Install Required Libraries

```
!pip install PyMuPDF
!pip install nltk
!pip install matplotlib seaborn
```

```
Requirement already satisfied: PyMuPDF in /usr/local/lib/python3.11/dist-packages (1.26.1)
Requirement already satisfied: nltk in /usr/local/lib/python3.11/dist-packages (3.9.1)
Requirement already satisfied: click in /usr/local/lib/python3.11/dist-packages (from nltk) (8.2.1)
Requirement already satisfied: joblib in /usr/local/lib/python3.11/dist-packages (from nltk) (1.5.1)
Requirement already satisfied: regex>=2021.8.3 in /usr/local/lib/python3.11/dist-packages (from nltk) (2024.11.6)
Requirement already satisfied: tqdm in /usr/local/lib/python3.11/dist-packages (from nltk) (4.67.1)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.11/dist-packages (3.10.0)
Requirement already satisfied: seaborn in /usr/local/lib/python3.11/dist-packages (0.13.2)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (1.3.2)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (4.58.4)
Requirement already satisfied: kiwisolver>=1.3.1 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (1.4.8)
Requirement already satisfied: numpy>=1.23 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (2.0.2)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (24.2)
Requirement already satisfied: pillow>=8 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (11.2.1)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (3.2.3)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.11/dist-packages (from matplotlib) (2.9.0.post0)
Requirement already satisfied: pandas>=1.2 in /usr/local/lib/python3.11/dist-packages (from seaborn) (2.2.2)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.11/dist-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: tzdata>=2022.7 in /usr/local/lib/python3.11/dist-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.11/dist-packages (from python-dateutil>=2.7->matplotlib) (1.17.0)
```

Import Libraries

```
import os
import re
import fitz  # PyMuPDF for PDF text extraction
import torch
import numpy as np
import pandas as pd
import nltk
from transformers import AutoTokenizer, AutoModel
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report, accuracy_score
from google.colab import files
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import confusion_matrix

# NLTK resources for text cleaning
```

```
nltk.download('stopwords')
nltk.download('wordnet')
from nltk.corpus import stopwords
from nltk.stem import WordNetLemmatizer
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package wordnet to /root/nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
```

Text Cleaning Function – Normalization, Stopword Removal, Lemmatization

```
stop_words = set(stopwords.words('english'))
lemmatizer = WordNetLemmatizer()

def preprocess_text(text):
    text = re.sub(r'\S+@\S+', '', text)  # Remove emails
    text = re.sub(r'\d{10}|\+?\d[\d -]{8,12}\d', '', text)  # Remove phone numbers
    text = re.sub(r'[^\w\s]', '', text)  # Remove special characters
    text = text.lower()  # Convert to lowercase
    words = text.split()
    words = [lemmatizer.lemmatize(w) for w in words if w not in stop_words]
    return ' '.join(words)
```

Load Foundation Model (BERT from HuggingFace)

```
model_name = "bert-base-uncased"

tokenizer = AutoTokenizer.from_pretrained(model_name)
model = AutoModel.from_pretrained(model_name)

def get_bert_embedding(text):
    inputs = tokenizer(text, return_tensors="pt", padding=True, truncation=True, max_length=512)
    with torch.no_grad():
        outputs = model(**inputs)
    return outputs.last_hidden_state.mean(dim=1).squeeze().numpy()
```

```
/usr/local/lib/python3.11/dist-packages/huggingface_hub/utils/_auth.py:94: UserWarning:
The secret `HF_TOKEN` does not exist in your Colab secrets.
To authenticate with the Hugging Face Hub, create a token in your settings tab (https://huggingface.co/settings/tokens), set it as secret in your Google Colab and restart you
You will be able to reuse this secret in all of your notebooks.
Please note that authentication is recommended but still optional to access public models or datasets.
  warnings.warn(
```

tokenizer_config.json: 100% 48.0/48.0 [00:00<00:00, 2.58kB/s]

config.json: 100% 570/570 [00:00<00:00, 26.4kB/s]

vocab.txt: 100% 232k/232k [00:00<00:00, 5.13MB/s]

tokenizer.json: 100% 466k/466k [00:00<00:00, 5.23MB/s]

model.safetensors: 100% 440M/440M [00:08<00:00, 35.4MB/s]

upload Resume Dataset CSV and Process Each Resume

```
# Upload and load your CSV file
uploaded = files.upload()
df = pd.read_csv("resume_dataset_large.csv")

# Preprocess and embed each resume
df['cleaned_text'] = df['resume_text'].apply(preprocess_text)
df['embedding'] = df['cleaned_text'].apply(get_bert_embedding)

# View first few rows
df.head()
```

