COMPARISON OF NLU/NLP PLATFORMS

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Abstract- Today chat bots, conversational assistants and interfaces have become a part of our daily lives. Most businesses are moving towards conversational interfaces to connect and understand their customers more efficiently without the human labor. The ability of a machine to understand natural languages (text, voice) is known as the NATURAL LANGUAGE UNDERSTANDING. In the past only experts were able to build these machines but nowadays the modern toolkits and platforms provide the services to build conversational interfaces with or without the programming knowledge which is the one of the many causes of their present-day popularity.
This paper discusses the comparison of various researches (the descriptive analysis and evaluation done in these papers) to compare and evaluate the best online NLU platform. There can be confusion with respect to current best cloud NLU services because research was done past years and they are improving day by day. The main goal is to reevaluate those papers and systems so we can bring the best NLU platform of 2020 to light**.**

Index Terms- Natural Language Understanding, NLU services, cloud NLU Platform, Comparison

I. INTRODUCTION

From the past humans have been dreaming and working to make computer talk and understand them for this conversational Ai, chat bots and computational linguistics are born. Today lots of businesses and companies have made their own conversational AI and bots its possible due to advancement in machine learning we now have assistants in our pockets that understand us and make things done for us. They include google assistant by google, Cortana by Microsoft, Siri by apple, and Alexa by amazon. Behind all of their capabilities to understand human language is NLU. It handles the understanding part of the machine. Previously only experts were able to develop such a system and there was a lack of computational power and hardware also but now thanks to the tech giants building of NLU applications are easier than ever. You don't need any special hardware, you don't need expertise and years of learning to make such systems. Tech giants like Google make available to the public their NLU services and one can build applications without programming knowledge. But lots of companies are providing these services and questions arise which one is the best and most suitable. There have been different research and articles on this discussion previously. The goal of our paper is to reevaluate and compare these researches and come to conclusion but as these technologies are updating very fast in days so the result of previous researches may prove wrong So get a proper conclusion we will compare those with our results

II. LITERATURE REVIEW

In Wit.ai vs Api.ai (Google vs Facebook) only dialogue flow and wit was compared for pizza system

In Evaluating NLU services of question answering System 2017 Paper the researchers compare online cloud NLU services using three different data sets but they only cover evaluation with no other parameters.

In A comparison and critique of Natural language understanding tools the researchers not only take other parameters of cloud services but also evaluate each service using single intent.

But as you see some only took parameter base comparison some totally evaluation base but the third took both but you they this it for only single intent and this all paper s are written I previous years in this paper we will not only compare those paper but also compare the latest technologies and evaluate results by taking under both parameters and performance

III. NLU , terminologies and NLU Platforms

Natural language understanding as the name suggests is used to extract meaning from the human input. Below Are few terminologies Related to NLU

A. NLU Terminologies

Utterance
Any Natural language input by the user or you can say sentences.
Intent
What user wants or what user is asking in utterance.
Entity
The information to be extracted from sentences to make decisions or helps in understanding.
Cloud Platform
Platform available online we access them through web or internet

B. NLU Platforms

In this paper only the most popular technologies will be discussed

Microsoft Luis
It is provided by Microsoft and is a part of azure service
Active learning is a prominent feature of Luis. Rest APi and sdks (C#, Python, Node and android) are available and support 13 different languages. Have an easy to understand system that helps in marking entities and also easy to publish and test mechanisms and have pre-built domains and entities that help in the process. It has easy to understand documentation.

Wit.ai
It is a platform provided by Facebook. Free to use and support 50+ languages. It is widely used for messenger bots and also provides integration in game engine unity3d. It is open source. You integrate Wit.ai in an app using node ruby python and http api also has speech to text feature.

Dialogue Flow
It is provided by google and is free or standard use. It's a complete NLP package you can built complete system
Built in entities are also included and there is a feature to extend system built-in entities. It also provides feature for define context.t also provide feature of follow-up intents and multiple level of nesting

Watson Conversation
Watson Conversation is the NLU platform of IBM, part of the IBM cloud services. It supports various programming and natural languages. It is built on a neural network. It finds intents, entities in sentences. It has a built in knowledge base. It handles context. Have a trial version and pricing depends upon the package you are buying.

