

---

#Install Required Libraries

!pip install -U spacy

!python -m spacy download en\_core\_web\_sm

→ Requirement already satisfied: spacy in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: spacy-legacy<3.1.0,>=3.0.11 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: spacy-loggers<2.0.0,>=1.0.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: murmurhash<1.1.0,>=0.28.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: cymem<2.1.0,>=2.0.2 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: preshed<3.1.0,>=3.0.2 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: thinc<8.4.0,>=8.3.4 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: wasabi<1.2.0,>=0.9.1 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: srsly<3.0.0,>=2.4.3 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: catalogue<2.1.0,>=2.0.6 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: weasel<0.5.0,>=0.1.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: typer<1.0.0,>=0.3.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: tqdm<5.0.0,>=4.38.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: numpy>=1.19.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: requests<3.0.0,>=2.13.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: pydantic!=1.8,!1.8.1,<3.0.0,>=1.7.4 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: jinja2 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: setuptools in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: langcodes<4.0.0,>=3.2.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: language-data>=1.2 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: annotated-types>=0.6.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: pydantic-core==2.27.2 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: typing-extensions>=4.12.2 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: blis<1.3.0,>=1.2.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: confection<1.0.0,>=0.0.1 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: click>=8.0.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: shellingham>=1.3.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: rich>=10.11.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: cloudpathlib<1.0.0,>=0.7.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: smart-open<8.0.0,>=5.2.1 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: marisa-trie>=1.1.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: markdown-it-py>=2.2.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: wrapt in /usr/local/lib/python3.11/dist-packages  
Requirement already satisfied: mdurl~=0.1 in /usr/local/lib/python3.11/dist-packages  
Collecting en-core-web-sm==3.8.0  
Downloading [https://github.com/explosion/spacy-models/releases/download/en\\_core\\_web\\_sm-3.8.0/en\\_core\\_web\\_sm-3.8.0.tar.gz](https://github.com/explosion/spacy-models/releases/download/en_core_web_sm-3.8.0/en_core_web_sm-3.8.0.tar.gz) 12.8/12.8 MB 51.3 MB/s eta 0:00

✓ 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.

