import pandas as pd

from sklearn.model\_selection import train\_test\_split

from sklearn.feature\_extraction.text import TfidfVectorizer

from sklearn.naive\_bayes import MultinomialNB

from sklearn.pipeline import Pipeline

from sklearn.metrics import classification\_report

import matplotlib.pyplot as plt

import seaborn as sns

# Load data

df = pd.read\_excel("Bitext\_Sample\_Customer\_Service\_Training\_Dataset.xlsx")

X = df['utterance']

y = df['intent']

# Split data

X\_train, X\_test, y\_train, y\_test = train\_test\_split(X, y, stratify=y, test\_size=0.2, random\_state=42)

# Model pipeline

model = Pipeline([

('tfidf', TfidfVectorizer(stop\_words='english')),

('clf', MultinomialNB())

])

# Train model

model.fit(X\_train, y\_train)

# Predict and evaluate

y\_pred = model.predict(X\_test)

print(classification\_report(y\_test, y\_pred))

# Visualize F1-scores of top 10 intents

report = classification\_report(y\_test, y\_pred, output\_dict=True)

top\_intents = sorted(report.keys(), key=lambda x: report[x]['f1-score'] if x not in ['accuracy', 'macro avg', 'weighted avg'] else -1, reverse=True)[:10]

f1\_scores = [report[intent]['f1-score'] for intent in top\_intents]

plt.figure(figsize=(10, 6))

sns.barplot(x=f1\_scores, y=top\_intents, palette="viridis")

plt.title('Top 10 Intent F1-Scores')

plt.xlabel('F1 Score')

plt.ylabel('Intent')

plt.tight\_layout()

plt.show()