Sentiment analysis is a natural language processing (NLP) technique used to determine the sentiment expressed in a piece of text—whether the sentiment is positive, negative, or neutral. It is widely used in various applications, such as social media monitoring, customer feedback analysis, and market research, to gauge public opinion or customer sentiment towards products or brands. In Python, sentiment analysis can be performed using several libraries, including TextBlob, VADER, spaCy, and machine learning frameworks like scikit-learn or transformers from Hugging Face. Below are examples of how to conduct sentiment analysis using different tools.

Example 1: Using TextBlob

TextBlob is a simple library for processing textual data that provides a simple API for diving into common natural language processing (NLP) tasks.

```python
In [35]:
from textblob import TextBlob
import numpy

# Sample texts
texts = [
    "I love this product! It's amazing.",
    "This is the worst experience I've ever had.",
    "It's okay, neither good nor bad."
]

# Analyzing sentiment
for text in texts:
    blob = TextBlob(text)
    sentiment = blob.sentiment
    print(f"Text: '{text}'")
    print(f"Sentiment: {sentiment}\n")  # Contains polarity and subjectivity
```

```
Text: 'I love this product! It's amazing.'
Sentiment: Sentiment(polarity=0.6125, subjectivity=0.75)

Text: 'This is the worst experience I've ever had.'
Sentiment: Sentiment(polarity=-1.0, subjectivity=1.0)

Text: 'It's okay, neither good nor bad.'
Sentiment: Sentiment(polarity=0.1666666666666667, subjectivity=0.5888888888888889)
```

Example 2: Using VADER from NLTK

VADER (Valence Aware Dictionary and sEntiment Reasoner) is a specialized library within NLTK that is effective for sentiment analysis, particularly in social media contexts.

In [36]:
```python
import nltk
from nltk.sentiment.vader import SentimentIntensityAnalyzer

# Download VADER lexicon
nltk.download('vader_lexicon')

# Initialize VADER
analyzer = SentimentIntensityAnalyzer()

# Sample texts
texts = [
    "I'm so happy and excited!",
    "This is a terrible nightmare.",
    "What just happened was unexpected."
]

# Analyzing sentiment
for text in texts:
    score = analyzer.polarity_scores(text)
    print(f"Text: '{text}'")
    print(f"Scores: {score}\n")  # pos, neg, neu and compound scores
```

```
Text: 'I'm so happy and excited!'
Scores: {'neg': 0.0, 'neu': 0.302, 'pos': 0.698, 'compound': 0.7875}

Text: 'This is a terrible nightmare.'
Scores: {'neg': 0.508, 'neu': 0.492, 'pos': 0.0, 'compound': -0.4767}

Text: 'What just happened was unexpected.'
Scores: {'neg': 0.0, 'neu': 1.0, 'pos': 0.0, 'compound': 0.0}
```

```
[nltk_data] Downloading package vader_lexicon to C:\Users\PURNANGSHU
[nltk_data]     ROY\AppData\Roaming\nltk_data...
[nltk_data]   Package vader_lexicon is already up-to-date!
```

Example 3: Using Pre-trained Models (Transformers)

For more complex analyses, you can use pre-trained models from the transformers library by Hugging Face. Here's an example using a sentiment analysis model.

