Rasa Conversational AI - Shopping Assistant Chatbot

Mert Akkor

Instructor: Prof. Giuseppe Riccardi

January 30, 2023

1 Introduction

The Rasa Conversational AI assistant is built on how people converse naturally by taking into account previous context that has been sent. Take appropriate action while addressing the unexpected conversation and in the light of the contexts. Driving the conversation when the user diverges from the usual course, as well as getting better over time. It is also able to answer out of scope or FAQ questions if designed properly.

2 Model and Domain

Task oriented dialogue agents are conversational chatbots that have been designed for task-based bots that assist users in completing particular tasks. In this project, I demonstrated a shopping chatbot that you can ask for a refund/return, check order status and change.

2.1 Order Status

Based on the interaction, there are some possible scenarios that can user ask. Firstly, user can where his/her order is.

- *Where is my order?* This interaction do not get any slot. Chatbot will drive the conversation to get more information by asking for the **order number** that you get after your purchase. After checking the database, if order number (ID) is valid, it will return the status.
- *Where is my order with order number 15970?* This is similar to the previous one but this time user provides the **order number**. In this case, chatbot will check the database for a valid number, if it is correct returns the status of the order.

2.2 Order Return/Refund

Second task is refunding or returning an item. In this task, we have three scenarios. Starting with no slots.

- *Start a refund/return* This is similar to asking order status. Since there is no information given by user, bot asks for the **order number** and searches the database. If it is a valid ID it will return information about how to refund items. If not, asks to check order number if typed correctly.
- *Start a return with order number 15970* Here, user provides the **order number** so the bot will directly check the database and return how to refund items. If not, asks to check order number if typed correctly.
- *return Blue Jean* For this interaction, user provides only the **item information**. However, bot ask for order number to check if it is true. If it is, asks again to confirm if the asked item is correct and continues to procedure.

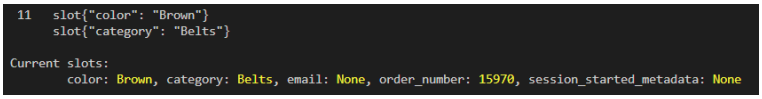

Figure 1: Filled slots from change order task

2.3 Order Change

Lastly, the bot is capable of changing the products that are asked from the user. Starting with the first task;

- *I want to change my Silver Watch* In this task, user provides the item information. After asking for **order number** and confirmation, bot asks for which item he/she wants. According to the reply, bot returns a confirmation and if it is affirmed by user, procedure finishes.
- *I want to change my Silver Watch with order number 15970* User provides prior information to change his/her items. After confirming that, bot asks for which item they would like to change and interaction finalize accordingly.

2.4 Chitchat

Chitchat and out of scope questions are fixed set of answers when user want to ask something else. This neither influence the conversation nor depend on the conversation.

3 Conversation Design

A language based on human conversations and experience is known as conversational design. The less inconvenience clients feel toward a chatbot, the more natural and engaging the conversation is. In this project, my conversational AI, chatbot is designed as user initiative type. User is in the wheel of the conversation by directing it most of the time.

However, how well you design there are still some limitations due to its being a program. When it is unable to provide a response, chatbot should prefer to state that it is unsure rather then attempting to do so and give false information to the user. In my project, chatbot has default answer that apologizes for not understanding.

3.1 Data

I used a dataset that is provided from Kaggle. Fashion dataset which has IDs (order numbers), category and color for the items. These are used to check and confirm when user provided the info for the conversational AI.

3.2 Intent and Entities

I have used 29 intent in the 'nlu.yml', training dataset and there are 4 entities (order number, email, color and category). To extract numeral entities (order number) and email, Duckling is used.

3.3 Slots and Rules

From the stories, depending on the answers that the user give, necessary information is extracted with the help of extractors. and classifiers. For our 4 entities we have same amount of slots, which are order number, email, color and category. Besides these slots, there are defined rules for mostly used or out of context topics. Rules include chitchat, telling a joke and out of scope questions and make it easy to answer them.

