5]: c.fetchall()
Out[5]: [('Grand Hotel', 'hi', 'south', 5)]
```

## SQL injection

```
# Bad Idea
query = "SELECT name from restaurant where area='{}'".format(area)
c.execute(query)

# Better
t = (area,price)
c.execute('SELECT * FROM hotels WHERE area=? and price=?', t)
```

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## Let's practice!

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# Exploring a DB with natural language

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## Example messages

- "Show me a great hotel"
- "I'm looking for a cheap hotel in the south of town"
- "Anywhere so long as it's central"

## Parameters from text

```
In [1]: message = "a cheap hotel in the north"

In [2]: data = interpreter.parse(message)

In [3]: data
Out[3]:
{'entities': [{'end': '7', 'entity': 'price', 'start': 2, 'value': 'lo'},
  {'end': 26, 'entity': 'location', 'start': 21, 'value': 'north'}],
 'intent': {'confidence': 0.9, 'name': 'hotel_search'}}

In [4]: params = {}

In [5]: for ent in data["entities"]:
   ...:     params[ent["entity"]] = ent["value"]

In [6]: params
Out[6]: {'location': 'north', 'price': 'lo'}
```

# Creating a query from parameters

```
In [7]: query = "select name FROM hotels"

In [8]: filters = ["{}=?".format(k) for k in params.keys()]

In [9]: filters
Out[9]: ['price=?', 'location=?']

In [10]: conditions = " and ".join(filters)

In [11]: conditions
Out[11]: 'price=? and location=?'

In [12]: final_q = " WHERE ".join([query, conditions])

In [13]: final_q
Out[13]: 'SELECT name FROM hotels WHERE price=? and location=?'
```

## Responses

```
In [1]: responses = [
          "I'm sorry :( I couldn't find anything like that",
          "what about {}?",
          "{} is one option, but I know others too :)"
        ]

In [2]: results = c.fetchall()

In [3]: len(results)
Out[3]: 4

In [4]: index = min(len(results), len(responses)-1)

In [5]: responses[index]
Out[5]: '{} is one option, but I know others too :)'
```

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# Incremental slot filling and negation

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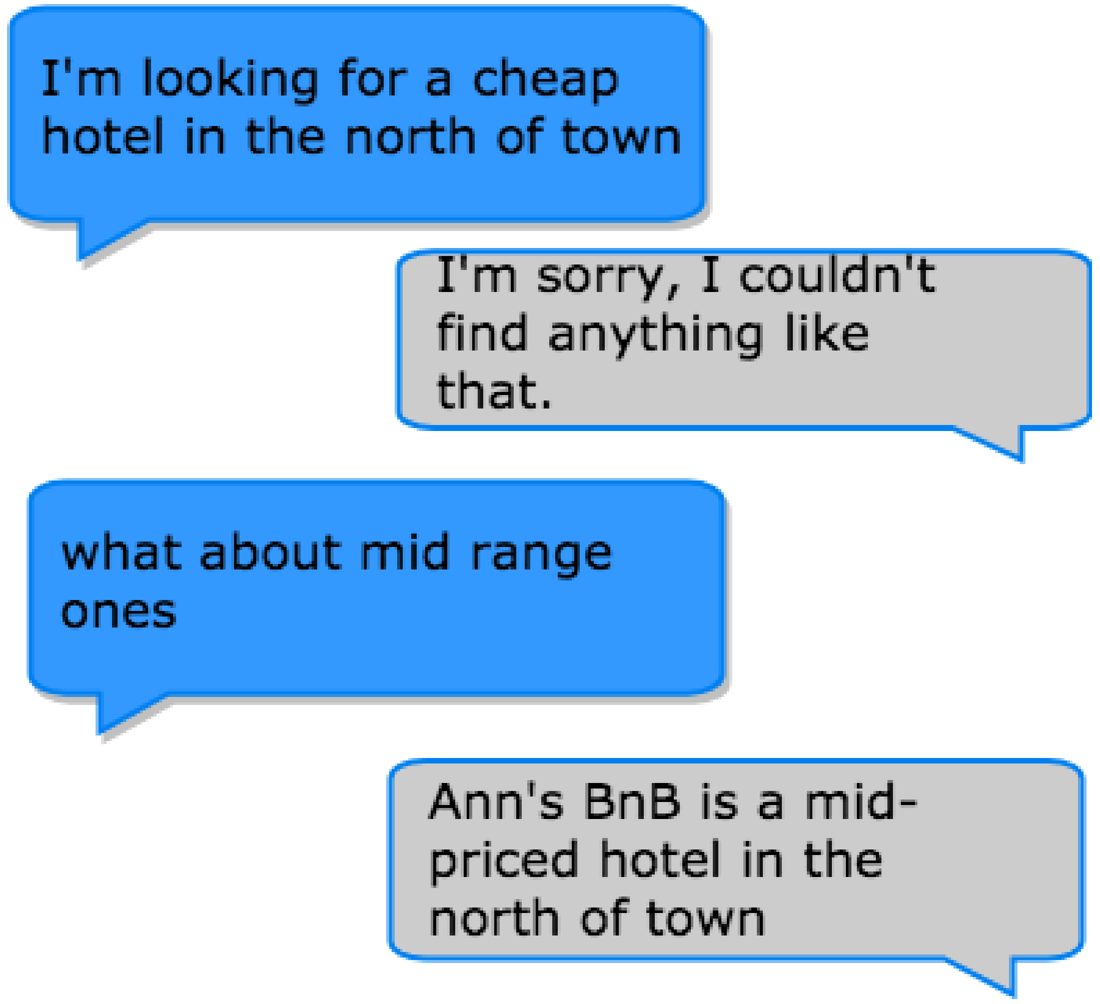
## Incremental filters


I'm looking for a cheap hotel in the north of town

I'm sorry, I couldn't find anything like that.

what about mid range ones

Ann's BnB is a mid-priced hotel in the north of town

## Basic Memory

