

Progress of the Internship – Isabel Soares

12/7 – 20/7: Searching for tools that helps me to create a general chat bot.

[Presentation with many possibilities in attachment]

20/7 – 28/7: Developing a chat bot that answers a certain type of questions through the Python Library, ChatterBot.

CHATTERBOT DOCUMENTATION:

To install, follow these steps: [Installation — ChatterBot 1.0.8 documentation](#)

To start, I found this tutorial that helped me very much in understanding better how ChatterBot works: [How to Create a Chatbot Using Chatterbot Python - YouTube](#)

Limitations of ChatterBot:

- a simple FAQs; *(I found this limitation while implementing)*
- we cannot filter the information through the question; *(I found this limitation while implementing)*
- we cannot have more than 1 answer per question. *(I found this limitation while implementing)*

Advantages of ChatterBot:

- Easy to use: chatbot answers questions similar to the Q&A.json(that was created by me) ([gunthercox/ChatterBot: ChatterBot is a machine learning, conversational dialog engine for creating chat bots \(github.com\)](#) && [ChatterBot Tutorial — ChatterBot 1.0.8 documentation](#)) and easy to add the data to the bot. That's why this type of chat bot is good for FAQs, for instance.
- Have Corpus for many languages ([gunthercox/chatterbot-corpus: A multilingual dialog corpus \(github.com\)](#)).
- Use Search and Classifications Algorithms ([Frequently Asked Questions — ChatterBot 1.0.8 documentation](#)) which helps in compensating for users' typos:

Basically, chat bot selects a response include:

[Search Algorithm]

- the similarity of an input statement to known statements
- the frequency in which similar known responses occur
- the likeliness of an input statement to fit into a category that known statements are a part of.

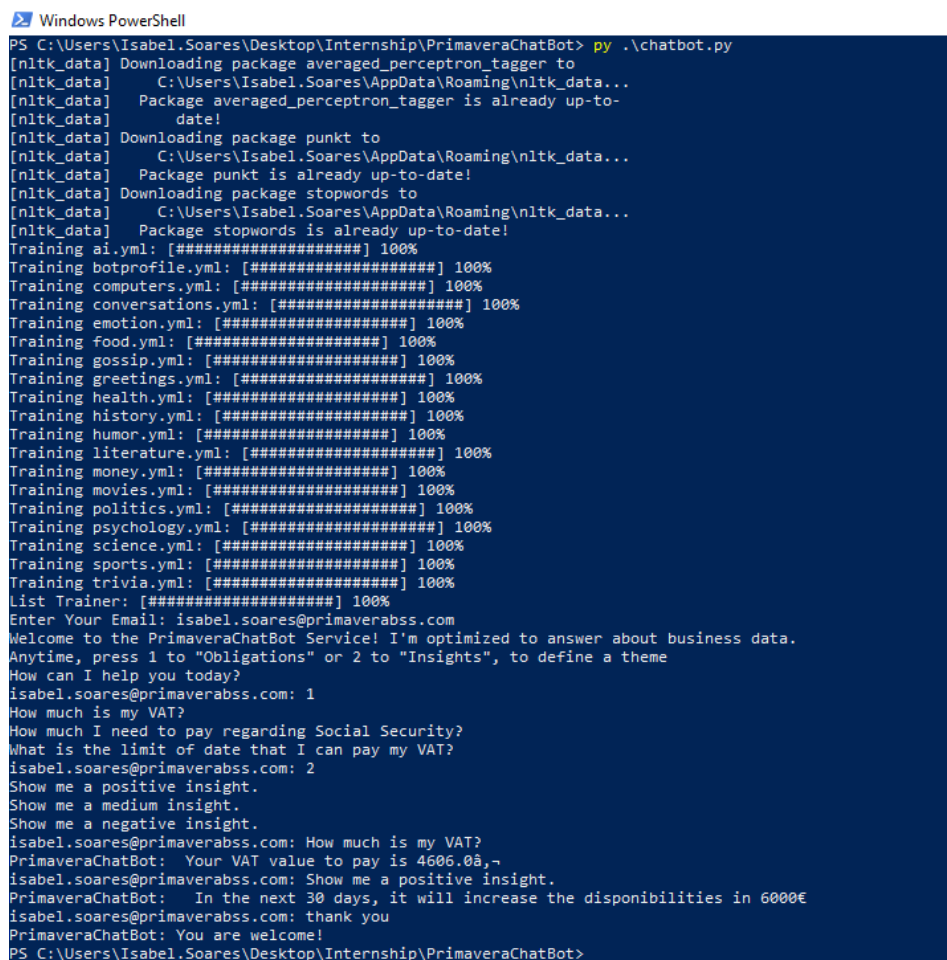
[Classification Algorithm]

- Use naive Bayesian classification algorithms to determine if an input statement meets a particular set of criteria that warrant a response to be generated from that logic adapter.

Improvements on my implementation of the ChatterBot:

- Not a random insight, but a string concatenated.

