RESTAURANT GENIE

GROUP 19

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Restaurant GENIE

- Restaurant GENIE is an interface that assists the users to choose restaurants based on their preferences.
- It follows the complete spoken dialog architecture which includes the following components:
  - Speech Recognition
  - Natural Language Understanding
  - Dialog Manager
  - Natural Language Generation
  - Speech Synthesis
- The preferences are based on the attributes:
  - Cuisine
  - Price
  - Rating
  - Location (Current Location – Latitude/Longitude)
- Used Factual API for querying information related to restaurants.

System Architecture

I'd like to have Italian Food

Speech Recognizer

Natural Language Understanding

provide-info (cuisine=Italian)

User

Dialog Manager

Speech Synthesizer

Natural Language Generation

provide-info (cuisine=Italian, num=8)

I found eight Italian restaurants

Speech Recognition & Generation

- Created the language model using the **CMU language modelling** toolkit.
- Used the language model and inbuilt acoustic model to understand the user input.
- Passed the recognized user query to NLU.
- Evaluated the speech recognizer using **Word-Error Rate** i.e. actual user input and query understood by speech recognizer.
- The following are the tools that we used:
  - CMU Sphinx

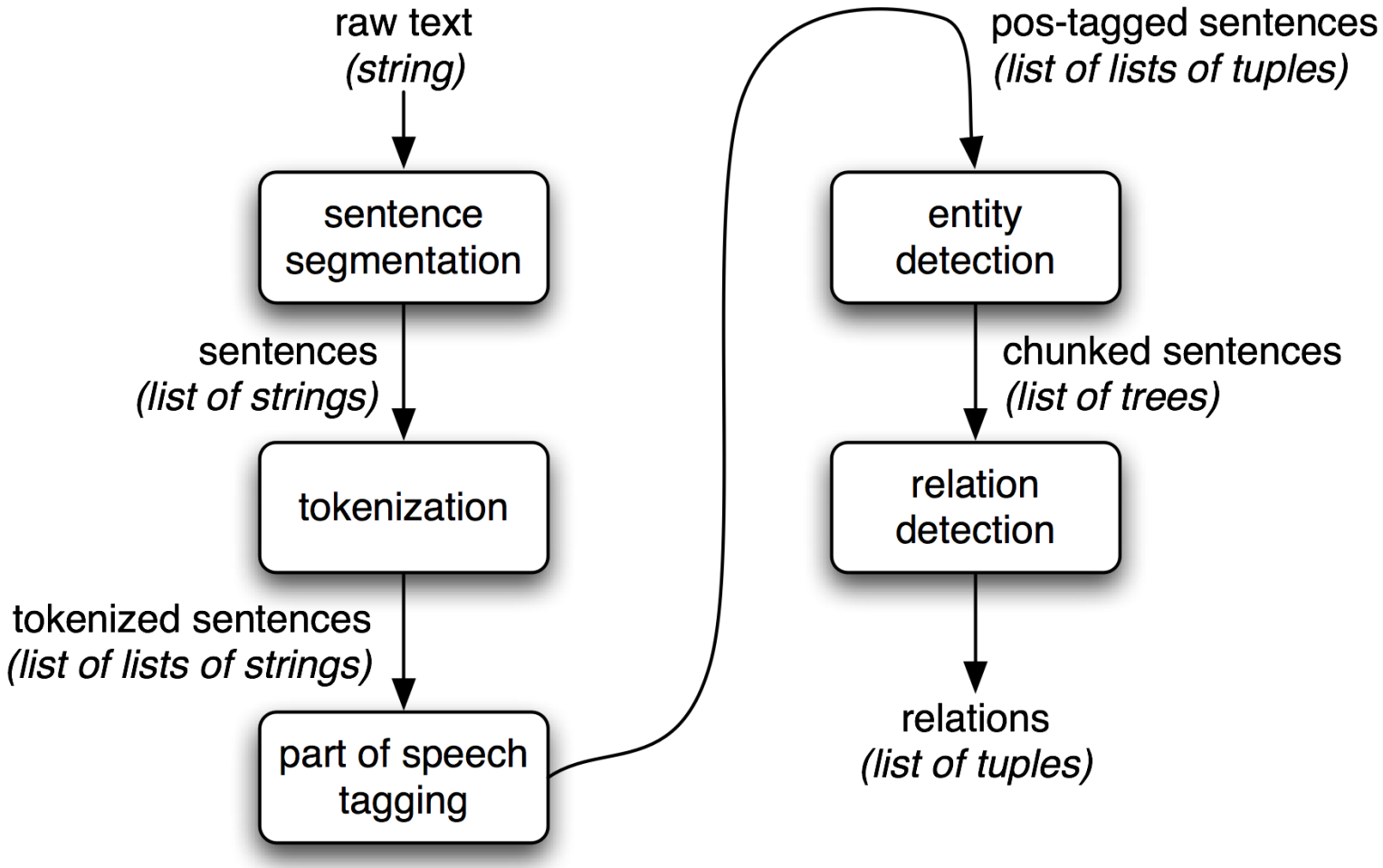
    http://cmusphinx.sourceforge.net/
  - CMU language modelling toolkit

    http://www.speech.cs.cmu.edu/tools/lmtool.html
  - Python Speech Recognition

    https://pypi.python.org/pypi/SpeechRecognition/2.1.3
  - PyAudio

    https://pypi.python.org/pypi/PyAudio

Natural Language Understanding



Natural Language Understanding Contd.