In [47]:
```
pip install tf-keras
```

Defaulting to user installation because normal site-packages is not writeableNote: you may need to restart the kernel to use update
d packages.
  WARNING: The scripts f2py.exe and numpy-config.exe are installed in 'C:\Users\PURNANGSHU ROY\AppData\Roaming\Python\Python311\Scr
ipts' which is not on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
  WARNING: The script tensorboard.exe is installed in 'C:\Users\PURNANGSHU ROY\AppData\Roaming\Python\Python311\Scripts' which is n
ot on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
  WARNING: The scripts import_pb_to_tensorboard.exe, saved_model_cli.exe, tensorboard.exe, tf_upgrade_v2.exe, tflite_convert.exe, t
oco.exe and toco_from_protos.exe are installed in 'C:\Users\PURNANGSHU ROY\AppData\Roaming\Python\Python311\Scripts' which is not o
n PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the so
urce of the following dependency conflicts.
gensim 4.3.0 requires FuzzyTM>=0.4.0, which is not installed.
tables 3.8.0 requires blosc2~=2.0.0, which is not installed.
tables 3.8.0 requires cython>=0.29.21, which is not installed.
numba 0.57.0 requires numpy<1.25,>=1.21, but you have numpy 2.0.2 which is incompatible.

```
Requirement already satisfied: tf-keras in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (2.18.0)
Requirement already satisfied: tensorflow<2.19,>=2.18 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (fr
om tf-keras) (2.18.0)
Collecting tensorflow-intel==2.18.0 (from tensorflow<2.19,>=2.18->tf-keras)
  Obtaining dependency information for tensorflow-intel==2.18.0 from https://files.pythonhosted.org/packages/76/ad/fa6c508a15ff79cb
5409294c293388e0999b7d480f84b65e4287277434fe/tensorflow_intel-2.18.0-cp311-cp311-win_amd64.whl.metadata
  Using cached tensorflow_intel-2.18.0-cp311-cp311-win_amd64.whl.metadata (4.9 kB)
Requirement already satisfied: absl-py>=1.0.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from tenso
rflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (2.1.0)
Requirement already satisfied: astunparse>=1.6.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from te
nsorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (1.6.3)
Requirement already satisfied: flatbuffers>=24.3.25 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from
tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (24.3.25)
Requirement already satisfied: gast!=0.5.0,!=0.5.1,!=0.5.2,>=0.2.1 in c:\users\purnangshu roy\appdata\roaming\python\python311\site
-packages (from tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (0.4.0)
Requirement already satisfied: google-pasta>=0.1.1 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from
tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (0.2.0)
Requirement already satisfied: libclang>=13.0.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from ten
sorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (18.1.1)
Requirement already satisfied: opt-einsum>=2.3.2 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from te
nsorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (3.4.0)
Requirement already satisfied: packaging in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from tensorflow
-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (24.0)
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<6.0.0dev,>=3.20.3 in c:\users\purnang
shu roy\appdata\roaming\python\python311\site-packages (from tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (4.25.5)
Requirement already satisfied: requests<3,>=2.21.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from
tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (2.32.3)
Requirement already satisfied: setuptools in c:\programdata\anaconda3\lib\site-packages (from tensorflow-intel==2.18.0->tensorflow<
2.19,>=2.18->tf-keras) (68.0.0)
Requirement already satisfied: six>=1.12.0 in c:\programdata\anaconda3\lib\site-packages (from tensorflow-intel==2.18.0->tensorflow
<2.19,>=2.18->tf-keras) (1.16.0)
Requirement already satisfied: termcolor>=1.1.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from ten
sorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (2.5.0)
Requirement already satisfied: typing-extensions>=3.6.6 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages
(from tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (4.12.2)
Requirement already satisfied: wrapt>=1.11.0 in c:\programdata\anaconda3\lib\site-packages (from tensorflow-intel==2.18.0->tensorfl
ow<2.19,>=2.18->tf-keras) (1.14.1)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from
tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (1.67.1)
Collecting tensorboard<2.19,>=2.18 (from tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras)
  Obtaining dependency information for tensorboard<2.19,>=2.18 from https://files.pythonhosted.org/packages/b1/de/021c1d407befb5057
91764ad2cbd56ceaaa53a746baed01d2e2143f05f18/tensorboard-2.18.0-py3-none-any.whl.metadata
  Using cached tensorboard-2.18.0-py3-none-any.whl.metadata (1.6 kB)
Collecting keras>=3.5.0 (from tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras)
```

```
    Obtaining dependency information for keras>=3.5.0 from https://files.pythonhosted.org/packages/8a/bf/9e3f10e55df30b0fb4bf6c2ee7d5
0bda2e070599b86f62ea3f9954af172b/keras-3.7.0-py3-none-any.whl.metadata
    Downloading keras-3.7.0-py3-none-any.whl.metadata (5.8 kB)
Collecting numpy<2.1.0,>=1.26.0 (from tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras)
    Obtaining dependency information for numpy<2.1.0,>=1.26.0 from https://files.pythonhosted.org/packages/eb/57/3a3f14d3a759dcf9bf6e
9eda905794726b758819df4663f217d658a58695/numpy-2.0.2-cp311-cp311-win_amd64.whl.metadata
    Using cached numpy-2.0.2-cp311-cp311-win_amd64.whl.metadata (59 kB)
Requirement already satisfied: h5py>=3.11.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from tensorf
low-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (3.12.1)
Requirement already satisfied: ml-dtypes<0.5.0,>=0.4.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (f
rom tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (0.4.1)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in c:\users\purnangshu roy\appdata\roaming\python\python311\sit
e-packages (from tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (0.31.0)
Requirement already satisfied: wheel<1.0,>=0.23.0 in c:\programdata\anaconda3\lib\site-packages (from astunparse>=1.6.0->tensorflow
-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (0.38.4)
Requirement already satisfied: rich in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from keras>=3.5.0->t
ensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (13.9.3)
Requirement already satisfied: namex in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from keras>=3.5.0->
tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (0.0.8)
Requirement already satisfied: optree in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from keras>=3.5.0-
>tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (0.13.0)
Requirement already satisfied: charset-normalizer<4,>=2 in c:\programdata\anaconda3\lib\site-packages (from requests<3,>=2.21.0->te
nsorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in c:\programdata\anaconda3\lib\site-packages (from requests<3,>=2.21.0->tensorflow-int
el==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in c:\programdata\anaconda3\lib\site-packages (from requests<3,>=2.21.0->tensorfl
ow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (1.26.16)
Requirement already satisfied: certifi>=2017.4.17 in c:\programdata\anaconda3\lib\site-packages (from requests<3,>=2.21.0->tensorfl
ow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (2023.7.22)
Requirement already satisfied: markdown>=2.6.8 in c:\programdata\anaconda3\lib\site-packages (from tensorboard<2.19,>=2.18->tensorf
low-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (3.4.1)
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\si
te-packages (from tensorboard<2.19,>=2.18->tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (0.7.2)
Requirement already satisfied: werkzeug>=1.0.1 in c:\programdata\anaconda3\lib\site-packages (from tensorboard<2.19,>=2.18->tensorf
low-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (2.2.3)
Requirement already satisfied: MarkupSafe>=2.1.1 in c:\programdata\anaconda3\lib\site-packages (from werkzeug>=1.0.1->tensorboard<
2.19,>=2.18->tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (2.1.1)
Requirement already satisfied: markdown-it-py>=2.2.0 in c:\programdata\anaconda3\lib\site-packages (from rich->keras>=3.5.0->tensor
flow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (2.2.0)
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in c:\programdata\anaconda3\lib\site-packages (from rich->keras>=3.5.0->tens
orflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (2.15.1)
Requirement already satisfied: mdurl~=0.1 in c:\programdata\anaconda3\lib\site-packages (from markdown-it-py>=2.2.0->rich->keras>=
3.5.0->tensorflow-intel==2.18.0->tensorflow<2.19,>=2.18->tf-keras) (0.1.0)
Using cached tensorflow_intel-2.18.0-cp311-cp311-win_amd64.whl (390.2 MB)
```

```
Downloading keras-3.7.0-py3-none-any.whl (1.2 MB)
   ---------------------------------------- 0.0/1.2 MB ? eta -:--:--
   ----- ---------------------------------- 0.2/1.2 MB 4.6 MB/s eta 0:00:01
   --------------- ------------------------ 0.5/1.2 MB 5.2 MB/s eta 0:00:01
   --------------------------------- ------ 1.0/1.2 MB 7.3 MB/s eta 0:00:01
   ---------------------------------------- 1.2/1.2 MB 7.7 MB/s eta 0:00:01
   ---------------------------------------- 1.2/1.2 MB 7.7 MB/s eta 0:00:01
   ---------------------------------------- 1.2/1.2 MB 4.3 MB/s eta 0:00:00
Using cached numpy-2.0.2-cp311-cp311-win_amd64.whl (15.9 MB)
Using cached tensorboard-2.18.0-py3-none-any.whl (5.5 MB)
Installing collected packages: numpy, tensorboard, keras, tensorflow-intel
  Attempting uninstall: numpy
    Found existing installation: numpy 1.23.5
    Uninstalling numpy-1.23.5:
      Successfully uninstalled numpy-1.23.5
  Attempting uninstall: tensorboard
    Found existing installation: tensorboard 2.12.3
    Uninstalling tensorboard-2.12.3:
      Successfully uninstalled tensorboard-2.12.3
  Attempting uninstall: keras
    Found existing installation: keras 2.12.0
    Uninstalling keras-2.12.0:
      Successfully uninstalled keras-2.12.0
  Attempting uninstall: tensorflow-intel
    Found existing installation: tensorflow-intel 2.12.0
    Uninstalling tensorflow-intel-2.12.0:
      Successfully uninstalled tensorflow-intel-2.12.0
Successfully installed keras-3.7.0 numpy-2.0.2 tensorboard-2.18.0 tensorflow-intel-2.18.0
```