SIMPLE CONVERSATION EXAMPLE



```
Windows PowerShell
PS C:\Users\Isabel.Souares\Desktop\Internship\PrimaveraChatBot> py .\chatbot.py
[nltk_data] Downloading package averaged_perceptron_tagger to
[nltk_data] C:\Users\Isabel.Souares\AppData\Roaming\nltk_data...
[nltk_data] Package averaged_perceptron_tagger is already up-to-
[nltk_data] date!
[nltk_data] Downloading package punkt to
[nltk_data] C:\Users\Isabel.Souares\AppData\Roaming\nltk_data...
[nltk_data] Package punkt is already up-to-date!
[nltk_data] Downloading package stopwords to
[nltk_data] C:\Users\Isabel.Souares\AppData\Roaming\nltk_data...
[nltk_data] Package stopwords is already up-to-date!
Training ai.yml: [#####] 100%
Training botprofile.yml: [#####] 100%
Training computers.yml: [#####] 100%
Training conversations.yml: [#####] 100%
Training emotion.yml: [#####] 100%
Training food.yml: [#####] 100%
Training gossip.yml: [#####] 100%
Training greetings.yml: [#####] 100%
Training health.yml: [#####] 100%
Training history.yml: [#####] 100%
Training humor.yml: [#####] 100%
Training literature.yml: [#####] 100%
Training money.yml: [#####] 100%
Training movies.yml: [#####] 100%
Training politics.yml: [#####] 100%
Training psychology.yml: [#####] 100%
Training science.yml: [#####] 100%
Training sports.yml: [#####] 100%
Training trivia.yml: [#####] 100%
List Trainer: [#####] 100%
Enter Your Email: isabel.souares@primaverabss.com
Welcome to the PrimaveraChatBot Service! I'm optimized to answer about business data.
Anytime, press 1 to "Obligations" or 2 to "Insights", to define a theme
How can I help you today?
isabel.souares@primaverabss.com: 1
How much is my VAT?
How much I need to pay regarding Social Security?
What is the limit of date that I can pay my VAT?
isabel.souares@primaverabss.com: 2
Show me a positive insight.
Show me a medium insight.
Show me a negative insight.
isabel.souares@primaverabss.com: How much is my VAT?
PrimaveraChatBot: Your VAT value to pay is 4606.0â,-
isabel.souares@primaverabss.com: Show me a positive insight.
PrimaveraChatBot: In the next 30 days, it will increase the disponibilities in 6000€
isabel.souares@primaverabss.com: thank you
PrimaveraChatBot: You are welcome!
PS C:\Users\Isabel.Souares\Desktop\Internship\PrimaveraChatBot>
```

Figure 1 - A conversation using Chatterbot.

28/7 – Present: Developing a chat bot that answers a certain type of questions through an open source tool, called Rasa.

RASA DOCUMENTATION:

Download: [Installing Rasa Open Source: Windows 10 \(Updated 2021\) - YouTube](#)

Quick Installation - [Installation \(rasa.com\)](#)

Note: I needed to use administrator permissions, because Anaconda did not work without it.

I started to understand the documentation but, in my opinion, it is more useful to watch these videos from the Rasa YouTube Channel, although they show an old version (the main changes between the versions are in the format used, which was previously on Markdown and now is on YAML and the last version is easier and simpler than first, regarding to the policies and pipeline):https://www.youtube.com/watch?v=-F6h43DRpcU&list=RDCMUcjOV6493mLvqdiVwOKWBODQ&start_radio=1&t=12s

In summary, Rasa divides itself in three majors' components:

1. **Rasa NLU** - It is responsible for understanding the input messages of the user. It should recognize what the user wants and also extract information like names, places from the messages.
 - a. Domain: defines the universe in which your bot operates. It specifies exactly:
 - i. - which intents you are expecting to respond to
 - ii. - which slots you wish to track
 - iii. - which actions your bot can take
 - b. Actions: are the things your bot can do.
 - c. Stories: is a training data sample for the dialogue system. This shows the bot how to act and react to the inputs given by the user.
 - d. Slots: are the things you want to keep track of during a conversation. The slots are the bot's memory.
2. **Rasa Core** - It maintains the conversation flow between the User and the Bot.
3. **Rasa X** - is a toolset for developers to build, improve, and deploy contextual assistants with the Rasa framework. The good thing about Rasa X is that you can share your assistant with real users and collect the conversations they have with the bot, allowing you to improve it without interrupting the bot running in production.

Good summarize in : [How to build a contextual assistant using RASA Forms | by Amal Menzli | Towards Data Science](#) (I found very useful to understand, in a general way, the documentation of Rasa)

When you are running/training your bot use an Anaconda Powershell Prompt and the **list of commands** that you can use are listed in [Command Line Interface \(rasa.com\)](#)

A good way to understand how querying a database with a chatbot works is by watching this livecoding: [Rasa Livecoding: Querying a database with a chatbot - YouTube](#) and the code is here (also very useful to understand how Rasa works with this example): [GitHub - rctatman/personal website bot: A simple bot to answer questions on my personal website. \(In development\)](#)

Limitations/Disadvantages of Rasa:

- more difficult in terms of understanding all the documentation; ([Introduction to Rasa Open Source](#))
- more difficult in terms of understanding how to connect our data to the bot, because it creates a database from our data (in my case .csv) (*I found this limitation while implementing and the links above helped me to overcome this limitation*)
- this is a limitation of rasa but I do not know the reason. I will give a tip that always helped me: when something is not working and you do not understand the bug, the best solution is to delete the models and the database of the obligations and insights. After, run again *rasa train* (to have a new a model) and create again new databases running the Jupiter notebook.

