

# **Report FoundIt**

## LT2319 Dialogue Systems 2

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# I. Introduction

I created an application “FoundIt” which is dedicated to help users finding the best job opportunity worldwide according to their needs. Users can specify a domain in which they would like to work, a desired location and the type of contract they are looking to. It runs with TDM, Speechstate and Xstate/React. It uses Google Jobs Results API to send user’s queries.

My first idea was to send a query through different APIs (Indeed, Jooble, Monster, Careerjet ...) then the user would have been able to choose the best job opportunity among many choices. However, most of the APIs were either not up-to-date, very limited, too restrictive when free, or too long to process for TDM (response of the server too slow that causes TDMRuntimeException). In the end, Google Jobs Results API was a perfect compromise as it combines job searches from different websites.

## II. Data collection

In order to implement all the features that a user would need in this project, I used the dialogues that I have collected during the first assignment of Dialogue System 2. In the first dialogue a user asks the system to search for a job, in the second dialogue the system offers to provide a specific service to a user. Here is an sample of one of the distilled dialogue:

U: I would like to find a job.

S: Okay. In which field?

U: Half computer science and half linguistics.

S: Half computer science and half linguistics. In which city?

U: I don’t mind about the city or the country.

S: Okay. Which kind of contract would you like to apply for?

U: At least a short-term contract but a long-term contract would be better.

When I did the data collection assignment, I wanted the user to be able to answer as precisely as he may need. This is why in one of the dialogue the user answers very specifically. My analysis then revealed that it may be difficult to extract the useful information provided by the user, as processing the whole input in a query may be irrelevant. Also, I realized that I didn’t know how to repeat user’s last input, so I decided to not include understanding statements. Another point is that there is no salary range parameter in APIs so I removed this predicate.

### III. Implementation

I implemented 5 dynamical predicates domain, city, country, type of contract and extra information (which is optional). As I faced some issues regarding the dynamical type (see Errors in Annexes), I injected more data in the "training-data-eng.yml" file (respectively in question and answer parts).

When I started this project, I wanted to create an action "send CV" where the system would ask some questions (name, family name, email address ...), and ask to submit a file (supposedly a CV). Then when the user find an interesting job opportunity, he would have been able to ask the system to apply to it, and his application would be sent. Later, I decided that I didn't have the sufficient knowledge and documentation to build this, so I aborted this idea.

Finally, even if I would have preferred the user to be able to provide multiple or no location in his answer, I had to arrange the location input to something understandable by the API (which needs one and only one location).

### IV. Sample dialogues handled by the system

### V. Discussion

During my work, I faced many different issues that caused my project to be very unstable from one trial to another. First, the configuration of Rasa on Eduserv failed, more likely due to some libraries requirements missing. Therefore, I have been working on one of my classmate's account.

As I mentioned previously, I have got difficulties with the dynamical type which has not been reliably working. To counter this problem, I implemented more data both in my grammar file, and the "training-data-eng.yml" file. But it hasn't efficiently solved my situation (see Errors in Annexes).

One of the limits of TDM is that it can't handle more than three predicates in one sentence (see Errors in Annexes), thus the one-shot test is unsuitable for my project. Another limitation of TDM is its Runtime, which has been most of the time too short for my API to process its queries. It led me to a vast majority of Runtime error by TDM via Speechstate, even with only one result to display.

Also, I noticed that when I run interaction tests through TDM or Pipeline, there were great chances to obtain a false failed result. Sometimes it will throw "An unexpected exception has occurred" error with no apparent reason. When I ran a second time these tests without any modification in my code, none of them were failing. This situation mostly occurred after a change in my code : the first interaction test trial will fail (even if it shouldn't), the second will be perfect. I guess it has something to do with compiling the code, but I didn't went any further.

## VI. Future work

In a more detailed and future work, I would like to implement this “send CV” action, which is, in my opinion, part of the interest of this application. Also, I would like to display the URL link of the job search query.

Finally, it would be great to allow the user to specify more than one or zero location, and also to search jobs by country, domain, city or even by company name.

