

# ASSIGNMENT 4

Group 4

## ABSTRACT

The overall objective of this assignment was to create an ontology using Protégé and a Chatbot agent based on our final project topic. The Chatbot agent was created using google DialogFlow through a well define set of competencies questions which were evaluated by test cases. Our Agent was successful in processing loan requests.

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## Objectives:

The aim of this assignment was to create an ontology and a Chabot agent using the concept of our final project. This was done through the following steps:

1. Choose a data science concept: Predictive system for credit risk assessment
2. Create an ontology using Protégé based on the chosen concept.
3. Prepare and document the competency questions list of 6.
4. Create the agent and create test-cases.
5. Train the chatbot agent.
6. Test each sections quality.
7. create 5 different ways of asking each competency question.
8. Do the training and evaluations online.

## Ontology

(Gruber, 1993) defines ontology as a formal specification of a shared conceptualization. Few years later, (Noy & McGuinness, 2001) also defined ontology as a common vocabulary for researchers who need to share information in a domain. It includes machine-interpretable definitions of basic concepts in the domain and.

(Noy & McGuinness, 2001) list few reasons why an ontology may be developed:

- To share common understanding of the structure of information among people or software agents
- To enable reuse of domain knowledge
- To make domain assumptions explicit
- To separate domain knowledge from the operational knowledge
- To analyze domain knowledge

As such, our ontology was built using Protégé, a free open-source ontology editor and framework for building intelligent systems. The competency questions used to achieve this task is shown in Table 1 below.

## Competency questions

We used the following questions to guide our agent learning:

Competency Questions	Test Questions
What is the process of getting a loan?	<ol style="list-style-type: none"><li>1. What do I need to do if I want a loan?</li><li>2. Is it possible for me to get a loan?</li><li>3. I would like to apply for a loan??</li><li>4. How does the loan process work?</li><li>5. How do you get a loan step by step?</li></ol>
How is credit risk assessed?	<ol style="list-style-type: none"><li>1. How do you assess my credit?</li><li>2. How is credit risk calculated?</li><li>3. How to measure credit worthiness?</li><li>4. What determines credit risk?</li><li>5. how is credit worthiness assessed?</li></ol>
How much money can one borrow?	<ol style="list-style-type: none"><li>1. What is the loan limit?</li><li>2. Can I borrow as much money as I want?</li><li>3. How much money can you lend me?</li><li>4. How much do I qualify for?</li><li>5. What is my loan limit? /how much can I borrow?</li></ol>
Do students loans have interest?	<ol style="list-style-type: none"><li>1. How are student loan interest calculated?</li><li>2. What is the current interest rate on student loan?</li><li>3. Do I have to pay interest on student loan?</li><li>4. How does student loan interest work?</li><li>5. What is the lowest interest rate for student loan</li></ol>
What happens when a customer default?	<ol style="list-style-type: none"><li>1. Can a default lead to prison?</li><li>2. Is default allowed?</li><li>3. What is the default sanction?</li><li>4. Can a defaulter request another loan?</li><li>5. Is there any penalty for defaulters?</li></ol>
What factors increases credit risk?	<ol style="list-style-type: none"><li>1. What affect credit score negatively?</li><li>2. Do you know what can increase my credit risk?</li><li>3. How do I keep a good credit score?</li><li>4. Factors affecting credit risk.</li><li>5. What are the causes of a bad credit score?</li></ol>

Table 1 Competency and test cases questions

In this assignment we used the classes showed in Table 1.

**Class properties:**

- *Loan*: this class englobes all the details pertaining to loan. It explains the loan process and the steps to follow such as the application form, required documents, credit reports...etc
- *Credit factor*: This is a listing of the factors that could negatively affect one's credit score. Among them we have: bill payment history, debt amount, types of credit
- *Credit risk*: this class covers the to risk assessment procedure
- *Default*: this part covers the penalty encounter in case of a default
- *Loan amount*: this class will answer questions related to loan amount as how much money can be borrowed
- *Student Loan interest*: This is answer all question in relation with student loan

Class Property	Object property
Loan	Factors
Credit factor	Penalties
Credit risk	
Default	
Loan amount	
Student loan interest	

