

## Customer Service Chatbot Application - Logistics Tracking Function

**\*\* Source Code (GitHub):** <https://github.com/kpsg24/CISC-520.git>

**\*\* Web App:** <https://cisc-520-final-project-afankjfanld.streamlit.app/>

**\*\* Presentation Video:** [https://youtu.be/XD2zTQDz\\_JA](https://youtu.be/XD2zTQDz_JA)

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### Final Project Introduction

#### 1. Facing Issue:

Customers often face difficulties in tracking their orders, resulting in delayed responses from customer service teams. Automating this process through a chatbot will enhance customer satisfaction by providing real-time updates and reducing the workload on support teams.

#### 2. Project's Goal:

The goal is to develop a chatbot or virtual assistant that assists customers in tracking their orders in real-time. The primary focus is to leverage LLM capabilities to generate natural, conversational interactions that guide users through the order-tracking process in an intuitive and user-friendly way. While the system will be integrated with logistics tracking data, the emphasis is on creating a seamless, human-like dialogue that enhances the customer experience by making the tracking process more accessible and easier to understand.

#### 3. Define the LLM Model:

For this project, I have chosen to use **microsoft/DialoGPT-small** as the underlying LLM model for the chatbot.

- **Efficient for conversational tasks:** DialoGPT is pre-trained for dialogue generation, making it an ideal choice for customer service functions like order tracking.
- **Lightweight and fast:** The "small" variant is faster and more lightweight than larger models, ensuring quick response times and lower computational resource requirements.
- **Fine-tuning capability:** It can be easily fine-tuned to understand and respond to specific logistics-related inquiries, providing accurate and contextual responses for order tracking queries.

This model will allow for streamlined communication between the customer and the logistics system, resulting in a more efficient and satisfying customer experience.

#### **4. Approach:**

##### Step 1: Collect and Prepare Dataset for Training

1. Load the customer support dataset for training.
2. Check and clean the dataset, including columns and size checks.
3. Explore the 'intent' column and identify unique values.
4. Filter the dataset to keep only "track order" related data.
5. Retain relevant columns ('instruction' and 'response') and convert them into a dialogue format.
6. Identify and replace all unique placeholders with appropriate tokens.

##### Step 2: Preprocess Dataset for Training

1. Load the tokenizer and set the padding token.
2. Define a function to tokenize, truncate, and pad the input dialogues.
3. Process the dataset by applying tokenization and removing the original dialogue column.
4. Set the dataset format to PyTorch Tensor for model training or inference.
5. Set up training arguments and train the tokenized dataset.
6. Save the trained model.

##### Step 3: Collect and Clean Order and Shipment Data

1. Load the sales order and shipment dataset.
2. Check the details of columns.
3. Resize or standardize the order number length.

##### Step 4: Build the Customer Service Chatbot Application

1. Import necessary Python libraries for data processing, model handling, and conversation management.
2. Load the sales order/shipment dataset.
3. Load the fine-tuned language model and tokenizer to generate responses.
4. Create a function to generate responses based on user input using the model.

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5. Develop a function to truncate responses at the last sentence-ending punctuation.
6. Implement functions to extract order and tracking numbers from user input using regular expressions.
7. Create a function to replace placeholders in responses with actual order details.
8. Develop a function to clean and format the response by removing placeholders.
9. Create a function to retrieve order details using extracted order or tracking numbers.
10. Build the main function to handle conversation flow and generate responses.
11. Ensure the main function is executed when the script runs, initializing the tracking assistant.

## 5. Use & Results

1. Run the application in Jupiter Notebook.
2. Type your question in the chatbot. Press return.
3. Wait for generating the response.
4. Enter further question as need.
5. Use ['exit', 'quit', 'bye', 'end', 'thank', 'thanks', 'thanks.'] to exit the program.