## VII. Annexes

### a. Dialogues

#### 1. Collected dialogues

##### Transcribed dialogue 1 :

U: Hi.  
S: Hi ! What can I do for you?  
U: I need a job.  
S: Okay. In which field?  
U: Computer.  
S: Computer. In which city?  
U: Sweden.  
S: Sweden. Which  
U: Sorry, I said country, I mean Gothenburg.  
S: Okay, no no it's fine  
U: Sorry, Gothenburg -laught-  
S: Gothenburg. Which kind of contract would you like to apply for?  
U: I prefer a long-term contract.  
S: Long-term contract. Which salary range fits you better? Between 15 000 till 30 000 or more than 30 000 kronas per month.  
U: The first one is better for me. -laughs-  
S: Okay! -laughs-  
U: Yeah, you have to think about this -laughs-  
S: Yeah...  
U: If someone says first one  
S: Yeah, true thanks! -laughs-  
S: Is there anything that you want to add?  
U: Yeah... I prefer to work em... online. -laughs-  
S: Okay. I'm looking for a long-term contract in Gothenburg in Computer. Online.  
U: Online. Yeah.  
S: I found 5 job opportunities. (and, I think I will stop there like I'm just giving...)  
U: Yeah you can say er... Yeah give it to ...  
S: Exactly  
U: Yeah you can say em... Which one you prefer to have?  
S: Oh, yeah  
U: Which one you want to choose or ...  
S: hm hm  
U: something like it.  
S: Okay

U: And then I can say that em... Developing em, developing software is fitting me, I like it  
 S: Okay  
 U: And you can say okay em...  
 S: I'm sending a em...  
 U: Yeah I'm sending your CV  
 S: Yeah, your CV  
 U: Yeah  
 S: Okay! Okay I will ...  
 U: You can say something like this  
 S; Yeah I will  
 U: And sending your CV? You want to send it to them  
 S: I will try to but  
 U: Yeah yeah yeah... Yeah it's good. I send  
 S: Or...  
 U: I send your CV to them  
 S: I'm sending your CV to and na na na  
 U: Oh! And and you know, also you can say that em... when when, when I em... when you em... When you are offering em just em 5 em jobs, you can say, because you you should have my CV at the first  
 S: Yes

**Note:**

- the user should be able to select a city but also a country
- the system has to manage answers referencing something, like "the first one"
- the system could ask user's CV

**Transcribed dialogue 2 :**

S: Hi, how can I help you?  
 U: I would like to find a job.  
 S: Okay. In which field?  
 U: Em... Half computer science and half linguistics.  
 S: Half computer science and half linguistics. In which city?  
 U: I don't mind about the city or the country.  
 S: ... -laughs-  
 U: You just say "okay" in this case -laughs-  
 S: ... -laughs-  
 U: Yeah, you you don't have to repeat every words so you can just say "okay"  
 S: Okay. Okay -laughs- em... Okay em... Which kind of contract would you like to apply for?  
 U: Em... At least a short-term contract but em... a long-term contract would be better.  
 S: Short time and long ... em short short-term and long-term okay... em... Which salary range fits you better? Below or more than 30 000 crowns per month?  
 U: Em... More.  
 S: ... -laughs- em... The first one? Okay sorry below okay  
 U: No! -laughs-  
 S: Yeah, more than 30 000 crowns okay! -laughs- Is there anything that you want to add?  
 U: Oh no, not really.  
 S: Okay I'm looking for em... em... a long-term and short-term contract? And em... and not specific country...  
 U: Thanks!  
 S: Okay... I found 100 jobs opportunities...  
 U: Wow!

S: Which one would you like to apply for?

U: None of them

S: Okay... I wouldn't send your CV bye

Note :

- if a user wants several topics, the system has to understand it
- if a user doesn't specify a country / city, it should be understood as "worldwide"
- the user should be able to ask for different contracts

## **2. Distilled dialogues**

### **Distillation dialogue 1 :**

U: Hi.

S: Hello! How can I help you?

U: I need a job.

S: Okay. In which field?

U: Computer.

S: Computer. In which city?

U: Gothenburg.

S: Gothenburg. Which kind of contract would you like to apply for?

U: I prefer a long-term contract.

S: Long-term contract. Which salary range fits you better? Below or more than 30 000 crowns per month?

U: The first one is better for me.

S: Below 30 000 crowns. Is there anything that you want to add?

