Install All Dependencies (https://)

In [9]:

In [1]: `!pip install langchain-community pymupdf sentence-transformers faiss-cpu`

```
Collecting langchain-community
  Downloading langchain_community-0.3.21-py3-none-any.whl.metadata (2.4
kB)
Collecting pymupdf
  Downloading pymupdf-1.25.5-cp39-abi3-manylinux2014_x86_64.manylinux_2
_17_x86_64.whl.metadata (3.4 kB)
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Requirement already satisfied: requests<3,>=2 in /usr/local/lib/python
3.11/dist-packages (from langchain-community) (2.32.3)
```

In [ ]:
```python
!pip install --upgrade langchain
```

```
Requirement already satisfied: langchain in /usr/local/lib/python3.11/dist
-packages (0.3.23)
Requirement already satisfied: langchain-core<1.0.0,>=0.3.51 in /usr/loca
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st-packages (from langchain) (6.0.2)
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In [ ]:
```
!pip install pymupdf
```

Collecting pymupdf
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_x86_64.whl.metadata (3.4 kB)
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0:00
Installing collected packages: pymupdf
Successfully installed pymupdf-1.25.5

```
In [ ]: !pip install --upgrade langchain_community pymupdf faiss-cpu
```

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Requirement already satisfied: greenlet>=1 in /usr/local/lib/python3.11/di
st-packages (from SQLAlchemy<3,>=1.4->langchain_community) (3.1.1)
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```

In [ ]:
```
!pip install langchain transformers sentence-transformers faiss-cpu pypdf
```

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Requirement already satisfied: langchain in /usr/local/lib/python3.11/d
ist-packages (0.3.23)
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tadata (4.4 kB)
Collecting pypdf
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Requirement already satisfied: pydantic<3.0.0,>=2.7.4 in /usr/local/li
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```

This notebook implements a PDF Question Answering system using Retrieval-Augmented Generation (RAG). It loads a PDF document, splits the content into manageable chunks, and uses FAISS for efficient document retrieval based on semantic similarity. The system then leverages a HuggingFace-based LLM (Gemma-7B) for generating context-aware answers. The process ensures that responses are fact-based and reliable by grounding them in the document's actual content, overcoming common limitations of LLMs like hallucinations and overgeneralization.

In [2]:
```python
!pip install -q langchain langchain-community langchain-core faiss-cpu pymu
!pip install -q transformers accelerate bitsandbytes

from google.colab import files
uploaded = files.upload()

from langchain_community.document_loaders import PyMuPDFLoader
from langchain.text_splitter import CharacterTextSplitter
from langchain_community.vectorstores import FAISS
from langchain_community.embeddings import HuggingFaceEmbeddings
from langchain.chains import RetrievalQA

from transformers import AutoTokenizer, AutoModelForCausalLM, pipeline
from langchain.llms import HuggingFacePipeline
import torch

pdf_path = "/content/drive/MyDrive/Rosalind Franklin_ The Dark Lady of DNA.
loader = PyMuPDFLoader(pdf_path)
docs = loader.load()

text_splitter = CharacterTextSplitter(chunk_size=500, chunk_overlap=50)
documents = text_splitter.split_documents(docs)

embedding_model = HuggingFaceEmbeddings(model_name="sentence-transformers/a
db = FAISS.from_documents(documents, embedding_model)

model_id = "unsloth/gemma-7b-it"
tokenizer = AutoTokenizer.from_pretrained(model_id)
model = AutoModelForCausalLM.from_pretrained(model_id, device_map="auto", t

pipe = pipeline("text-generation", model=model, tokenizer=tokenizer, max_ne
llm = HuggingFacePipeline(pipeline=pipe)


retriever = db.as_retriever()
qa_chain = RetrievalQA.from_chain_type(llm=llm, chain_type="stuff", retriev


query = "Summarize the document."
result = qa_chain.run(query)
print("Answer:", result)
```

———————————————————————————————————— 76.1/76.1 MB 9.4 MB/s eta
0:00:00

Choose Files No file chosen

Upload widget is only available when the cell has been executed in the current browser session.
Please rerun this cell to enable.

Saving Maddox, Brenda - Rosalind Franklin_ The Dark Lady of DNA (2012, Harper Perennial) - libgen.li.pdf to Maddox, Brenda - Rosalind Franklin _ The Dark Lady of DNA (2012, Harper Perennial) - libgen.li.pdf

```
<ipython-input-2-7607139bce3d>:30: LangChainDeprecationWarning: The cla
ss `HuggingFaceEmbeddings` was deprecated in LangChain 0.2.2 and will b
e removed in 1.0. An updated version of the class exists in the :class:
```

In [3]:
```python
#Test the model with a specific question
query = "Who is Rosalind Franklin and what was her contribution to DNA rese
result = qa_chain.run(query)
print("Answer:", result)

