

Lesson 1: Advanced RAG Pipeline

```
In [8]: import utils

import os
import openai
openai.api_key = utils.get_openai_api_key()
```

```
In [9]: from llama_index import SimpleDirectoryReader

documents = SimpleDirectoryReader(
    input_files=["./eBook-How-to-Build-a-Career-in-AI.pdf"]
).load_data()
```

```
In [10]: print(type(documents), "\n")
print(len(documents), "\n")
print(type(documents[0]))
print(documents[0])
```

<class 'list'>

41

<class 'llama_index.schema.Document'>
Doc ID: f88ab2b6-94d6-4f67-a868-4d643f1b6355
Text: PAGE 1Founder, DeepLearning.AICollected Insights from Andrew Ng
How to Build Your Career in AIA Simple Guide

Basic RAG pipeline

```
In [11]: from llama_index import Document

document = Document(text="\n\n".join([doc.text for doc in documents]))
```

```
In [12]: from llama_index import VectorStoreIndex
from llama_index import ServiceContext
from llama_index.llms import OpenAI

llm = OpenAI(model="gpt-3.5-turbo", temperature=0.1)
service_context = ServiceContext.from_defaults(
    llm=llm, embed_model="local:BAAI/bge-small-en-v1.5"
)
index = VectorStoreIndex.from_documents([document],
                                       service_context=service_context)
```

```
In [13]: query_engine = index.as_query_engine()
```

```
In [14]: response = query_engine.query(
          "What are steps to take when finding projects to build your experience"
        )
        print(str(response))
```

Develop a side hustle, ensure the project will help you grow technically, collaborate with good teammates, and consider if the project can be a meaningful stepping stone to larger projects.

Evaluation setup using TruLens

```
In [15]: eval_questions = []
        with open('eval_questions.txt', 'r') as file:
            for line in file:
                # Remove newline character and convert to integer
                item = line.strip()
                print(item)
                eval_questions.append(item)
```

What are the keys to building a career in AI?
 How can teamwork contribute to success in AI?
 What is the importance of networking in AI?
 What are some good habits to develop for a successful career?
 How can altruism be beneficial in building a career?
 What is imposter syndrome and how does it relate to AI?
 Who are some accomplished individuals who have experienced imposter syndrome?
 What is the first step to becoming good at AI?
 What are some common challenges in AI?
 Is it normal to find parts of AI challenging?

```
In [16]: # You can try your own question:
        new_question = "What is the right AI job for me?"
        eval_questions.append(new_question)
```

```
In [17]: print(eval_questions)
```

['What are the keys to building a career in AI?', 'How can teamwork contribute to success in AI?', 'What is the importance of networking in AI?', 'What are some good habits to develop for a successful career?', 'How can altruism be beneficial in building a career?', 'What is imposter syndrome and how does it relate to AI?', 'Who are some accomplished individuals who have experienced imposter syndrome?', 'What is the first step to becoming good at AI?', 'What are some common challenges in AI?', 'Is it normal to find parts of AI challenging?', 'What is the right AI job for me?']

```
In [18]: from trulens_eval import Tru
        tru = Tru()

        tru.reset_database()
```



Tru initialized with db url sqlite:///default.sqlite .



Secret keys may be written to the database. See the `database_redact_keys` option of `Tru` to prevent this.

For the classroom, we've written some of the code in helper functions inside a utils.py file.

- You can view the `utils.py` file in the file directory by clicking on the "Jupyter" logo at the top of the notebook.
- In later lessons, you'll get to work directly with the code that's currently wrapped inside these helper functions, to give you more options to customize your RAG pipeline.

```
In [19]: from utils import get_prebuilt_trulens_recorder

tru_recorder = get_prebuilt_trulens_recorder(query_engine,
                                              app_id="Direct Query Engine")
```

```
In [20]: with tru_recorder as recording:
         for question in eval_questions:
             response = query_engine.query(question)
```

```
In [21]: records, feedback = tru.get_records_and_feedback(app_ids=[])
```

```
In [22]: records.head()
```

f_json	ts	Answer Relevance	Context Relevance	Groundedness	Answer Relevance_calls	Cor Relevance_calls
"2024-05-16550", "..."	2024-05-28T19:49:52.474960	0.9	1.00	1.000000	[{'args': {'prompt': 'What are the keys to bui...	[{'args': {'proi 'What are keys to l
"2024-05-16533", "..."	2024-05-28T19:49:53.995300	1.0	0.50	1.000000	[{'args': {'prompt': 'How can teamwork contrib...	[{'args': {'proi 'How team' cont
"2024-05-17865", "..."	2024-05-28T19:49:55.895055	1.0	0.50	0.666667	[{'args': {'prompt': 'What is the importance o...	[{'args': {'proi 'What is importance
"2024-05-17632", "..."	2024-05-28T19:49:57.476015	1.0	0.85	1.000000	[{'args': {'prompt': 'What are some good habit...	[{'args': {'proi 'What are s good ha
"2024-05-18507", "..."	2024-05-28T19:49:59.240443	1.0	NaN	NaN	[{'args': {'prompt': 'How can altruism be bene...	

```
In [23]: # launches on http://localhost:8501/  
tru.run_dashboard()
```

Starting dashboard ...