U: I prefer to work online.

S: Okay. I'm looking for a long-term contract online in the field of Computer in Gothenburg.

S: I found 5 job opportunities. Which one would you like to apply for?

U: I want to apply to developing software.

S: Okay. I'm sending your CV.

### **Distillation dialogue 2 :**

S: Hi, how can I help you?

U: I would like to find a job.

S: Okay. In which field?

U: Half computer science and half linguistics.

S: Half computer science and half linguistics. In which city?

U: I don't mind about the city or the country.

S: Okay. Which kind of contract would you like to apply for?

U: At least a short-term contract but a long-term contract would be better.

S: Short-term and long-term contract. Which salary range fits you better? Below or more than 30 000 crowns per month?

U: More.

S: More than 30 000 crowns. Is there anything that you want to add?

U: No, not really.

S: Okay I'm looking for a long-term and short-term contract with no specific country in the following fields, computer science and linguistics.

U: Thanks!

S: Okay. I found 100 jobs opportunities.

S: Which one would you like to apply for?

U: None of them.

S: Okay.

### 3. Annotated dialogues

#### Annotated dialogue 1 :

U: <greet>Hi</greet>.  
S: <greet>Hello!</greet><ask:goal> How can I help you?</ask>  
U: <request: find-job>I need a job.</request>  
S: <icm:acc\*pos>Okay.</icm> <ask: field>In which field?</ask>  
U: <ans: field>Computer.</ans>  
S: <icm: sem\*pos>Computer.</icm> <ask: city>In which city?</ask>  
U: <ans: city>Gothenburg.</ans>  
S: <icm: sem\*pos>Gothenburg.</icm> <ask: contract>Which kind of contract would you like to apply for?</ask>  
U: <ans: contract>I prefer a long-term contract.</ans>  
S: <icm: sem\*pos>Long-term contract.</icm> <ask: salary>Which salary range fits you better? Below or more than 30 000 crowns per month?</ask>  
U: <ans: salary>The first one is better for me.</ans>  
S: <icm: und\*pos>Below 30 000 crowns.</icm> <ask: extra-information>Is there anything that you want to add?</ask>  
U: <ans: extra-information>I prefer to work online.</ans>  
S: <icm: acc\*pos>Okay.</icm> <confirm: search-job>I'm looking for a <icm: sem\*pos>long-term contract</icm> <icm: sem\*pos>online</icm> in the field of <icm: sem\*pos>Computer</icm> in <icm: sem\*pos>Gothenburg</icm>. </confirm>  
S: <ans: jobs-opportunities>I found 5 job opportunities.</ans> (The system lists jobs opportunities)  
S: <ask: apply>Which one would you like to apply for?</ask>  
U: <ans: apply>I want to apply to developing software.</ans>  
S: <icm: und\*pos>Okay.</icm> <confirm: send-CV>I'm sending your CV.</confirm>

#### Annotated dialogue 2 :

S: <greet>Hi</greet>, <ask:goal>how can I help you?</ask>  
U: <request: find-job>I would like to find a job.</request>  
S: <icm:acc\*pos>Okay.</icm> <ask: field>In which field?</ask>  
U: <ans: field>Half computer science and half linguistics.</ans>  
S: <icm: sem\*pos>Half computer science and half linguistics.</icm> <ask: city>In which city?</ask>  
U: <ans: city>I don't mind about the city or the country.</ans>  
S: <icm: acc\*pos>Okay.</icm> <ask: contract>Which kind of contract would you like to apply for?</ask>  
U: <ans: contract>At least a short-term contract but a long-term contract would be better.</ans>  
S: <icm: sem\*pos>Short-term and long-term contract.</icm> <ask: salary>Which salary range fits you better? Below or more than 30 000 crowns per month?</ask>  
U: <ans: salary>More.</ans>  
S: <icm: und\*pos>More than 30 000 crowns.</icm> <ask: extra-information>Is there anything that you want to add?</ask>  
U: <ans: extra-information>No, not really.</ans>  
S: <icm: acc\*pos>Okay.</icm> <confirm: search-job>I'm looking for a <icm: sem\*pos>long-term or short-term contract</icm> <icm: und\*pos>with no specific country</icm> in the following fields, <icm: sem\*pos>computer science and linguistics.</icm></confirm>