4 Conversation Model

Conversational model is built with RASA Framework which is a chatbot and situational AI assistant in both text and speech with open source machine learning framework.

For Natural Language Understanding (NLU) model, different classifiers, tokenizers extractors are used.

- **Fallback Classifier:** When the Intent Classifier is not confident about the intent, this classifier steps in.
- **Whitespace Tokenizer:** This tokenizer splits on and discards only whitespace characters.
- **DIET Classifier:** Classifier that has a transformer architecture that can handle both intent classification and entity recognition together.
- **Duckling Extractor:** This extractor is used to extract email and numerical values like order number.

4.1 Response Policy

There are three main policies used in my project. First being the **Memorization Policy.** This is a Rasa policy recommendation. This policy makes it easier to recall the stories from training data, which is really beneficial when I generate my data by considering potential outcomes. Secondly we have **Rule Policy.** This policy forces the model to follow to a predetermined behavior that has been specified in the rules. Lastly, **TED Policy.** This is a must have policy, since it is recommended by Rasa for almost every project. TED is short for Transformer Embedding Dialogue and used to select which action the assistant should take.

4.2 Vocal Model

Alexa, Amazon's cloud-based voice service is connected to and trained by Rasa's conversational assistant. Users will be able to communicate with the chatbot through Alexa-compatible devices by text or voice. Rasa will be in charge of working out conversations while Alexa take care of the speech part.

5 Evaluation and Results

5.1 NLU and Dialogue Model

Since the technical words make it too confusing, it would be quite difficult to ask people to assess the components. Therefore, I used the command line offered by Rasa to carry out the cross-validation to determine the model's performance. You can see the results on the appendix at the end of the report.

5.2 Dialogue Management Components

5.2.1 Feedback from the User

For evaluation, after the task are done, chatbot asks feedback to the user. Choices with 'Great - Good - Okay - Bad - Very bad' are given as a choice for evaluation.

5.2.2 Questionnaire

I choose to include the human element in this section as well as feedback from the user and conduct a broad assessment of how effective my assistance is in order to gain a general sense. In order to test this, I made a straightforward questionnaire which includes 5 questions that are easy for user to comprehend while still covering the issue of task completion, policies and how well the model adapts to the conditions. All the questions are answered on a scale of 1 to 10. 20 people participated in this questionnaire and interacted with the bot for 5-15 minutes.

- How natural did you feel when you interacted with the chatbot? **Average: 3.89**

- How well did the chatbot answer your questions? **Average: 7.34**
- How good do you think chatbot can answer chitchat conversations? **Average: 8.01**
- How likely would you recommend this bot to someone? **Average: 6.42**
- What final score would you give to the chatbot? **Average: 6.76**

6 Conclusion

Nevertheless, conversational AI that I've created is user initiative, users are happy with the result. Their interactions felt natural and mostly managed to complete their tasks. However, there are more room for improvement for this conversational AI. More options and interactions could be added as well as GUI to offer better service.