Choose Files resume_dat...t_large.csv

- **resume_dataset_large.csv**(text/csv) - 11256 bytes, last modified: 23/6/2025 - 100% done

```
Saving resume_dataset_large.csv to resume_dataset_large (1).csv
```

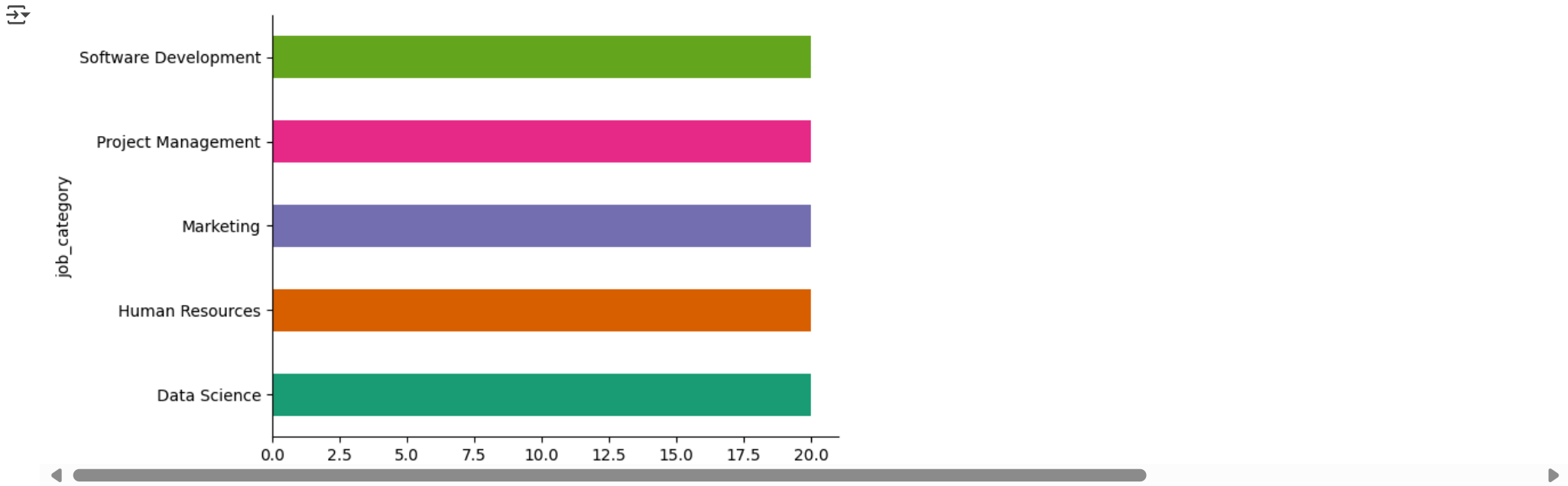
	resume_text	job_category	cleaned_text	embedding
0	Python, pandas, numpy, data visualization, mac...	Data Science	python panda numpy data visualization machine ...	[-0.20325175, -0.22759521, 0.2535777, 0.046082...
1	Designed scalable backend systems, implemented...	Software Development	designed scalable backend system implemented a...	[-0.1398428, -0.34146836, 0.21370716, 0.193847...
2	Managed recruitment processes, handled employe...	Human Resources	managed recruitment process handled employee o...	[0.02306105, 0.23481545, 0.03672036, 0.1229101...
3	Created marketing funnels, email automation wo...	Marketing	created marketing funnel email automation work...	[-0.17968519, 0.054422155, 0.044121355, -0.051...
4	PMP certified professional with experience in ...	Project Management	pmp certified professional experience risk man...	[-0.010442588, 0.19198556, -0.013224305, 0.051...

Next steps: Generate code with df | View recommended plots | New interactive sheet

job_category

job_category

Show code



Prepare Features and Labels for Training

```
X = np.stack(df['embedding'].values)
y = df['job_category'].values
```

