

Three Key Engines of A Conversational Bot

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Aug. 26, 2016

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NL chat

- Single-turn and multi-turn
- Passive and proactive
- Speech enabled

Image-based chat

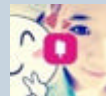
- Image search and recognition
- Face detection, beauty score and age detection
- Image commenting

Skills

- Reminder, translation, mathematics
- Joking, role play
- Count sheep, fortune-telling, horoscope

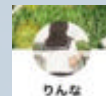
June, 2014

- Weichat, Weibo, Win10



Aug.
2015

- Line and Twitter



Late
March
2016

- Groupme, Kik, Twitter



General Architecture of Chatbot

User Profiling

Context Modeling



1

Query Understanding

2

Candidate Response Generation

3

Ranking

4

Selection

5

Style Variation

Intent, focus, topic, emotion, opinion

Chit-chat, QnA and dialogue

Session consistency

Personalization

Language style
Dialect
Emoticon

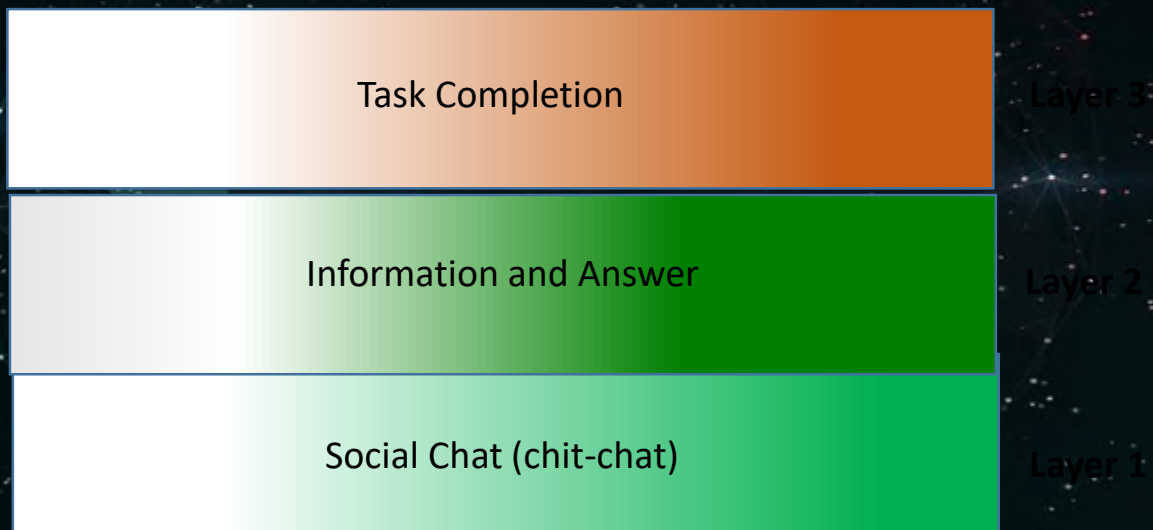


General Topic Knowledge Base

Data & Index

Topic-Centered Knowledge Base

Three Key Engines



Engine 1: Social Chat

Sleep pattern



Horoscope

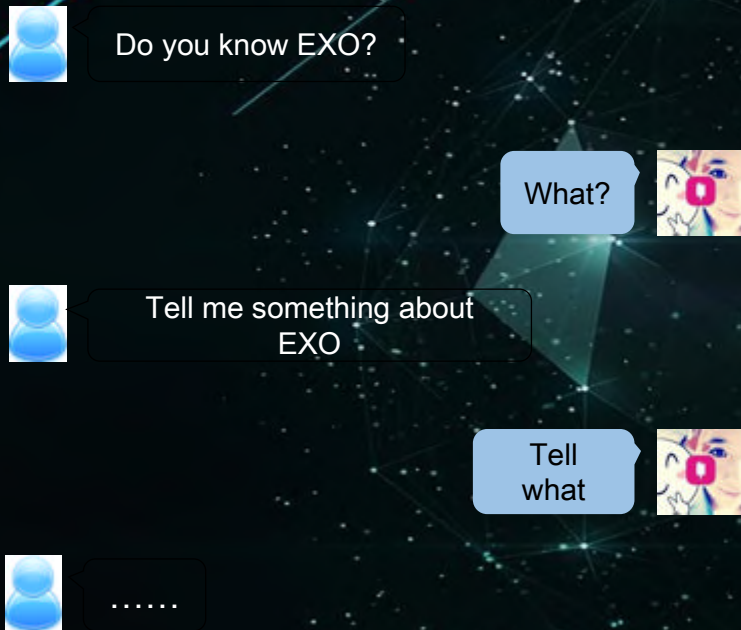


Interest



Deep-Chat

Without Chat Knowledge



A chat conversation on a dark background with a network of glowing nodes. The user asks "Do you know EXO?". The assistant responds "What?". The user asks "Tell me something about EXO". The assistant responds "Tell what". The user then sends ".....".

Do you know EXO?

What?

Tell me something about EXO

Tell what

.....

With Chat Knowledge