7 Appendix

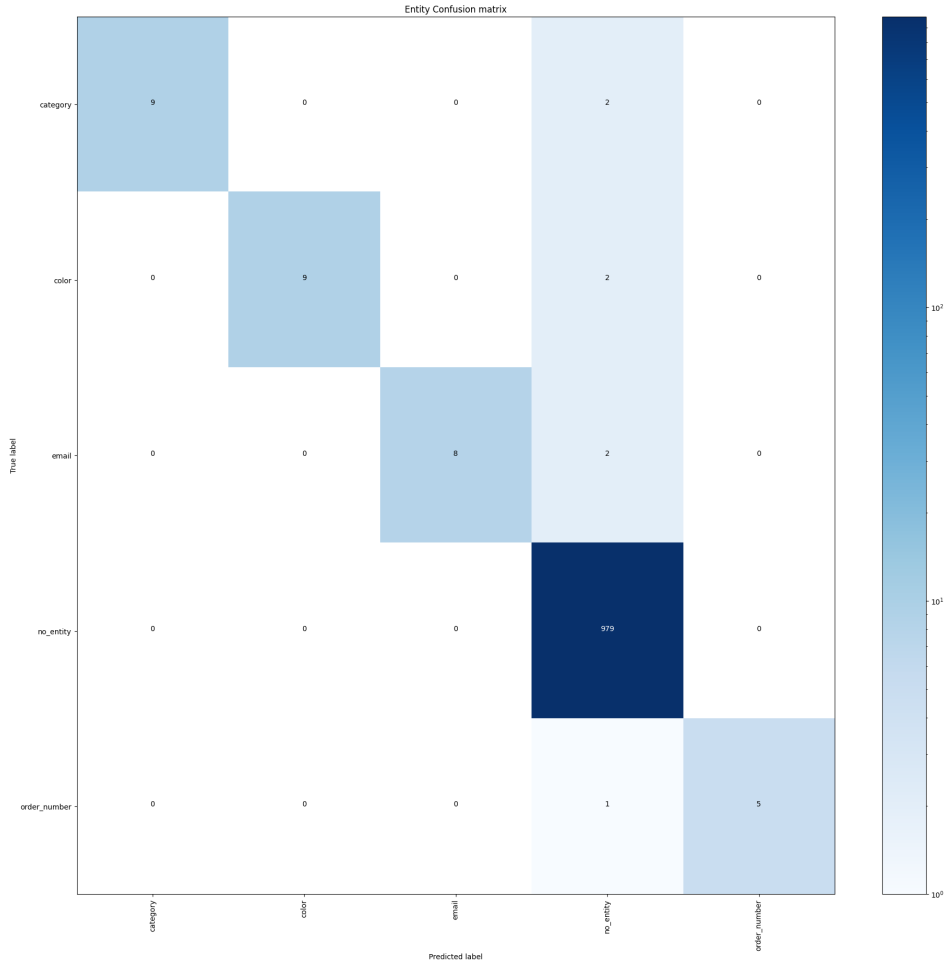

Figure 2: CRFEntityExtractor Confusion Matrix