Amazon Lex
Amazon ex is by Amazon web services. With Lex you can use the same power like Alexa and also has speech recognition features plus its pricing is pay for what you use and trial for a first year limited trial. Amazon Lex has limitations in training.it support only English plus have integration for various chat platform ad programing languages

IV. COMPARISON

First we will do comparison based on features such as pricing, Ease of use, sdks, integration and all in one nlp platform, context handling, learning material, pre-built entities and intents, interface, supported languages, supported programming languages and fall back intents.

- For Dialog flow it use a web interface to build bots it is easy use and its documentation is easy to stand and lots of video tutorial and pre-built domains are available and it's all in one nlp platform supports 32 languages and fall back intents and utilize input and output context to handle context and support multilingual with the concept of root and local language. Google provide partner telephony, dialogue flow built in, google open source integrations and non-partner integrations. Famous built in integrations are (Dialog flow messenger, dialogue flow phone gateway, google assistant slack Facebook messenger etc. It is famous for its easy integration features and provide sdks for all famous languages C#, Go, Ruby, python, php ,rest apis etc.

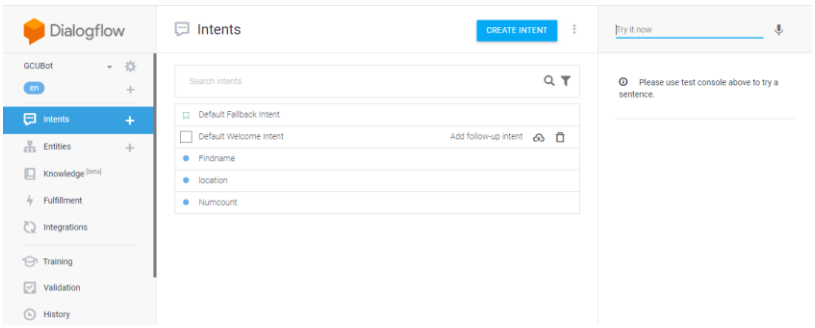

Fig.1 Dialogue flow console

- whereas in Luis is only nlu engine all other features are separate and is main power are active learning and also support fall back intent and is a part of azure service and also provide built-in testing in its web interface and is a little built difficult than dialogue flow, also support multiple languages (18) but dialogue flow supports more. It is free but you need to have an azure subscription but also provide trial for some time Luis and there is no such thing as context in Luis the developer needs to handle this itself can build separate agents for different languages but if multilingual required translation is required and does not support multilingual at same time. 17 pre-built entities and 11 pre-built domains and 7 entity types for custom entities.

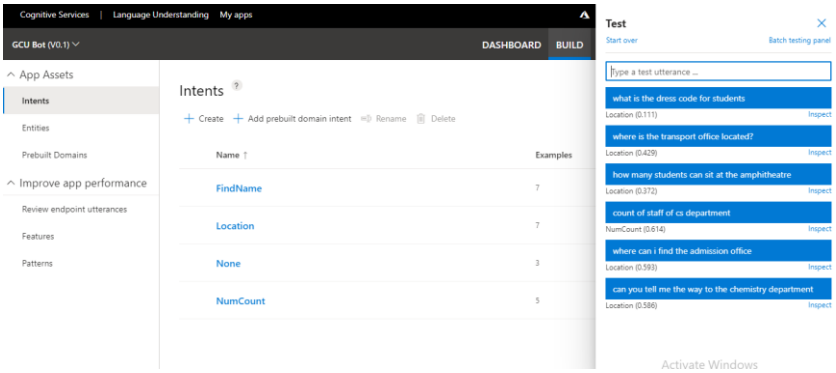

Fig.2 Microsoft Luis

- In wit ai there are 31 built in entities it is completely free and open source but more developer centric and thus a bit difficult for non-developer but can find a lot of sample projects to learn, it has its own open source community ad also support text to speech feature but is not a complete nlu engine context handling is developers task it does not support it and it support 124 different languages with option if you need try you can contact them but unfortunately multilingual feature is not supported. And 30+ languages are supported in speech recognition, support Facebook messenger integration no other but also have http api and sdk for famous programming languages. (python, ruby, go, Node).There is no testing mechanism you have to use curl to test .

