BOOK GENRE CLASSIFICATION USING METADATA

A PROJECT REPORT

Problem Statement: Use metadata such as author, length, and keywords to classify book genre.

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Introduction

In the digital age, book categorization plays a critical role in organizing content, enhancing discoverability, and improving recommendation systems. With the massive volume of literature published daily, manually tagging books by genre has become inefficient and prone to inconsistency. To address this challenge, machine learning offers a scalable solution by automatically classifying books based on key metadata features.

This project focuses on classifying books into genres using structured metadata such as author popularity, book length, and the number of keywords associated with each title. These features provide valuable insight into the nature and scope of a book's content, enabling effective classification.

By applying a supervised learning approach, the goal is to predict a book's genre—such as Fiction, Fantasy, Mystery, or Non-Fiction—based on these input features. The project leverages the Random Forest algorithm due to its robustness and suitability for handling tabular data. The results are evaluated using key metrics such as accuracy, precision, recall, and a confusion matrix to assess model performance.

Methodology

This project used a machine learning approach to classify book genres based on structured metadata.

Data Loading

- *The dataset was loaded and checked for structure and completeness using pandas.*

Feature Selection

- *Selected features included author popularity, book length, and Num keywords. The target was the genre column.*

Label Encoding

- *Genre labels were encoded into numeric form using LabelEncoder for model compatibility.*

Train-Test Split

- *Data was split into 70% training and 30% testing to evaluate performance on unseen data.*

Model Training

- *A RandomForestClassifier was trained on the training data due to its effectiveness with structured data.*

Prediction & Evaluation

- *The model predicted test genres and results were evaluated using a confusion matrix and classification report (precision, recall, F1-score).*

Visualization

- *A heatmap was created to visualize prediction accuracy, and feature importance was plotted to identify influential attributes.*

Code

```
import pandas as pd

import seaborn as sns

import matplotlib.pyplot as plt

from sklearn.model_selection import train_test_split

from sklearn.preprocessing import LabelEncoder

from sklearn.ensemble import RandomForestClassifier

from sklearn.metrics import confusion_matrix, classification_report


# Load dataset

df = pd.read_csv("/content/book_genres.csv")


# Separate features and target

X = df.drop(columns='genre')

y = df['genre']


# Encode target labels

label_encoder = LabelEncoder()

y_encoded = label_encoder.fit_transform(y)

import pandas as pd

import seaborn as sns

import matplotlib.pyplot as plt

from sklearn.model_selection import train_test_split

from sklearn.ensemble import RandomForestClassifier

from sklearn.metrics import classification_report, confusion_matrix
```

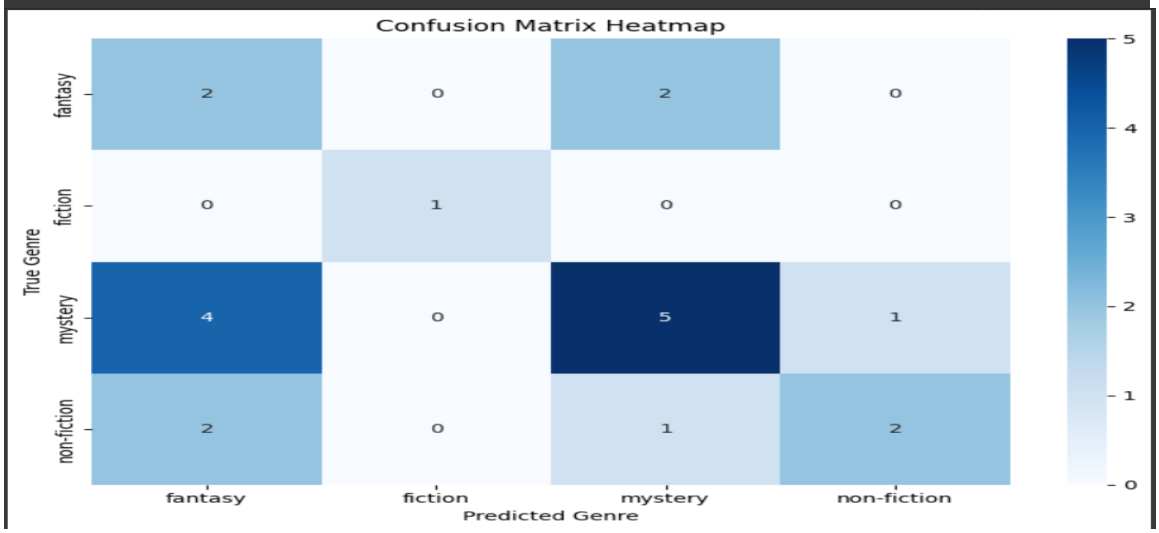
```
# Load the dataset
df = pd.read_csv("/content/book_genres.csv")

# Define features and target
X = df[['author_popularity', 'book_length', 'num_keywords']]
y = df['genre']

# Train-test split
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=42
)

# Train classifier
clf = RandomForestClassifier(random_state=42)
clf.fit(X_train, y_train)

# Predictions
y_pred = clf.predict(X_test)

# Print confusion matrix
print("=== Confusion Matrix ===")
conf_matrix = confusion_matrix(y_test, y_pred)
print(conf_matrix)

# Print classification report
print("\n=== Classification Report ===")
print(classification_report(y_test, y_pred))
```