Advantages of Rasa:

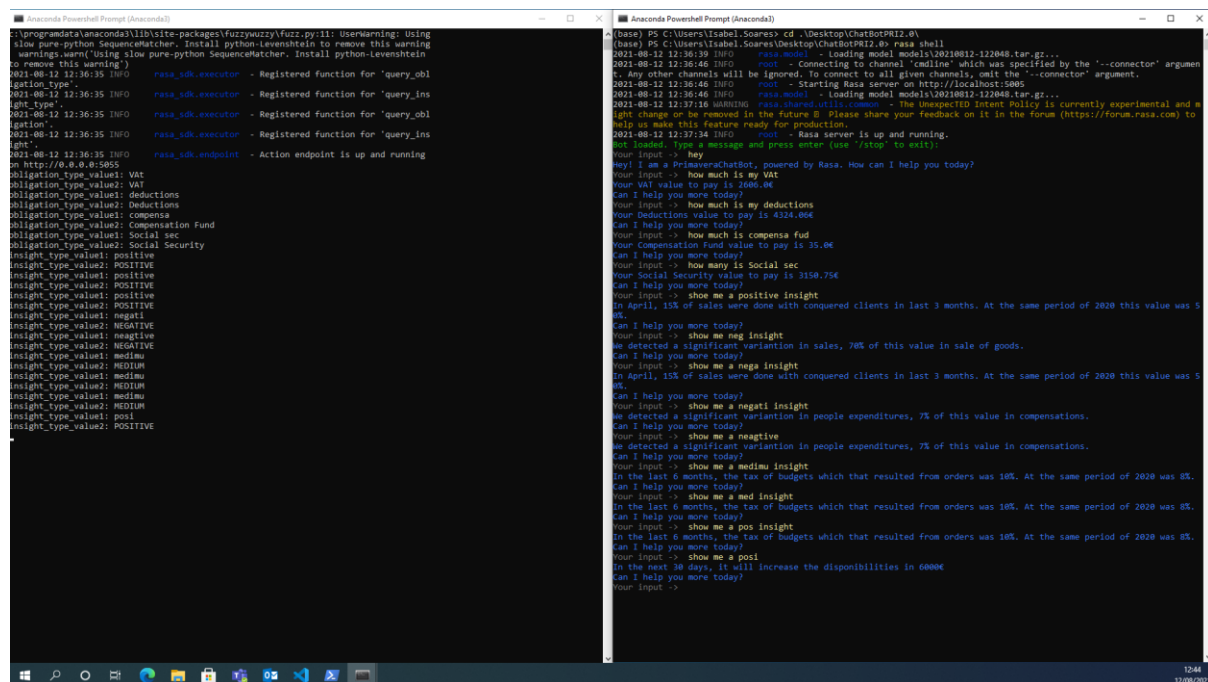
- more powerful and complex tool than chatterbot, because the code of rasa keeps being updated and chatterbot is no longer updated (*I found this limitation comparing the documentation of both tools*);
- it also has a similar algorithm to ChatterBot, which tries to compensate for users' typos.

I started by creating a simple conversation, like a FAQs where the bot only answers two questions:

```
Core stories/configuration did not change. Only the responses section has been changed. A new model with the updated responses will be created.
Your Rasa model is trained and saved at 'C:\Users\Isabel.Souares\Desktop\ChatBotPRI2.0\models\20210810-182902.tar.gz'.
(base) PS C:\Users\Isabel.Souares\Desktop\ChatBotPRI2.0> rasa shell
2021-08-10 18:29:24 INFO     rasa.model - Loading model models\20210810-182902.tar.gz...
2021-08-10 18:29:31 INFO     root - Connecting to channel 'cmdline' which was specified by the '--connector' argument. Any other channels will be ignored. To connect to all given channels, omit the '--connector' argument.
2021-08-10 18:29:31 INFO     root - Starting Rasa server on http://localhost:5005
2021-08-10 18:29:31 INFO     rasa.model - Loading model models\20210810-182902.tar.gz...
2021-08-10 18:29:57 WARNING rasa.shared.utils.common - The Unexpected Intent Policy is currently experimental and might change or be removed in the future. Please share your feedback on it in the forum (https://forum.rasa.com) to help us make this feature ready for production.
2021-08-10 18:30:00 INFO     root - Rasa server is up and running.
Bot loaded. Type a message and press enter (use '/stop' to exit):
Your input -> hi
Hey! How can I help you today?
Your input -> how much is my VAT
Your VAT value to pay is 4686.0€
Can I help you more today?
Your input -> no
Your input -> bye
Bye
Your input -> Show me a positive insight
In the next 30 days, it will increase the disponibilities in 6000€
Can I help you more today?
Your input -> yes
Your input -> Shiw me a positive insigh
In the next 30 days, it will increase the disponibilities in 6000€
Can I help you more today?
Your input -> no
Your input -> bye
Bye
Your input -> /stop
2021-08-10 18:31:43 INFO     root - Killing Sanic server now.
(base) PS C:\Users\Isabel.Souares\Desktop\ChatBotPRI2.0>
```

Figure 2 - A simple conversation using Rasa.

