Generating and transforming text

WORKING WITH THE OPENAI API

James Chapman
Curriculum Manager, DataCamp

datacamp

Recap...

- Q&A

```
response = client.chat.completions.create(
  model="gpt-4o-mini",
  messages=[{"role": "user", "content": "How many days are in October?"}]
)

print(response.choices[0].message.content)
```

```
October has 31 days.
```

How is the output generated?

- Text *most likely* to complete the prompt

```
response = client.chat.completions.create(
  model="gpt-4o-mini",
  messages=[{"role": "user", "content": "Life is like a box of chocolates."}]
)

print(response.choices[0].message.content)
```

```
You never know what you're going to get. This famous quote from the movie
"Forrest Gump"...
```

- Response is **non-deterministic** (inherently random)

Controlling response randomness

- `temperature` : control on *determinism*
- Ranges from `0` (highly deterministic) to `2` (very random)

```
response = client.chat.completions.create(
    model="gpt-4o-mini",
    messages=[{"role": "user", "content": "Life is like a box of chocolates."}],
    temperature=2
)
print(response.choices[0].message.content)
```

```
"...you never know what you're gonna get." That quote reminds us of the
unpredictability of life and the diverse set of experiences we might encounter.
Whether sweet, nutty, bitter, or flashy, life holds a treasure trove of surprises.
```

Content transformation

- Changing text based on an instruction
  - Find and replace
  - Summarization
  - Copyediting

```
prompt = """
Update name to Maarten, pronouns to he/him, and job title to Senior Content Developer
in the following text:

Joanne is a Content Developer at DataCamp. Her favorite programming language is R,
which she uses for her statistical analyses.
"""
```

Content transformation

```
response = client.chat.completions.create(
    model="gpt-4o-mini",
    messages=[{"role": "user", "content": prompt}]
)

print(response.choices[0].message.content)
```

```
Maarten is a Senior Content Developer at DataCamp. His favorite programming language
is R, which he uses for his statistical analyses.
```

Content generation

```
prompt = "Create a tagline for a new hot dog stand."

response = client.chat.completions.create(
    model="gpt-4o-mini",
    messages=[{"role": "user", "content": prompt}]
)

print(response.choices[0].message.content)
```

```
"Frankly, we've got the BEST dogs in town!"
```

Controlling response length

Default max_tokens

```
response = client.chat.completions.create(
  model="gpt-4o-mini",
  prompt="Write a haiku about AI."
)

print(response.choices[0].text)
```

```
AI so powerful
Computers that think and learn
Superseding
```

Controlling response length

Default max_tokens

```
response = client.chat.completions.create(
  model="gpt-4o-mini",
  prompt="Write a haiku about AI."
)

print(response.choices[0].text)
```

```
AI so powerful
Computers that think and learn
Superseding
```

max_tokens = 30

```
response = client.chat.completions.create(
  model="gpt-4o-mini",
  prompt="Write a haiku about AI.",
  max_tokens=30
)

print(response.choices[0].text)
```

```
A machine mind thinks
Logic dictates its choices
Mankind ponders anew
```

Understanding tokens

Returning to cost

- Usage costs dependent on amount of input and output text
  - Models are priced by *cost/tokens*
  - Input and output tokens can be priced differently
- Increasing `max_tokens` increases cost
- Scoping feature cost often starts with a rough calculation:

$$\frac{\text{Cost}}{\text{Time}} = \text{Avg. Tokens Generated} \times \text{Model Cost} \times 1000 \times \frac{\text{Expected no. of requests}}{\text{Time}}$$

[1] https://openai.com/pricing

Let's practice!