In [9]:
```
pip install transformers
```

Defaulting to user installation because normal site-packages is not writeableNote: you may need to restart the kernel to use update
d packages.

Requirement already satisfied: transformers in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (4.46.0)
Requirement already satisfied: filelock in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from transformer
s) (3.13.4)
Requirement already satisfied: huggingface-hub<1.0,>=0.23.2 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packag
es (from transformers) (0.26.2)
Requirement already satisfied: numpy>=1.17 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from transfor
mers) (2.0.2)
Requirement already satisfied: packaging>=20.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from tran
sformers) (24.0)
Requirement already satisfied: pyyaml>=5.1 in c:\programdata\anaconda3\lib\site-packages (from transformers) (6.0)
Requirement already satisfied: regex!=2019.12.17 in c:\programdata\anaconda3\lib\site-packages (from transformers) (2022.7.9)
Requirement already satisfied: requests in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from transformer
s) (2.32.3)
Requirement already satisfied: safetensors>=0.4.1 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from t
ransformers) (0.4.5)
Requirement already satisfied: tokenizers<0.21,>=0.20 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (fr
om transformers) (0.20.1)
Requirement already satisfied: tqdm>=4.27 in c:\programdata\anaconda3\lib\site-packages (from transformers) (4.65.0)
Requirement already satisfied: fsspec>=2023.5.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from hug
gingface-hub<1.0,>=0.23.2->transformers) (2024.10.0)
Requirement already satisfied: typing-extensions>=3.7.4.3 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages
(from huggingface-hub<1.0,>=0.23.2->transformers) (4.12.2)
Requirement already satisfied: colorama in c:\programdata\anaconda3\lib\site-packages (from tqdm>=4.27->transformers) (0.4.6)
Requirement already satisfied: charset-normalizer<4,>=2 in c:\programdata\anaconda3\lib\site-packages (from requests->transformers)
(2.0.4)
Requirement already satisfied: idna<4,>=2.5 in c:\programdata\anaconda3\lib\site-packages (from requests->transformers) (3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in c:\programdata\anaconda3\lib\site-packages (from requests->transformers) (1.2
6.16)
Requirement already satisfied: certifi>=2017.4.17 in c:\programdata\anaconda3\lib\site-packages (from requests->transformers) (202
3.7.22)