U: <thank>Thanks!</thank>

S: <ans: job-opportunities>I found 100 jobs opportunities.</ans> (The system lists jobs opportunities)

S: <ask: apply>Which one would you like to apply for?</ask>

U: <ans: apply>None of them.</ans>

S: <icm: acc\*pos>Okay.</icm>

## b. Errors

Test file ran twice with pipeline with no code modification in between, 10 seconds apart:

```
berenice@berenice:~/Documents/current courses/Dialogue System/Project/FoundIt/FoundIt/ddds/FoundIt$ kubectl exec -n gu
sakhka -it deploy/tdm -- tala test http://pipeline/interact /okteto/FoundIt/test/interaction_tests_eng.txt
Defaulted container "tdm" out of: tdm, ddds (init), tdm-build (init), okteto-bin (init)
Connecting to http://pipeline/interact...done.
Running interaction tests from /okteto/FoundIt/test/interaction_tests_eng.txt
.F.FF
=====
Failure in test 'job seeker (incremental)'
-----
On line 14 of /okteto/FoundIt/test/interaction_tests_eng.txt,
encountered an error:
  An unexpected exception has occurred.
=====
Failure in test 'job seeker (one-shot)'
-----
On line 28 of /okteto/FoundIt/test/interaction_tests_eng.txt,
encountered an error:
  An unexpected exception has occurred.
=====
Failure in test 'extra info (one-shot)'
-----
On line 41 of /okteto/FoundIt/test/interaction_tests_eng.txt,
encountered an error:
  An unexpected exception has occurred.
-----
Ran 5 tests in 15.498s

FAILED (failures=3)
command terminated with exit code 255
berenice@berenice:~/Documents/current courses/Dialogue System/Project/FoundIt/FoundIt/ddds/FoundIt$ kubectl exec -n gu
sakhka -it deploy/tdm -- tala test http://pipeline/interact /okteto/FoundIt/test/interaction_tests_eng.txt
Defaulted container "tdm" out of: tdm, ddds (init), tdm-build (init), okteto-bin (init)
Connecting to http://pipeline/interact...done.
Running interaction tests from /okteto/FoundIt/test/interaction_tests_eng.txt
.....
-----
Ran 5 tests in 9.116s

OK
```