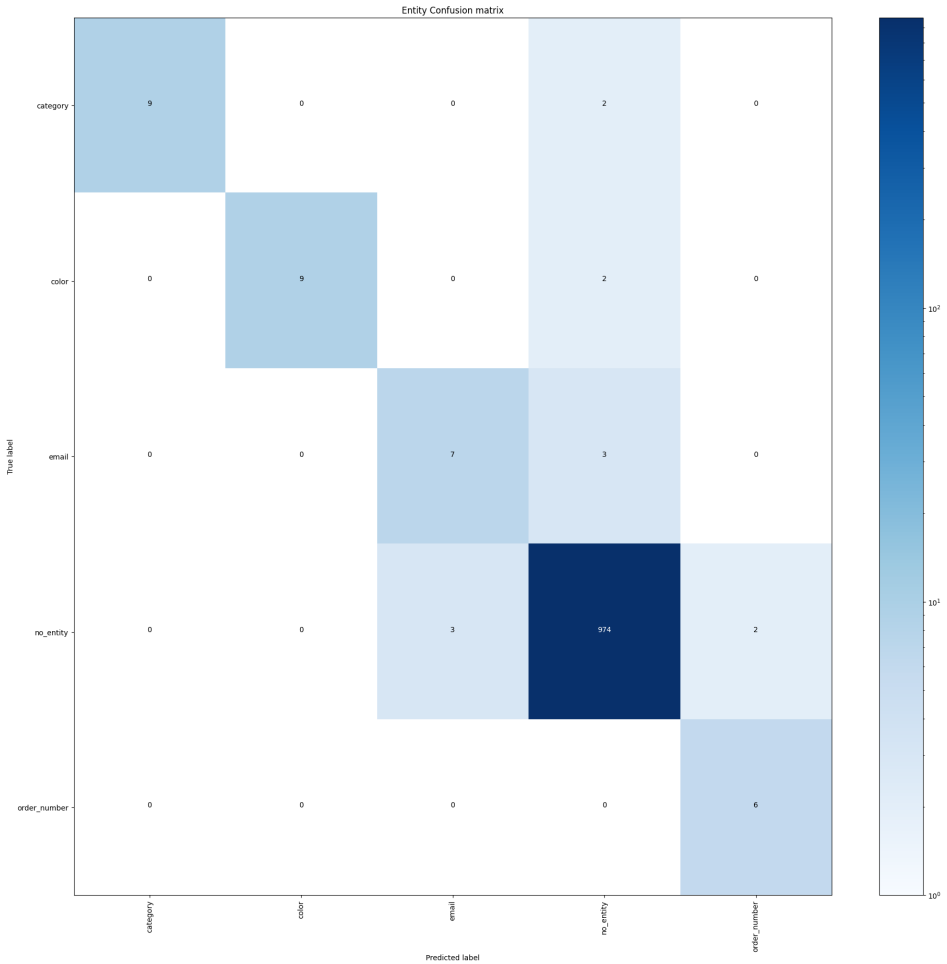

Figure 3: DIET Classifier Confusion Matrix

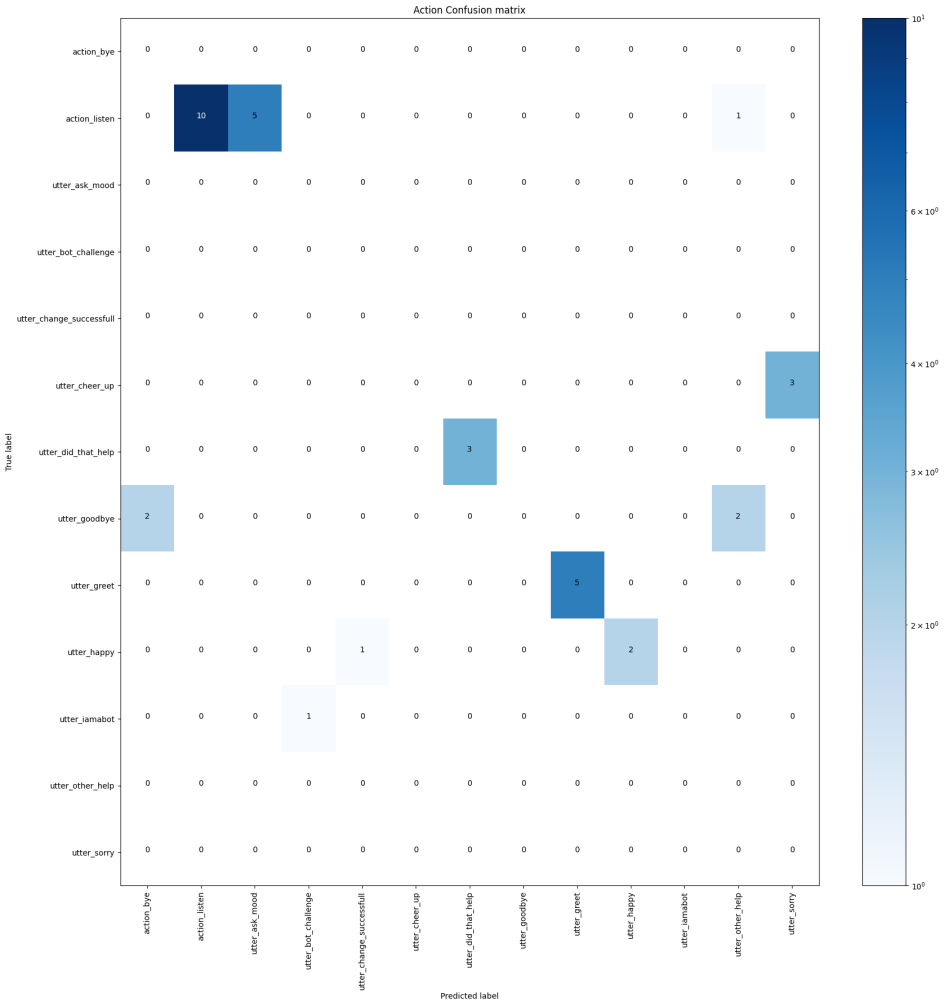