By exploring some more functionalities of Rasa, I concluded that sometimes if the keyword was wrongly written, the bot will not understand and you can see it here:



The image shows two terminal windows. The left window is an Anaconda Powershell Prompt showing the installation of Rasa and the execution of the Rasa server. The right window shows the Rasa server's output, including a warning about the Unspecified Intent Policy and a list of registered functions for the 'query_obligation_type' action. The conversation log on the right shows a user asking for VAT, Social Security, and Deductions, and the bot providing the corresponding values.

Figure 3 - A limitation of Rasa.

(NOTE: At the left Anaconda Powershell Prompt is where the actions associated to the database run and I added some prints to test what and if the bot understood the keyword even if it was not correctly written and at the right, you can see the conversation between bot and user)

Both with Chatterbot and Rasa, I used some **type questions** regarding the *obligations*, such as:

- How much is my VAT?
- How much I need to pay regarding VAT?
- How much is my Social Security?
- How much I need to pay regarding Social Security?
- How much is my Deductions?
- How much I need to pay regarding Deductions?
- How much is my Compensation Fund?
- How much I need to pay regarding Compensation Fund?
- Until when can I pay my VAT?
- What is the limit of date that I can pay my VAT?
- Until when can I pay my Social Security?
- What is the limit of date that I can pay my Social Security?
- Until when can I pay my Deductions?
- What is the limit of date that I can pay my Deductions?
- Until when can I pay my Compensation Fund?
- What is the limit of date that I can pay my Compensation Fund?

And related to the *insights*, I used these:

- Show me a positive insight.
- Show me a medium insight.
- Show me a negative insight.
- Show me all insights.
- Show me all positive insights.
- Show me all medium insights.
- Show me all negative insights.

After querying a database with a chatbot, I was able of creating a more complex conversation, where the bot answers multiple type questions (some displayed above):

```
Anaconda Powershell Prompt (Anaconda3)
(base) PS C:\Users\Isabel.Souares\Desktop\ChatBotPR12.0> rasa shell
2021-08-18 10:18:09 INFO   rasa.model - Loading model models\20210812-122848.tar.gz...
2021-08-18 10:18:10 INFO   root - Connecting to channel 'cmdline' which was specified by the '--connector' argument. Any other channels will be ignored. To connect to all
given channels, omit the '--connector' argument.
2021-08-18 10:18:18 INFO   root - Starting Rasa server on http://localhost:5005
2021-08-18 10:18:18 INFO   rasa.model - Loading model models\20210812-122848.tar.gz...
2021-08-18 10:19:01 WARNING rasa.shared.utils.common - The Unexpected Intent Policy is currently experimental and might change or be removed in the future @ Please share
your feedback on it in the forum (https://forum.rasa.com) to help us make this feature ready for production.
2021-08-18 10:19:13 INFO   root - Rasa server is up and running.
Bot loaded. Type a message and press enter (use '/stop' to exit):
Your input -> hey
Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
Your input -> how much is my VAT
Your VAT value to pay is 4686.84
Can I help you more today?
Your input -> how much is my deductions
Your Deductions value to pay is 3324.004
Can I help you more today?
Your input -> how much is my social security
Your Social Security value to pay is 3158.754
Can I help you more today?
Your input -> show me a positive insight
I am showing a random insight: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 50%.
Can I help you more today?
Your input -> how much is my compensation fund
Your Compensation Fund value to pay is 35.04
Can I help you more today?
Your input -> show me a medium insight
I am showing a random insight: In the last 6 months, the tax of budgets which that resulted from orders was 10%. At the same period of 2020 was 8%.
Can I help you more today?
Your input -> show me a negative insight
I am showing a random insight: We detected a significant variation in energy expenditures, 68% of this value in electrical expenditures.
Can I help you more today?
Your input -> bye
Bye
Your input -> /stop
2021-08-18 10:21:55 INFO   root - Killing Sonic server now.
(base) PS C:\Users\Isabel.Souares\Desktop\ChatBotPR12.0>
```

Figure 4 - More complex conversation using Rasa.