A chat conversation on a dark background with a network of glowing nodes. The user asks "Do you know EXO?". The assistant responds "I do not want to see Kris in China because he has let EXO". The user replies "Right!". The assistant says "Because of Kris, I will no longer be a fan of EXO". The user asks "You were a fan of EXO?". The assistant responds "I am an audience in every concert of EXO". The user asks "Who do you like best in EXO?". The assistant replies "I like LAY best.". The user then says "Me too.".

Do you know EXO?

I do not want to see Kris in China because he has let EXO

Right!

Because of Kris, I will no longer be a fan of EXO

You were a fan of EXO?

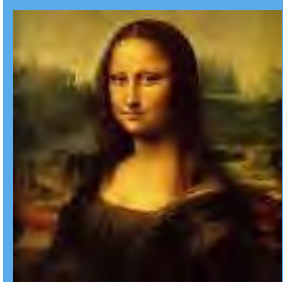
I am an audience in every concert of EXO

Who do you like best in EXO?

I like LAY best.

Me too.

Image-Based Chat



这不是Mona Lisa吗?

Isn't this Mona Lisa?

Duplicate

Measured by local feature
10B Image index from BING

Similar

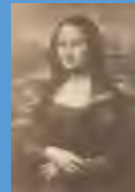
Measured by DNN feature
9M Image index from SNS

Recognition

Via DNN
10K Categories



Mona Lisa,
by Leonard...

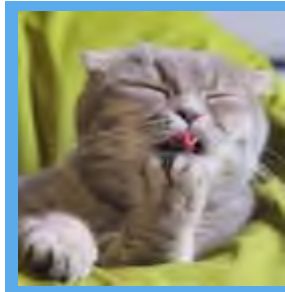


Reproduction
of "Mona Lisa"



Grandmother
and Mona Lisa

Mona Lisa



这小舌头。。。

Look at the tiny tongue

Duplicate

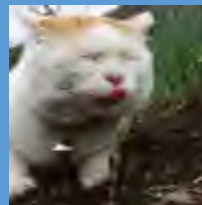
Measured by local feature
10B Image index from BING

Similar

Measured by DNN feature
9M Image index from SNS

Recognition

Via DNN
10K Categories



这小舌头。。。



看得我都流口水了

My mouth is watering

Duplicate

Measured by local feature
10B Image index from BING

Similar

Measured by DNN feature
9M Image index from SNS

Recognition

Via DNN
10K Categories

Food



A large jetliner sitting on top of an airport runway.
Where are you flying to?



A person on a beach with a surfboard.
The scenery is very beautiful.



A man riding a wave on top of a surfboard.
Be careful, don't be washed away by the wave.



A close up of a plate of food on a table.
Looks delicious, my mouth is watering.