Config file already exists. Skipping writing process.

Credentials file already exists. Skipping writing process.



► Dashboard log

Dashboard started at <https://s172-31-12-156p58476.lab-aws-production.deeplearning.ai/> (<https://s172-31-12-156p58476.lab-aws-production.deeplearning.ai/>) .

<Popen: returncode: None args: ['streamlit', 'run', '--server.headless=True']...>

Advanced RAG pipeline

1. Sentence Window retrieval

```
In [24]: from llama_index.llms import OpenAI  
  
llm = OpenAI(model="gpt-3.5-turbo", temperature=0.1)
```

```
In [25]: from utils import build_sentence_window_index  
  
sentence_index = build_sentence_window_index(  
    document,  
    llm,  
    embed_model="local:BAAI/bge-small-en-v1.5",  
    save_dir="sentence_index"  
)
```

```
In [26]: from utils import get_sentence_window_query_engine

sentence_window_engine = get_sentence_window_query_engine(sentence_index
```

⚡ ⚡ config.json: ⚡	⚡ 799/799 [00:00<00:00,
100%	119kB/s]
⚡ ⚡ model.safetensors: ⚡	⚡ 1.11G/1.11G [00:09<00:00,
100%	113MB/s]
⚡ ⚡ tokenizer_config.json: ⚡	⚡ 443/443 [00:00<00:00,
100%	70.6kB/s]
⚡ ⚡ sentencepiece.bpe.model: ⚡	⚡ 5.07M/5.07M
100%	[00:00<00:00, 108MB/s]
⚡ ⚡ tokenizer.json: ⚡	⚡ 17.1M/17.1M [00:00<00:00,
100%	116MB/s]
⚡ ⚡ special_tokens_map.json: ⚡	⚡ 279/279 [00:00<00:00,
100%	43.8kB/s]

```
In [27]: window_response = sentence_window_engine.query(
            "how do I get started on a personal project in AI?"
        )
print(str(window_response))
```

To get started on a personal project in AI, you can begin by identifying a project that aligns with your career goals and interests. It is important to choose a project that is responsible, ethical, and beneficial to people. Once you have selected a project, you can follow the steps outlined in the chapters provided, such as scoping the project, executing it with an eye toward career development, and building a portfolio that demonstrates skill progression. This approach will help you embark on a meaningful AI project that contributes to your professional growth.

```
In [28]: tru.reset_database()

tru_recorder_sentence_window = get_prebuilt_trulens_recorder(
    sentence_window_engine,
    app_id = "Sentence Window Query Engine"
)
```

```
In [29]: for question in eval_questions:
          with tru_recorder_sentence_window as recording:
              response = sentence_window_engine.query(question)
              print(question)
              print(str(response))
```

What are the keys to building a career in AI?

The keys to building a career in AI include learning foundational technical skills, working on projects, finding a job, and being part of a supportive community.

How can teamwork contribute to success in AI?

Teamwork can contribute to success in AI by allowing individuals to leverage the diverse skills and perspectives of their colleagues. Collaborating with others can lead to more innovative solutions, effective problem-solving, and a more comprehensive understanding of complex AI projects. Additionally, working in a team can create a supportive environment that fosters continuous learning and growth, ultimately leading to improved project outcomes.

What is the importance of networking in AI?

Networking in AI is crucial as it can provide valuable insights, guidance, and opportunities for individuals looking to advance in the field. By connecting with professionals who have experience in AI, individuals can gain knowledge about the industry, potential career paths, and current trends. Networking also allows for the exchange of ideas, collaboration on projects, and access to job opportunities that may not be advertised publicly. Overall, networking in AI can help individuals build a strong support system, stay informed about developments in the field, and enhance their career prospects.

What are some good habits to develop for a successful career?

Developing good habits in areas such as eating, exercise, sleep, personal relationships, work, learning, and self-care can help individuals move forward in their careers while maintaining their health.

How can altruism be beneficial in building a career?

Altruism can be beneficial in building a career by fostering positive relationships and creating a supportive network. By helping others and lifting them up along the way, individuals can establish a reputation for being a team player and someone who is willing to contribute to the success of others. This can lead to increased opportunities, collaborations, and a strong support system that can be valuable in advancing one's career.

What is imposter syndrome and how does it relate to AI?

