



Agentic_AI_Lab1

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OVERALL PURPOSE OF THE CODE

This notebook demonstrates **5 levels of text splitting techniques** used in **NLP / LLM pipelines**, especially for:

- Large document processing
- Chunking text for embeddings
- Preparing data for **RAG (Retrieval-Augmented Generation)**
- Improving search, summarization, and QA systems

The idea is:

Different text splitting strategies are needed depending on data size, structure, and task.


◆ STEP 1: ENVIRONMENT SETUP & DRIVE MOUNTING

```
from google.colab import drive
```

```
drive.mount('/content/drive') 
```

What's happening?

- Mounts Google Drive into Colab
- Allows access to:
 - PDFs
 - Text files
 - Datasets stored in Drive

 Needed when working with **large documents**

◆ STEP 2: IMPORTING REQUIRED LIBRARIES

You import libraries related to:

- Text processing
- LangChain text splitters
- File loaders

Typical imports

include:

```
from langchain.text_splitter import  
( CharacterTextSplitter,  
RecursiveCharacterTextSplitter,  
TokenTextSplitter
```

)

Why these?

LangChain provides **advanced text splitting utilities** designed for LLM workflows.

◆ LEVEL 1: BASIC CHARACTER TEXT SPLITTING

◆ Code Logic

```
CharacterTextSplitter( separator="\\n", chunk_size=1000, chunk_overlap=200 )
```

Working

- Splits text **purely based on character count**
- Uses a newline (`\\n`) as separator
- Ensures:
 - Each chunk \leq chunk_size
 - chunk_overlap preserves context between chunks

■ Use Case

- Simple text files
- When structure doesn't matter

+ Limitation

- Can break:
 - Sentences
 - Paragraph meaning
-

◆ LEVEL 2: RECURSIVE CHARACTER TEXT SPLITTING (MOST IMPORTANT)

```
RecursiveCharacterTextSplitter( chunk_size=1000, chunk_overlap=200 )
```

Working (Very Important Concept)

This splitter tries separators **in order**:

1. `\n\n` (paragraphs)
2. `\n` (lines)
3. (spaces)
4. Characters (last resort)

It **recursively** splits until chunk size condition is met.

Advantages

- Preserves:
 - Paragraphs
 - Sentences
 - Semantic meaning

 **This is the industry-standard splitter for RAG**

LEVEL 3: TOKEN-BASED TEXT SPLITTING

```
TokenTextSplitter(  
    chunk_size=500,  
    chunk_overlap=50  
)
```

Working

- Splits text based on **tokens**, not characters
- Tokens \neq words (depends on tokenizer like GPT, BERT)

Why important?

LLMs have **token limits**, not character limits.

Example

- "ChatGPT is amazing" \rightarrow maybe 5 tokens, not 3 words
-

LEVEL 4: DOCUMENT-BASED SPLITTING

This level involves:

- Loading documents (PDF, TXT)

- Splitting while **preserving metadata**

Example logic:

```
docs = loader.load()
```

```
split_docs = splitter.split_documents(docs)
```

Working

- Each chunk retains:
 - Page number
 - Source file
 - Document metadata

Useful for:

- Search results with citations
- Academic & legal documents

◆ **LEVEL 5: SEMANTIC / SMART SPLITTING (ADVANCED)**

This level focuses on:

- Meaning-aware splitting
- Chunking based on **content relevance**

May involve:

- Embeddings
- Similarity-based grouping

Working Conceptually

1. Convert text → **embeddings**
2. Detect semantic boundaries
3. Split where meaning changes

Used in:

- Advanced RAG systems
- Research-level NLP
- Production AI assistants