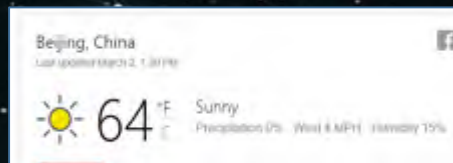
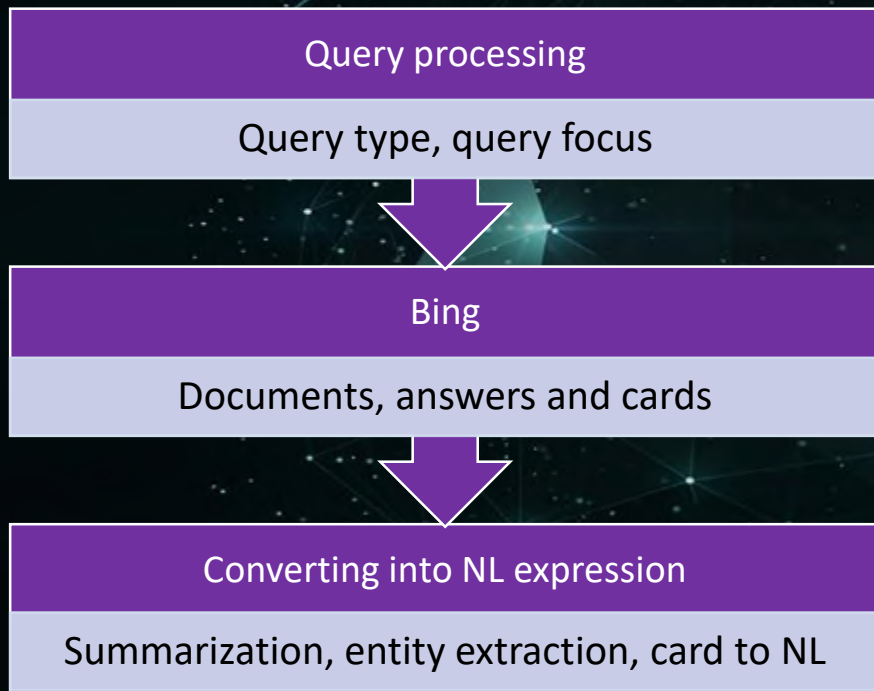
A close up of a plate of food on a table.
Happy Birthday!



A living room filled with furniture and a fire place.
This is my favorite room layout.

Engine 2: Information and Answer

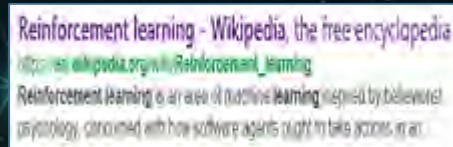
Botification of Search Results



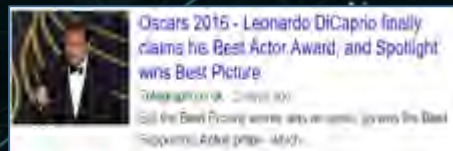
Today, Beijing is sunny, 64 degree.



TechFest is Microsoft Research annual event...