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Sentiment analysis and classification

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Curriculum Manager, DataCamp

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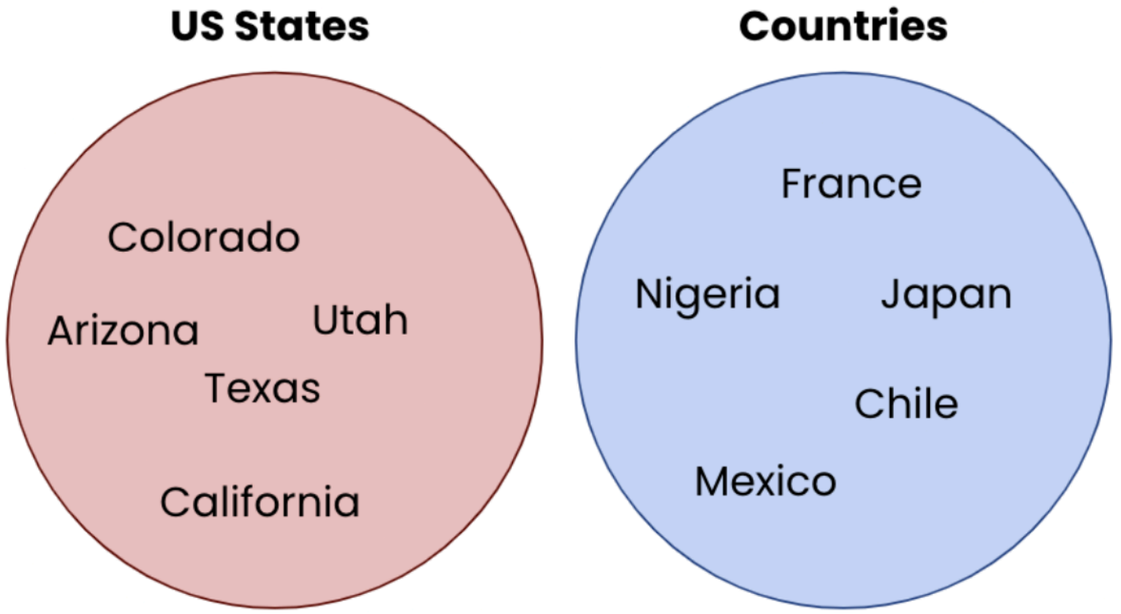
Classification tasks

- Task that involves assigning a label to information
  - Identifying the language from text
  - Categorization
  - Classifying sentiment

- OpenAI models can perform these tasks, providing:
  - Model has sufficient knowledge
  - Prompt contains sufficient context



Categorizing animals

```
response = client.chat.completions.create(
    model="gpt-4o-mini",
    messages=[{"role": "user", "content": "Classify the following animals into
    categories: zebra, crocodile, blue whale, polar bear, salmon, dog."}],
    max_tokens=50
)
print(response.choices[0].message.content)
```

```
Here are the animals classified into categories based on their general classifications:

Mammals: Zebra, Polar Bear, Dog
Fish: Salmon
Reptiles: Crocodile
```

Specifying groups

```
response = client.chat.completions.create(
    model="gpt-4o-mini",
    messages=[{"role": "user", "content": "Classify the following animals into animals
    with fur and without: zebra, crocodile, dolphin, polar bear, salmon, dog."}],
    max_tokens=50
)

print(response.choices[0].message.content)
```

```
Sure! Here's the classification of the animals you provided:

Animals with fur: Dog, Polar Bear, Zebra
Animals without fur: Crocodile, Dolphin, Salmon
```

Classifying sentiment

```
prompt = """Classify sentiment in the following statements:
1. The service was very slow
2. The steak was awfully tasty!
3. Meal was decent, but I've had better.
4. My food was delayed, but drinks were good.
"""
response = client.chat.completions.create(
    model="gpt-4o-mini",
    messages=[{"role": "user", "content": prompt}],
    max_tokens=50
)
print(response.choices[0].message.content)
```

Classifying sentiment

1. The service was very slow
2. The steak was awfully tasty!
3. Meal was decent, but I've had better.
4. My food was delayed, but drinks were good.

```
1. Negative
2. Positive
3. Neutral
4. Mixed
```

Classifying sentiment

```
prompt = """Classify sentiment as 1-5 (bad-good) in the following statements:
1. The service was very slow
2. The steak was awfully tasty!
3. Meal was decent, but I've had better.
4. My food was delayed, but drinks were good.
"""
```

```
1. 1
2. 5
3. 3
4. 2
```