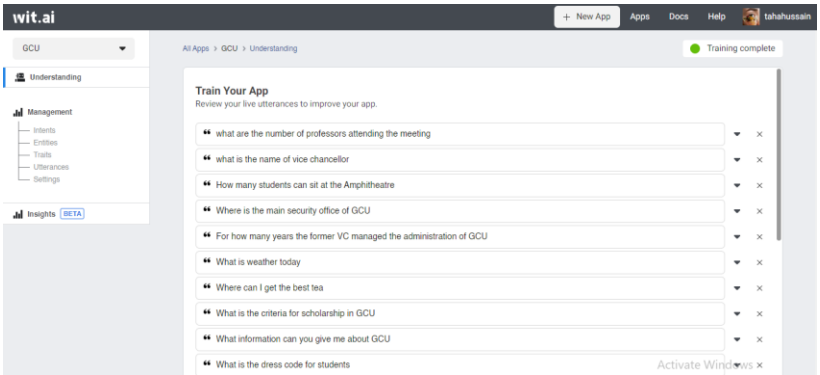

Fig.3 Wit.ai new interface

- IBM Watson Assistant on other hand has different pricing model. It gives you lite model to try out and there are 3 other models and a phone category with 3 models also it supports 13 languages and a neutral network powers it Watson conversation is now called Watson assistant it's a complete nlp platform it also you to build agent and give them skills and in

each skill you have intents entities and dialog. Dialogue is used to manage the flow and the most general term in dialog comes below and specific comes above. Watson assistant also helps you to improve your bot with customer conversation history and it handles conversation using nodes in top to bottom manner and sub nodes. The Text to speech and speech text feature is handled by their respective api. Watson interface is easy to use and understand and the node like structure makes it is most easy to learn for a non-code user plus the documentation and tutorials are available. There is also search skill available for plus plan that can search for answer from external sources. It also has a nice interface for testing and correcting and the same for user history data has five built in entities. Watson also has its own knowledge base that helps it in learning. Watson also provide existing skills you can use. Java, ruby, android, Node, sale force, python, swift,unity,Go,.NET etc. sdks are available.

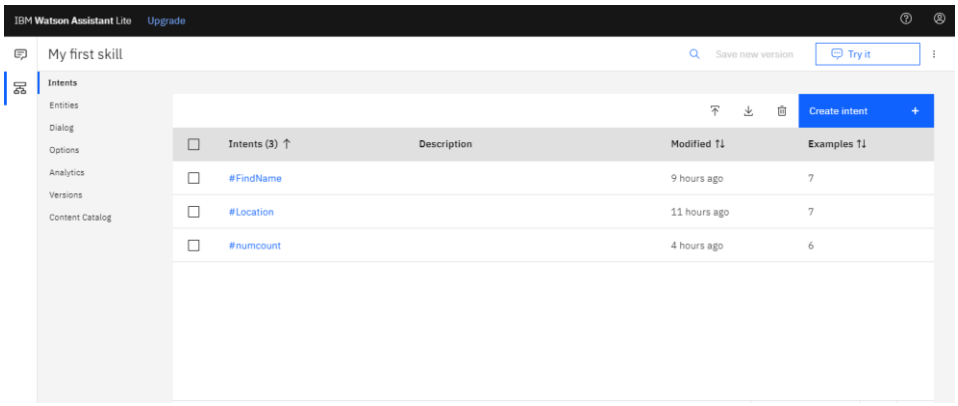

Fig.3 IBM Watson Assistant

- Amazon Lex by amazon web services supports only one language and allows you to hand multi turn conversation and also have ways to handle confirmation and error using confirmation and utility prompts control transfer from one to other intent use lambda function for backend it is free for first year. Its registration procedure is longer than other platforms and the user must have to enter its credit/debit card to test it. In the performance section we are not taking amazon Lex because of card limitation. Amazon has 10 sdk available for mobile web, react, iOS, android, python, ruby, java, JavaScript, php, .net. and provide integration with Facebook, WhatsApp, other services of aws and much more.