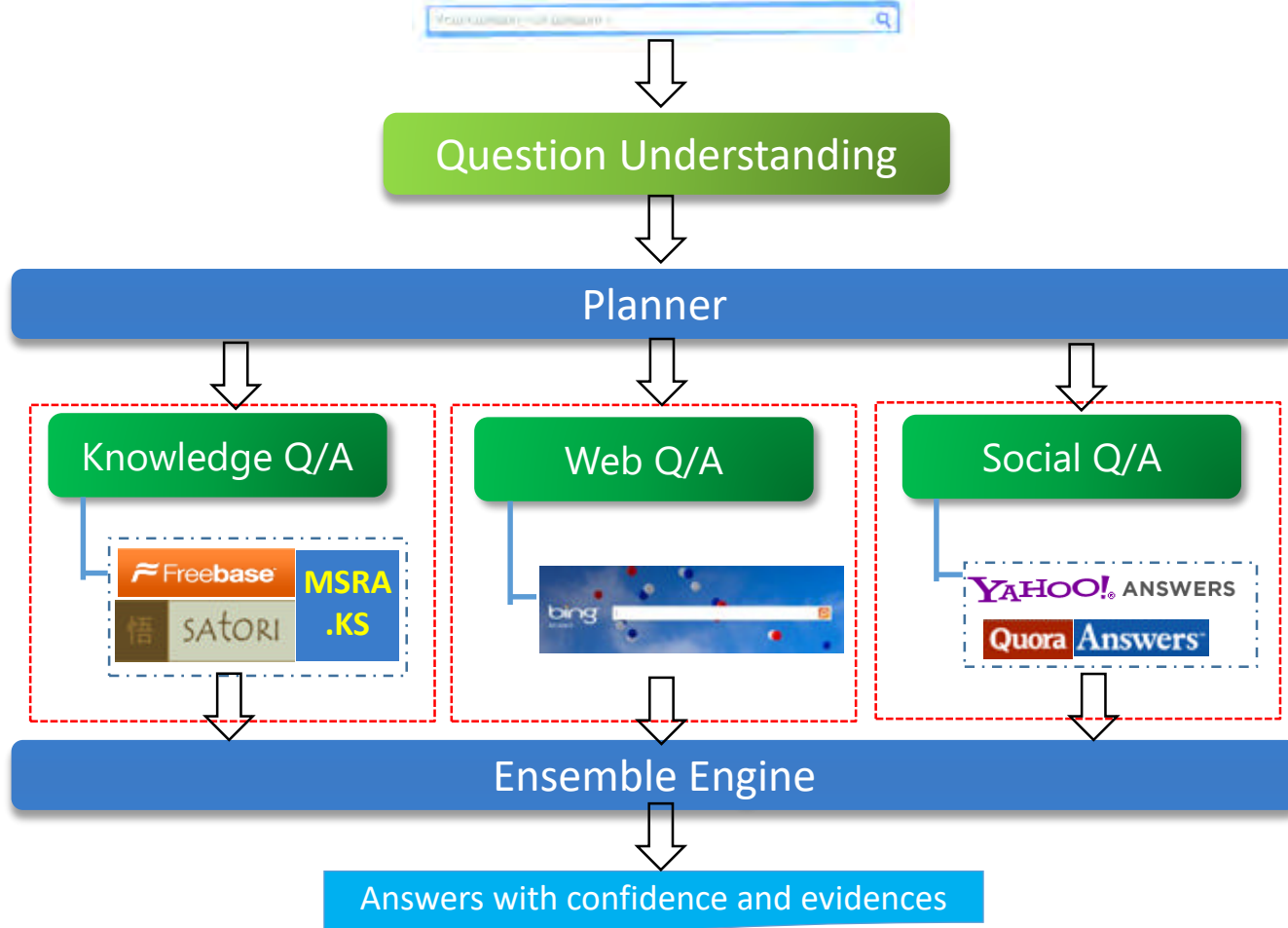


Reinforcement learning is an area of machine learning...