Zero-shot vs. one-shot vs. few-shot prompting

- **Zero-shot** prompting: *no examples* provided

In-context learning:

- **One-shot** prompting: *one example* provided
- **Few-shot** prompting: *multiple examples* provided

One-shot prompting

```
prompt = """Classify sentiment in the following statements:
The service was very slow // Disgruntled
Meal was decent, but I've had better. //
"""

response = client.chat.completions.create(
    model="gpt-4o-mini",
    messages=[{"role": "user", "content": prompt}]
)

print(response.choices[0].message.content)
```

```
Neutral to Discontented
```

Few-shot prompting

```
prompt = """Classify sentiment in the following statements:
The service was very slow // Disgruntled
The steak was awfully tasty! // Delighted
Good experience overall. // Satisfied
Meal was decent, but I've had better. //
"""

response = client.chat.completions.create(
    model="gpt-4o-mini",
    messages=[{"role": "user", "content": prompt}]
)

print(response.choices[0].message.content)
```

```
Neutral/Discontented
```

Let's practice!

WORKING WITH THE OPENAI API

Chat completions with GPT

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James Chapman
Curriculum Manager, DataCamp

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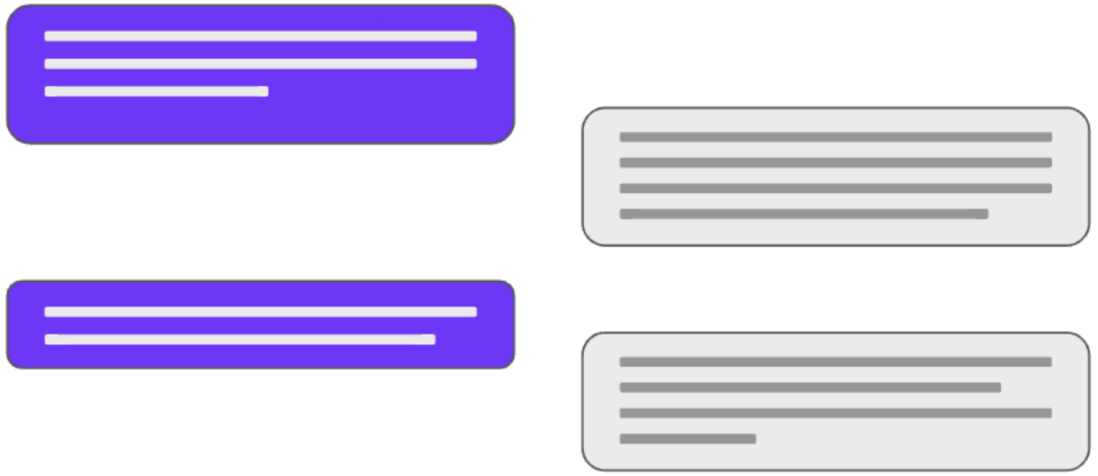
The Chat Completions endpoint

