

```
!pip install nltk spacy
!python -m spacy download en_core_web_sm
```

```
Requirement already satisfied: nltk in /usr/local/lib/python3.12/dist-packages (3.9.1)
Requirement already satisfied: spacy in /usr/local/lib/python3.12/dist-packages (3.8.11)
Requirement already satisfied: click in /usr/local/lib/python3.12/dist-packages (from nltk) (8.3.1)
Requirement already satisfied: joblib in /usr/local/lib/python3.12/dist-packages (from nltk) (1.5.3)
Requirement already satisfied: regex>=2021.8.3 in /usr/local/lib/python3.12/dist-packages (from nltk) (2025.11.3)
Requirement already satisfied: tqdm in /usr/local/lib/python3.12/dist-packages (from nltk) (4.67.1)
Requirement already satisfied: spacy-legacy<3.1.0,>=3.0.11 in /usr/local/lib/python3.12/dist-packages (from spacy) (3.0.12)
Requirement already satisfied: spacy-loggers<2.0.0,>=1.0.0 in /usr/local/lib/python3.12/dist-packages (from spacy) (1.0.5)
Requirement already satisfied: murmurhash<1.1.0,>=0.28.0 in /usr/local/lib/python3.12/dist-packages (from spacy) (1.0.15)
Requirement already satisfied: cymem<2.1.0,>=2.0.2 in /usr/local/lib/python3.12/dist-packages (from spacy) (2.0.13)
Requirement already satisfied: preshed<3.1.0,>=3.0.2 in /usr/local/lib/python3.12/dist-packages (from spacy) (3.0.12)
Requirement already satisfied: thinc<8.4.0,>=8.3.4 in /usr/local/lib/python3.12/dist-packages (from spacy) (8.3.10)
Requirement already satisfied: wasabi<1.2.0,>=0.9.1 in /usr/local/lib/python3.12/dist-packages (from spacy) (1.1.3)
Requirement already satisfied: srsly<3.0.0,>=2.4.3 in /usr/local/lib/python3.12/dist-packages (from spacy) (2.5.2)
Requirement already satisfied: catalogue<2.1.0,>=2.0.6 in /usr/local/lib/python3.12/dist-packages (from spacy) (2.0.10)
Requirement already satisfied: weasel<0.5.0,>=0.4.2 in /usr/local/lib/python3.12/dist-packages (from spacy) (0.4.3)
Requirement already satisfied: typer-slim<1.0.0,>=0.3.0 in /usr/local/lib/python3.12/dist-packages (from spacy) (0.20.0)
Requirement already satisfied: numpy>=1.19.0 in /usr/local/lib/python3.12/dist-packages (from spacy) (2.0.2)
Requirement already satisfied: requests<3.0.0,>=2.13.0 in /usr/local/lib/python3.12/dist-packages (from spacy) (2.32.4)
Requirement already satisfied: pydantic!=1.8,!>1.8.1,<3.0.0,>=1.7.4 in /usr/local/lib/python3.12/dist-packages (from spacy) (2.1)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.12/dist-packages (from spacy) (3.1.6)
Requirement already satisfied: setuptools in /usr/local/lib/python3.12/dist-packages (from spacy) (75.2.0)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.12/dist-packages (from spacy) (25.0)
Requirement already satisfied: annotated-types>=0.6.0 in /usr/local/lib/python3.12/dist-packages (from pydantic!=1.8,!>1.8.1,<3.0.0,>=1.7.4)
Requirement already satisfied: pydantic-core==2.41.4 in /usr/local/lib/python3.12/dist-packages (from pydantic!=1.8,!>1.8.1,<3.0.0,>=1.7.4)
Requirement already satisfied: typing-extensions>=4.14.1 in /usr/local/lib/python3.12/dist-packages (from pydantic!=1.8,!>1.8.1,<3.0.0,>=1.7.4)
Requirement already satisfied: typing-inspection>=0.4.2 in /usr/local/lib/python3.12/dist-packages (from pydantic!=1.8,!>1.8.1,<3.0.0,>=1.7.4)
Requirement already satisfied: charset_normalizer<4,>>2 in /usr/local/lib/python3.12/dist-packages (from requests<3.0.0,>=2.13.0->spacy) (3.1.6)
Requirement already satisfied: idna<4,>>2.5 in /usr/local/lib/python3.12/dist-packages (from requests<3.0.0,>=2.13.0->spacy) (3.4.0)
Requirement already satisfied: urllib3<3,>>1.21.1 in /usr/local/lib/python3.12/dist-packages (from requests<3.0.0,>=2.13.0->spacy) (3.1.6)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.12/dist-packages (from requests<3.0.0,>=2.13.0->spacy) (3.1.6)
Requirement already satisfied: blis<1.4.0,>>1.3.0 in /usr/local/lib/python3.12/dist-packages (from thinc<8.4.0,>=8.3.4->spacy) (1.3.0)
Requirement already satisfied: confection<1.0.0,>>0.0.1 in /usr/local/lib/python3.12/dist-packages (from thinc<8.4.0,>=8.3.4->spacy) (0.0.1)
Requirement already satisfied: cloudpathlib<1.0.0,>>0.7.0 in /usr/local/lib/python3.12/dist-packages (from weasel<0.5.0,>=0.4.2->spacy) (0.7.0)
Requirement already satisfied: smart-open<8.0.0,>>5.2.1 in /usr/local/lib/python3.12/dist-packages (from weasel<0.5.0,>=0.4.2->spacy) (5.2.1)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.12/dist-packages (from jinja2->spacy) (3.0.3)
Requirement already satisfied: wrapt in /usr/local/lib/python3.12/dist-packages (from smart-open<8.0.0,>>5.2.1->weasel<0.5.0,>=0.4.2->spacy) (3.0.3)
Collecting en-core-web-sm==3.8.0
  Using cached https://github.com/explosion/spacy-models/releases/download/en_core_web_sm-3.8.0/en_core_web_sm-3.8.0-py3-none-any.whl
  ✓ Download and installation successful
You can now load the package via spacy.load('en_core_web_sm')
⚠ Restart to reload dependencies
If you are in a Jupyter or Colab notebook, you may need to restart Python in
order to load all the package's dependencies. You can do this by selecting the
'Restart kernel' or 'Restart runtime' option.
```

```
import nltk
import spacy

from nltk.tokenize import sent_tokenize, word_tokenize
from nltk.stem import PorterStemmer, WordNetLemmatizer
```

```
nltk.download('punkt')
nltk.download('wordnet')
```

```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]  Unzipping tokenizers/punkt.zip.
[nltk_data] Downloading package wordnet to /root/nltk_data...
True
```

```
nlp = spacy.load("en_core_web_sm")
```

```
medical_text = """
Diabetes is a chronic disease that affects how the body processes blood sugar.
If untreated, diabetes may cause heart disease, kidney failure, nerve damage and vision problems.
Early diagnosis and proper treatment help improve patient outcomes.
"""
```

```
import nltk

nltk.download('punkt')
nltk.download('punkt_tab')

[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package punkt_tab to /root/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt_tab.zip.
True
```

```
from nltk.tokenize import sent_tokenize

sentences = sent_tokenize(medical_text)

print("Sentence Tokenization:\n")
for s in sentences:
    print(s)
```