In [38]:
```
pip install tensorflow==2.12
```

Defaulting to user installation because normal site-packages is not writeableNote: you may need to restart the kernel to use update
d packages.

```
  WARNING: The script f2py.exe is installed in 'C:\Users\PURNANGSHU ROY\AppData\Roaming\Python\Python311\Scripts' which is not on P
ATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
  WARNING: The script google-oauthlib-tool.exe is installed in 'C:\Users\PURNANGSHU ROY\AppData\Roaming\Python\Python311\Scripts' w
hich is not on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
  WARNING: The script tensorboard.exe is installed in 'C:\Users\PURNANGSHU ROY\AppData\Roaming\Python\Python311\Scripts' which is n
ot on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
  WARNING: The scripts estimator_ckpt_converter.exe, import_pb_to_tensorboard.exe, saved_model_cli.exe, tensorboard.exe, tf_upgrade
_v2.exe, tflite_convert.exe, toco.exe and toco_from_protos.exe are installed in 'C:\Users\PURNANGSHU ROY\AppData\Roaming\Python\Pyt
hon311\Scripts' which is not on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
ERROR: Could not install packages due to an OSError: [WinError 5] Access is denied: 'C:\\Users\\PURNANGSHU ROY\\AppData\\Roaming\\P
ython\\Python311\\site-packages\\~ensorflow\\compiler\\mlir\\lite\\python\\_pywrap_converter_api.pyd'
Check the permissions.
```

```
Collecting tensorflow==2.12
  Obtaining dependency information for tensorflow==2.12 from https://files.pythonhosted.org/packages/29/32/634f7277aee86101e74d5023
0e72795c33a5d3279320b78ac67e8f37454b/tensorflow-2.12.0-cp311-cp311-win_amd64.whl.metadata
  Using cached tensorflow-2.12.0-cp311-cp311-win_amd64.whl.metadata (2.5 kB)
Collecting tensorflow-intel==2.12.0 (from tensorflow==2.12)
  Obtaining dependency information for tensorflow-intel==2.12.0 from https://files.pythonhosted.org/packages/2c/14/5ae3083726951286
7efbfa7144b45e816db43b98e3f663f5a51a8148d5c3/tensorflow_intel-2.12.0-cp311-cp311-win_amd64.whl.metadata
  Using cached tensorflow_intel-2.12.0-cp311-cp311-win_amd64.whl.metadata (4.1 kB)
Requirement already satisfied: absl-py>=1.0.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from tenso
rflow-intel==2.12.0->tensorflow==2.12) (2.1.0)
Requirement already satisfied: astunparse>=1.6.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from te
nsorflow-intel==2.12.0->tensorflow==2.12) (1.6.3)
Requirement already satisfied: flatbuffers>=2.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from ten
sorflow-intel==2.12.0->tensorflow==2.12) (24.3.25)
Collecting gast<=0.4.0,>=0.2.1 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for gast<=0.4.0,>=0.2.1 from https://files.pythonhosted.org/packages/b6/48/583c032b79ae5b3daa022
25a675aeb673e58d2cb698e78510feceb11958c/gast-0.4.0-py3-none-any.whl.metadata
  Using cached gast-0.4.0-py3-none-any.whl.metadata (1.1 kB)
Requirement already satisfied: google-pasta>=0.1.1 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from
tensorflow-intel==2.12.0->tensorflow==2.12) (0.2.0)
Requirement already satisfied: h5py>=2.9.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from tensorfl
ow-intel==2.12.0->tensorflow==2.12) (3.12.1)
Collecting jax>=0.3.15 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jax>=0.3.15 from https://files.pythonhosted.org/packages/22/49/b4418a7a892c0dd64442bbbeef54e
1cdfe722dfc5a7bf0d611d3f5f90e99/jax-0.4.38-py3-none-any.whl.metadata
  Using cached jax-0.4.38-py3-none-any.whl.metadata (22 kB)
Requirement already satisfied: libclang>=13.0.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from ten
sorflow-intel==2.12.0->tensorflow==2.12) (18.1.1)
Collecting numpy<1.24,>=1.22 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for numpy<1.24,>=1.22 from https://files.pythonhosted.org/packages/19/0d/b8c34e4baf258d77a8592bd
ce45183e9a12874c167f5966c7dd467b74ea9/numpy-1.23.5-cp311-cp311-win_amd64.whl.metadata
  Using cached numpy-1.23.5-cp311-cp311-win_amd64.whl.metadata (2.3 kB)
Requirement already satisfied: opt-einsum>=2.3.2 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from te
nsorflow-intel==2.12.0->tensorflow==2.12) (3.4.0)
Requirement already satisfied: packaging in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from tensorflow
-intel==2.12.0->tensorflow==2.12) (24.0)
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<5.0.0dev,>=3.20.3 in c:\users\purnang
shu roy\appdata\roaming\python\python311\site-packages (from tensorflow-intel==2.12.0->tensorflow==2.12) (4.25.5)
Requirement already satisfied: setuptools in c:\programdata\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow=
=2.12) (68.0.0)
Requirement already satisfied: six>=1.12.0 in c:\programdata\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow
==2.12) (1.16.0)
Requirement already satisfied: termcolor>=1.1.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from ten
sorflow-intel==2.12.0->tensorflow==2.12) (2.5.0)
```

```
Requirement already satisfied: typing-extensions>=3.6.6 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages
(from tensorflow-intel==2.12.0->tensorflow==2.12) (4.12.2)
Requirement already satisfied: wrapt<1.15,>=1.11.0 in c:\programdata\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->te
nsorflow==2.12) (1.14.1)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from
tensorflow-intel==2.12.0->tensorflow==2.12) (1.67.1)
Collecting tensorboard<2.13,>=2.12 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for tensorboard<2.13,>=2.12 from https://files.pythonhosted.org/packages/32/09/86e2ef3b4f4ec04bd
