```
!pip install pandas scikit-learn nltk
```

LLL (focused on Diff Algos)

```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.naive_bayes import MultinomialNB
from sklearn.metrics import classification_report, accuracy_score
import nltk
from nltk.corpus import stopwords
import re
nltk.download('stopwords')
```

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

```
df = pd.read_csv('/content/helpdesk_customer_multi_lang_tickets.csv')
df.head()
```

	id	subject	body	answer	type	queue	priority	language	business_type	tag_1	tag_2	tag_3	tag_4	tag_5	tag_6	
0	1001352387736	Urgent: Critical impact on enterprise network ...	Dear Customer Support Team, We are experiencin...	Subject: Re: Urgent: Critical impact on enterp...	Incident	Technical Support	high	en	IT Services	Service Outage	Network Issue	Urgent Issue	Technical Support	Problem Resolution	Critical Failure	System
1	1004699418379	Intermittent Cursor Freezing Issue on Dell XPS	Dear Customer Support, I hope this mess...	Dear <name>,\n\nThank you for reaching out reg...	Incident	Product Support	low	en	Tech Online Store	Technical Support	Product Support	Hardware Failure	Problem Resolution	Urgent Issue	Service Recovery	Document Re
2	1006966905046	Dringend: Unterstützung für die Datenwiederher...	Hallo, wir haben severe Datenverluste in MySQL...	Hallo, vielen Dank, dass Sie uns kontaktiert h...	Incident	Technical Support	high	de	IT Services	Data Breach	Backup Restore	Technical Support	Urgent Issue	Software Bug	Problem Resolution	
3	1009231330404	Anfrage zu den MacBook Air M1 Funktionen	Sehr geehrtes Kundenserviceteam,\n\nich hoffe,...	Sehr geehrter <name>,\n\nvielen Dank für Ihre ...	Request	Sales and Pre-Sales	low	de	Tech Online Store	Customer Service	Product Support	Sales Inquiry	Technical Guidance	Warranty Claim	General Inquiry	
4	1024440081041	Solicitação de Assistência com Erro de Instala...	Caro Suporte ao Cliente,\n\nEstou enfrentando ...	Caro <name>,\n\nObrigado por entrar em contato...	Problem	Technical Support	medium	pt	IT Services	Technical Support	Software Bug	Urgent Issue	Problem Resolution	Product Support	NaN	

```
def clean_text(text):
    if not isinstance(text, str):
        text = str(text)
    text = re.sub(r'[^a-zA-Z\s]', '', text)
    text = text.lower()
    stop_words = set(stopwords.words('english'))
    text = ' '.join(word for word in text.split() if word not in stop_words)
    return text

df['combined_text'] = df['subject'] + ' ' + df['body']
df['cleaned_text'] = df['combined_text'].apply(clean_text)
df[['combined_text', 'cleaned_text']].head()
```

	combined_text	cleaned_text
0	Urgent: Critical impact on enterprise network ...	urgent critical impact enterprise network conn...
1	Intermittent Cursor Freezing Issue on Dell XPS...	intermittent cursor freezing issue dell xps de...
2	Dringend: Unterstützung für die Datenwiederher...	dringend untersttzung fr die datenwiederherste...
3	Anfrage zu den MacBook Air M1 Funktionen Sehr ...	anfrage zu den macbook air funktionen sehr gee...
4	Solicitação de Assistência com Erro de Instala...	solicitao de assistncia com erro de instalao o...

```
# Split the dataset into features and labels
X = df['cleaned_text']
y = df['type']  # Using 'type' as the target variable (replace with your actual target column name)

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Initialize TF-IDF Vectorizer
vectorizer = TfidfVectorizer()
X_train_tfidf = vectorizer.fit_transform(X_train)
X_test_tfidf = vectorizer.transform(X_test)
```

```
# Check class distribution
class_distribution = df['type'].value_counts()
print(class_distribution)
```

```
type
Incident    663
Request     468
Problem     292
Change      143
Name: count, dtype: int64
```

```
from sklearn.linear_model import LogisticRegression
from imblearn.over_sampling import SMOTE

smote = SMOTE(random_state=42)

X_train_resampled, y_train_resampled = smote.fit_resample(X_train_tfidf, y_train)
model = LogisticRegression(random_state=42)
```

```python
model.fit(X_train_resampled, y_train_resampled)
from sklearn.metrics import classification_report

y_pred = model.predict(X_test_tfidf)
print(classification_report(y_test, y_pred))
```