### Example 1:

Assistant: Hello! Welcome to the Order Tracking Assistant. How can I help you today?  
You:

Assistant: Hello! Welcome to the Order Tracking Assistant. How can I help you today?  
You: How to track order status?  
Assistant: Your order is smooth and smooth. I can help you with tracking your order and any relevant tracking information. Once I have the additional details, I'll be more than happy to assist you further.  
You: I have order number 99999.  
I'm sorry, I couldn't find any details for the provided order number or tracking number. Please check and try again.  
You:

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You: How to track order status?  
Assistant: Your order is smooth and smooth. I can help you with tracking your order and any relevant tracking information. Once I have the additional details, I'll be more than happy to assist you further.  
You: I have order number 99999.  
I'm sorry, I couldn't find any details for the provided order number or tracking number. Please check and try again.  
You: I have order number 60740.  
Hi,Susan. Your order 60740 is currently Pending Payment. The estimated delivery date is 6/13/17. Is there anything else I can assist you with today? Feel free to ask if you need further help or have any other questions.  
You: Thank  
Assistant: My pleasure! Let me know if you need further help.

### Example 2:

Assistant: Hello! Welcome to the Order Tracking Assistant. How can I help you today?  
You: How to track order status?  
Assistant: Your order is smooth and smooth. I can help you with tracking your order and any relevant tracking information. Once I have the additional details, I'll be more than happy to assist you further.  
You: I have order number 99999.  
I'm sorry, I couldn't find any details for the provided order number or tracking number. Please check and try again.  
You: I have order number 60740.  
Hi,Susan. Your order 60740 is currently Pending Payment. The estimated delivery date is 6/13/17. Is there anything else I can assist you with today? Feel free to ask if you need further help or have any other questions.  
You: Thank  
Assistant: My pleasure! Let me know if you need further help.

### Example 3:

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Assistant: Hello! Welcome to the Order Tracking Assistant. How can I help you today?  
You: I want to track my order 60740.  
Hi,Susan. Your order 60740 is currently Pending Payment. The estimated delivery date is 6/13/17. Is there anything else I can assist you with today? Feel free to ask if you need further help or have any other questions.  
You: Thank  
Assistant: My pleasure! Let me know if you need further help.

Assistant: Hello! Welcome to the Order Tracking Assistant. How can I help you today?  
You: How to track order status?  
Assistant: Your order is smooth and smooth. I can help you with tracking your order and any relevant tracking information. Once I have the additional details, I'll be more than happy to assist you further.  
You: I have order number 99999.  
I'm sorry, I couldn't find any details for the provided order number or tracking number. Please check and try again.  
You: I have order number 60740.  
Hi,Susan. Your order 60740 is currently Pending Payment. The estimated delivery date is 6/13/17. Is there anything else I can assist you with today? Feel free to ask if you need further help or have any other questions.  
You: Thank  
Assistant: My pleasure! Let me know if you need further help.

### Example 4:

Assistant: Hello! Welcome to the Order Tracking Assistant. How can I help you today?  
You: How to track order status?  
Assistant: Thank you for contacting us. I understand that you want help tracking your order on the status of your purchase. To provide you with the most accurate information, I kindly ask for the necessary details.  
You:

## 6. Conclusion

The order tracking assistant developed here can engage users in natural dialogue to provide tracking assistance for orders, either by offering direct information or by guiding the user on next steps. While the assistant generally performs well, some discrepancies may occur, resulting in less accurate responses. These limitations are largely due to constrained training data, computational resources, and limited training time.

For future improvements, expanding the dataset and increasing the number of training iterations could significantly enhance the assistant's performance. By incorporating more order and shipment data, the assistant could generate more comprehensive and relevant responses. Additionally, broadening the scope of intents trained would enable the chatbot to handle a wider variety of customer inquiries, making it a more versatile customer service assistant.

## 7. Reference

"Bitext - Customer Service Tagged Training Dataset for LLM-based Virtual Assistants":

<https://huggingface.co/datasets/bitext/Bitext-customer-support-llm-chatbot-training-dataset>

"Supply Chain-Inventory Management-Data Analyst":

<https://www.kaggle.com/datasets/mohammedazarudheen/supply-chain-inventory-management-data-analyst>