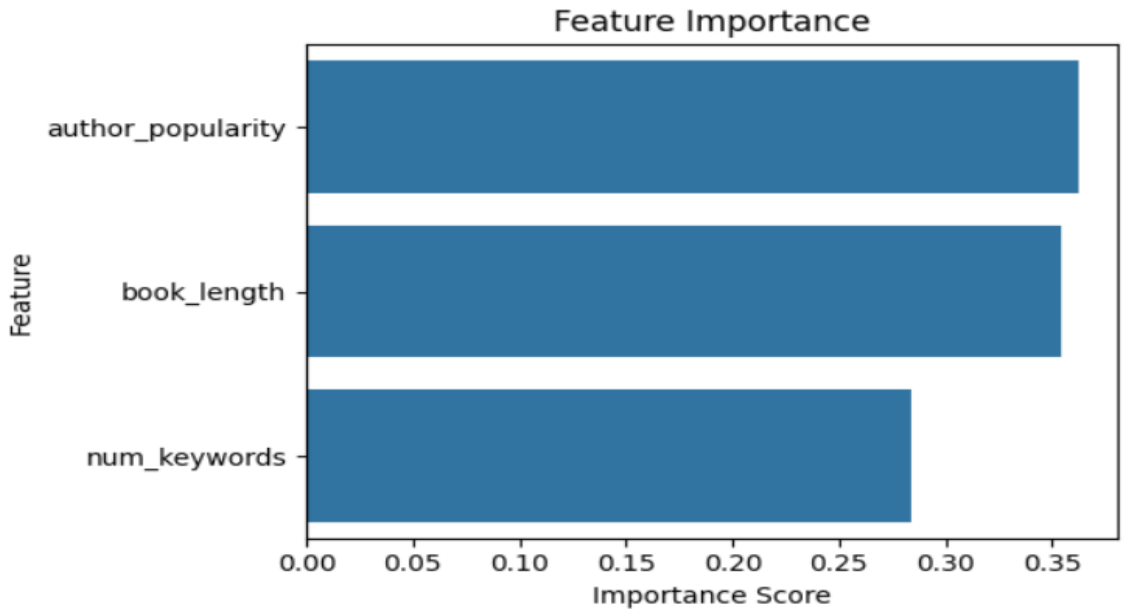
```
# Plot confusion matrix heatmap
plt.figure(figsize=(8, 6))
sns.heatmap(conf_matrix, annot=True, fmt="d", cmap="Blues",
            xticklabels=clf.classes_, yticklabels=clf.classes_)
plt.title("Confusion Matrix Heatmap")
plt.xlabel("Predicted Genre")
plt.ylabel("True Genre")
plt.tight_layout()
plt.show()

# Plot feature importances
importances = clf.feature_importances_
features = X.columns

plt.figure(figsize=(6, 4))
sns.barplot(x=importances, y=features)
plt.title("Feature Importance")
plt.xlabel("Importance Score")
plt.ylabel("Feature")
plt.tight_layout()
plt.show()
# Train-test split
X_train, X_test, y_train, y_test = train_test_split(X, y_encoded, test_size=0.3, random_state=42)

# Train Random Forest Classifier
clf = RandomForestClassifier(random_state=42)
clf.fit(X_train, y_train)
```