*Table 2 Ontology class and object properties*

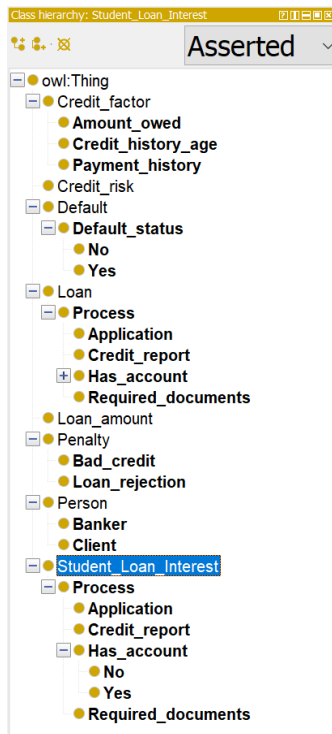


Figure 1 Class property

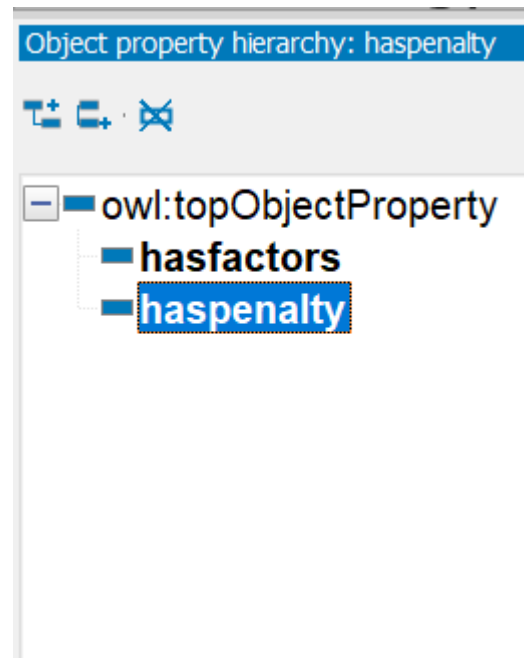


Figure 2 Object Property

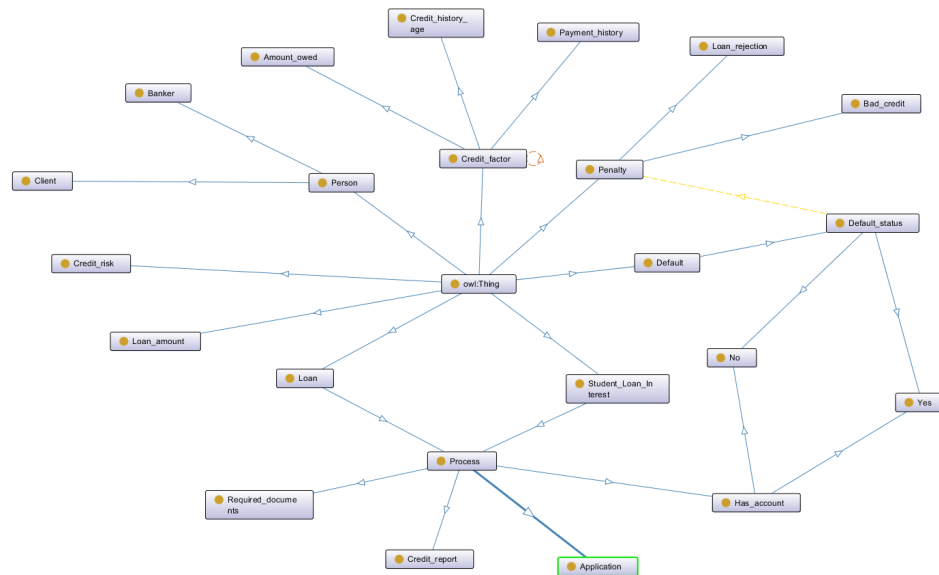


Figure 3 Asserted Ontology Graph

## ChatBot Agent

We used dialog flow to build our agent to simulate the loan request preliminary steps. In a nutshell, if a customer wants to get a loan, he has the option to go through the chatbot, which is going to collect information, which are going to be assessed by the predictive model system, and decide if the request can be granted or not.

