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

Show hidden output

LLL (focused on Diff Algos)

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LLLL (3% and sample templates)

```
import pandas as pd
import numpy as np
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.ensemble import RandomForestClassifier
from collections import defaultdict
```

```
class TicketAnalysisSystem:
    def __init__(self, threshold_percentage=3.0):
        self.vectorizer = TfidfVectorizer(ngram_range=(1, 2))
        self.classifier = RandomForestClassifier(random_state=42)
        self.threshold_percentage = threshold_percentage
        self.response_templates = self.initialize_templates()

    def initialize_templates(self):
        return {
            'Technical Support': {
                'Network Issue': """
Dear {customer_name},

Thank you for reaching out regarding your network connectivity issue. We understand this is causing disruption to your work.

Initial troubleshooting steps:
1. Restart your network devices (modem/router)
2. Check all physical connections
3. Run network diagnostics using our tool at: [Network Tool URL]

If issues persist:
- Contact our technical team at: {support_contact}
- Reference ticket: {ticket_id}

Best regards,
{support_team}
                """,

                'Software Bug': """
Dear {customer_name},

Thank you for reporting the software issue with {product_name}.

Please try these immediate steps:
1. Clear application cache
2. Update to the latest version
3. Restart the application

If the problem continues:
- Check our knowledge base: {kb_link}
- Contact technical support: {support_contact}
- Ticket reference: {ticket_id}

Best regards,
{support_team}
                """
            },

            'Product Support': {
                'Hardware Failure': """
Dear {customer_name},

We apologize for the issues you're experiencing with your {product_name}.

Required information:
1. Product serial number: {serial_number}
2. Purchase date: {purchase_date}
3. Warranty status: {warranty_status}

Immediate actions:
1. Run hardware diagnostics
2. Check physical connections
3. Document any error messages

Next steps:
{next_steps}

Ticket ID: {ticket_id}
Support contact: {support_contact}

Best regards,
{support_team}
                """
            }
        }

    def analyze_tickets(self, df):
        # Analyze frequency of issues
        total_tickets = len(df)
        issue_counts = df['queue'].value_counts()
        frequent_issues = issue_counts[
            (issue_counts / total_tickets * 100) == self.threshold_percentage
        ]

        # Analyze departments
        dept_analysis = df['queue'].value_counts().to_dict()

        # Get top tags
        all_tags = []
        for i in range(1, 7):  # Assuming tag_1 through tag_6
```

```
            col = f'tag_{i}'
            if col in df.columns:
                all_tags.extend(df[col].dropna().tolist())

        tag_counts = pd.Series(all_tags).value_counts()

        return {
            'frequent_issues': frequent_issues.to_dict(),
            'department_analysis': dept_analysis,
            'top_tags': tag_counts.to_dict()
        }

    def generate_response(self, ticket_data):
        # Extract relevant information
        dept = ticket_data.get('queue', '')
        tags = [ticket_data.get(f'tag_{i}', '') for i in range(1, 7)]
        tags = [t for t in tags if t]  # Remove empty tags

        # Find most appropriate template
        if dept in self.response_templates:
            # Find matching tag
            for tag in tags:
                if tag in self.response_templates[dept]:
                    template = self.response_templates[dept][tag]

                    # Fill template with ticket data
                    response = template.format(
                        customer_name=ticket_data.get('customer_name', 'Valued Customer'),
                        product_name=ticket_data.get('product_name', ''),
                        ticket_id=ticket_data.get('id', ''),
                        support_contact='support@company.com',
                        support_team='Customer Support Team',
                        next_steps='Please contact our support team for further assistance.',
                        serial_number='[Please provide]',
                        purchase_date='[Please provide]',
                        warranty_status='[To be verified]',
                        kb_link='https://support.company.com/kb'
                    )

                    return response

        # Default response if no matching template
        return """
Dear Valued Customer,

Thank you for contacting us. We have received your ticket and our team will review it shortly.

Ticket ID: {ticket_id}

Best regards,
Customer Support Team
        """.format(ticket_id=ticket_data.get('id', ''))
```

```
def main():
    # Load data
    df = pd.read_csv('helpdesk_customer_multi_lang_tickets.csv')

    # Initialize system
    system = TicketAnalysisSystem(threshold_percentage=3.0)

    # Analyze tickets
    analysis = system.analyze_tickets(df)

    print("Frequent Issues (3%):")
    for issue, count in analysis['frequent_issues'].items():
        print(f"- {issue}: {count}")

    print("\nDepartment Analysis:")
    for dept, count in analysis['department_analysis'].items():
        print(f"- {dept}: {count}")

    # Generate sample response
    sample_ticket = df.iloc[0].to_dict()
    response = system.generate_response(sample_ticket)
    print("\nSample Automated Response:")
    print(response)

if __name__ == "__main__":
    main()
```

```
Frequent Issues (3%):

Department Analysis:
- Technical Support: 589
- Product Support: 288
- Customer Service: 234
- IT Support: 179
- Billing and Payments: 117
- Sales and Pre-Sales: 49
- Returns and Exchanges: 44
- Service Outages and Maintenance: 44
- General Inquiry: 13
- Human Resources: 9

Sample Automated Response:

Dear Valued Customer,

Thank you for reaching out regarding your network connectivity issue. We understand this is causing disruption to your work.

Initial troubleshooting steps:
1. Restart your network devices (modem/router)
2. Check all physical connections
3. Run network diagnostics using our tool at: [Network Tool URL]

If issues persist:
- Contact our technical team at: support@company.com
- Reference ticket: 1001352387736

Best regards,
Customer Support Team
```

Start coding or generate with AI.

```
Start coding or generate with AI.
```

LLLLL (Resolution with AI response)

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FINAL

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