- The main task of the NLU component is to identify the **Noun Phrases (NP)** and map them to a model (keywords with its corresponding synonyms)
- We have used **NLTK** to carry out the part-of-speech tagging and to extract the Noun-Phrases.
- **Named Entity Recognition** is carried out by extracting these Noun Phrases and mapping them to the keywords.

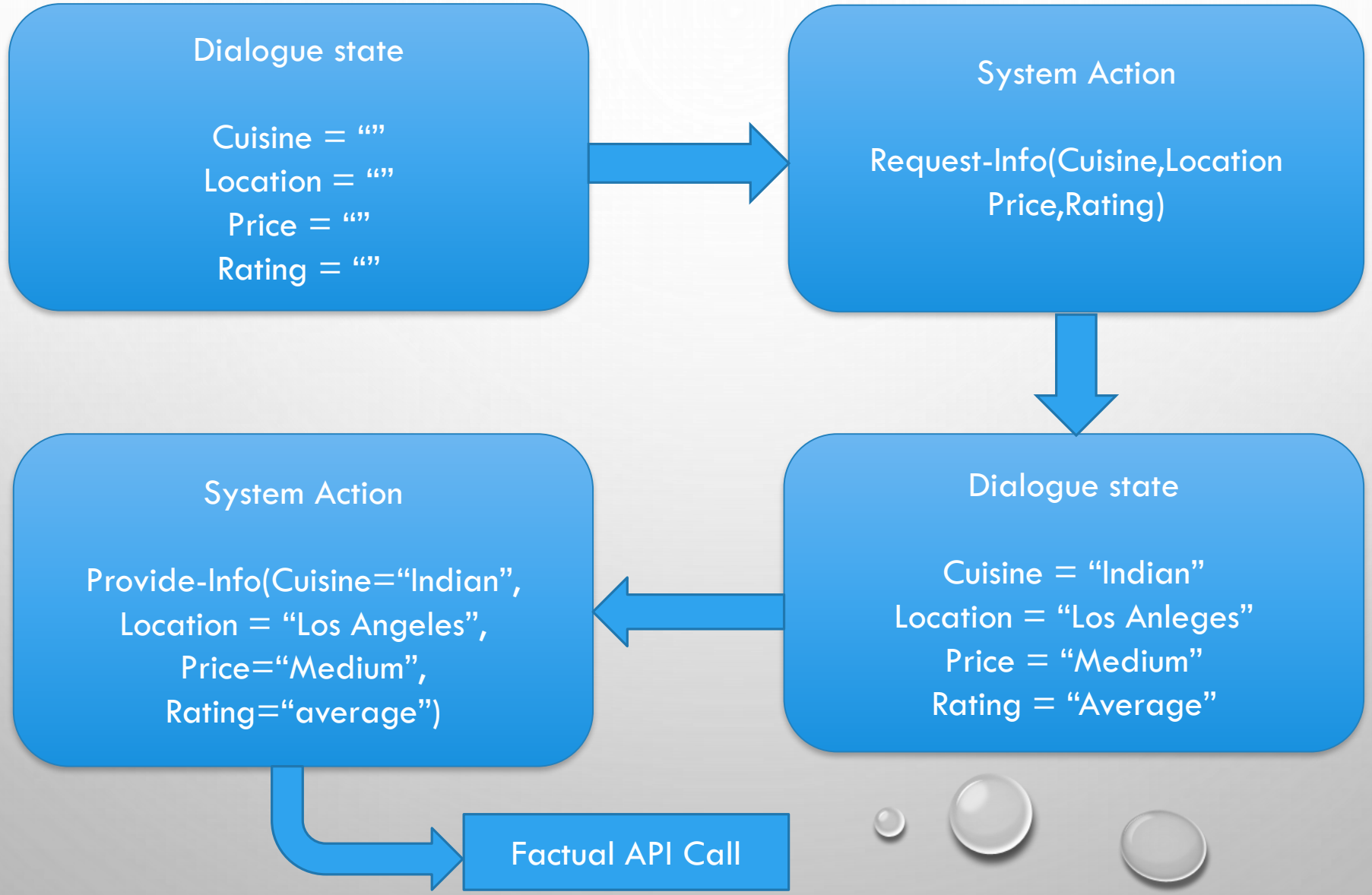
- The Natural Language Understanding component will be evaluated separately based on the **Precision**, **Recall** and **F-Score**. (Comparing the dialog with the annotations generated)