e0eca499325f291ae6b3313381d0666ee20b5b80c73/tensorboard-2.12.3-py3-none-any.whl.metadata
  Using cached tensorboard-2.12.3-py3-none-any.whl.metadata (1.8 kB)
Requirement already satisfied: tensorflow-estimator<2.13,>=2.12.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-
packages (from tensorflow-intel==2.12.0->tensorflow==2.12) (2.12.0)
Collecting keras<2.13,>=2.12.0 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for keras<2.13,>=2.12.0 from https://files.pythonhosted.org/packages/d5/80/34e55d7e3ed9cf1802092
9460f969de1bf82cf2f509c639b358ae2b25618/keras-2.12.0-py2.py3-none-any.whl.metadata
  Using cached keras-2.12.0-py2.py3-none-any.whl.metadata (1.4 kB)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in c:\users\purnangshu roy\appdata\roaming\python\python311\sit
e-packages (from tensorflow-intel==2.12.0->tensorflow==2.12) (0.31.0)
Requirement already satisfied: wheel<1.0,>=0.23.0 in c:\programdata\anaconda3\lib\site-packages (from astunparse>=1.6.0->tensorflow
-intel==2.12.0->tensorflow==2.12) (0.38.4)
Collecting jaxlib<=0.4.38,>=0.4.38 (from jax>=0.3.15->tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jaxlib<=0.4.38,>=0.4.38 from https://files.pythonhosted.org/packages/cc/24/a9c571c8a189f58e0
b54b14d53fc7f5a0a06e4f1d7ab9edcf8d1d91d07e7/jaxlib-0.4.38-cp311-cp311-win_amd64.whl.metadata
  Using cached jaxlib-0.4.38-cp311-cp311-win_amd64.whl.metadata (1.1 kB)
Requirement already satisfied: ml_dtypes>=0.4.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from jax
>=0.3.15->tensorflow-intel==2.12.0->tensorflow==2.12) (0.4.1)
INFO: pip is looking at multiple versions of jax to determine which version is compatible with other requirements. This could take
a while.
Collecting jax>=0.3.15 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jax>=0.3.15 from https://files.pythonhosted.org/packages/5f/3f/6c5553baaa7faa3fa8bae8279b1e4
6cb54c7ce52360139eae53498786ea5/jax-0.4.37-py3-none-any.whl.metadata
  Using cached jax-0.4.37-py3-none-any.whl.metadata (22 kB)
Collecting jaxlib<=0.4.37,>=0.4.36 (from jax>=0.3.15->tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jaxlib<=0.4.37,>=0.4.36 from https://files.pythonhosted.org/packages/b7/46/31c3a519a94e84c67
2ca264c4151998e3e3fd11c481d8fa5af5885b91a1e/jaxlib-0.4.36-cp311-cp311-win_amd64.whl.metadata
  Using cached jaxlib-0.4.36-cp311-cp311-win_amd64.whl.metadata (1.1 kB)
Collecting jax>=0.3.15 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jax>=0.3.15 from https://files.pythonhosted.org/packages/a5/d5/1240192a0bc7b284bca9f753e69e9
2645afb82a6b2c3e1138520698938f4/jax-0.4.36-py3-none-any.whl.metadata
  Using cached jax-0.4.36-py3-none-any.whl.metadata (22 kB)
  Obtaining dependency information for jax>=0.3.15 from https://files.pythonhosted.org/packages/62/20/6c57c50c0ccc645fea1895950f1e5
cd02f961ee44b3ffe83617fa46b0c1d/jax-0.4.35-py3-none-any.whl.metadata
  Using cached jax-0.4.35-py3-none-any.whl.metadata (22 kB)
Collecting jaxlib<=0.4.35,>=0.4.34 (from jax>=0.3.15->tensorflow-intel==2.12.0->tensorflow==2.12)
```

```
  Obtaining dependency information for jaxlib<=0.4.35,>=0.4.34 from https://files.pythonhosted.org/packages/7d/7c/73a4c4a34f2bbfce6
3e8baefee11753b0d58a71e0d2c33f210e00edba3cb/jaxlib-0.4.35-cp311-cp311-win_amd64.whl.metadata
  Using cached jaxlib-0.4.35-cp311-cp311-win_amd64.whl.metadata (1.0 kB)
Collecting jax>=0.3.15 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jax>=0.3.15 from https://files.pythonhosted.org/packages/06/f3/c499d358dd7f267a63d7d38ef54aa
dad82e28d2c28bafff15360c3091946/jax-0.4.34-py3-none-any.whl.metadata
  Using cached jax-0.4.34-py3-none-any.whl.metadata (22 kB)
Collecting jaxlib<=0.4.34,>=0.4.34 (from jax>=0.3.15->tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jaxlib<=0.4.34,>=0.4.34 from https://files.pythonhosted.org/packages/9d/5d/7e71019af5f6fdebe
6c10eab97d01f44b931d94609330da9e142cb155f8c/jaxlib-0.4.34-cp311-cp311-win_amd64.whl.metadata
  Using cached jaxlib-0.4.34-cp311-cp311-win_amd64.whl.metadata (1.0 kB)
Collecting jax>=0.3.15 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jax>=0.3.15 from https://files.pythonhosted.org/packages/49/48/0e32458ab7e02d75f423fe8c2ab10
d7fa1aba9b314391d2659e68891912b/jax-0.4.33-py3-none-any.whl.metadata
  Using cached jax-0.4.33-py3-none-any.whl.metadata (22 kB)
Collecting jaxlib<=0.4.33,>=0.4.33 (from jax>=0.3.15->tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jaxlib<=0.4.33,>=0.4.33 from https://files.pythonhosted.org/packages/12/64/7890a65a521a139fc
6b8449925614b7d4ca4d426c79838cae1e37348d4ea/jaxlib-0.4.33-cp311-cp311-win_amd64.whl.metadata
  Using cached jaxlib-0.4.33-cp311-cp311-win_amd64.whl.metadata (1.0 kB)
Collecting jax>=0.3.15 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jax>=0.3.15 from https://files.pythonhosted.org/packages/7e/cf/5f51b43bd692e90585c0ef6e8d1b0
db5d254fe0224a6570daa59a1be014f/jax-0.4.31-py3-none-any.whl.metadata
  Using cached jax-0.4.31-py3-none-any.whl.metadata (22 kB)
Collecting jaxlib<=0.4.31,>=0.4.30 (from jax>=0.3.15->tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jaxlib<=0.4.31,>=0.4.30 from https://files.pythonhosted.org/packages/9f/e2/5b7d20ed550d15631
1587eee6e44c48971fe6c3b43f39e82dacda3875396/jaxlib-0.4.31-cp311-cp311-win_amd64.whl.metadata
  Using cached jaxlib-0.4.31-cp311-cp311-win_amd64.whl.metadata (1.0 kB)
Collecting jax>=0.3.15 (from tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jax>=0.3.15 from https://files.pythonhosted.org/packages/fd/f2/9dbb75de3058acfd1600cf0839bcc
e7ea391148c9d2b4fa5f5666e66f09e/jax-0.4.30-py3-none-any.whl.metadata
  Using cached jax-0.4.30-py3-none-any.whl.metadata (22 kB)