Imposter syndrome is a phenomenon where individuals doubt their accomplishments and have a persistent fear of being exposed as a fraud. In the field of AI, newcomers may experience imposter syndrome, feeling like they do not truly belong in the AI community despite their success. This can be discouraging for individuals trying to grow in AI, but it is a common experience with around 70 percent of people facing some form of imposter syndrome at some point.

Who are some accomplished individuals who have experienced imposter syndrome?

Former Facebook COO Sheryl Sandberg, U.S. first lady Michelle Obama, actor Tom Hanks, and Atlassian co-CEO Mike Cannon-Brookes are some accomplished individuals who have experienced imposter syndrome.

What is the first step to becoming good at AI?

Identifying possible roles and conducting informational interviews.

What are some common challenges in AI?

Common challenges in AI include the evolving nature of technologies, the need to stay updated with rapidly changing technology, the difficulty in estimating project timelines and returns on investment, the iterative nature of AI projects leading to uncertainties in project management, the necessity to collaborate with stakeholders lacking AI expertise, and the challenge of finding suitable AI skills for hiring in companies.

Is it normal to find parts of AI challenging?

It is normal to find parts of AI challenging.

What is the right AI job for me?

The right AI job for you can be found by following the steps outlined in Chapter 9: Finding the Right AI Job for You. By utilizing the simple framework for starting your AI job search, building a portfolio of projects that

demonstrate skill progression, and conducting informational interviews to find the right job, you can identify the AI job that aligns with your career goals and aspirations.

```
In [30]: tru.get_leaderboard(app_ids=[])
```

	Answer Relevance	Groundedness	Context Relevance	latency	total_cost
app_id					
Sentence Window Query Engine	0.927273	0.743182	0.463636	4.272727	0.000824

```
In [ ]: # Launches on http://localhost:8501/
tru.run_dashboard()
```

2. Auto-merging retrieval

```
In [31]: from utils import build_automerging_index

automerging_index = build_automerging_index(
    documents,
    llm,
    embed_model="local:BAAI/bge-small-en-v1.5",
    save_dir="merging_index"
)
```

```
In [32]: from utils import get_automerging_query_engine

automerging_query_engine = get_automerging_query_engine(
    automerging_index,
)
```



```
In [33]: auto_merging_response = automerging_query_engine.query(
        "How do I build a portfolio of AI projects?"
    )
    print(str(auto_merging_response))
```

> Merging 1 nodes into parent node.
 > Parent node id: 96bbae09-eb6b-4abf-be45-10a51fb25290.
 > Parent node text: PAGE 21Building a Portfolio of
 Projects that Shows
 Skill Progression CHAPTER 6
 PROJECTS

> Merging 1 nodes into parent node.
 > Parent node id: 46eb4300-d98c-4fc7-96cf-2dfb1609740e.
 > Parent node text: PAGE 21Building a Portfolio of
 Projects that Shows
 Skill Progression CHAPTER 6
 PROJECTS

Building a portfolio of AI projects involves showcasing a progression from simple to complex undertakings over time. It is important to be able to communicate your thinking effectively to demonstrate the value of your work and gain the trust of others. Identifying worthwhile ideas to work on is a crucial skill for an AI architect, and gaining experience through working on projects across various industries can help in building a diverse and impactful portfolio.

```
In [34]: tru.reset_database()

tru_recorder_automerging = get_prebuilt_trulens_recorder(automerging_query_engine,
                                                         app_id="Automerging")
```

```
In [35]: for question in eval_questions:
        with tru_recorder_automerging as recording:
            response = automerging_query_engine.query(question)
            print(question)
            print(response)
```

> Merging 2 nodes into parent node.
 > Parent node id: ee6f6043-4c09-4160-ace4-a630726112e6.
 > Parent node text: PAGE 3Table of
 ContentsIntroduction: Coding AI is the New Literacy.
 Chapter 1: Three Steps to Ca...

> Merging 1 nodes into parent node.
 > Parent node id: a7633408-4f3b-48d4-ad79-e12d3dce1bcb.
 > Parent node text: PAGE 3Table of
 ContentsIntroduction: Coding AI is the New Literacy.
 Chapter 1: Three Steps to Ca...

What are the keys to building a career in AI?
 Learning foundational technical skills, working on projects, finding a job, and being part of a community are essential keys to building a career in AI. Additionally, collaborating with others, influencing, and being influenced by others are critical aspects for success in AI.
 How can teamwork contribute to success in AI?
 Teamwork can contribute to success in AI by enabling individuals to work together on projects, share knowledge, and provide support to each other.

```
In [36]: tru.get_leaderboard(app_ids=[])
```

```
In [ ]: # Launches on http://localhost:8501/  
tru.run_dashboard()
```