Single-turn tasks

- Text generation
- Text transformation
- Classification

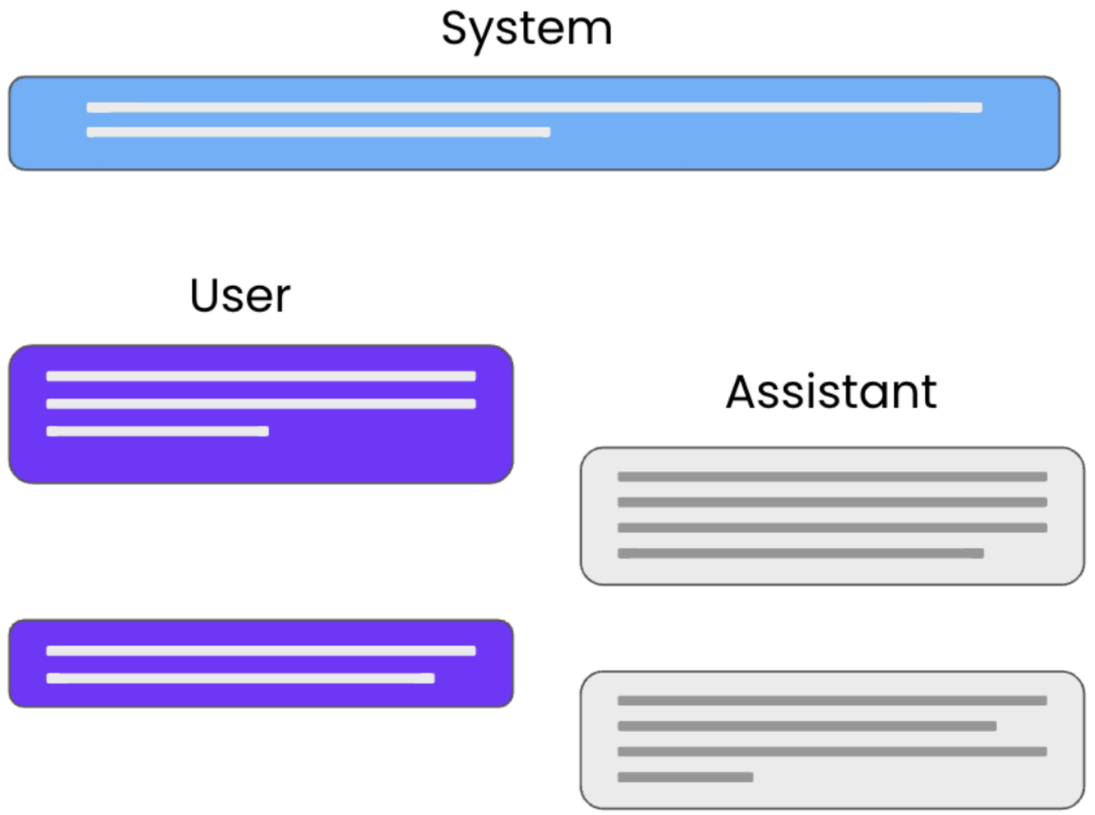


Multi-turn conversations

→ Build on previous prompts and responses

Roles

- **System:** controls assistant's *behavior*
- **User:** *instruct* the assistant
- **Assistant:** response to user instruction
  - Can also be written by the user to provide examples



Request setup

```
response = client.chat.completions.create(
    model="gpt-4o-mini",
    messages=[{"role": "user", "content": prompt}]
)
```

Prompt setup

```
messages=[{"role": "system",
           "content": "You are a data science tutor who speaks concisely."},
          {"role": "user",
           "content": "What is the difference between mutable and immutable objects?"}]
```

Making a request

```
response = client.chat.completions.create(
  model="gpt-4o-mini",
  messages=[{"role": "system",
             "content": "You are a data science tutor who speaks concisely."},
            {"role": "user",
             "content": "What is the difference between mutable and immutable objects?"}]
)

print(response.choices[0].message.content)
```

The response

```
Mutable objects can be changed after creation, while immutable objects cannot be
modified once they are created.
```

Let's practice!

WORKING WITH THE OPENAI API

Multi-turn chat completions with GPT

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Curriculum Manager, DataCamp

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Chat completions for single-turn tasks

```
response = client.chat.completions.create(
  model="gpt-4o-mini",
  messages=[{"role": "system",
             "content": "You are a data science tutor."},
            {"role": "user",
             "content": "What is the difference between mutable and immutable objects?"}]
)
```

- **System:** controls assistant's *behavior*
- **User:** *instruct* the assistant
- **Assistant:** response to user instruction

Providing examples

- Steer model in the right direction
- Nothing surfaced to the end-user
- **Example:** Data Science Tutor Application
  - Provide examples of data science questions and answers

Providing examples

```
response = client.chat.completions.create(
  model="gpt-4o-mini",
  messages=[{"role": "system",
             "content": "You are a data science tutor who speaks concisely."},
            {"role": "user",
             "content": "How do you define a Python list?"},
            {"role": "assistant",
             "content": "Lists are defined by enclosing a comma-separated sequence of
                        objects inside square brackets [ ]."},
            {"role": "user",
             "content": "What is the difference between mutable and immutable objects?"}]
)
```