Collecting jaxlib<=0.4.30,>=0.4.27 (from jax>=0.3.15->tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for jaxlib<=0.4.30,>=0.4.27 from https://files.pythonhosted.org/packages/bb/1a/8f45ea28a5ca67e4d
23ebd70fc78ea94be6fa20323f983c7607c32c6f9a5/jaxlib-0.4.30-cp311-cp311-win_amd64.whl.metadata
  Using cached jaxlib-0.4.30-cp311-cp311-win_amd64.whl.metadata (1.1 kB)
Requirement already satisfied: scipy>=1.9 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from jax>=0.3.
15->tensorflow-intel==2.12.0->tensorflow==2.12) (1.14.1)
Requirement already satisfied: google-auth<3,>=1.6.3 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (fro
m tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (2.35.0)
Collecting google-auth-oauthlib<1.1,>=0.5 (from tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12)
  Obtaining dependency information for google-auth-oauthlib<1.1,>=0.5 from https://files.pythonhosted.org/packages/4a/07/8d9a8186e6
768b55dfffeb57c719bc03770cf8a970a074616ae6f9e26a57/google_auth_oauthlib-1.0.0-py2.py3-none-any.whl.metadata
  Using cached google_auth_oauthlib-1.0.0-py2.py3-none-any.whl.metadata (2.7 kB)
Requirement already satisfied: markdown>=2.6.8 in c:\programdata\anaconda3\lib\site-packages (from tensorboard<2.13,>=2.12->tensorf
```

```
low-intel==2.12.0->tensorflow==2.12) (3.4.1)
Requirement already satisfied: requests<3,>=2.21.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from
tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (2.32.3)
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\si
te-packages (from tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (0.7.2)
Requirement already satisfied: werkzeug>=1.0.1 in c:\programdata\anaconda3\lib\site-packages (from tensorboard<2.13,>=2.12->tensorf
low-intel==2.12.0->tensorflow==2.12) (2.2.3)
Requirement already satisfied: cachetools<6.0,>=2.0.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (fr
om google-auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (5.5.0)
Requirement already satisfied: pyasn1-modules>=0.2.1 in c:\programdata\anaconda3\lib\site-packages (from google-auth<3,>=1.6.3->ten
sorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (0.2.8)
Requirement already satisfied: rsa<5,>=3.1.4 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from google
-auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (4.9)
Requirement already satisfied: requests-oauthlib>=0.7.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages
(from google-auth-oauthlib<1.1,>=0.5->tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (2.0.0)
Requirement already satisfied: charset-normalizer<4,>=2 in c:\programdata\anaconda3\lib\site-packages (from requests<3,>=2.21.0->te
nsorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in c:\programdata\anaconda3\lib\site-packages (from requests<3,>=2.21.0->tensorboard<2.
13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in c:\programdata\anaconda3\lib\site-packages (from requests<3,>=2.21.0->tensorbo
ard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (1.26.16)
Requirement already satisfied: certifi>=2017.4.17 in c:\programdata\anaconda3\lib\site-packages (from requests<3,>=2.21.0->tensorbo
ard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (2023.7.22)
Requirement already satisfied: MarkupSafe>=2.1.1 in c:\programdata\anaconda3\lib\site-packages (from werkzeug>=1.0.1->tensorboard<
2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (2.1.1)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in c:\programdata\anaconda3\lib\site-packages (from pyasn1-modules>=0.2.1->goog
le-auth<3,>=1.6.3->tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (0.4.8)
Requirement already satisfied: oauthlib>=3.0.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from requ
ests-oauthlib>=0.7.0->google-auth-oauthlib<1.1,>=0.5->tensorboard<2.13,>=2.12->tensorflow-intel==2.12.0->tensorflow==2.12) (3.2.2)
Using cached tensorflow-2.12.0-cp311-cp311-win_amd64.whl (1.9 kB)
Using cached tensorflow_intel-2.12.0-cp311-cp311-win_amd64.whl (272.9 MB)
Using cached gast-0.4.0-py3-none-any.whl (9.8 kB)
Using cached jax-0.4.30-py3-none-any.whl (2.0 MB)
Using cached keras-2.12.0-py2.py3-none-any.whl (1.7 MB)
Using cached numpy-1.23.5-cp311-cp311-win_amd64.whl (14.6 MB)
Using cached tensorboard-2.12.3-py3-none-any.whl (5.6 MB)
Using cached google_auth_oauthlib-1.0.0-py2.py3-none-any.whl (18 kB)
Using cached jaxlib-0.4.30-cp311-cp311-win_amd64.whl (51.9 MB)
Installing collected packages: numpy, keras, gast, jaxlib, google-auth-oauthlib, tensorboard, jax, tensorflow-intel, tensorflow
  Attempting uninstall: numpy
    Found existing installation: numpy 2.0.2
    Uninstalling numpy-2.0.2:
      Successfully uninstalled numpy-2.0.2
  Attempting uninstall: keras
```

```
    Found existing installation: keras 3.6.0
    Uninstalling keras-3.6.0:
      Successfully uninstalled keras-3.6.0
  Attempting uninstall: gast
    Found existing installation: gast 0.6.0
    Uninstalling gast-0.6.0:
      Successfully uninstalled gast-0.6.0
  Attempting uninstall: google-auth-oauthlib
    Found existing installation: google-auth-oauthlib 1.2.1
    Uninstalling google-auth-oauthlib-1.2.1:
      Successfully uninstalled google-auth-oauthlib-1.2.1
  Attempting uninstall: tensorboard
    Found existing installation: tensorboard 2.18.0
    Uninstalling tensorboard-2.18.0:
      Successfully uninstalled tensorboard-2.18.0
  Attempting uninstall: tensorflow-intel
    Found existing installation: tensorflow_intel 2.18.0
    Uninstalling tensorflow_intel-2.18.0:
      Successfully uninstalled tensorflow_intel-2.18.0
```

