NPFL123 Dialogue Systems

9. Dialog Authoring Tools

https://ufal.cznpfl123

Ondřej Dušek, Vojtěch Hudeček & Jan Cuřín

11. 4. 2022
Short Intro of Jan Cuřín

Education
• IFAL, MFF UK – PhD in 2006 (Statistical Machine Translation)

Work Experience
• The MAMA AI – 2021 - Co-Founder
  • Natural Language Processing, Conversational Agents, AI
• IBM – 2004-2021 – Research Scientist, Manager at IBM Watson R&D Lab
  • Conversational Systems, NLU Technologies, AI
• IFAL, MFF UK – 2002-2004 – Researcher, PhD Student
  • Machine Translation, NLU Technologies
• Schemantix – 2000-2001 – Software Engineer
  • Machine Translation, XML Technologies

IBM Watson Services
• Watson Assistant
• Watson Speech (STT/TTS)
• Watson Language Translator
Business Use Of Dialogue Systems

• Chat bots on web pages
  • Navigation through the content of the web pages (smart search)
  • Frequently asked question (FAQ)

• Mobile applications with open text input
  • Domain specific apps with chatting functionality, banking apps
  • Intra company systems

• Assisting systems
  • Intra company “expert” system
  • Support for human operators

• Speech based systems
  • Call center automation – handling top x% of traffic
  • Outbound calls (to inform or collect feedback)

• Automotive applications
  • Search, calls, navigation, infotainment/entertainment (music, POIs)

• Infotainment systems
  • Infotainment systems for hotels, banks’ lobbies, home, etc …
Challenges of Creating Good DS

• Data
  • Use of existing of human-to-human logs
  • Use of intracompany structured and unstructured data
  • No data, just ideas
  • No idea at all

• Scenarios, use-cases
  • Single domain
  • Single domain with chit-chat capability
  • Multi-domain

• Multimodality, omnichannel
Authoring tools

- IBM Watson Assistant
  - [https://www.ibm.com/cloud/watson-assistant/](https://www.ibm.com/cloud/watson-assistant/)

- Google Dialog Flow
  - [https://dialogflow.com/](https://dialogflow.com/)
  - Video tutorials: [https://cloud.google.com/dialogflow/docs/video](https://cloud.google.com/dialogflow/docs/video)

- Amazon Alexa Skills

- Microsoft Cortana Skills

- Apple SiriKit (Siri-enabled iOS apps)
Gartner Magic Quadrant for Enterprise Conversational AI Platforms 2022

- Evaluation of conversational AI platforms in 2022 (Nov 21)
- IBM is historically performing well, still the best in the Completeness of vision

Source: article in **CXToday**
Restaurant booking scenario

• System: Hello, this is Chez Pépé restaurant reservation system. How may I help you?
• User: I would like to reserve a table for tomorrow for 5 people
• System: From what time?
• User: From 7pm
• System: OK, I will make a reservation for tomorrow at 7pm, table for 5.
• User: Great!
• System: Looking forward to see you soon.
Authoring a Dialogues

Restaurant booking scenario

**Intents**

#reserve_table
- I would like to reserve a table for 5 people.
- Can I make a reservation for tomorrow?

#opening_hours
- Until when are you open?
- What are the opening hours?

#cancel_reservation
- I made my reservation yesterday, I want to cancel it.
- We could not make it today, may I cancel the reservation?

**Entities**

- I need reservation for 5 people for tomorrow at 7pm.
- Next Friday from 6pm.
- For two.
- @date
- @time
- @number
- @restaurant_location

**Dialogue**

Welcome
Book a table

<table>
<thead>
<tr>
<th>Entity</th>
<th>Context variable</th>
<th>Req.</th>
</tr>
</thead>
<tbody>
<tr>
<td>@date</td>
<td>$res_date</td>
<td>Y</td>
</tr>
<tr>
<td>@time</td>
<td>$res_time</td>
<td>Y</td>
</tr>
<tr>
<td>@number</td>
<td>$guests</td>
<td>Y</td>
</tr>
</tbody>
</table>

Opening hours
Cancel reservation
- Yes
- No
<default answer>
• Collection of example how users will trigger the intent
• Usually corresponds to the actions supported by the dialog

• Intent model can be trained even on a small set of examples
• Word and sentence embeddings, stemmer, lemmatizer
• Bigger data collection needed for production system

• Ordered n-best lists with confidences
• Use of intent n-bests in the dialog – disambiguation

Intents

#reserve_table
I would like to reserve a table for 5
Can I make a reservation?
I need a reservation for tomorrow

#opening_hours
Until when are you open?
What are the opening hours?