Train Logistic Regression Classifier

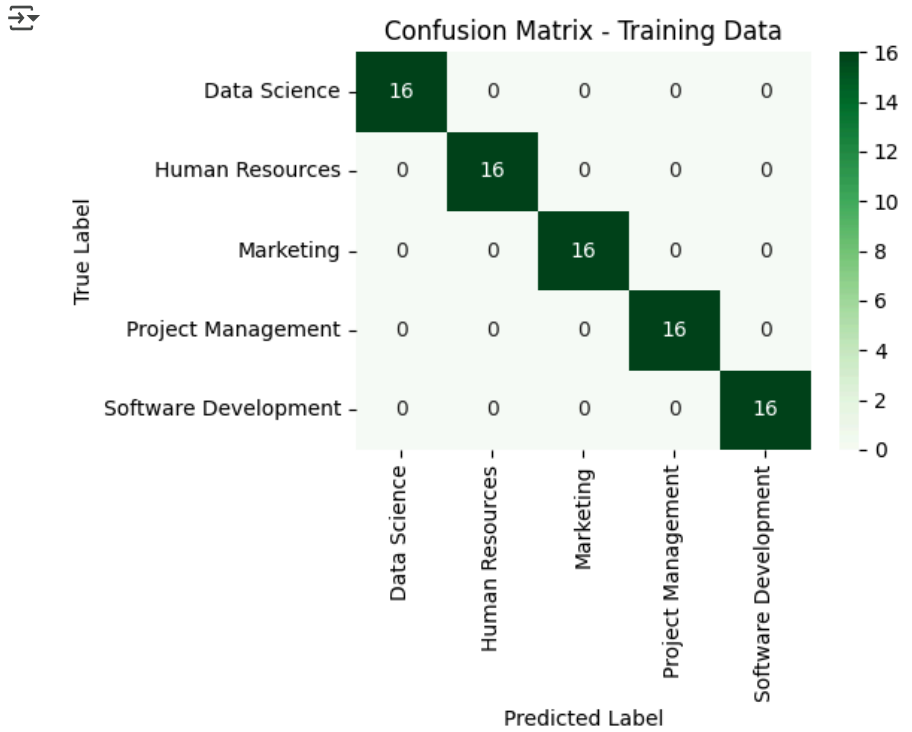
```
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=42, stratify=y)
```

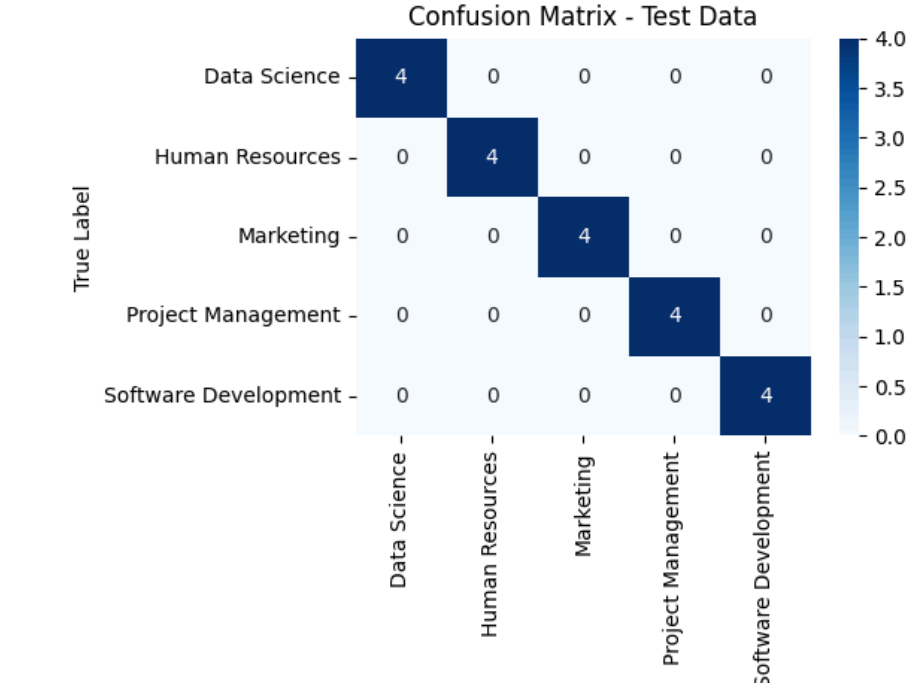
```
clf = LogisticRegression(max_iter=1000)
clf.fit(X_train, y_train)

y_pred = clf.predict(X_test)

print(" Classification Report:\n")
print(classification_report(y_test, y_pred))
print(" Accuracy Score:", accuracy_score(y_test, y_pred))
```

```
 Classification Report:

                         precision    recall  f1-score   support

           Data Science       1.00      1.00      1.00         4
        Human Resources       1.00      1.00      1.00         4
              Marketing       1.00      1.00      1.00         4
       Project Management       1.00      1.00      1.00         4
    Software Development       1.00      1.00      1.00         4

               accuracy                           1.00        20
              macro avg       1.00      1.00      1.00        20
           weighted avg       1.00      1.00      1.00        20

     Accuracy Score: 1.0
```

```
# Predict on training set
y_train_pred = clf.predict(X_train)

# Confusion Matrices
train_cm = confusion_matrix(y_train, y_train_pred, labels=clf.classes_)
test_cm = confusion_matrix(y_test, y_pred, labels=clf.classes_)

# Plot Confusion Matrices
fig, axes = plt.subplots(2, 1, figsize=(6, 10))

# Training Confusion Matrix
sns.heatmap(train_cm, annot=True, fmt="d", cmap="Greens", ax=axes[0],
            xticklabels=clf.classes_, yticklabels=clf.classes_)
axes[0].set_title("Confusion Matrix - Training Data")
axes[0].set_xlabel("Predicted Label")
axes[0].set_ylabel("True Label")

# Test Confusion Matrix
sns.heatmap(test_cm, annot=True, fmt="d", cmap="Blues", ax=axes[1],
            xticklabels=clf.classes_, yticklabels=clf.classes_)
axes[1].set_title("Confusion Matrix - Test Data")
axes[1].set_xlabel("Predicted Label")
axes[1].set_ylabel("True Label")

plt.tight_layout()
```

```
plt.show()
```