Dialog Manager

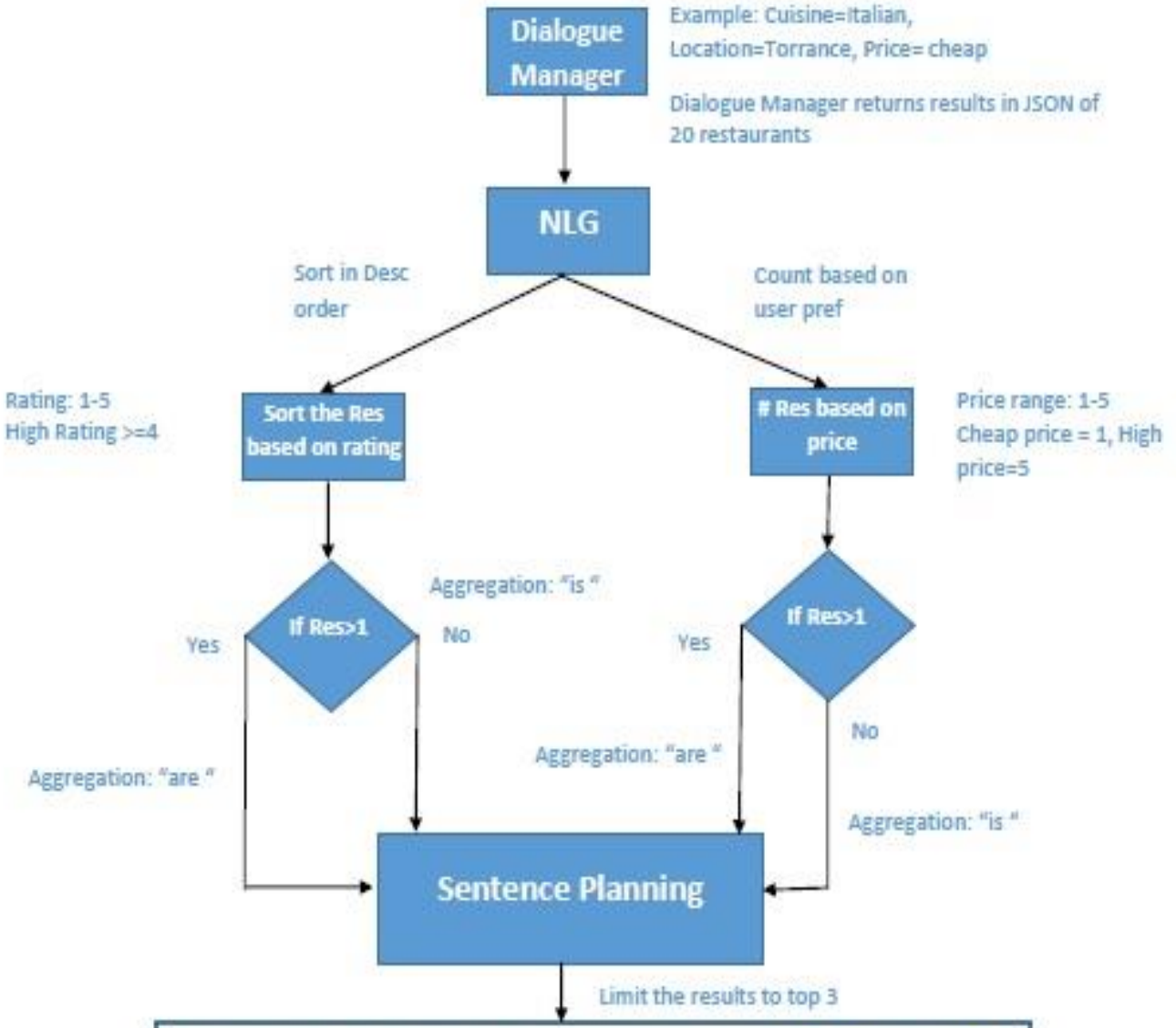
The following are the functions of a Dialog Manager in this project:

- Slot filling based approach.
- Takes input from NLU Component and outputs dialog act for NLG Component.
- Keeps track of dialogue and stores information in dialogue state.
- Queries the user to fill the required parameter.
- Once all the parameter is received from the user, the query is sent to factual API in real time.
- The result from the API is sent to the NLG to generate the response to the user.

Dialog Manager Contd.



NLG – Decision Tree with summary and refined output



Evaluation

- The following 2 components were evaluated individually:
  - **Speech Recognition – Word-Error Rate**
  - **Natural Language Understanding – Precision, Recall and F-Score**
- The overall system performance is measured using **Precision**, **Recall** and **F-Score**.
- The overall accuracy of the system will be measured by user surveys.

Speech Recognition (Word-Error Rate)	**97.30%**

Component	Precision (%)	Recall (%)	F-Score (%)
NLU	94.40	96.30	95.34
Overall	93.20	94.45	93.82


Thank you!