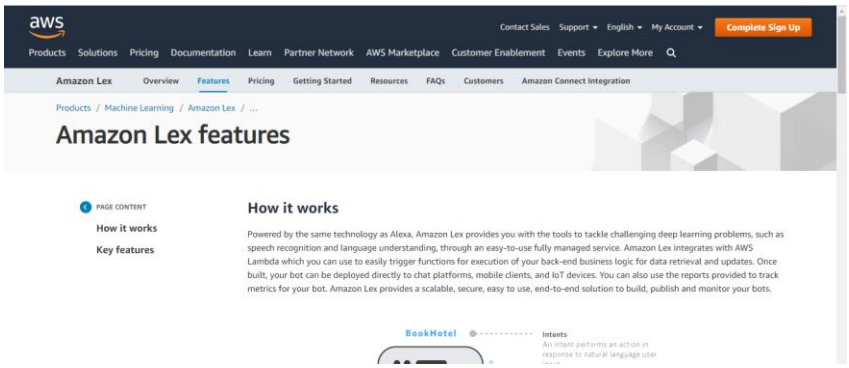

Fig4. Amazon Lex

V. PERFORMANCE EVALUATION

In performance evaluation bots are trained for the some data and results will be checked.

TESTING SET

#FindName

- who is president of society
- who is head of English department

- who is vice chancellor of gcu
- who inaugurated the Bukhari auditorium?
- who schedules the timetable in the department of computer science?
- who is responsible for conducting the exams in the department of computer science
- who is the head of the department of computer science?

#Location

- location of CS department
- can you locate VC office?
- please tell me where the VC office is
- do you know where the history department is
- where is the English department of GCU?
- can you tell me the location of GCU?
- where is the amphitheater

#numcount

- how many societies operate in GCU?
- how many computer systems are there in the m-lab?
- how many rooms are there in the CS department?
- what is the count of the staff in the department of computer science?
- how many departments does GCU have?

Entities

- @event
- @designation/title
- @departmentname
- @cause
- @Asset
- @action
- @place
- @societies

TESTING SET

***From same set**

- how many rooms are there in the CS department?
- what is the count of the staff in the department of computer science?
- who is vice chancellor of GCU
- can you tell me the location of GCU?

***Same intent and entities**

- Can you tell me the way to the Chemistry Department?
- Where can I find the admission office
- What date is it today?
- How many students can sit at the Amphitheatre?
- Where is the transport office located?
- what is the name of vice chancellor?
- what are the number of professors attending the meeting?

***Truly random**

- What is the dress code for students?
- What information can you give me about GCU
- What is the criteria for scholarship in GCU?
- Where can I get the best tea
- What is weather todays

RESULTS

In performance evaluation we trained each bot on 19 utterances with 3 intents and 8 entities and the testing set consist of 16 sentences divided into utterances from the training, utterances wit same intent as in training and random questions.

First with the same sentences that are 4 in count all give 1 confidence and wit gave 0.99 but in next part sentences with same intents Watson gave accurate response of 6 out of 7. Wit gave 4 out of 7 right and Luis gave 7 out of 7 and dialogue flow gave 3 out of 7. In random and fall back test dialogue low gave 2 out of 5. Luis gave 1 out of 5 .it gave 3 out of 5and Watson gave 3 of 5.

In total Watson scored 13 points, wit 11 Luis 12 and google dialog flow 9.

The dull values show false results

	Dialog Flow	Microsoft Luis	Wit .ai	IBM Watson
1	1	0.912	0.99	1
2	1	0.862	0.99	1
3	1	0.781	0.99	1
4	1	0.909	0.99	1
5	0.750	0.586	0.99	0.24
6	0.7236	0.593	0.988	0.93
7	0.642	0.614	0.7578	0.73
8	0	0.343	0	0.38
9	0.7681	0.429	0.99	0.97
10	0	0.87	0.53	0.29
11	0	0.15	0.83	0
12	0	0.111	0	0
13	0.4879	0.553	0.8485	0.42
14	0.4149	0.327	0.5395	0.28
15	0	0.446	0.9088	0.26
16	0	0.128	0	0
	9	12	11	13

VI. CONCLUSION

Human passion to talk to machine and make them understand humans led to many researches and development of many technologies NLP and NLU engines are one them as discussed before day by day these technologies will improve and there will be a race to become the king. In our evaluation we compared features and performances. From studying previous researches we can say these services improved a lot with the introduction of lite model of IBM and its performance evaluation with highest score is the best service but point to be noted is that the data set to train the model is very important and the results may vary. It depends on use case and data and data size. In the end we will recommend keeping in mind all the aspects, pricing, need and evaluation in choosing system to build your bot or conversational application.

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