Confusion Matrix - Training Data
Data Science
Human Resources
Marketing
Project Management
Software Development
True Label
Predicted Label
16
0
0
0
0
0
16
0
0
0
0
0
16
0
0
0
0
0
16
0
0
0
0
0
16
16
14
12
10
8
6
4
2
0


Confusion Matrix - Test Data
Data Science
Human Resources
Marketing
Project Management
Software Development
True Label
4
0
0
0
0
0
4
0
0
0
0
0
4
0
0
0
0
0
4
0
0
0
0
0
4
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

Predicted Label

single Resume Classification

```
uploaded = files.upload()

def extract_text_from_pdf(path):
    doc = fitz.open(path)
    text = ""
    for page in doc:
        text += page.get_text()
    return text

pdf_path = next(iter(uploaded))
resume_text = extract_text_from_pdf(pdf_path)
cleaned_text = preprocess_text(resume_text)
resume_embedding = get_bert_embedding(cleaned_text).reshape(1, -1)
predicted_category = clf.predict(resume_embedding)[0]

print("Predicted Job Category:", predicted_category)
```

Choose Files resume_software_dev.pdf

- **resume_software_dev.pdf**(application/pdf) - 954 bytes, last modified: 23/6/2025 - 100% done

```
Saving resume_software_dev.pdf to resume_software_dev.pdf
Predicted Job Category: Software Development
```

Batch Resume Classification from Folder

```
# Upload multiple PDFs into a folder
folder_path = "resume_folder"
if not os.path.exists(folder_path):
    os.makedirs(folder_path)

uploaded_files = files.upload()
for filename in uploaded_files.keys():
    if filename.endswith(".pdf"):
        os.rename(filename, os.path.join(folder_path, filename))
```

Choose Files 4 files

- **resume_marketing.pdf**(application/pdf) - 971 bytes, last modified: 23/6/2025 - 100% done
- **resume_software_dev.pdf**(application/pdf) - 954 bytes, last modified: 23/6/2025 - 100% done
- **resume_data_science.pdf**(application/pdf) - 983 bytes, last modified: 23/6/2025 - 100% done
- **resume_hr.pdf**(application/pdf) - 959 bytes, last modified: 23/6/2025 - 100% done

```
Saving resume_marketing.pdf to resume_marketing.pdf
Saving resume_software_dev.pdf to resume_software_dev (1).pdf
Saving resume_data_science.pdf to resume_data_science.pdf
Saving resume_hr.pdf to resume_hr.pdf
```

Classify All PDFs in Folder and Generate Report

```
def classify_resumes_in_folder(folder_path):
    results = []
    for file in os.listdir(folder_path):
        if file.endswith(".pdf"):
            path = os.path.join(folder_path, file)
            try:
                text = extract_text_from_pdf(path)
                cleaned = preprocess_text(text)
                embedding = get_bert_embedding(cleaned).reshape(1, -1)
                category = clf.predict(embedding)[0]
                results.append({"Resume File": file, "Predicted Category": category})
            except Exception as e:
                results.append({"Resume File": file, "Predicted Category": f"Error: {str(e)}"})
    return pd.DataFrame(results)

# Generate and download report
df_report = classify_resumes_in_folder(folder_path)
df_report.to_csv("resume_classification_report.csv", index=False)
print("Resume Classification Report:\n")
print(df_report)

files.download("resume_classification_report.csv")
```

```
Resume Classification Report:

                    Resume File    Predicted Category
0      resume_data_science.pdf          Data Science
1                resume_hr.pdf       Human Resources
2         resume_marketing.pdf             Marketing
```