TDM can't handle more predicates:

```
berenice@berenice: ~/Documents/current courses/Dialogue System/Project/FoundIt/ddds/FoundIt
File Edit View Search Terminal Tabs Help

guslegbe@GU.GU.SE@edu... * berenice@berenice: ~/Docu... * berenice@berenice: ~/Docu... * berenice@berenice: ~/Docu... *
root@tdm-5d9cc78686-2d1cn:/okteto# tdm build; tdm serve eng --log-to-stdout --log-level INFO
Generating models for DDD 'FoundIt'.
[eng] Cleaning build directory 'build/eng'...Done.
[eng] Generating grammar.
Missing grammar entry: How do speakers talk about the action how? Specify the utterance:

    <action name="how">how</action>

Alternatively, you can specify several possible utterances in a list:

    <action name="how">
      <one-of>
        <item>how one way</item>
        <item>how another way</item>
        <item>how <slot type="individual" predicate="city"/></item>
      </one-of>
    </action>

[eng] Finished generating grammar.
Finished generating models for DDD 'FoundIt'.
Training models for DDD 'FoundIt'.
[eng] Asserting that language grammar is lower case...Done.
[eng] Compiling generated grammar.
begin GF error output:
FoundIt sem.gf:
  FoundIt_sem.gf:115:
    Happened in linearization of job_seeker_user_question_4
    no overload instance of ask_whq
    for
      Predicate {s : Str} {s : Str} {s : Str} {s : Str}
    among
      {s : Str}
      {s : Str} {s : Str}
      {s : Str} {s : Str} {s : Str}
      {s : Str} {s : Str} {s : Str} {s : Str}
    with value type {s : Str}

end GF error output
[eng] Finished compiling generated grammar.
[eng] No ASR specified, will not build language model.
[eng] Copying ASR language modules from '/okteto/FoundIt/grammar/build/eng' to ddd directory...Done.
[eng] Not using word list correction, will not generate word list.
Traceback (most recent call last):
  File "/usr/local/lib/python3.9/site-packages/tdm/nlu/gf/gf_grammar.py", line 86, in _load_pgf
    return pgf.readPGF(filename)
FileNotFoundError: [Errno 2] No such file or directory: 'grammar/build/eng/FoundIt_sem.pgf'

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "/usr/local/bin/tdm", line 8, in <module>
    sys.exit(main())
  File "/usr/local/lib/python3.9/site-packages/tdm/cli/console_script.py", line 203, in main
    parsed_args.func(parsed_args)
```

```

berenice@berenice: ~/Documents/current courses/Dialogue System/Project/FoundIt/ddd/FoundIt
File Edit View Search Terminal Tabs Help

guslegbe@GU.GU.SE@edu... x berenice@berenice: ~/Docu... x berenice@berenice: ~/Docu... x berenice@berenice: ~/Docu... x [?]

[eng] Asserting that language grammar is lower case...Done.
[eng] Compiling generated grammar.
begin GF error output:
FoundIt_sem.gf:
FoundIt_sem.gf:115:
  Happened in linearization of job_seeker_user_question_4
  no overload instance of ask_whq
  for
    Predicate {s : Str} {s : Str} {s : Str} {s : Str}
  among
    {s : Str}
    {s : Str} {s : Str}
    {s : Str} {s : Str} {s : Str}
    {s : Str} {s : Str} {s : Str} {s : Str}
  with value type {s : Str}

end GF error output
[eng] Finished compiling generated grammar.
[eng] No ASR specified, will not build language model.
[eng] Copying ASR language modules from '/okteto/FoundIt/grammar/build/eng' to ddd directory...Done.
[eng] Not using word list correction, will not generate word list.
Traceback (most recent call last):
  File "/usr/local/lib/python3.9/site-packages/tdm/nlu/gf/gf_grammar.py", line 86, in _load_pgf
    return pgf.readPGF(filename)
FileNotFoundError: [Errno 2] No such file or directory: 'grammar/build/eng/FoundIt_sem.pgf'

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "/usr/local/bin/tdm", line 8, in <module>
    sys.exit(main())
  File "/usr/local/lib/python3.9/site-packages/tdm/cli/console_script.py", line 203, in main
    parsed_args.func(parsed_args)
  File "/usr/local/lib/python3.9/site-packages/tdm/cli/console_script.py", line 100, in serve
    backend_dependencies = BackendDependenciesForRunning(args, logger)
  File "/usr/local/lib/python3.9/site-packages/tdm/backend/dependencies/for_running.py", line 25, in __init__
    self.ddd = self.load_ddd(self._raw_config["ddd"])
  File "/usr/local/lib/python3.9/site-packages/tdm/backend/dependencies/for_running.py", line 72, in load_ddd
    ddds = component_set_loader.ddd_as_list(
  File "/usr/local/lib/python3.9/site-packages/tdm/ddd/loading/component_set_loader.py", line 13, in ddds_as_list
    ddds dict = self.load_ddd(ddds, *args, **kwargs)
  File "/usr/local/lib/python3.9/site-packages/tdm/ddd/loading/component_set_loader.py", line 24, in _load_ddd
    ddds[ddd_name] = self.load_ddd(ddd_name, config, *args, **kwargs)
  File "/usr/local/lib/python3.9/site-packages/tdm/ddd/loading/component_set_loader.py", line 35, in _load_ddd
    return ddd_loader.load()
  File "/usr/local/lib/python3.9/site-packages/tdm/ddd/loading/component_loader.py", line 47, in load
    gf_grammars[language_code] = self.load_gf_grammar(self.ddd.ontology, language_code, entity_db)
  File "/usr/local/lib/python3.9/site-packages/tdm/ddd/loading/component_loader.py", line 34, in _load_gf_grammar
    return GfGrammarForDynamicEntities(self.ddd.name, ontology, language_code, entity_db)
  File "/usr/local/lib/python3.9/site-packages/tdm/nlu/gf/gf_grammar.py", line 232, in __init__
    super(GfGrammarForDynamicEntities, self).__init__(ddd.name, language, entity_db)
  File "/usr/local/lib/python3.9/site-packages/tdm/nlu/gf/gf_grammar.py", line 62, in __init__
    self._sem_grammar_wrapper = self.load_pgf(self.semantic_grammar_path)
  File "/usr/local/lib/python3.9/site-packages/tdm/nlu/gf/gf_grammar.py", line 88, in _load_pgf
    raise GrammarNotFoundException(f"failed to read PGF file {filename!r}")
tdm.nlu.gf.gf_grammar.GrammarNotFoundException: failed to read PGF file 'grammar/build/eng/FoundIt sem.pgf'

