

PRUDENT* - A Generic Dialog Agent for Information Retrieval That Can Flexibly Mix Automated Planning and Reinforcement Learning

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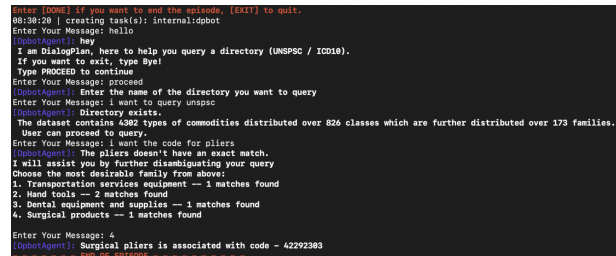
Abstract

With easy availability of large data sets online, like product catalogs and open data, a common business problem is to allow users to search them for information. However, this information is inaccessible to a lot of people as they are unaware of query languages used for searching through data. In this demonstration, we present PRUDENT - where we harness the power of dialog systems to help the user search for information using natural language. PRUDENT makes use of a planner to adapt to the content structure of the data source and retrieve results, thereby, making the dialog agent generic. However, PDDL based planning needs models and one would want to learn plans over time. Hence, RL based plan generation is also desirable. We show a system which can do this and demonstrate the viability of our approach on large data sets of UNSPSC and ICD-10. The demo video is available at <https://youtu.be/X217eW6dyBc>.

Introduction

The widespread availability of data online leads to the importance of gleaning information more than ever. The common methods for information retrieval are by using either specialized languages like Structured Query Language (SQL) or the tedious process of sifting and sieving through the huge corpus of data - which are neither effective nor accessible to diverse users and data sources. We seek to make data accessible to users using the natural interface of dialogs.

Information retrieval using dialog systems is analyzed in-depth in (Radlinski and Craswell 2017). The recent trend in research is to train the dialog system from end-to-end, allowing error signal from the end output (system) utterance to be back-propagated to raw (user) input, so that the whole dialog can be jointly optimized. However, major caveats with these systems are that (a) they need large corpus of training data, and (b) once trained and deployed, they do not offer an ability to control the flow of conversation which is desirable in high-stakes domains like health and law. This has lead to renewed interest in inference-based methods to control system behavior (Cohen 2019). In this demonstration, we present PRUDENT - a generic dialog system that is capable



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enter [DONE] if you want to end the episode, [EXIT] to quit.
[38]3829 | creating task(s): internal:opbot
Enter Your Message: hello
[38]3829 | hey
I am DialogPlan, here to help you query a directory (UNSPSC / ICD10).
If you want to exit, type Bye!
Type PROCEED to continue
Enter Your Message: proceed
[38]3829 | Enter the name of the directory you want to query
Enter Your Message: i want to query unspsc
[38]3829 | Directory exists.
The dataset contains 4382 types of commodities distributed over 826 classes which are further distributed over 173 families.
User can proceed to query.
Enter Your Message: i want the code for pliers
[38]3829 | The pliers doesn't have an exact match.
I will assist you by further disambiguating your query
Choose the most desirable family from above:
1. Transportation services equipment -- 1 matches found
2. Hand tools -- 2 matches found
3. Dental equipment and supplies -- 1 matches found
4. Surgical products -- 1 matches found
Enter Your Message: 4
[38]3829 | Surgical pliers is associated with code - 42292303
```

Figure 1: Information lookup on UNSPSC with term - *code for pliers*.

of retrieving information from data sources. The dialog system is built using a reinforcement learning (RL)-based platform, ParlAI (Miller et al. 2018) integrated with automated planning. RL is used to automate the selection of appropriate data source based on the user’s query. Once the source is selected, the planner helps in adapting to the content structure of the data source and retrieve results satisfying the user’s query.

The system is able to navigate the ambiguity of request, the complexity of content (size, hierarchy, schema) and usage considerations (response time, dialog length) to create a series of conversation leading to the system providing user the appropriate information. One of the highlights of the approach is that the system is general with respect to data sources. The user can start the conversation with no data source and select them one by one, and the system can answer queries across them seamlessly. We give a brief description of the approach here; more details about the system approach, data sources mentioned and preliminary experiments can be found in (Pallagani and Srivastava 2021).

Demonstration

We demonstrate the generality of PRUDENT using two large datasets: UNSPSC and ICD-10. United Nations Standard Products and Services Code (UNSPSC¹), is “*is an open, global, multi-sector standard for efficient, accurate classification of products and services*”. It has 4,302 items arranged into class, family, segment and commodity (lowest level). A query on *pliers* may refer to 28 different

*Planning and RL Used for Dialog management
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¹<https://www.unspsc.org/>