#using spaCy 3.x NER training, add this too

```
!pip install -U spacy-transformers
```

```
883.7/883.7 kB 46.9 MB/s eta 0:00:00
Downloading nvidia_cudnn_cu12-9.1.0.70-py3-none-manylinux2014_x86_64.whl (664.8 MB)
664.8/664.8 MB 1.3 MB/s eta 0:00:00
Downloading nvidia_cufft_cu12-11.2.1.3-py3-none-manylinux2014_x86_64.whl (211.5 MB)
211.5/211.5 MB 4.7 MB/s eta 0:00:00
Downloading nvidia_curand_cu12-10.3.5.147-py3-none-manylinux2014_x86_64.whl (56.3 MB)
56.3/56.3 MB 12.3 MB/s eta 0:00:00
Downloading nvidia_cusolver_cu12-11.6.1.9-py3-none-manylinux2014_x86_64.whl (127.9 MB)
127.9/127.9 MB 7.4 MB/s eta 0:00:00
Downloading nvidia_cusparses_cu12-12.3.1.170-py3-none-manylinux2014_x86_64.whl (207.5 MB)
207.5/207.5 MB 6.0 MB/s eta 0:00:00
Downloading nvidia_nvjitlink_cu12-12.4.127-py3-none-manylinux2014_x86_64.whl (21.1 MB)
21.1/21.1 MB 69.9 MB/s eta 0:00:00
Downloading transformers-4.49.0-py3-none-any.whl (10.0 MB)
10.0/10.0 MB 97.6 MB/s eta 0:00:00
Installing collected packages: spacy-alignments, nvidia-nvjitlink-cu12, nvidia-cudnn-cu12, nvidia-cublas-cu12, nvidia-cufile-cu12, nvidia-cupti-cu12, nvidia-cuda-runtime-cu12, nvidia-cuda-nvrtc-cu12, nvidia-cuda-cupti-cu12, nvidia-cublas-cu12, nvidia-cufft-cu12, nvidia-curand-cu12, nvidia-cusolver-cu12, nvidia-cusparses-cu12, transformers
Attempting uninstall: nvidia-nvjitlink-cu12
Found existing installation: nvidia-nvjitlink-cu12 12.5.82
Uninstalling nvidia-nvjitlink-cu12-12.5.82:
Successfully uninstalled nvidia-nvjitlink-cu12-12.5.82
Attempting uninstall: nvidia-curand-cu12
Found existing installation: nvidia-curand-cu12 10.3.6.82
Uninstalling nvidia-curand-cu12-10.3.6.82:
Successfully uninstalled nvidia-curand-cu12-10.3.6.82
Attempting uninstall: nvidia-cufft-cu12
Found existing installation: nvidia-cufft-cu12 11.2.3.61
Uninstalling nvidia-cufft-cu12-11.2.3.61:
Successfully uninstalled nvidia-cufft-cu12-11.2.3.61
Attempting uninstall: nvidia-cuda-runtime-cu12
Found existing installation: nvidia-cuda-runtime-cu12 12.5.82
Uninstalling nvidia-cuda-runtime-cu12-12.5.82:
Successfully uninstalled nvidia-cuda-runtime-cu12-12.5.82
Attempting uninstall: nvidia-cuda-nvrtc-cu12
Found existing installation: nvidia-cuda-nvrtc-cu12 12.5.82
Uninstalling nvidia-cuda-nvrtc-cu12-12.5.82:
Successfully uninstalled nvidia-cuda-nvrtc-cu12-12.5.82
Attempting uninstall: nvidia-cuda-cupti-cu12
Found existing installation: nvidia-cuda-cupti-cu12 12.5.82
Uninstalling nvidia-cuda-cupti-cu12-12.5.82:
Successfully uninstalled nvidia-cuda-cupti-cu12-12.5.82
Attempting uninstall: nvidia-cublas-cu12
Found existing installation: nvidia-cublas-cu12 12.5.3.2
Uninstalling nvidia-cublas-cu12-12.5.3.2:
Successfully uninstalled nvidia-cublas-cu12-12.5.3.2
Attempting uninstall: nvidia-cusparses-cu12
Found existing installation: nvidia-cusparses-cu12 12.5.1.3
Uninstalling nvidia-cusparses-cu12-12.5.1.3:
Successfully uninstalled nvidia-cusparses-cu12-12.5.1.3
Attempting uninstall: nvidia-cudnn-cu12
Found existing installation: nvidia-cudnn-cu12 9.3.0.75
```

```
Uninstalling nvidia-cudnn-cu12-9.3.0.75:
  Successfully uninstalled nvidia-cudnn-cu12-9.3.0.75
Attempting uninstall: nvidia-cusolver-cu12
  Found existing installation: nvidia-cusolver-cu12 11.6.3.83
  Uninstalling nvidia-cusolver-cu12-11.6.3.83:
    Successfully uninstalled nvidia-cusolver-cu12-11.6.3.83
Attempting uninstall: transformers
  Found existing installation: transformers 4.50.0
  Uninstalling transformers-4.50.0:
```

```
#convert annotations.json into spaCy training data
```

```
import json
import random
from spacy.training.example import Example
import spacy

with open("annotations.json", "r") as f:
    raw_data = json.load(f)["annotations"]

# Prepare training data
TRAIN_DATA = []
for text, annot in raw_data:
    entities = annot["entities"]
    TRAIN_DATA.append((text, {"entities": entities}))

# Show a sample
random.choice(TRAIN_DATA)
```

```
➞ ("Acer Predator Helios 300 is having issues and not functioning well when
playing Assassin's Creed Valhalla with its NVIDIA GeForce Graphics Driver and
also experiencing issues with the driver Realtek Audio Driver.\r",
{'entities': [[0, 4, 'BRAND'],
[5, 24, 'MODEL'],
[25, 27, '<UNK>'],
[28, 41, 'ISSUE'],
[42, 45, '<UNK>'],
[46, 105, 'ISSUE'],
[106, 114, '<UNK>'],
[115, 145, 'COMPONENT'],
[146, 154, '<UNK>'],
[155, 190, 'ISSUE'],
[191, 211, 'COMPONENT']]})
```

```

# Train the NER Model, run this spaCy training loop directly
nlp = spacy.blank("en") # create blank Language class
ner = nlp.add_pipe("ner")

# Add labels
for _, annotations in TRAIN_DATA:
    for ent in annotations.get("entities"):
        ner.add_label(ent[2])

# Training loop
from spacy.util import minibatch, compounding

optimizer = nlp.begin_training()
for i in range(10): # Number of epochs
    random.shuffle(TRAIN_DATA)
    losses = {}
    batches = minibatch(TRAIN_DATA, size=compounding(4.0, 32.0, 1.001))
    for batch in batches:
        texts, annotations = zip(*batch)
        examples = [Example.from_dict(nlp.make_doc(text), ann) for text, ann in zip(texts, annotations)]
        nlp.update(examples, drop=0.5, losses=losses)
    print(f"Losses at iteration {i}: {losses}")