Sentence Tokenization:

Diabetes is a chronic disease that affects how the body processes blood sugar.  
If untreated, diabetes may cause heart disease, kidney failure, nerve damage and vision problems.  
Early diagnosis and proper treatment help improve patient outcomes.

```
from nltk.tokenize import word_tokenize

words_nltk = word_tokenize(medical_text)
print("Word Tokenization using NLTK:\n")
print(words_nltk)
```

Word Tokenization using NLTK:

['Diabetes', 'is', 'a', 'chronic', 'disease', 'that', 'affects', 'how', 'the', 'body', 'processes', 'blood', 'sugar', '.', 'If',

```
doc = nlp(medical_text)
```

```
words_spacy = [token.text for token in doc]
print("\nWord Tokenization using spaCy:\n")
print(words_spacy)
```

Word Tokenization using spaCy:

['\n', 'Diabetes', 'is', 'a', 'chronic', 'disease', 'that', 'affects', 'how', 'the', 'body', 'processes', 'blood', 'sugar', '.',

```
from nltk.stem import PorterStemmer

stemmer = PorterStemmer()

stemmed_words = [stemmer.stem(word) for word in words_nltk if word.isalpha()]

print("Stemmed Words:\n")
print(stemmed_words)
```

Stemmed Words:

['diabet', 'is', 'a', 'chronic', 'diseas', 'that', 'affect', 'how', 'the', 'bodi', 'process', 'blood', 'sugar', 'if', 'untreat',

```
from nltk.stem import WordNetLemmatizer

lemmatizer = WordNetLemmatizer()

lemmatized_words_nltk = [
    lemmatizer.lemmatize(word.lower())
    for word in words_nltk
    if word.isalpha()
]
```

```
print("Lemmatized Words using NLTK:\n")
print(lemmatized_words_nltk)
```

Lemmatized Words using NLTK:

```
['diabetes', 'is', 'a', 'chronic', 'disease', 'that', 'affect', 'how', 'the', 'body', 'process', 'blood', 'sugar', 'if', 'untrea
```

```
lemmatized_words_spacy = [token.lemma_ for token in doc if token.is_alpha]
```

```
print("\nLemmatized Words using spaCy:\n")
print(lemmatized_words_spacy)
```

Lemmatized Words using spaCy:

```
['Diabetes', 'be', 'a', 'chronic', 'disease', 'that', 'affect', 'how', 'the', 'body', 'process', 'blood', 'sugar', 'if', 'untrea
```

```
print("Original Words:\n", words_nltk)
print("\nStemmed Words:\n", stemmed_words)
print("\nLemmatized Words (spaCy):\n", lemmatized_words_spacy)
```

Original Words:

```
['Diabetes', 'is', 'a', 'chronic', 'disease', 'that', 'affects', 'how', 'the', 'body', 'processes', 'blood', 'sugar', '.', 'If'
```

Stemmed Words:

```
['diabet', 'is', 'a', 'chronic', 'diseas', 'that', 'affect', 'how', 'the', 'bodi', 'process', 'blood', 'sugar', 'if', 'untreat'
```

Lemmatized Words (spaCy):

```
['Diabetes', 'be', 'a', 'chronic', 'disease', 'that', 'affect', 'how', 'the', 'body', 'process', 'blood', 'sugar', 'if', 'untre
```