```
In [1]: def respond(message, params):
   ...:     # update params with entities in message
   ...:     # run query
   ...:     # pick response
   ...:     return response, params

# initialise params
In [2]: params = {}

# message comes in
In [3]: response, params = respond(message, params)
```

## Negation

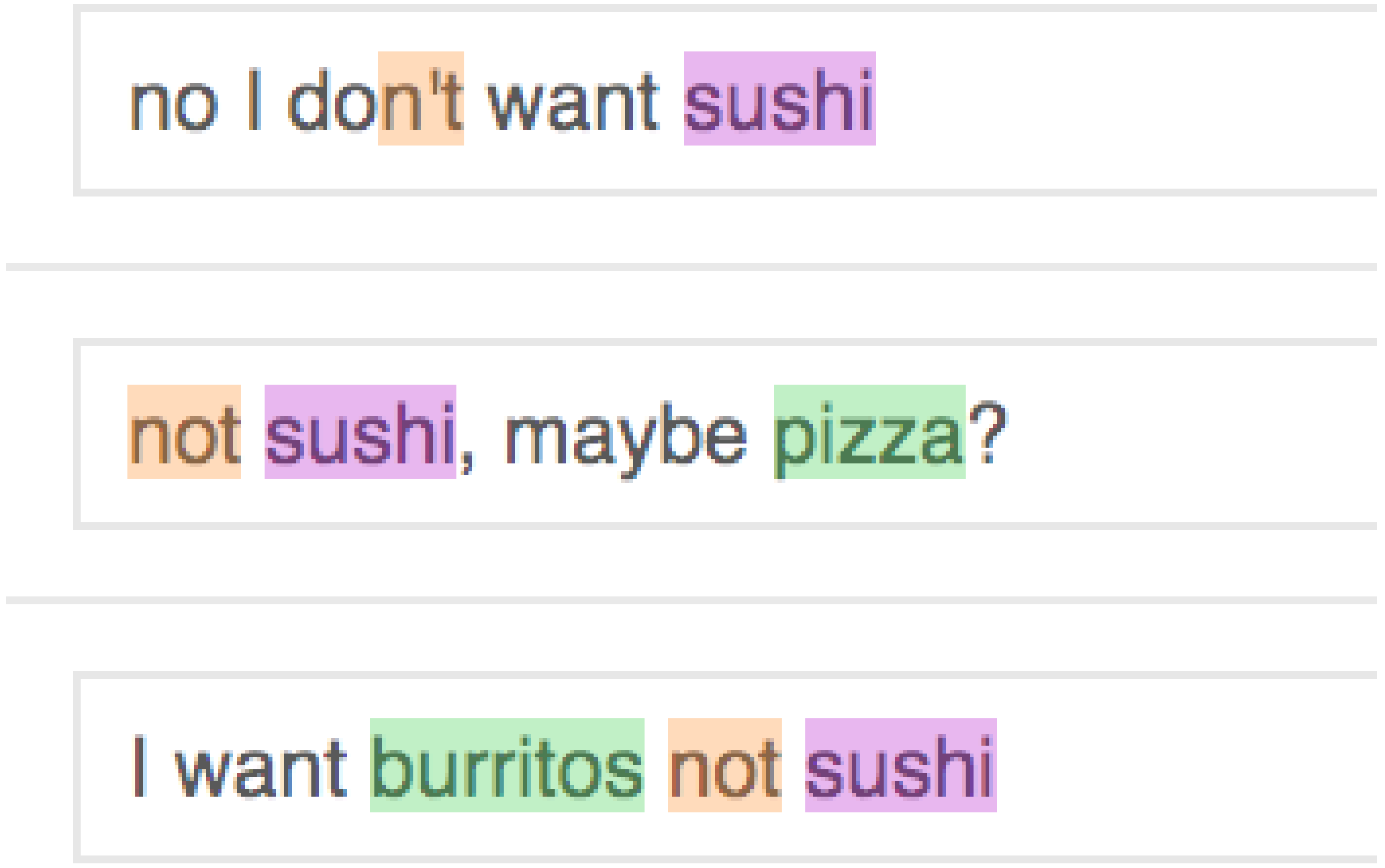
"where should I go for dinner?"

"what about Sally's Sushi Place?"

"no I don't like sushi"

"ok, what about Joe's Steakhouse?"

## Negated entities


no I don't want sushi

not sushi, maybe pizza?

I want burritos not sushi

- assume that "not" or "n't" just before an entity means user wants to exclude this
- normal entities in green, negated entities in purple

## Catching negations

```
In [1]: doc = nlp('not sushi, maybe pizza?')

In [2]: indices = [1, 4]

In [3]: ents, negated_ents = [], []

In [4]:  start = 0
   ...:  for i in indices:
   ...:      phrase = "{}".format(doc[start:i])
   ...:      if "not" in phrase or "n't" in phrase:
   ...:          negated_ents.append(doc[i])
   ...:      else:
   ...:          ents.append(doc[i])
   ...:      start = i
```

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