```

```

⇒ Losses at iteration 0: {'ner': np.float32(1167.3414)}
Losses at iteration 1: {'ner': np.float32(789.37933)}
Losses at iteration 2: {'ner': np.float32(887.0262)}
Losses at iteration 3: {'ner': np.float32(823.6109)}
Losses at iteration 4: {'ner': np.float32(653.5066)}
Losses at iteration 5: {'ner': np.float32(536.31726)}
Losses at iteration 6: {'ner': np.float32(438.28073)}
Losses at iteration 7: {'ner': np.float32(390.4348)}
Losses at iteration 8: {'ner': np.float32(300.8829)}
Losses at iteration 9: {'ner': np.float32(246.71185)}

```

#Test the Model on test.txt

```

with open("test.txt", "r") as f:
    lines = f.readlines()

for line in lines[:5]: # Check first 5 lines
    doc = nlp(line)
    print(f"\nText: {line.strip()}")
    for ent in doc.ents:
        print(f" → {ent.text} ({ent.label_})")

```



Text: Asus ROG Zephyrus G15 is experiencing issues with the driver NVIDIA GeForce  
→ Asus (BRAND)  
→ ROG Zephyrus G15 (MODEL)  
→ is (<UNK>)  
→ experiencing issues with the driver (ISSUE)  
→ NVIDIA GeForce Graphics Driver (COMPONENT)  
→ and (<UNK>)  
→ Realtek Audio Driver (COMPONENT)

Text: HP EliteDesk 800 G6 is having issues and not functioning well with its :  
→ HP (BRAND)  
→ EliteDesk 800 G6 (MODEL)  
→ is (<UNK>)  
→ having issues (ISSUE)  
→ and (<UNK>)  
→ not functioning well with its (ISSUE)  
→ Intel Wi-Fi 6 AX201 Driver (COMPONENT)  
→ and (<UNK>)  
→ Realtek Audio Driver (COMPONENT)

Text: Dell XPS 13 2-in-1 is experiencing issues with the driver Intel Iris Xe  
→ Dell (BRAND)  
→ XPS 13 2-in-1 (MODEL)  
→ is (<UNK>)  
→ experiencing issues with the driver (ISSUE)  
→ Intel Iris Xe Graphics Driver (COMPONENT)  
→ and (<UNK>)  
→ Realtek Audio Driver (COMPONENT)

Text: Lenovo IdeaCentre 3 is having issues and not functioning well with its f  
→ Lenovo (BRAND)  
→ IdeaCentre 3 (MODEL)  
→ is (<UNK>)  
→ having issues (ISSUE)  
→ and (<UNK>)  
→ not functioning well with its (ISSUE)  
→ Realtek Ethernet Driver (COMPONENT)  
→ and (<UNK>)  
→ Intel Graphics Driver (COMPONENT)

Text: Acer TravelMate P6 is experiencing issues with the driver Intel Graphics  
→ Acer (BRAND)  
→ TravelMate P6 (MODEL)  
→ is (<UNK>)  
→ experiencing issues with the driver (ISSUE)  
→ Intel Graphics Driver (COMPONENT)  
→ and (<UNK>)  
→ Realtek Audio Driver (COMPONENT)

```
#Visualize Results
```

```
from spacy import displacy
```

```
displacy.render(nlp("Dell XPS 13 has a malfunctioning fingerprint scanner."
```



Dell **BRAND** XPS 13 **MODEL** has a malfunctioning fingerprint scanner.

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