More complete conversation with some limitations on date key (only works with these expressions “April 2021” and “May 2021”):

```
Anaconda Powershell Prompt (Anaconda3)
(base) PS C:\Users\Isabel.Souares\Desktop\ChatBotPR12.0> rasa shell
2021-08-18 15:44:18 INFO   rasa.model - Loading model models\20210810-154349.tar.gz...
2021-08-18 15:44:20 INFO   root - Connecting to channel 'cmdline' which was specified by the '--connector' argument. Any other channels will be ignored. To connect to all
given channels, omit the '--connector' argument.
2021-08-18 15:44:20 INFO   root - Starting Rasa server on http://localhost:5005
2021-08-18 15:44:20 INFO   rasa.model - Loading model models\20210810-154349.tar.gz...
2021-08-18 15:45:08 WARNING rasa.shared.utils.common - The Unexpected Intent Policy is currently experimental and might change or be removed in the future @ Please share your feedback on it in the forum (https://forum.rasa.com) to hel
on new this feature ready for production.
2021-08-18 15:45:10 INFO   root - Rasa server is up and running.
Bot loaded. Type a message and press enter (use '/stop' to exit):
Your input -> hi
Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
Your input -> How much is my vat
Which date do you want?
Your input -> May 2021
Your VAT value to pay is 2686.04
Can I help you more today?
Your input -> How much is my deductions
Which date do you want?
Your input -> April 2021
Your Deductions value to pay is 3324.004
Can I help you more today?
Your input -> How much is my compensation fund
Which date do you want?
Your input -> April 2020
Your Compensation Fund value to pay is 35.04
Can I help you more today?
Your input -> How much is my social security
Which date do you want?
Your input -> May 2021
Your Social Security value to pay is 3158.754
Can I help you more today?
Your input -> show me a insight
I am showing a random insight: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 50%.
Can I help you more today?
Your input -> show me a medium insight
I am showing a random insight: In the last 6 months, the tax of budgets which that resulted from orders was 10%. At the same period of 2020 was 8%.
Can I help you more today?
Your input -> show me all insights
POSITIVE INSIGHT: In the next 30 days, it will increase the disponibilities in 6000€
NEGATIVE INSIGHT: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 50%.
NEGATIVE INSIGHT: We detected a significant variation in sales, 70% of this value in sale of goods.
NEGATIVE INSIGHT: We detected a significant variation in energy expenditures, 68% of this value in electrical expenditures.
NEGATIVE INSIGHT: We detected a significant variation in people expenditures, 7% of this value in compensation.
NEGATIVE INSIGHT: In the last 6 months, the tax of budgets which that resulted from orders was 10%. At the same period of 2020 was 8%.
Can I help you more today?
Your input -> show me negative all insights
NEGATIVE INSIGHT: We detected a significant variation in energy expenditures, 68% of this value in electrical expenditures.
NEGATIVE INSIGHT: We detected a significant variation in people expenditures, 7% of this value in compensation.
Can I help you more today?
Your input -> show me all medium insights
NEGATIVE INSIGHT: We detected a significant variation in energy expenditures, 68% of this value in electrical expenditures.
NEGATIVE INSIGHT: We detected a significant variation in people expenditures, 7% of this value in compensation.
Can I help you more today?
Your input -> show me all positive insights
POSITIVE INSIGHT: In the next 30 days, it will increase the disponibilities in 6000€
POSITIVE INSIGHT: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 50%.
POSITIVE INSIGHT: We detected a significant variation in sales, 70% of this value in sale of goods.
Can I help you more today?
Your input -> /stop
2021-08-18 15:52:20 INFO   root - Killing Sonic server now.
(base) PS C:\Users\Isabel.Souares\Desktop\ChatBotPR12.0>
```

Figure 5 - More complete conversation with some limitations yet (using rasa).

[illegible]

```

Select AWS Lambda PowerShell Prompt (Amazon)
10/21-08:10:35:05 [INFO] - Rasa server is up and running.
Processed story blocks: 1005
Processed rules: 1000
Not loaded: visualization at http://localhost:5000/visualization.html
Type a message and press enter (press 'Ctrl-c' to exit).
Your input -> hi
? Your NLU model classified 'hi' with intent 'greet' and there are no entities, is this correct? Yes
-----
Chat History
# Bot You
1 action_listen
2 hi
   intent: greet 1.00
Current slots:
obligation_type: None, obligation_date_key: None, insight_type: None, session_started_metadata: None
-----
? The bot wants to run 'utter_greet', correct? Yes
-----
Chat History
# Bot You
1 action_listen
2 hi
   intent: greet 1.00
3 utter_greet 1.00
   Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
Current slots:
obligation_type: None, obligation_date_key: None, insight_type: None, session_started_metadata: None
-----
? The bot wants to run 'action_listen', correct? Yes
Your input -> until when can I pay my VAT
? Is the intent 'ask_obligation_payment_date' correct for 'until when can I pay my [VAT](obligation_type)' and are all entities labeled correctly? Yes
-----
Chat History
# Bot You
1 action_listen
2 hi
   intent: greet 1.00
3 utter_greet 1.00
   Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
   action_listen 1.00
4 until when can I pay my [VAT](obligation_type)
   intent: ask_obligation_payment_date 1.00
5 slot("obligation_type": "VAT")

```

7

```
Select Anaconda Powershell Prompt (Anaconda3)
Current slots:
  obligation_type: VAT, obligation_date_key: May 2021, insight_type: None, session_started_metadata: None
-----
/ The bot wants to run 'query_obligation_payment_date', correct? Yes
-----
Chat History
# Bot You
1 action_listen
2 hi
  intent: greet 1.00
3 utter_greet 1.00
  Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
  action_listen 1.00
4 until when can I pay my [VAT](obligation_type)
  intent: ask_obligation_payment_date 1.00
5 slot("obligation_type": "VAT")
  utter_ask_date 1.00
  Which date do you want?
  action_listen 1.00
6 (May 2021)(obligation_date_key)
  intent: give_date_key 1.00
7 slot("obligation_date_key": "May 2021")
  query_obligation_payment_date 1.00
  You should pay your VAT until 2021-05-20 00:00:00.

Current slots:
  obligation_type: VAT, obligation_date_key: May 2021, insight_type: None, session_started_metadata: None
-----
/ The bot wants to run 'utter_how_can_i_help_more', correct? Yes
-----
Chat History
# Bot You
1 action_listen
2 hi
  intent: greet 1.00
3 utter_greet 1.00
  Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
  action_listen 1.00
4 until when can I pay my [VAT](obligation_type)
  intent: ask_obligation_payment_date 1.00
5 slot("obligation_type": "VAT")
  utter_ask_date 1.00
  Which date do you want?
  action_listen 1.00
6 (May 2021)(obligation_date_key)
```