#cancel_reservation
I made my reservation yesterday,
I want to cancel it.
We could not make it today,
may I cancel the reservation?
~ Named entities recognition (NER)

• Different type of entities
  • Prebuilt (system) entities
    • Numbers, dates, time, GEO location, person names, units, currency
  • Domain catalogues
  • User defined entities
    • Gazetteers – fixed list of entities/synonyms
    • Regular expression based
    • Sequence labelling model based on sample annotations (contextual entities)
Dialogue Flow/Tree

• Slot filling style (linear dialog)
  • Set of slots to fill is (required/optional)
  • Able to fill all slots partially or at once
  • Asking just for missing information
  • Ability to customize questions and answer for a particular slot
  • Ability to correct already filled information
  • Tight to user variables

• Dialogues tree (non-linear dialog)
  • Dialogue flow driven by a tree or graph structure
  • Conditions to get to the individual nodes of the tree/graph
  • Fallback strategies (none of the conditions is specified)
Practical Example

• Sample chatbot in Watson Assistant

Restaurant booking scenario

http://www.bienvenuechezpepe.com/
Features used in runtime

- Dialogue context / history
  - Condition on context variables collected in previous turns
  - Reference/anaphora resolution using collected variables

- Fallback strategies / Digression
  - Allow "jumping" to different topic for a while and then return back

- Disambiguation support
  - Similar confidence of multiple choices – ask user to select

- Calling external APIs
  - Webhooks/Cloud functions ...
Deployment and Usage

• Authoring tools usually go with an integration support
  • WebWidget - chatting console
  • Slack
  • Facebook
  • Intercom (voice) …

• APIs
  • To include it in customer apps, integration to other solutions
  • Using sessions or conversation ids to track context/history
  • REST API with JSON request/response

• Watson SDK
  • Python, Java, Node.js, .NET
  • https://github.com/watson-developer-cloud
Maintaining and improving chatbot in production

• Automatically
  • Learning from user selections
  • Statistics on user selections – automated "pre-selection" for next users

• Semi-automatically or manually
  • Chat log analysis
  • Used Measures:
    • **Coverage** ... rate at which your chatbot is confident that it can address the user’s request (per dialogue turn)
    • **Containment** ... rate at which your chatbot can satisfy a user’s request without human intervention, i.e. connect to human agent not requested (per conversation)

• Content updates
  • To increase the measures above
  • To cover new topics, entities, situations
Chat log analysis - IBM Watson Assistant example

- Python notebook provided to analyze chat log data
  - Covered – check the most frequent
  - Not Covered – extend the coverage
- Visualization of the statistics
  - Number of conversations
  - Conversation length (in turns) stats
  - Coverage and containment history
  - Most frequent intents and entities recognized
  - Low confident intents
  - ...

Source: Measure Watson Assistant Performance Python notebook

20+ Metrics for Chatbot Analytics in 2021 by AI Multiple: https://research.aimultiple.com/chatbot-analytics/
Authoring tools for outbound calls by Mama AI/Telma AI

• Mama Telma AI tooling for outbound calls
  • Easy of use
  • Modularization
    • Yes/No
    • Rating
    • Open question
  • Language support
  • SMS integration

Examples: [https://telma.ai/products/outbound](https://telma.ai/products/outbound)

• Inbound call
  • Python implementation
  • Modules
    • (longer) Number dictation
    • Address dictation (RÚIAN)
  • Guess animal game on Alexa (see [youtube](https://youtube.com))

Examples: [https://telma.ai/products/inbound](https://telma.ai/products/inbound)
Thank you for your attention.

Jan Cuřín <jan.curin@themama.ai>

https://themama.ai
https://telma.ai