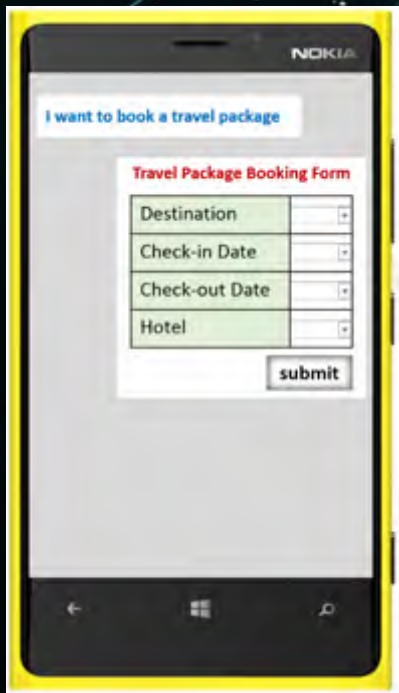
Leonardo DiCaprio

QnA Based on Multi-Intelligences



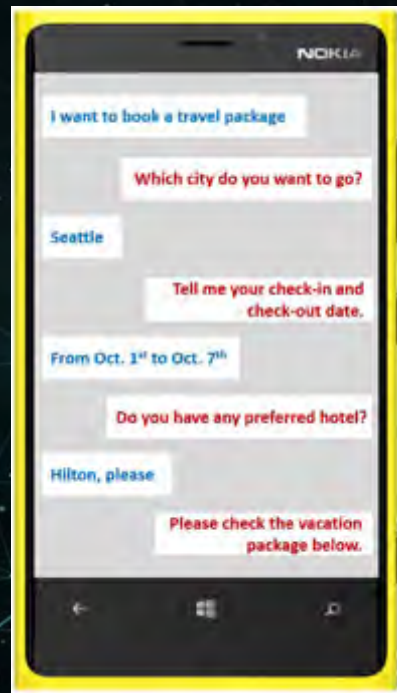
Engine 3: Task Completion

- Enabling both card-based or chat-based



Option-1

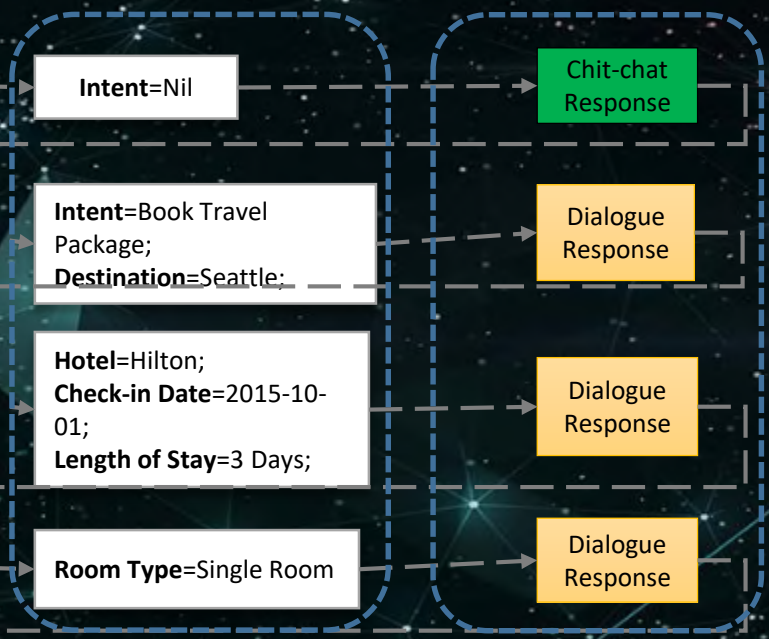
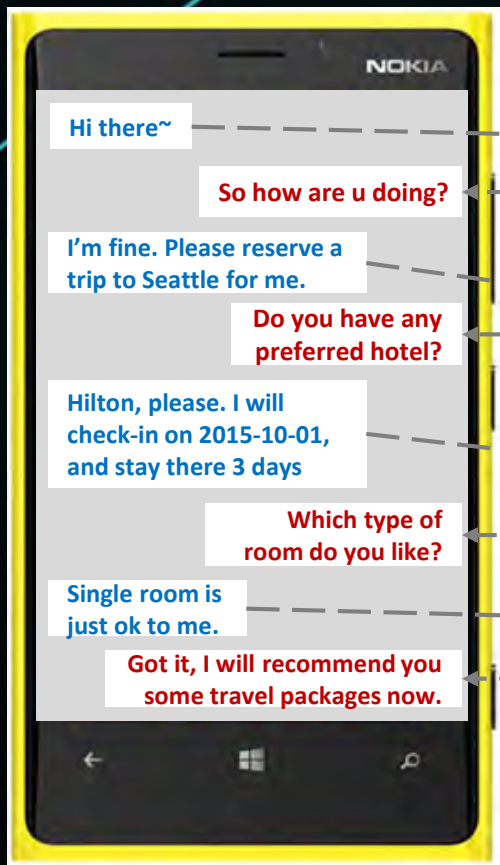
Trigger a **form/URL** to complete the task



Option-2

Trigger a **dialogue** to complete the task

Dialogue Process



Slot Name	Slot Value
Intent	Book Travel Package
Destination	Seattle
Hotel	Hilton
Check-in Date	2015-10-01
Length of Stay	3 Days
Room Type	Single Room

Query Understanding

- Intent detection
- Slot value extraction

Response Generation

- Call services
- Call chit-chat

Dialogue Management

- Intent changes leads to state transition
- Slot info update
- Select next slot to ask