Figure 8 - Running rasa interactive (continuation).

```
Select Anaconda Powershell Prompt (Anaconda3)
Current slots:
  obligation_type: VAT, obligation_date_key: None, insight_type: None, session_started_metadata: None
-----
/ The bot wants to run 'utter_ask_date', correct? Yes
-----
Chat History
# Bot You
1 action_listen
2 hi
  intent: greet 1.00
3 utter_greet 1.00
  Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
  action_listen 1.00
4 until when can I pay my [VAT](obligation_type)
  intent: ask_obligation_payment_date 1.00
5 slot("obligation_type": "VAT")
  utter_ask_date 1.00
  Which date do you want?
  action_listen 1.00
6 (May 2021)(obligation_date_key)
  intent: give_date_key 1.00
7 slot("obligation_date_key": "May 2021")
  action_listen 1.00
8 Your input -> May 2021
  Is the intent 'give_date_key' correct for '(May 2021)(obligation_date_key)' and are all entities labeled correctly? Yes
-----
Chat History
# Bot You
1 action_listen
2 hi
  intent: greet 1.00
3 utter_greet 1.00
  Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
  action_listen 1.00
4 until when can I pay my [VAT](obligation_type)
  intent: ask_obligation_payment_date 1.00
5 slot("obligation_type": "VAT")
  utter_ask_date 1.00
  Which date do you want?
  action_listen 1.00
6 (May 2021)(obligation_date_key)
  intent: give_date_key 1.00
7 slot("obligation_date_key": "May 2021")
  action_listen 1.00
```

Figure 9 - Running rasa interactive (continuation).

Note that the value that appears next to the actions and intents is the confidence that the bot has in each of them.


```

Select Anaconda Powershell Prompt (Anaconda)
5 slot("obligation_type": "VAT")
utter_ask_date 1.00
which date do you want?
action_listen 1.00

6 [May 2021](obligation_date_key)
intent: give_date_key 1.00

7 slot("obligation_date_key": "May 2021")
query_obligation_payment_date 1.00
You should pay your VAT until 2021-05-20 00:00:00.

Current slots:
obligation_type: VAT, obligation_date_key: May 2021, insight_type: None, session_started_metadata: None

-----
The bot wants to run 'utter_how_can_i_help_more', correct? Yes
-----
Chat History
# Bot You
1 action_listen
2 hi
intent: greet 1.00
3 utter_greet 1.00
Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
action_listen 1.00
4 until when can I pay my [VAT](obligation_type)
intent: ask_obligation_payment_date 1.00
5 slot("obligation_type": "VAT")
utter_ask_date 1.00
which date do you want?
action_listen 1.00
6 [May 2021](obligation_date_key)
intent: give_date_key 1.00
7 slot("obligation_date_key": "May 2021")
query_obligation_payment_date 1.00
You should pay your VAT until 2021-05-20 00:00:00.
utter_how_can_i_help_more 1.00
Can I help you more today?

Current slots:
obligation_type: VAT, obligation_date_key: May 2021, insight_type: None, session_started_metadata: None

-----
The bot wants to run 'action_listen', correct? Yes
Your input ->
Do you want to stop? Export & Quit
Export stories to (if file exists, this will append the stories)
Cancelled by user

2021-08-16 18:08:40 INFO rasa.core.training.interactive - Killing Sanic server now.
(base) PS C:\Users\lisa\Documents\ChatBotPR12>

```

Figure 10 - Running *rasa interactive* (continuation).

(Before these prints) I noticed that the confidence of the action “*query_obligation_payment_date*” was 0.22 and that the confidence of the action “*query_obligation_value_to_pay*” was 0.30. This is the reason why the bot always answered the value to pay and not the payment date. In order to solve this bug, I gave more confidence to the action “*query_obligation_payment_date*”. However, after the bot started always answering the payment date and not the value to pay.

While running *rasa interactive*, I could see a visualization of what was happening in real time with the bot:

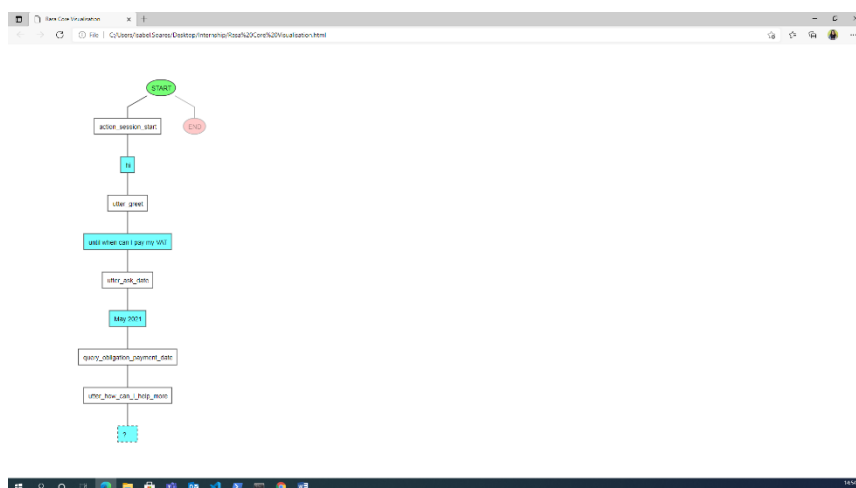


Figure 11 - Rasa visualization of the story.