Show hidden output

```python
vectorizer = TfidfVectorizer(ngram_range=(1, 2))  # Use unigrams and bigrams
```

```python
from sklearn.ensemble import RandomForestClassifier

# Initialize and train a Random Forest classifier
rf_model = RandomForestClassifier(random_state=42)
rf_model.fit(X_train_tfidf, y_train)

# Predict on the test set
y_pred_rf = rf_model.predict(X_test_tfidf)

print("Accuracy:", accuracy_score(y_test, y_pred_rf))
print("\nClassification Report:\n", classification_report(y_test, y_pred_rf))
```

```
Accuracy: 0.7547770700636943

Classification Report:
               precision    recall  f1-score   support

      Change       0.89      0.32      0.47        25
    Incident       0.70      0.96      0.81       137
     Problem       0.94      0.35      0.51        49
     Request       0.81      0.79      0.80       103

    accuracy                           0.75       314
   macro avg       0.84      0.60      0.65       314
weighted avg       0.79      0.75      0.73       314
```

```python
from sklearn.model_selection import GridSearchCV

# Example for Random Forest hyperparameter tuning
param_grid = {
    'n_estimators': [50, 100],
    'max_depth': [None, 10, 20],
    'min_samples_split': [2, 5]
}

grid_search = GridSearchCV(RandomForestClassifier(random_state=42), param_grid, cv=5)
grid_search.fit(X_train_tfidf, y_train)

# Best parameters and score
print("Best parameters:", grid_search.best_params_)
print("Best cross-validation score:", grid_search.best_score_)
```

```
Best parameters: {'max_depth': None, 'min_samples_split': 2, 'n_estimators': 100}
Best cross-validation score: 0.7172685258964144
```

```python
from sklearn.model_selection import cross_val_score

scores = cross_val_score(model, X_train_tfidf, y_train, cv=5)
print("Cross-validation scores:", scores)
print("Mean cross-validation score:", scores.mean())
```