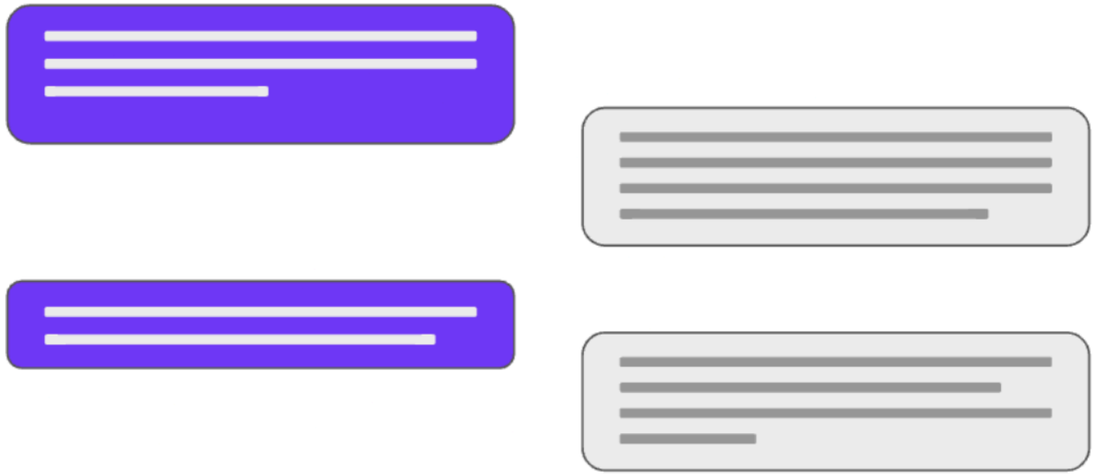
The response

```
print(response.choices[0].message.content)
```

```
Mutable objects are objects whose values can change after they are created. Examples of
mutable objects in Python include lists, sets and dictionaries. Immutable objects are
objects whose values cannot change after they are created. Examples of immutable objects
in Python include strings, numbers and tuples.
```

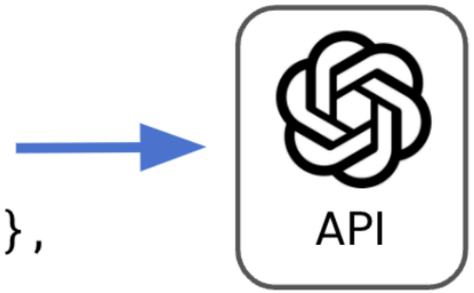
Storing responses

- Create conversation history
- Create back-and-forth conversations



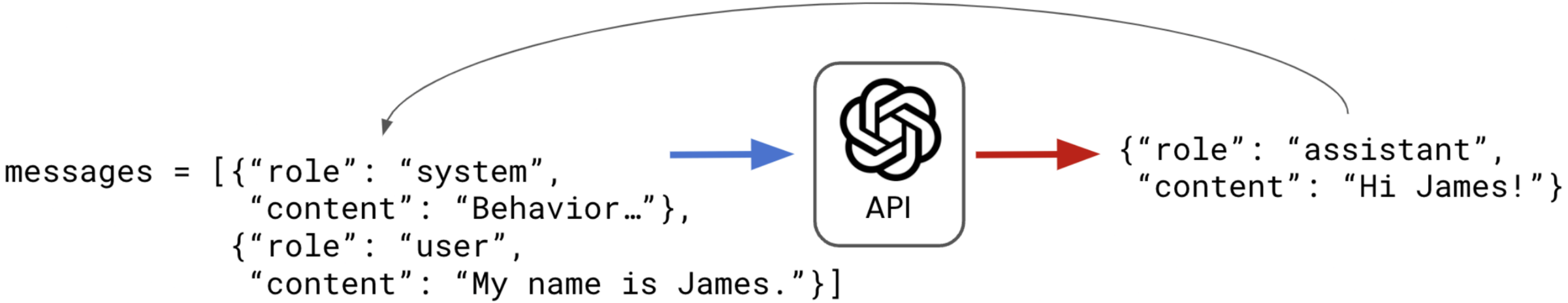
Building a conversation

```
messages = [{"role": "system",
             "content": "Behavior…"},
            {"role": "user",
             "content": "My name is James."}]
```