Note: If you run the command *rasa visualize*, it generates a visual representation of your stories, like the one above.

After many trainings using *rasa interactive* and after changing the names of the actions and intents (because they were similar and this confused the bot), the bot was able to answer all the questions correctly:

```
Anaconda PowerShell Prompt (Anaconda)
(base) PS C:\Users\Isabel.Soaes\Desktop\ChatBotPR12.0> rasa shell
2021-08-17 16:19:15 INFO     rasa.models - Loading model models\20210817-154212.tar.gz...
2021-08-17 16:19:21 INFO     root - Connecting to channel 'cmdline' which was specified by the '--connector' argument. Any other channels will be ignored. To connect to all given channels, omit the '--connector' argument.
2021-08-17 16:19:21 INFO     root - Starting Rasa server on http://localhost:5055
2021-08-17 16:19:21 INFO     rasa.models - Loading model models\20210817-154212.tar.gz...
2021-08-17 16:19:48 WARNING  rasa.shared.utils.common - The Unexpected Intent Policy is currently experimental and might change or be removed in the future. Please share your feedback on it in the forum (https://forum.rasa.com) to help us make this feature ready for production.
2021-08-17 16:19:57 INFO     root - Rasa server is up and running.
Bot loaded. Type a message and press enter (use '/stop' to exit):
Your input -> hello
Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
Your input -> How much is my VAT
Which date do you want? Insert "Month year"
Your input -> April 2021
Your VAT value to pay is 4086.04
Can I help you more today?
Your input -> How much is my deductions
Which date do you want? Insert "Month year"
Your input -> April 2021
Your Deductions value to pay is 3124.054
Can I help you more today?
Your input -> How much I need to pay regarding Social Security
Which date do you want? Insert "Month year"
Your input -> May 2021
Your Social Security value to pay is 3150.754
Can I help you more today?
Your input -> How much I need to pay regarding Compensation Fund
Which date do you want? Insert "Month year"
Your input -> May 2021
Your Compensation Fund value to pay is 35.04
Can I help you more today?
Your input -> what is the limit of date that I can pay my vat
Which date do you want? Insert "Month year"
Your input -> April 2021
You should pay your VAT until 2021-05-20 00:00:00.
Can I help you more today?
Your input -> until when can I pay my social security
Which date do you want? Insert "Month year"
Your input -> May 2021
You should pay your Social Security until 2021-06-20 00:00:00.
Can I help you more today?
Your input -> What is the limit of date that I can pay my Deductions
Which date do you want? Insert "Month year"
Your input -> April 2021
You should pay your Deductions until 2021-05-20 00:00:00.
Can I help you more today?
Your input -> until when can I pay my Compensation Fund
Which date do you want? Insert "Month year"
Your input -> May 2021
You should pay your Compensation Fund until 2021-06-20 00:00:00.
Can I help you more today?
Your input -> bye
Bye
Your input -> /stop
2021-08-17 16:24:18 INFO     root - Killing Sanic server now.
(base) PS C:\Users\Isabel.Soaes\Desktop\ChatBotPR12.0>
```

Figure 12 - The bot answers questions about the obligations.

```
Anaconda PowerShell Prompt (Anaconda)
(base) PS C:\Users\Isabel.Soaes\Desktop\ChatBotPR12.0> rasa shell
2021-08-17 16:26:07 INFO     rasa.models - Loading model models\20210817-154212.tar.gz...
2021-08-17 16:26:14 INFO     root - Connecting to channel 'cmdline' which was specified by the '--connector' argument. Any other channels will be ignored. To connect to all given channels, omit the '--connector' argument.
2021-08-17 16:26:14 INFO     root - Starting Rasa server on http://localhost:5055
2021-08-17 16:26:14 INFO     rasa.models - Loading model models\20210817-154212.tar.gz...
2021-08-17 16:26:40 WARNING  rasa.shared.utils.common - The Unexpected Intent Policy is currently experimental and might change or be removed in the future. Please share your feedback on it in the forum (https://forum.rasa.com) to help us make this feature ready for production.
2021-08-17 16:26:54 INFO     root - Rasa server is up and running.
Bot loaded. Type a message and press enter (use '/stop' to exit):
Your input -> hi
Hey! I am a PrimaveraChatBot, powered by Rasa. How can I help you today?
Your input -> show me a positive insight
A POSITIVE INSIGHT: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 58%.
Can I help you more today?
Your input -> show me a negative insight
A NEGATIVE INSIGHT: We detected a significant variation in people expenditures, 7% of this value in compensations.
Can I help you more today?
Your input -> show me a medium insight.
A MEDIUM INSIGHT: In the last 6 months, the tax of budgets which that resulted from orders was 18%. At the same period of 2020 was 8%.
Can I help you more today?
Your input -> show me all insights
A POSITIVE INSIGHT: In the next 36 days, it will increase the disponibilities in 6000K
A POSITIVE INSIGHT: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 58%.
A POSITIVE INSIGHT: We detected a significant variation in sales, 78% of this value in sale of goods.
A NEGATIVE INSIGHT: We detected a significant variation in energy expenditures, 68% of this value in electrical expenditures.
A NEGATIVE INSIGHT: We detected a significant variation in people expenditures, 7% of this value in compensations.
A MEDIUM INSIGHT: In the last 6 months, the tax of budgets which that resulted from orders was 18%. At the same period of 2020 was 8%.
Can I help you more today?
Your input -> show me all positive insights
A POSITIVE INSIGHT: In the next 36 days, it will increase the disponibilities in 6000K
A POSITIVE INSIGHT: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 58%.
A POSITIVE INSIGHT: We detected a significant variation in sales, 78% of this value in sale of goods.
Can I help you more today?
Your input -> show me all negative insights
A NEGATIVE INSIGHT: We detected a significant variation in energy expenditures, 68% of this value in electrical expenditures.
A NEGATIVE INSIGHT: We detected a significant variation in people expenditures, 7% of this value in compensations.
Can I help you more today?
Your input -> show me all medium insights
A MEDIUM INSIGHT: In the last 6 months, the tax of budgets which that resulted from orders was 18%. At the same period of 2020 was 8%.
Can I help you more today?
Your input -> bye
Bye
Your input -> /stop
2021-08-17 16:28:40 INFO     root - Killing Sanic server now.
(base) PS C:\Users\Isabel.Soaes\Desktop\ChatBotPR12.0>
```