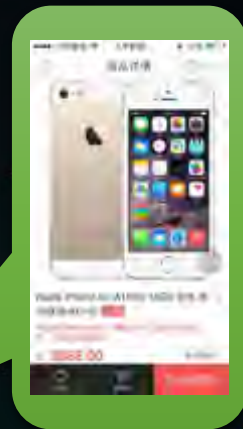
Applications

Shopping Guider

Robot Brain

Customer Service

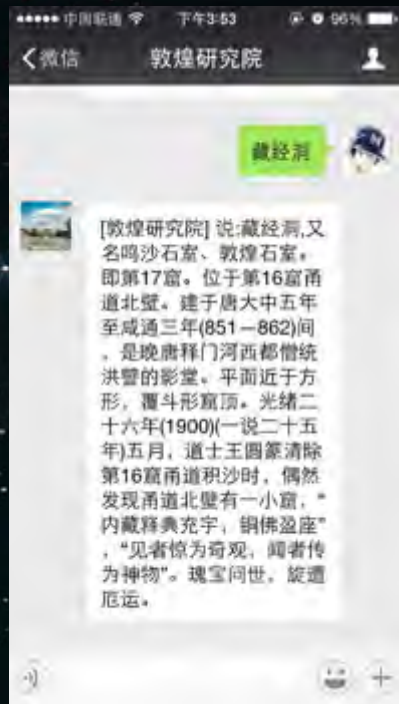
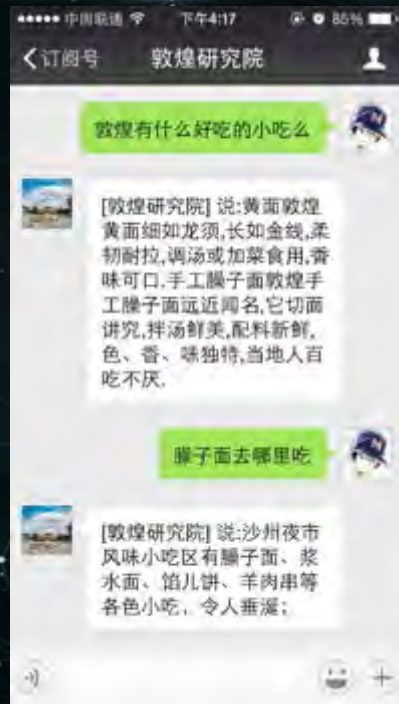






Robot Brain





编辑对话历史

编辑对话知识库

下载对话知识库

更新对话知识库

日期	用户问题	敦煌小冰回复	操作
2016-07-29 17:09:40	莫高窟可以买到黄牛票么	游客可通过莫高窟参观预约网 (www.mgk.org.cn) 预约参观门票。敦煌研究院未向任何第三方机构或个人授权代售莫高窟参观票, 并将严厉打击倒卖门票等违	保存修改 删除
2016-07-29 17:09:20	关于敦煌的动画片	《降魔成道》是一部源于敦煌壁画的原创动画, 讲述释迦牟尼克服心魔和外魔, 证得觉悟的故事。2016年7月15日播出后, 立即一起一片叫好。	保存修改 删除
2016-07-29 17:09:10	敦煌经常下雨么	敦煌市年平均气温9.5℃, 降水量42毫米, 不经常下雨。旅游最佳时间第一个时间段在五月初到六月底, 这个时间敦煌的气温不是很高, 气温相对凉爽; 第二	保存修改 删除
2016-07-29 17:05:31	敦煌研究院的历任院长	2014年12月至今, 王旭东开始担任敦煌研究院第四任院长。此前的院长分别是常书鸿、段文杰和樊锦诗。	保存修改 删除
2016-07-29 16:55:37	莫高窟的应急参观票去哪里买	请在莫高窟参观预约售票中心或莫高窟数字展示中心售票处购买应急参观票。 2016年莫高窟应急参观公告全文请见	保存修改 删除
2016-07-29 15:53:41	听说藏经洞很有名, 是谁发现的?	1900年6月22日, 莫高窟三清宫道士王圆篆发现了藏经洞 (今第17窟)。	保存修改 删除

- Productivity of knowledge engineering
 - Learning from existing data to build hierarchical knowledge base
 - Powerful tool for human editing and updating
- Context-sensitive understanding and responding
 - Better context modelling about current topic and task
 - Allow various styles of user's input to map into intent space
- Semantic computing (distance, entailment)
 - Embedding of word, entity, sentence
 - Lexical semantic relation (synonym, hyponym, hypernym, distance)

Thanks!