## Evaluation and Error Analysis:

The evaluation process of our chatbot consisted of the training of the agent through the test cases questions as shown in Table 2 above. During this process, several changes were applied according to the error produced. We also encountered some errors that we couldn't fix because they were caused by the data frame. A simple example of this instance is when our agent asks the customer for his/her name, we noticed that the dialogflow dataframe has already an inbuilt list of given and last names, as such, some names especially the non-english ones like Gayatri or some Asians and African names, caused the agent to go in to fallback, in other words, it throws our agent off.

### Agent/User interaction

Now that we successfully built our Question-answering system, we decided to play around with dialog flow and create a chatbot that can answer loan request. This could be considered as a loan



process preliminary, since the agent will collect the initial information from the customer and redirect it back to the “central”. The table below summaries the overview idea of the agent .

Chatbot Questions	User
Welcome	<ul style="list-style-type: none"> <li>• Hi</li> <li>• Hello</li> <li>• Hey there</li> <li>• Greetings</li> <li>• I greet you</li> </ul>
Hi, what’s name and How can I assist you today?	<ul style="list-style-type: none"> <li>• My name is John Smith and how do I get a loan</li> <li>• My name is John Smith, loan</li> <li>• Jean Baptist, loan</li> <li>• John smith I would like a loan</li> <li>• Yvgs Kiosk and I would like to apply for a loan</li> </ul>
Do you have an account with us?: <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	<ul style="list-style-type: none"> <li>• Yes I do</li> <li>• Yes I have several accounts</li> <li>• Of course I have an account</li> <li>• Yes</li> <li>• Yes, I have an account</li> <li>• I don’t think so</li> <li>• Unfortunately no</li> <li>• Not at all</li> <li>• Not yet</li> <li>• No</li> </ul>
<ul style="list-style-type: none"> <li>• If you don’t have an account with us, please open one</li> <li>• Awesome, please provide your client ID, starting with ID follow by the digit with digit</li> </ul>	<ul style="list-style-type: none"> <li>• How can I open an account</li> <li>• How?</li> <li>• How do I do that</li> <li>• What should I do</li> <li>• How do I open an account</li> <li>• This is my id ID3</li> <li>• My client ID is ID1</li> <li>• ID2</li> <li>• I don’t know</li> <li>• I can’t recall</li> <li>• I don’t have it</li> </ul>
<ul style="list-style-type: none"> <li>• You have to visit one of our branches</li> <li>• It’s alright, please what are your date of birth and phone number?</li> </ul>	<ul style="list-style-type: none"> <li>• Thank you</li> <li>• Alright cheers,</li> <li>• My date of birth is October 23, 1372, my phone number is 9278739223</li> <li>• 28-04-1737 and 8357493490 are my date of birth and phone number</li> <li>• Date of birth 27-09-3838 and phone number is 4376428902</li> </ul>

	<ul style="list-style-type: none"> <li>• 28-04-1737 and 8357493490</li> <li>• My Date of birth is 27-09-3838 and my phone number is 4376428902</li> </ul>
Thank you, what is the loan purpose?	<ul style="list-style-type: none"> <li>• Vacation</li> <li>• Start-up</li> <li>• Open my own business</li> <li>• Marriage</li> <li>• School fee</li> </ul>
Awesome, what is the loan Amount?	<ul style="list-style-type: none"> <li>• I think I need exactly \$977253</li> <li>• Can I have \$816372</li> <li>• I would like to borrow \$273562</li> <li>• I need \$165232</li> <li>• \$937463</li> </ul>
How long do you plan to Repay it for?	<ul style="list-style-type: none"> <li>• 5</li> <li>• 1 months</li> <li>• 15 months</li> <li>• I will be repaying in 27 months</li> <li>• I would like to repay it in 36 months</li> </ul>
How often do you want to make a payment? <ul style="list-style-type: none"> <li>• Bi-weekly</li> <li>• monthly</li> </ul>	<ul style="list-style-type: none"> <li>• bi-weekly</li> <li>• probably monthly</li> <li>• most likely bi weekly</li> <li>• monthly</li> <li>• biweekly</li> </ul>

Table 3 chatbot/user interaction

## Bibliography

Gruber, T. R., 1993. *Knowledge Acquisition*. Stanford, Elsevier, pp. 199-220.

Noy, N. F. & McGuinness, D. L., 2001. *Ontology Development 101: A Guide to Creating Your First Ontology*, Stanford Knowledge Systems Laboratory Technical Report: Stanford.

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