```

## Unhandled rejection Azure:

1 of 2 errors on the page

Unhandled Rejection (Error): web-speech-cognitive-services: Failed to syntheis speech. server returned 403

Inspector Console Debugger Network Style Editor Performance Memory Storage Accessibility Application

Filter Output

S> What kind of contract would you prefer?  
U> Full time. 0.6529411  
S> Found It!.. Here is the best job opportunity for you. Best job opportunity: Software Developer II for S&P Global in New York, NY, 4 hours ago, Full-time, No degree mentioned. You can find th

XHR POST https://northeurope.tts.speech.microsoft.com/cognitiveservices/v1

Uncaught (in promise) Error: web-speech-cognitive-services: Failed to syntheis speech, server returned 403

callee\$ fetchSpeechData.js:11  
Babel 12  
preLoad SpeechSynthesisUtterance.js:164  
speak createSpeechSynthesisPonyfill.js:87  
<anonymous> index.tsx:290  
effectExec useMachine.js:34  
executeEffect useReactEffectActions.js:33  
useReactEffectActions useReactEffectActions.js:69  
React 5  
unstable\_runWithPriority scheduler.development.js:468  
React 3  
workLoop scheduler.development.js:417  
flushWork scheduler.development.js:390  
performWorkUntilDeadline scheduler.development.js:157  
js scheduler.development.js:180  
js scheduler.development.js:645  
Webpack 21

Uncaught (in promise) Error: synthesis-failed

callee\$ fetchSpeechData.js:11  
Babel 12  
preLoad SpeechSynthesisUtterance.js:164  
speak createSpeechSynthesisPonyfill.js:87  
<anonymous> index.tsx:290  
effectExec useMachine.js:34  
executeEffect useReactEffectActions.js:33  
useReactEffectActions useReactEffectActions.js:69  
React 5  
unstable\_runWithPriority scheduler.development.js:468  
React 3  
workLoop scheduler.development.js:417  
flushWork scheduler.development.js:390  
performWorkUntilDeadline scheduler.development.js:157  
js scheduler.development.js:180  
js scheduler.development.js:645  
Webpack 21

Behavior pipeline interact:

In this example all inputs are unknown from the system (except “I want to find a job”). But some values act as dynamical values while some aren’t. Also, the system should ask “In which country ?” but this question never comes. (Right now, some of these inputs may have been encoded in the grammar file, but it is still possible to test with other unknown values.)

```
berenice@berenice:~/Documents/current courses/Dialogue System/Project/FoundIt/FoundIt/ddds/FoundIt$ kubectl exec -n gu
sakhka -it deploy/tdm -- tala interact http://pipeline/interact
Defaulted container "tdm" out of: tdm, ddds (init), tdm-build (init), okteto-bin (init)
S> What would you like to do?
U> I want to find a job
S> Which field?
U> developer
S> Which field?
U> programmer
S> I heard you say programmer. I don't understand. So, Which field?
U> translator
S> Which field?
U> data
S> I heard you say data. I don't understand. So, Which field?
U> IT
S> I heard you say IT. I don't understand. So, Which field?
U> science
S> Which city?
U>
S> So, Which city?
U> Göteborg
S> I heard you say Göteborg. I don't understand. So, Which city?
U> Goteborg
S> I heard you say Goteborg. I don't understand. So, Which city?
U> Malmö
S> Which contract?
U>
S> So, Which contract?
U> mid time
S> Found It! Here are the best job opportunities I found for you. There is no result for this query. Try with other pa
rameters..
U>
S> Returning to main menu. What would you like to do?
U>
berenice@berenice:~/Documents/current courses/Dialogue System/Project/FoundIt/FoundIt/ddds/FoundIt$
```