Submission: Intelligent Email Classification and Response Generation with FLAN-T5

1. System Implementation

The provided Python-based system uses FLAN-T5 to classify customer emails and generate tailored responses. Built with the Hugging Face Transformers library, it processes emails, assigns them to predefined categories, and produces concise, empathetic replies. The system generates multiple response variants, evaluates them, and flags low-quality outputs for manual review.

Key Features:

- Loads and preprocesses email data.

- Classifies emails using FLAN-T5 into set categories.

- Generates responses via templates and model output.

- Scores response variants for quality.

- Exports results in CSV or JSON for external integration.

2. Development Approach

The system was designed as a comprehensive solution for automating email handling. Below is the approach breakdown:

1. **Email Data Processing**
   Emails (ID, subject, body) are loaded from a structured dataset to serve as input for classification and response tasks.

2. **Model Integration**
   FLAN-T5 was selected for its strength in text classification and generation. The Hugging Face library enabled seamless model and tokenizer integration.

3. **Prompt Design**
   A set of 15 categories (e.g., refund requests, inquiries) was defined. Prompts were crafted to guide the model in interpreting email intent accurately.

4. **Response Creation**
   Based on the email's category, a template is chosen, and FLAN-T5 generates a customized response aligned with the email's tone and content.

5. **Response Evaluation**
   Multiple response variants are scored using a custom function assessing

relevance and tone. The best response is selected, with subpar ones flagged for review.

6. **Result Export**
Processed data, including email IDs, categories, and responses, is saved in CSV or JSON formats for analysis or integration.

3. Example Execution

Sample Input:
Email 1:

- Subject: Refund Request

- Body: "I'd like a refund for a product I bought last week. It didn't work, and I'm disappointed."

Process:

1. Email classified as "Refund Request."

2. Refund template selected.

3. Multiple response variants generated.

4. Best response chosen based on scoring.

Sample Output:

- Response: "We're sorry for the inconvenience. Please share your order details, and we'll start the refund process promptly."

Exported Data:
Results include email ID, category, and final response in structured format.

4. Prompt Development

Initial Prompts:

- Classification: "Classify this email into categories like refund request, product inquiry, or technical issue."

- Response: "Generate a polite, concise, empathetic response for this email."

Challenges:

- Classification struggled with vague emails, leading to mislabeling.

- Early responses lacked personalization or tonal accuracy.

Improvements:

1. Enhanced classification prompts with detailed intent cues.

2. Adjusted templates for better alignment with email context.

3. Developed a scoring function to prioritize high-quality responses.

5. Summary

Design Choices:

- FLAN-T5 was chosen for its dual capability in classification and generation.

- 15 categories streamlined classification and templating.

- Multi-variant response generation with scoring ensured quality.

Challenges:

- Ambiguous emails required prompt refinement.

- Maintaining consistent response quality led to iterative template and scoring updates.

Potential Enhancements:

- Fine-tune FLAN-T5 on customer service data for better accuracy.

- Implement dynamic templates adapting to email nuances.

- Use advanced metrics for response evaluation.

Production Notes:

- **Scalability:** Cloud resources and parallel processing can handle high email volumes.

- **Real-Time Use:** Integration with email APIs enables instant processing.

- **Review Interface:** A human review tool could simplify handling flagged emails.