#Test another specific question
query_2 = "Explain the significance of Rosalind Franklin's X-ray images in
result_2 = qa_chain.run(query_2)
print("Answer:", result_2)
```

Answer: Use the following pieces of context to answer the question at t
he end. If you don't know the answer, just say that you don't know, do
n't try to make up an answer.

ACKNOWLEDGEMENTS
Rosalind Franklin apart, the principals in the drama of the discovery o
f the
structure of DNA in 1953 survived into the twenty- first century. I hav
e
been fortunate to have had many discussions with Dr Francis Crick, Dr
James Watson, and Professor Maurice Wilkins. All three have been
generous with their time, their recollections, opinions and permissions
to
quote unpublished letters. Among Rosalind's close associates, those who
have shown great interest and offers of assistance include Professor D.
L.D.
Caspar, Dr K.C. Holmes, Professor Raymond Gosling, Sir Aaron Klug and
Dr Vittorio Luzzati.
As I went along, I was surprised (and relieved) by the willingness of

In [4]:
```python
query = "Who contributed to the discovery of the DNA double helix?"
result = qa_chain.run(query)
print("Answer:", result)
```

Answer: Use the following pieces of context to answer the question at the end. If you don't know the answer, just say that you don't know, don't try to make up an answer.

Society, No. 435, Vol. 55, Part 3, Mar. 1959.
Wilson, Edward O., Consilience (New York: Knopf, 1998).
Wilson, H.R., 'The double helix and all that', Trends in Biochemical Sciences, 13, 7, pp. 275–8, Jul. 1988.
'Connections', TIBS, 26, 5, pp. 334–7, May 2001.

along the right lines (though Jim had occasional doubts), but the experimental evidence, though supporting the model, was at that time not enough to prove it beyond a reasonable doubt. Strictly speaking, our model was not finally decisively proved till some 25 or so years later, when the crystal structure of short lengths of DNA of defined sequences was solved by the isomorphous replacement method.

What remained to be discovered was how the double helix came apart. The two chains could not copy themselves without unwinding, but no one

Correct Specific answer

In [5]:
```python
query = "Rosalind Franklin' life after death?"
result = qa_chain.run(query)
print("Answer:", result)
```

Answer: Use the following pieces of context to answer the question at the end. If you don't know the answer, just say that you don't know, don't try to make up an answer.

19 - Clarity and Perfection
Epilogue: Life After Death
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Also by Brenda Maddox
Praise for Rosalind Franklin
Copyright
About the Publisher

The funeral was held next day at the United Jewish Cemetery in Willesden. Vittorio Luzzati, who was in London, came. So did the team from the lab. The mourners held themselves in two distinct groups —

The model only generates responses when it has enough relevant information, avoiding speculation or the provision of uncertain answers.

In [6]:
```python
query = "Rosalind Franklin's love life"
result = qa_chain.run(query)
print("Answer:", result)
```

Answer: Use the following pieces of context to answer the question at the
end. If you don't know the answer, just say that you don't know, don't try
to make up an answer.

Rosalind Franklin
Brenda Maddox

19 - Clarity and Perfection
Epilogue: Life After Death
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visit her that summer, that she had never been kissed. The talk turned to
having babies. The cousins discovered that although each knew vaguely
how a baby was born, neither knew how the ovum was fertilised. (A few
months later, Irene informed Rosalind that her fiancé had enlightened her.
Rosalind was wiser too. She said she had asked a medical student.) But
such things were remote from her mind. She was now ready to be a working
scientist. The question was where to work.

Her family was stunned by Bernal's obituary in The Times. Coinciding, as i
t
did, with the exhibition of Rosalind's model at the Brussels World's Fair,
it
made them realise how very good a scientist she had been. As her Aunt
Alice wrote to Anne Sayre a week after Rosalind's death, 'She was very
modest and also knowing it was Greek to us — she did not waste time in
talking about her work with those who would irritate her by silly question
s.'
This self-deprecating comment from a highly able woman illustrates (as
does, in many ways, Rosalind's entire career) the isolation of the scienti
st,
cut off from ordinary discourse, even with loved ones, about what is of
most intense interest in his or her daily life.
After Rosalind's death, Klug invited Muriel Franklin to visit 2i
Torrington Place to show her where and how her daughter had worked. He
showed her around the small top-floor room, with its neatly labelled test-
tubes and the white lab coat still hanging on the back of the door. He
praised the originality and delicacy Rosalind brought to her experiments.
His words drove the grieving mother back — perhaps to thoughts of the
homesick little girl at boarding-school knitting a scarf for Nannie. 'Rosa
lind
was always good at sewing,' she said.

Question: Rosalind Franklin's love life
Helpful Answer: I do not know. The text does not provide information about
Rosalind Franklin's love life, therefore I cannot answer this question.