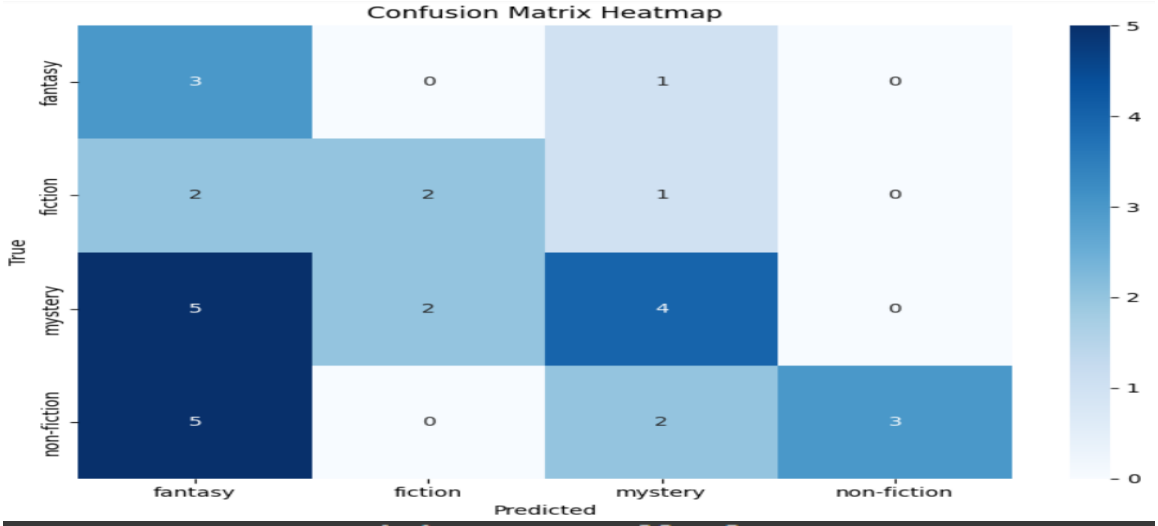
```
# Predict on test set
y_pred = clf.predict(X_test)

# Generate confusion matrix
cm = confusion_matrix(y_test, y_pred)
labels = label_encoder.classes_

# Plot heatmap
plt.figure(figsize=(8, 6))
sns.heatmap(cm, annot=True, fmt="d", cmap="Blues", xticklabels=labels, yticklabels=labels)
plt.title("Confusion Matrix Heatmap")
plt.xlabel("Predicted")
plt.ylabel("True")
plt.tight_layout()
plt.show()

# Classification report
report = classification_report(y_test, y_pred, target_names=labels, output_dict=True)
report_df = pd.DataFrame(report).transpose()
print(report_df[['precision', 'recall', 'f1-score', 'support']])
```

Output/Result

```
=== Confusion Matrix ===
[[2 0 2 0]
 [0 1 0 0]
 [4 0 5 1]
 [2 0 1 2]]

=== Classification Report ===
              precision    recall  f1-score   support

     fantasy       0.25      0.50      0.33         4
     fiction       1.00      1.00      1.00         1
     mystery       0.62      0.50      0.56        10
 non-fiction       0.67      0.40      0.50         5

    accuracy                           0.50        20
   macro avg       0.64      0.60      0.60        20
weighted avg       0.58      0.50      0.52        20
```







	precision	recall	f1-score	support
fantasy	0.200000	0.750000	0.315789	4.0
fiction	0.500000	0.400000	0.444444	5.0
mystery	0.500000	0.363636	0.421053	11.0
non-fiction	1.000000	0.300000	0.461538	10.0
accuracy	0.400000	0.400000	0.400000	0.4
macro avg	0.550000	0.453409	0.410706	30.0
weighted avg	0.626667	0.400000	0.424411	30.0

References/Credits

- *Dataset: book_genres.csv*
- *Libraries used: pandas, scikit-learn, matplotlib, seaborn*

🔗 *https://www.kaggle.com/datasets*

https://scikit-learn.org/stable/