Figure 4: Story Confusion Matrix

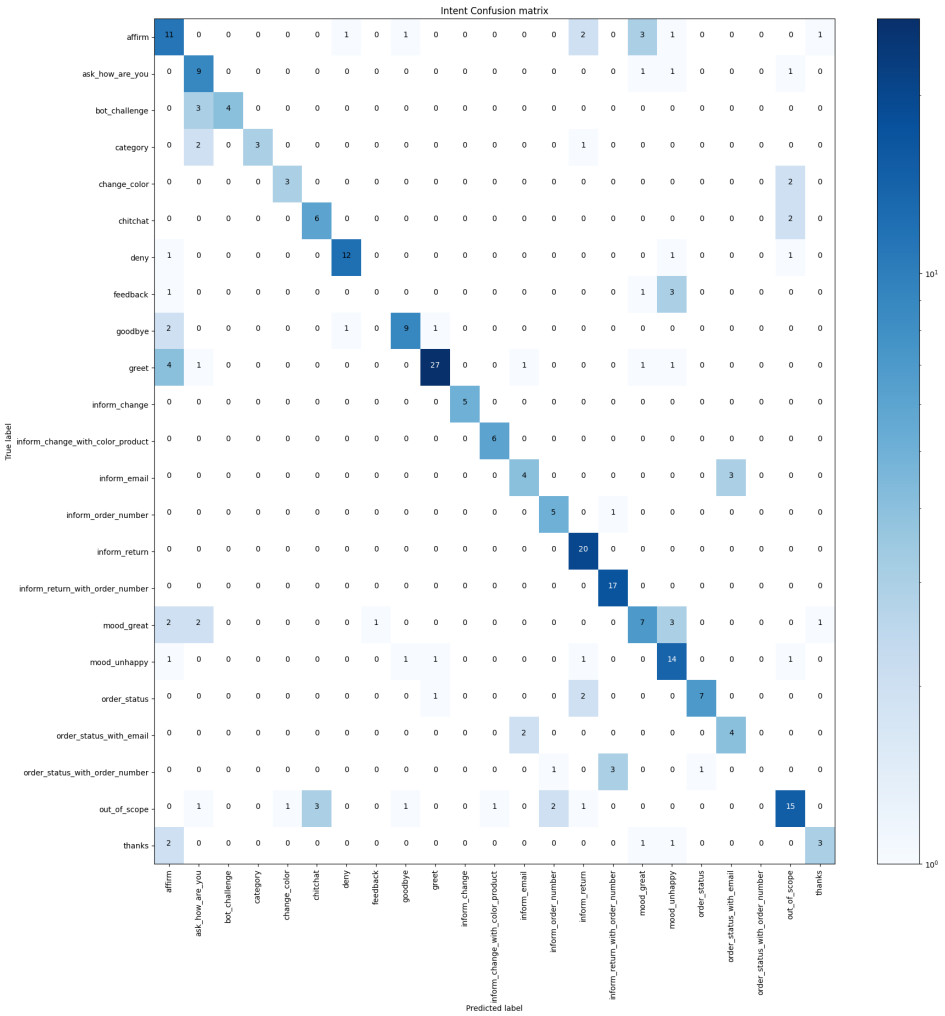

Figure 5: Intent Confusion Matrix