Show hidden output

```python
change_issues_english = df[(df['type'] == 'Change') & (df['language'] == 'en')]
print(change_issues_english)
```

```
            id                                            subject  \
5     1024619926727    Exchange Request for Malfunctioning Dell XPS 13
81    1298612785497                      Request for Configuration Changes
104   1384147072018        Urgent Update Required for Jira Software 8.20
161   1580466210956                        Database Design Change Request
168   1606434653828              Support Request for Cisco Router ISR4331
197   1700780402975  Request for Change in AWS Configurations for O...
221   1802540942775  Required Modifications for IT Ticket System Pi...
228   1817922125973  Request for Change in AWS Management Configura...
265   1993113202384           Urgent Request for Jira Ticket Modification
268   2004384793766          Request for Change in User Permissions Setup
278   2033436905679     Request for exchange due to connectivity issues
318   2185287920624                               Jira Workflow Update
334   2265536069552  Update Required: Billing Information for Googl...
347   2310123083348                           Software Update Request
349   2316651057386                        Excel Version Update Request
350   2320024895676                      AWS Management Service Inquiry
412   2566830953046                Request for Jira Software Enhancements
431   2669013662886            Request for Server Configuration Changes
468   2804797318166           Request to Upgrade Microsoft Surface Pro 7
514   2996574934417                          Request for UI Components Update
611   3471331458763                        Printer Settings Update Request
756   4223816851399  Request for Improvements: AWS Infrastructure S...
776   4321490756952               Cloud Infrastructure Optimization
825   4589871630880                                 Upgrade Zoom Request
1037  6061792906944  Modification Request: AWS Cost Optimization St...
1175  7028417467141  Request to upgrade IntelliJ IDEA for improved ...
1395  8730931854770      Request for Changes in AWS Management Dashboard

                                                   body  \
5        Dear Tech Online Store Customer Support,\n\nI ...
81       Dear IT Support Team, \n\nI hope this email fi...
104      Dear Customer Support,\n\nI am writing to urge...
161      Dear Customer Support Team, \n\nI hope this me...
168      Dear IT Services Support Team,\n\nI hope this ...
197      Dear IT Services Customer Support Team,\n\nI h...
221      Dear Customer Support,\n\nI am writing to requ...
228      Dear IT Services Support,\n\nI am writing to r...
265      Dear Customer Support,\n\nI hope this message ...
268      Dear Customer Support,\n\nI hope this message ...
278      Dear Customer Support Team,\n\nI hope this mes...
318      Dear Customer Support Team, \n\nI hope this me...
334      Dear Customer Support Team,\n\nI hope this ema...
347      Dear Support Team, I am writing to request an ...
```

```
      349   Dear Customer Support Team,\n\nI hope this mes...
      350   Dear Customer Support,\n\nI hope this message ...
      412   Dear Customer Support Team, \n\nI am writing t...
      431   Dear Customer Support Team,\n\nI hope this mes...
      468   Dear Tech Online Store Customer Support Team,\...
      514   Dear Customer Support Team,\n\nI hope this mes...
      611   Dear Tech Online Store Support,\n\nI am writin...
      756   Dear IT Services Customer Support Team,\n\nI a...
      776   Dear Customer Support Team, I am reaching out ...
      825   Dear Customer Support,\n\nI hope this email fi...
     1037   Dear Customer Support Team,\n\nI hope this mes...
     1175   Dear Customer Support Team,\n\nI hope this mes...
     1395   Dear IT Services Customer Support,\n\nI am wri...
```

```
!pip install git+https://github.com/togethercomputer/together.git
```

⮂ **Show hidden output**

```python
import requests

def fetch_resolution_steps_together(product_name, issue_description):
    # Define your Together AI API endpoint and headers
    api_url = "https://api.together.ai/completions"  # Replace with the actual endpoint
    headers = {
        "Authorization": "Bearer d4f51d8cb40a8fc1e9dc006d9aec78698c05c73f9f02433a61de6731e6c868ed",  # Replace with your Together AI API key
        "Content-Type": "application/json"
    }

    # Construct the request payload
    payload = {
        "model": "mistralai/Mixtral-8x7B-v0.1",  # Specify the Together AI model to use
        "prompt": f"Provide detailed troubleshooting steps for a {product_name} regarding the following issue: {issue_description}.",
        "max_tokens": 200,
        "temperature": 0.7,
        "top_p": 0.9,
        "top_k": 50,
        "repetition_penalty": 1.0
    }

    # Send a POST request to the Together API
    response = requests.post(api_url, headers=headers, json=payload)

    if response.status_code == 200:
        # Extract the response text
        result = response.json()
        resolution_steps = result.get("choices", [{}])[0].get("text", "No steps found.")
        return resolution_steps
    else:
        print(f"Error fetching resolution steps: {response.status_code}, {response.text}")
        return "Error fetching resolution steps."

# Example usage
product_name = "Smartphone"
issue_description = "Battery drains too quickly even in standby mode."
resolution_steps = fetch_resolution_steps_together(product_name, issue_description)

print(f"Resolution Steps:\n{resolution_steps}")
```

⮂ Resolution Steps:

```
    ## Battery Drains Too Quickly

    1. Check for rogue apps

    This is probably the most common cause of excessive battery drain, and it's not too hard to figure out what the culprit is.

    1. Tap on Settings.
    2. Tap on Battery.
    3. Tap on Battery Usage.

    This will show you which apps are using the most battery. If you notice an app that you don't use often or at all, you can tap on it and select Force Stop. You can also go into the app's settings an

    2. Turn off location services

    Location services are one of the biggest drains on your battery, and if you don't need them, it's best to just turn them off.

    1. Tap on Settings.
    2. Tap on Location.
```

```python
filtered_df = df[(df['queue'] == "Sales and Pre-Sales") & (df['language'] == "en")]
print(filtered_df)
```