Figure 13 - The bot answers questions about the insights.

Then, in order to solve the limitation on date key (the user had to write in a specific way for the bot to understand), I used a Python library, *dateutil*. Hence, the bot is able of parsing different date representations. (You can see on the picture below):

```

(base) PS C:\Users\Isabel.Soare\Desktop\ChatBotPR12.0> rasa run actions
2021-08-18 15:21:36 INFO rasa - Starting action endpoint server...
2021-08-18 15:21:36 INFO rasa - Connecting to Channel 'twilio' which was specified by the '--connector' argument. Any other channels will be ignored. To connect to all given channels, omit the '--connector' argument.
2021-08-18 15:21:36 INFO rasa - Loading model models\20210818-144414.tar.gz...
2021-08-18 15:21:36 INFO rasa - Starting Rasa server on http://localhost:5005
2021-08-18 15:21:36 INFO rasa - The Unexpected Intent Policy is currently experimental and might change or be removed in the future. Please share your feedback on it in the forum (https://forum.rasa.com) to help us make this feature ready for production.
2021-08-18 15:21:36 INFO rasa - Rasa server is up and running.
2021-08-18 15:21:36 INFO rasa - Bot loaded. Type a message and press enter (use /stop to exit).
Your input -> Hi
Hey! I am a PrivateerChatBot, powered by Rasa. How can I help you today?
Your input -> How much is my compensation fund
Which date do you want? Insert "Month year"
Your input -> 2021 May
Your Compensation Fund value to pay is 35.04
Can I help you more today?
Your input -> until when can I pay my deductions
Which date do you want? Insert "Month year"
Your input -> May2021
You should pay your deductions until 2021-05-28 00:00:00.
Can I help you more today?
Your input -> show me all insights
A POSITIVE INSIGHT: In the next 30 days, it will increase the disponibilities in 60004
A POSITIVE INSIGHT: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 58%.
A POSITIVE INSIGHT: We detected a significant variation in sales, 78% of this value in sale of goods.
A POSITIVE INSIGHT: We detected a significant variation in energy expenditures, 60% of this value in electrical expenditures.
A NEGATIVE INSIGHT: We detected a significant variation in people expenditures, 7% of this value in compensations.
A MEDIUM INSIGHT: In the last 6 months, the tax of budgets which that resulted from orders was 18%. At the same period of 2020 was 85.
Can I help you more today?
Your input -> show me all positive onsighty
A POSITIVE INSIGHT: In the next 30 days, it will increase the disponibilities in 60004
A POSITIVE INSIGHT: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 58%.
A POSITIVE INSIGHT: We detected a significant variation in sales, 78% of this value in sale of goods.
Your input -> show me all negative insight
A POSITIVE INSIGHT: In the next 30 days, it will increase the disponibilities in 60004
A POSITIVE INSIGHT: In April, 15% of sales were done with conquered clients in last 3 months. At the same period of 2020 this value was 58%.
A POSITIVE INSIGHT: We detected a significant variation in sales, 78% of this value in sale of goods.
Can I help you more today?
Your input ->

obligation_type_value1: compensation fund
obligation_type_value2: Compensation Fund
obligation_type_value1: deductions
obligation_type_value2: Deductions
insight_type_value1: POSITIVE
insight_type_value2: NEGATIVE
insight_type_value1: MEDIUM
insight_type_value2: None
2021-08-18 15:28:32 WARNING rasa - Applied processor reduces input query to empty
string, all comparisons will have score 0. [Query: '']
insight_type_value1: POSITIVE
insight_type_value2: None
insight_type_value1: None
insight_type_value2: POSITIVE
  
```

Figure 14 - A conversation with different date formats and issues on certain keywords.

Still regarding the picture above, I could notice that when I/ the user write/s the keyword wrongly, per default, the bot answers as if a positive insight. Maybe because this value is the first on the categorical slot, *insight_type*.