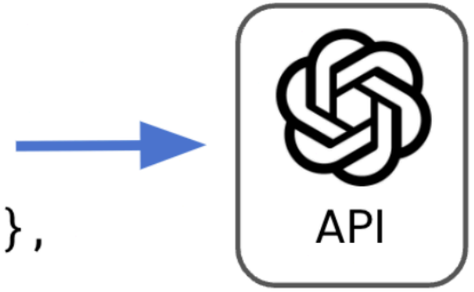

```
{"role": "assistant",
 "content": "Hi James!"}
```

Building a conversation



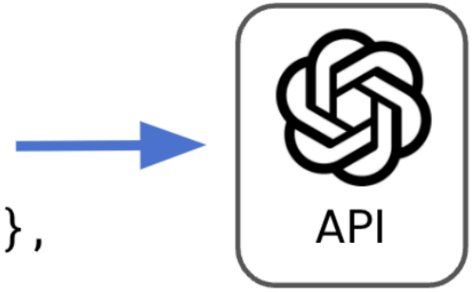
Building a conversation

```
messages = [{“role”: “system”,
             “content”: “Behavior…”},
            {“role”: “user”,
             “content”: “My name is James.”},
            {“role”: “assistant”,
             “content”: “Hi James!”}]
```



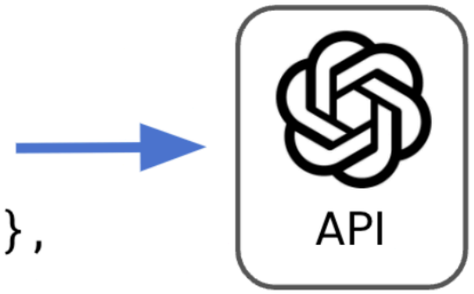
Building a conversation

```
messages = [{“role”: “system”,
             “content”: “Behavior…”},
            {“role”: “user”,
             “content”: “My name is James.”},
            {“role”: “assistant”,
             “content”: “Hi James!”},
            {“role”: “user”,
             “content”: “What is my name?”}]
```



Building a conversation

```
messages = [{"role": "system",
             "content": "Behavior…"},
            {"role": "user",
             "content": "My name is James."},
            {"role": "assistant",
             "content": "Hi James!"},
            {"role": "user",
             "content": "What is my name?"}]
```




```
{"role": "assistant",
 "content": "Your name
is James."}
```

Coding a conversation

```
messages = [{"role": "system",
             "content": "You are a data science tutor who provides short, simple explanations."}]

user_qs = ["Why is Python so popular?", "Summarize this in one sentence."]

for q in user_qs:
    print("User: ", q)
    user_dict = {"role": "user", "content": q}
    messages.append(user_dict)

    response = client.chat.completions.create(
        model="gpt-4o-mini",
        messages=messages
    )

    assistant_dict = {"role": "assistant", "content": response.choices[0].message.content}
    messages.append(assistant_dict)
    print("Assistant: ", response.choices[0].message.content, "\n")
```

Conversation with an AI

```
User:  Why is Python so popular?
Assistant:  Python is popular for many reasons, including its simplicity,
versatility, and wide range of available libraries. It has a relatively
easy-to-learn syntax that makes it accessible to beginners and experts alike. It
can be used for a variety of tasks, such as data analysis, web development,
scientific computing, and machine learning. Additionally, Python has an active
community of developers who contribute to its development and share their
knowledge through online resources and forums.

User:  Summarize this in one sentence.
Assistant:  Python is popular due to its simplicity, versatility, wide range of
libraries, and active community of developers.
```

Let's practice!

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