⮂
```
              id                                        subject  \
    20   1076159728172          Issues Setting Up AWS EC2 Security Group
    112  1405122028467  Inquiry About JavaScript React Development Ser...
    153  1546158465854          Assistance Required for Amazon Navigation
    253  1933728029170          Performance Issue with Dell XPS 13 9310 Demo
    283  2048430313380  Touchscreen and Keyboard Issues with Surface P...
    345  2299419716850  Request for Detailed Information on React Serv...
    386  2454775410747  Inquiry About Features and Pricing Options for...
    480  2877649703775             Issue with Dell XPS 13 overheating
    530  3061399426554          Inquiry About MacBook Air M1 Features
    877  4906805644678          Inquiry on MacBook Air M1 availability

                                                    body  \
    20   Dear Customer Support,\n\nI am writing to seek...
    112  Hello Customer Support Team,\n\nI hope this me...
    153  Dear Customer Support Team,\n\nI am reaching o...
    253  Dear Customer Support,\n\nI am writing to expr...
    283  Dear Tech Online Store Customer Support,\n\nI ...
    345  Dear Customer Support Team,\n\nI hope this mes...
    386  Dear Customer Support,\n\nI am interested in y...
    480  Hello Customer Support,\n\nI am experiencing h...
    530  Dear Customer Support Team, \n\nI hope this me...
    877  Dear Customer Support,\n\nI hope this message ...

                                                  answer     type  \
    20   Dear <name>,\n\nThank you for contacting us ab...  Problem
    112  Hello <name>,\n\nThank you for reaching out to...  Request
    153  Subject: Re: Assistance Required for Amazon Na...  Request
    253  Dear <name>,\n\nThank you for bringing this to...  Incident
    283  Dear <name>,\n\nThank you for reaching out to ...  Problem
```

```
    345  Dear <name>,\n\nThank you for reaching out to ...    Request
    386  Dear <name>,\n\nThank you for your interest in...    Request
    480  Subject: Re: Issue with Dell XPS 13 overheatin...  Incident
    530  Dear <name>,\n\nThank you for your inquiry abo...    Request
    877  Dear <name>,\n\nThank you for reaching out. Th...    Request

                    queue priority language              business_type  \
    20   Sales and Pre-Sales      low       en                 IT Services
    112  Sales and Pre-Sales   medium       en  Software Development Company
    153  Sales and Pre-Sales      low       en            Tech Online Store
    253  Sales and Pre-Sales   medium       en            Tech Online Store
    283  Sales and Pre-Sales   medium       en            Tech Online Store
    345  Sales and Pre-Sales   medium       en  Software Development Company
    386  Sales and Pre-Sales   medium       en           IT Consulting Firm
    480  Sales and Pre-Sales   medium       en            Tech Online Store
    530  Sales and Pre-Sales      low       en            Tech Online Store
    877  Sales and Pre-Sales   medium       en            Tech Online Store

                  tag_1              tag_2               tag_3  \
    20   Technical Support         IT Support       Network Issue
    112      Sales Inquiry   Customer Service  Technical Guidance
    153   Customer Service    General Inquiry  Technical Guidance
    253    Product Support  Technical Support  Performance Tuning
    283  Technical Support    Product Support        Software Bug
    345      Sales Inquiry  Technical Support     Product Support
    386      Sales Inquiry    Product Support     Feature Request
    480  Technical Support    Product Support    Hardware Failure
    530    Product Support      Sales Inquiry   Technical Support
```

Start coding or generate with AI.

Start coding or generate with AI.

> LLLL (3% and sample templates)

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> LLLLL (Resolution with AI response)

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> FINAL

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