Example 3: Using Pre-trained Models (Transformers)

For more complex analyses, you can use pre-trained models from the transformers library by Hugging Face. Here's an example using a sentiment analysis model.

In [44]:
```
pip install transformers
```

```
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: transformers in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (4.46.0)
Requirement already satisfied: filelock in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from transformer
s) (3.13.4)
Requirement already satisfied: huggingface-hub<1.0,>=0.23.2 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packag
es (from transformers) (0.26.2)
Requirement already satisfied: numpy>=1.17 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from transfor
mers) (1.23.5)
Requirement already satisfied: packaging>=20.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from tran
sformers) (24.0)
Requirement already satisfied: pyyaml>=5.1 in c:\programdata\anaconda3\lib\site-packages (from transformers) (6.0)
Requirement already satisfied: regex!=2019.12.17 in c:\programdata\anaconda3\lib\site-packages (from transformers) (2022.7.9)
Requirement already satisfied: requests in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from transformer
s) (2.32.3)
Requirement already satisfied: safetensors>=0.4.1 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from t
ransformers) (0.4.5)
Requirement already satisfied: tokenizers<0.21,>=0.20 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (fr
om transformers) (0.20.1)
Requirement already satisfied: tqdm>=4.27 in c:\programdata\anaconda3\lib\site-packages (from transformers) (4.65.0)
Requirement already satisfied: fsspec>=2023.5.0 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages (from hug
gingface-hub<1.0,>=0.23.2->transformers) (2024.10.0)
Requirement already satisfied: typing-extensions>=3.7.4.3 in c:\users\purnangshu roy\appdata\roaming\python\python311\site-packages
(from huggingface-hub<1.0,>=0.23.2->transformers) (4.12.2)
Requirement already satisfied: colorama in c:\programdata\anaconda3\lib\site-packages (from tqdm>=4.27->transformers) (0.4.6)
Requirement already satisfied: charset-normalizer<4,>=2 in c:\programdata\anaconda3\lib\site-packages (from requests->transformers)
(2.0.4)
Requirement already satisfied: idna<4,>=2.5 in c:\programdata\anaconda3\lib\site-packages (from requests->transformers) (3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in c:\programdata\anaconda3\lib\site-packages (from requests->transformers) (1.2
6.16)
Requirement already satisfied: certifi>=2017.4.17 in c:\programdata\anaconda3\lib\site-packages (from requests->transformers) (202
3.7.22)
Note: you may need to restart the kernel to use updated packages.
```

In [49]:
```python
from transformers import pipeline
```

Load a Pre-trained Sentiment Analysis Model

The pipeline function simplifies loading pre-trained models. Initialize it for sentiment analysis:

In [48]:
```python
# Import the pipeline function
from transformers import pipeline
```

```python
# Initialize the sentiment analysis pipeline
sentiment_pipeline = pipeline('sentiment-analysis')

# Use the pipeline on some text
results = sentiment_pipeline("I love using Hugging Face's transformers library!")
print(results)
# Analyze sentiment of text
texts = [
    "I love using Hugging Face Transformers, it's amazing!",
    "I had a terrible experience with this product.",
    "The movie was just okay, nothing special."
]

# Get predictions
results = sentiment_pipeline(texts)

# Print the results
for i, result in enumerate(results):
    print(f"Text: {texts[i]}")
    print(f"Sentiment: {result['label']}, Confidence: {result['score']:.2f}\n")
```

No model was supplied, defaulted to distilbert/distilbert-base-uncased-finetuned-sst-2-english and revision 714eb0f (https://huggingface.co/distilbert/distilbert-base-uncased-finetuned-sst-2-english).
Using a pipeline without specifying a model name and revision in production is not recommended.
WARNING:tensorflow:From C:\Users\PURNANGSHU ROY\AppData\Roaming\Python\Python311\site-packages\tf_keras\src\losses.py:2976: The name tf.losses.sparse_softmax_cross_entropy is deprecated. Please use tf.compat.v1.losses.sparse_softmax_cross_entropy instead.

model.safetensors: 0%| | 0.00/268M [00:00<?, ?B/s]

C:\Users\PURNANGSHU ROY\AppData\Roaming\Python\Python311\site-packages\huggingface_hub\file_download.py:139: UserWarning: `huggingface_hub` cache-system uses symlinks by default to efficiently store duplicated files but your machine does not support them in C:\Users\PURNANGSHU ROY\.cache\huggingface\hub\models--distilbert--distilbert-base-uncased-finetuned-sst-2-english. Caching files will still work but in a degraded version that might require more space on your disk. This warning can be disabled by setting the `HF_HUB_DISABLE_SYMLINKS_WARNING` environment variable. For more details, see https://huggingface.co/docs/huggingface_hub/how-to-cache#limitations.
To support symlinks on Windows, you either need to activate Developer Mode or to run Python as an administrator. In order to activate developer mode, see this article: https://docs.microsoft.com/en-us/windows/apps/get-started/enable-your-device-for-development
  warnings.warn(message)
tokenizer_config.json: 0%| | 0.00/48.0 [00:00<?, ?B/s]
vocab.txt: 0%| | 0.00/232k [00:00<?, ?B/s]

```
[{'label': 'POSITIVE', 'score': 0.9978122711181641}]
Text: I love using Hugging Face Transformers, it's amazing!
Sentiment: POSITIVE, Confidence: 1.00

Text: I had a terrible experience with this product.
Sentiment: NEGATIVE, Confidence: 1.00

Text: The movie was just okay, nothing special.
Sentiment: NEGATIVE, Confidence: 0.99
```

Example 4: Custom Model using Scikit-learn

You can also build a custom sentiment analysis model using machine learning libraries like Scikit-learn. Here's a simple example using logistic regression.

In [14]:
```python
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.linear_model import LogisticRegression
from sklearn.pipeline import make_pipeline

# Sample dataset
data = {
    'text': ["I love this!", "This is awful.", "Best thing ever!", "I hate it.", "It's okay."],
    'sentiment': [1, 0, 1, 0, 0]
}
df = pd.DataFrame(data)

# Splitting data
X_train, X_test, y_train, y_test = train_test_split(df['text'], df['sentiment'], test_size=0.2, random_state=42)

# Creating a model pipeline
model = make_pipeline(CountVectorizer(), LogisticRegression())

# Training the model
model.fit(X_train, y_train)

# Predicting on test data
predictions = model.predict(X_test)
```

```python
for text, pred in zip(X_test, predictions):
    print(f"Text: '{text}' | Predicted Sentiment: {pred}\n")
```

```
Text: 'This is awful.' | Predicted Sentiment: 1
```

Summary

Sentiment analysis can be implemented in various ways depending on the complexity required. Libraries like TextBlob and VADER are great for quick analyses, while Hugging Face Transformers provide state-of-the-art accuracy with deep learning models. Alternatively, building a custom model with Scikit-learn allows for more tailored approaches, according to specific datasets and requirements.

In [ ]: