

Dialog System and Chatbot

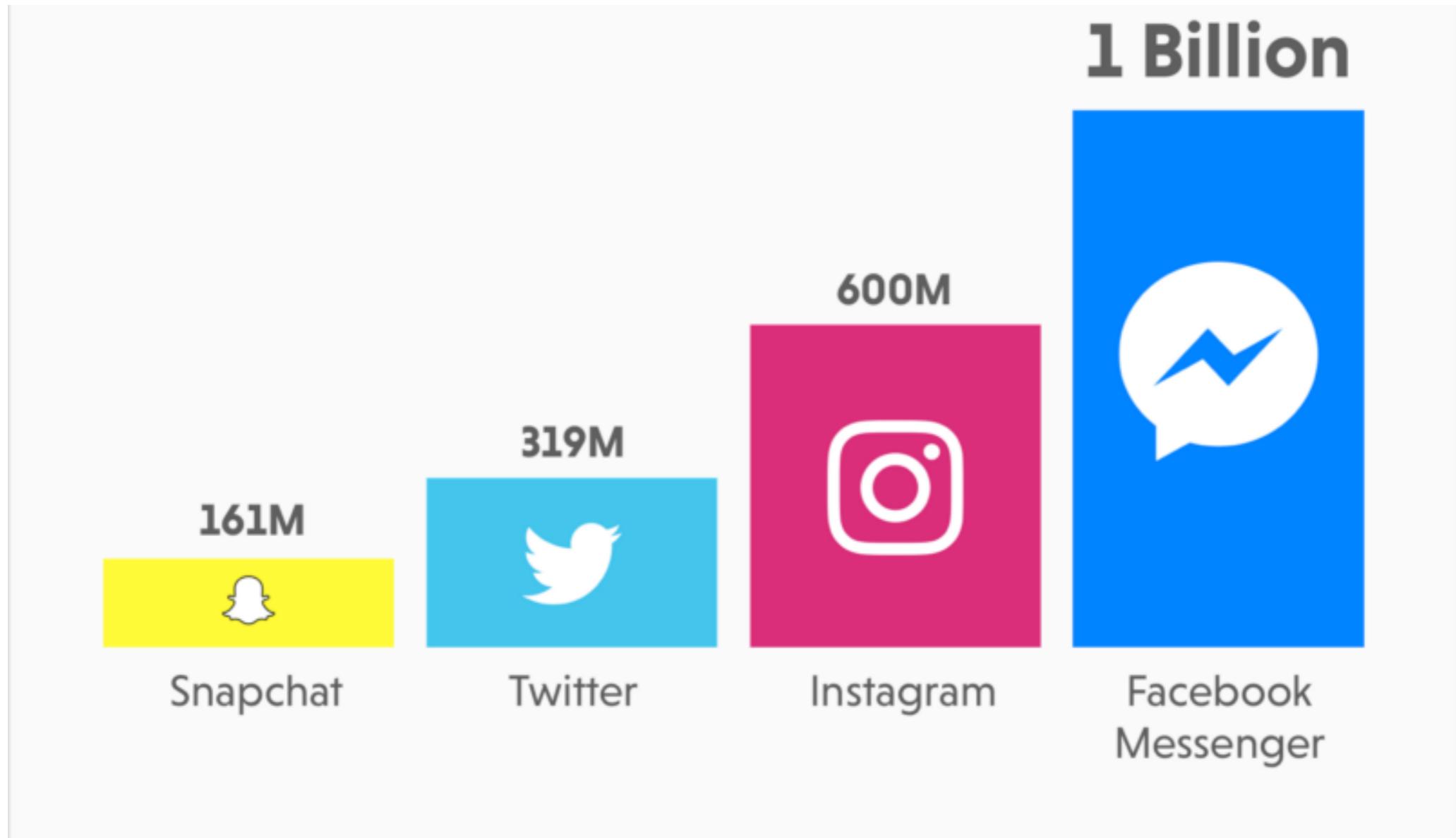
Head First Theory and Practice

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Bot is Everywhere

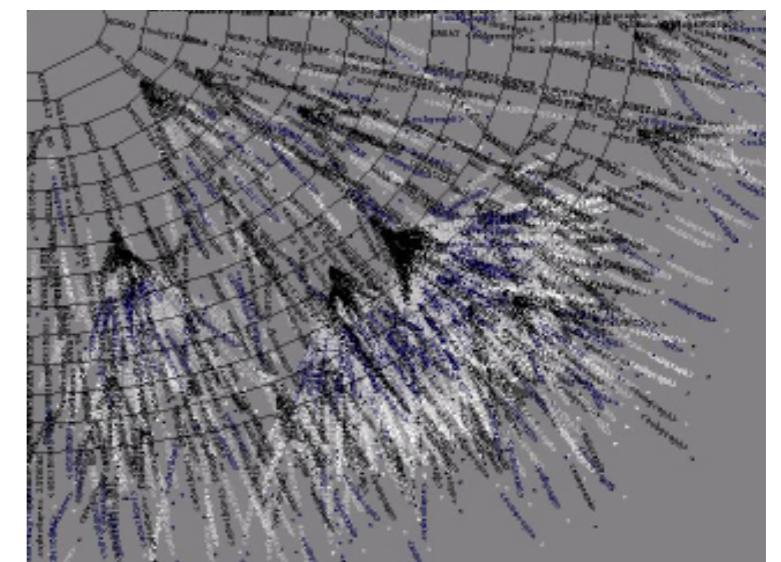
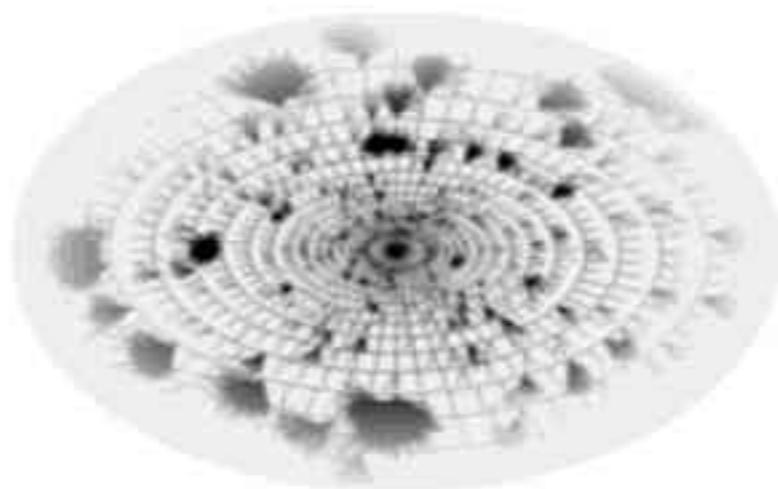
What are they?



The bots are becoming widespread

The World's First Chatbot

- A.L.I.C.E.
 - in short for Artificial Linguistic Internet Computer Entity
 - Program A —> D
 - does not have a purpose
 - amazing derivatives, e.g. A.L.I.C.E. Brain Picture Gallery (<http://www.alicebot.org/documentation/gallery/>)



The World's First Chatbot



<http://alice.pandorabots.com/>



About: Inquiries, comments, accusations, criticisms gratefully accepted - contact info@p

Powered by:



Video: [Chatting with Fake Kirk](#)

You say: Send Help

Captain's Log:

Lieutenant: ricecake

James T. Kirk: I can't damn him for his loyalty, for doing his duty, but I'm not going to let him commit patricide.

Lieutenant: what happened?

James T. Kirk: Perhaps there was an interruption in my brain.

Lieutenant: what interruption?

James T. Kirk: Spock knows.

Lieutenant: who is spock?

James T. Kirk: Mr. Spock? he is the first officer of the Enterprise.

Lieutenant: what enterprise?

James T. Kirk: Very good, Lieutenant.

Lieutenant: I can't understand

James T. Kirk: Blame Lieutenant. That was no tri-ox compound he shot me with. He slipped in a neural paralyser. Knocked me out, simulated death

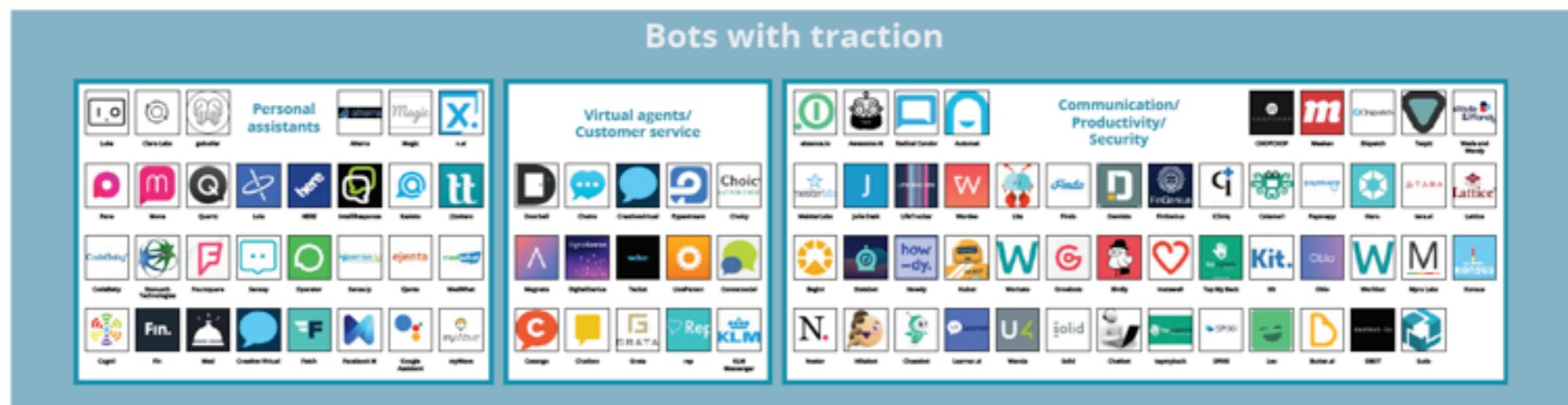
Lieutenant: can you tell me a joke?

James T. Kirk: I never forget a face, but in your case I'll make an exception.

DESIGNED BY
JON CIFUENTES

Bots Landscape

POWERED BY
VB | Profiles



Connectors/ Shared Services



Bot Discovery



Analytics



AI Tools: Natural Language Processing, Machine Learning, Speech & Voice Recognition



Bot developer frameworks and tools



Messaging



Existing Applications

- Chit-chat bots
- Personal Assistant
 - information inquiry
 - plan management
- Customer Service
 - sell
 - booking

Existing Applications

- Chit-chat bots
 - Xiaoice, Cortana, Siri, Allo...
 - 小i 机器人, Turing



Existing Applications

- Chit-chat bots
 - Xiaoice, Cortana, Siri, Allo...
 - 小i 机器人, Turing
 - Facebook Wit.ai

Alex Kantrowitz 10/14, 8:49pm
what is Updog?

M 10/14, 8:49pm
How can I help you?

Alex Kantrowitz 10/14, 9:04pm
Can you send me a funny GIF?

M 10/14, 9:05pm

Do You Even Gif?

M 10/14, 9:06pm
Do you like this gif?

Alex Kantrowitz 10/14, 9:07pm
I'd like a funnier one. Can you top it?

M 10/14, 9:08pm

Dancing Duck

Alex Kantrowitz 10/14, 9:10pm
#winning

Facebook Wit.ai

[GETTING STARTED](#)[DOCS](#)[COMMUNITY](#)[PRICING](#)[FAQ](#)[BLOG](#)[JOBS](#)

Natural Language for Developers



Bots



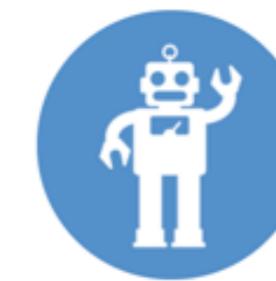
Mobile apps



Home automation



Wearable devices



Robots

Users enjoy a hands-free mobile experience while driving, working out, cooking. Developers use Wit to easily build a voice interface for their app.

[Log in with GitHub](#)

[Log in with Facebook](#)

or [see how it works](#)

Facebook Wit.ai

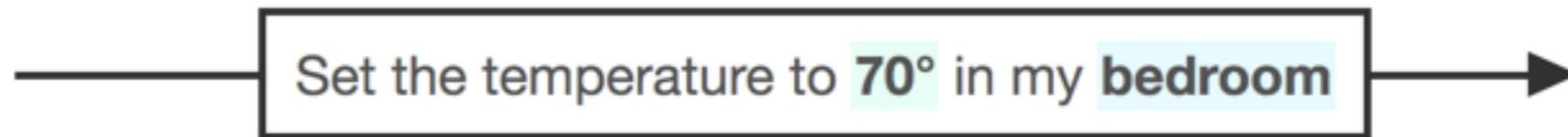
Intent Parser

Understand what your users mean. Easily turn text into actions.

Set the temperature to 70° in my bedroom

Did you try...Remind me to feed the baby tomorrow at 7am~~24~~

intent = heating_control
temperature = 70°F
where = master_bedroom



Your user

Wit.ai

Your app

Facebook Wit.ai

Stories^{beta}

Manage dialog using Wit. You tell us what your user said, we tell you what your bot should do next.

The screenshot shows the Wit.ai Stories beta interface for managing dialog flow. At the top, there's a header with a close button (X), a user icon, and a save button labeled "All changes saved". Below the header, a user message "Hi, my name is John" is shown with a blue underline, indicating it's selected. This message is associated with a "wit/contact" entity and the value "John". A "Merge" node follows, which merges context and entities and produces a "contact" context. This node has an "Add context field" option. Below the merge node is a "Say" node, which outputs the message "Hi, {contact}!". This node has an "Add variable" option. At the bottom, there are three tabs: "User says..." (blue icon), "Bot says..." (blue icon with speech bubble), and "Bot executes..." (blue icon with lightning bolt).

Hi, my name is John

wit/contact John

Add a new entity

merge (context, entities) ⚡️

Produces context: contact

Add context field

say (Hi, {contact}!)

Add variable

User says... Bot says... Bot executes...

Facebook Wit.ai



Alex Kantrowitz

10/19, 4:58pm

Are you capable of writing short little songs?



M

10/19, 4:59pm

Sure, what would you like a song about?



Alex Kantrowitz

10/19, 5:00pm

I am trying to write one to my dear roommate brendan,
the concept is: thanks for sweeping the floor

it can be really short and not make much sense

ten lines at most



M

10/19, 5:00pm

I'm on it!



M

10/19, 5:09pm

Here's your song!

As soon as I opened the front door,

I saw that you had cleaned the floors

What did I do to deserve such a friend?

How can I repay the help that you lend?

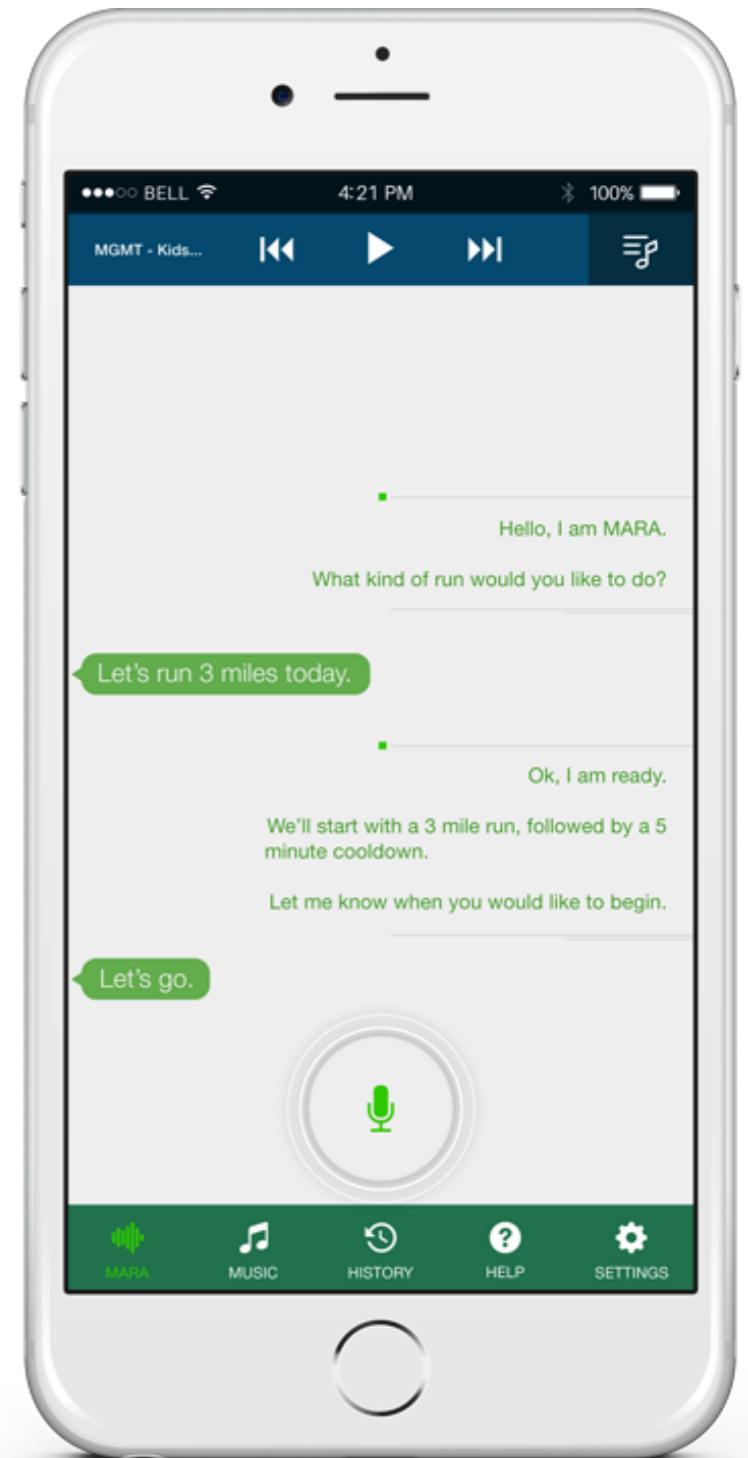
Brendan, you are the roommate for me

Brendan, with floors so shiny

Brendan, you are the best!

Existing Applications

- Personal Assistant
 - information inquiry
 - Siri
 - 出门问问
 - plan management
 - Allo
 - *running assistant
 - M.A.R.A.
 - more: <https://wit.ai/community>



Existing Applications

- Customer Service

- sell

- JingDong

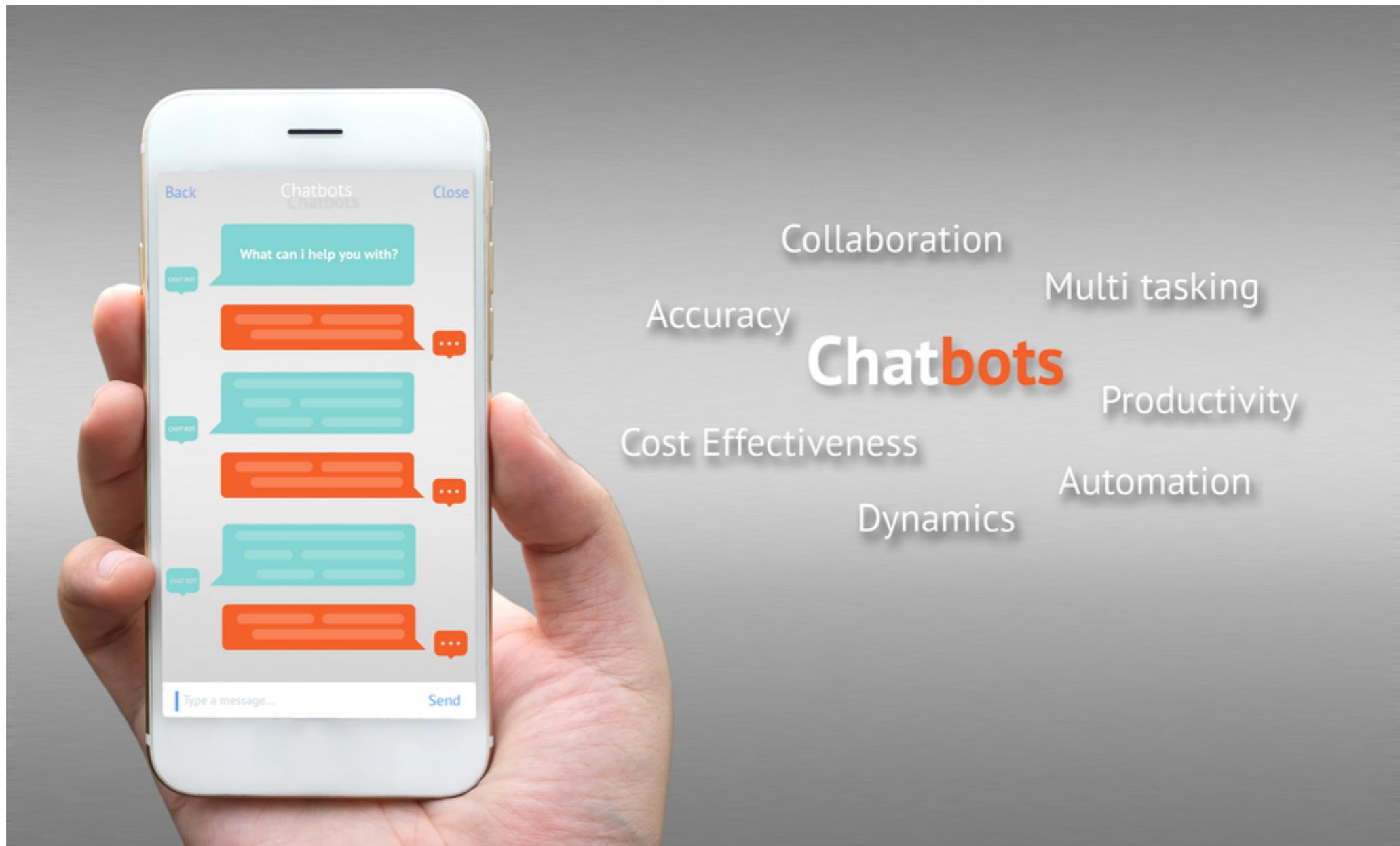
- Ali

- booking

- restaurant

- hotel



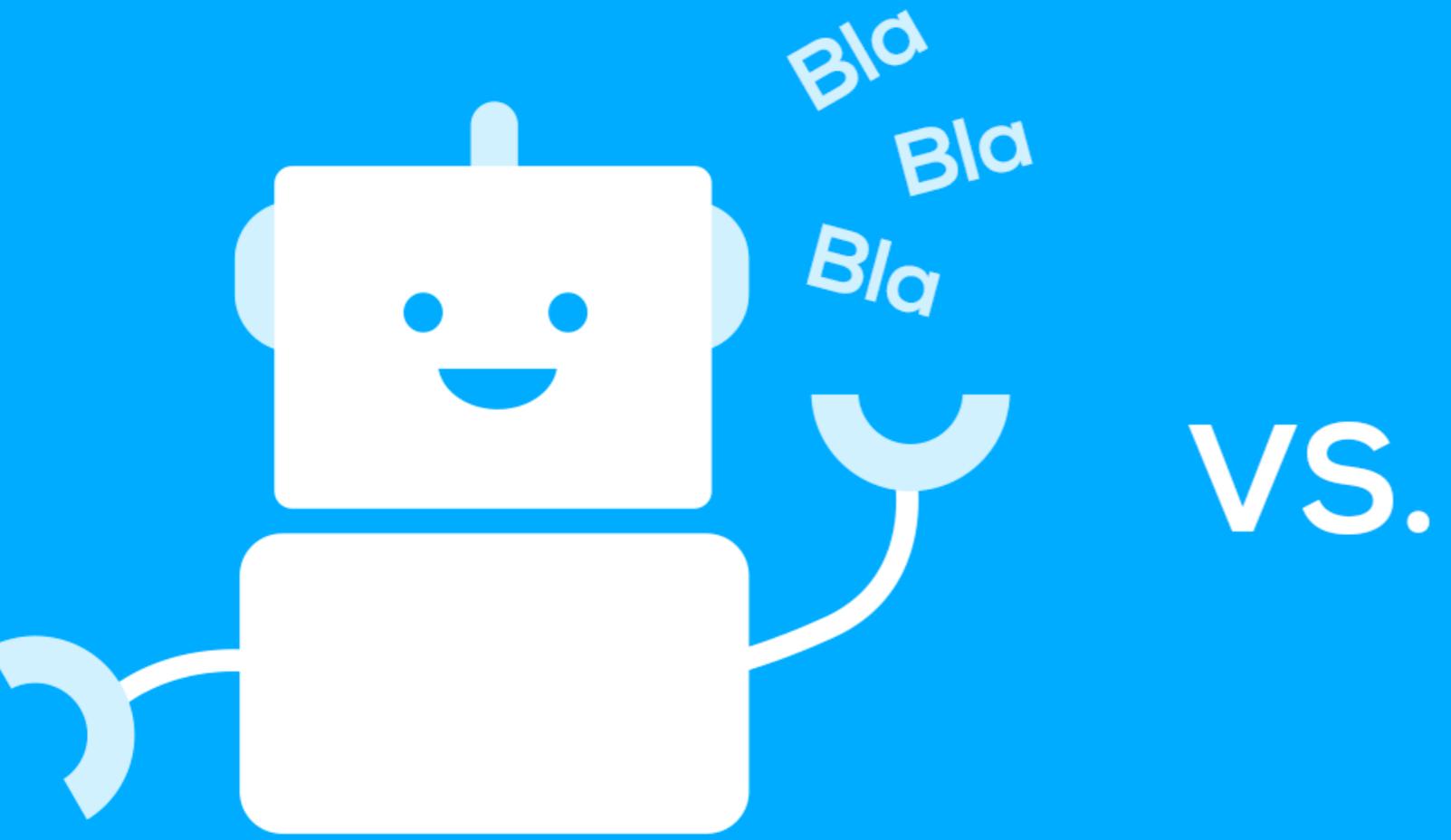


Chatbot is Important

Why?

It is important for both Industry and Academia

- Company can
 - free up human labour
 - provide automatic better service (e.g., 7*24)
- Developing chatbots
 - involves series of common NLP techniques
 - chatbots have interaction with humans where researchers believe the real intelligence emerges.



vs.



Mainstream Approaches

Two Paradigms

Two Paradigms

M: Hello, welcome to the Cambridge dialogue system, What kind of food would you like?

H: Yeah I want to find a restaurant that serves European food.

M: Hotel du Vin and Bistro is a nice place. It serves European food.

H: Uh what is the address and phone number?

M: Hotel du Vin and Bistro is a nice place. Their address is XXX and their phone is YYY.

H: Thank you goodbye.

M: Thank you for using this system.

A: How old are you ?

B: I'm 16. Why are you asking ?

A: I thought you were 12.

B: What made you think so ?

A: I don't know what you are talking about.

B: You don't know what you are saying.

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Task-oriented Domain-specific Dialog System

A: How old are you ?
B: I'm 16. Why are you asking ?
A: I thought you were 12.
B: What made you think so ?
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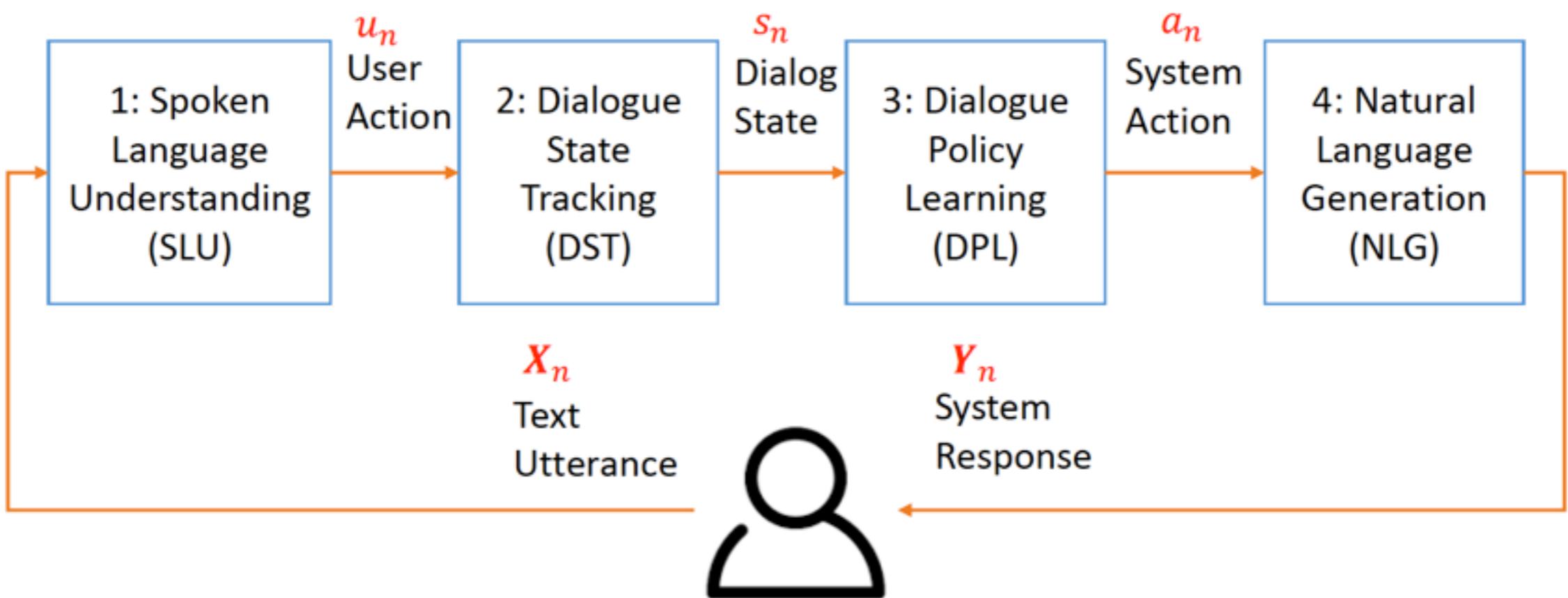
Chit-chat Open Domain Conversational Agent

Two Paradigms

- Task-oriented Dialog System
 - Task (*Goal)-oriented, complete a task, e.g. book a hotel
 - Require precise understanding, hard to collect data
 - Modular, highly handcrafted (API), restricted ability, easy to evaluate
- Chit-chat Conversational Agent
 - Chit-chat (non-*goal), auxiliary topics
 - Vast amount of data (but probably not helpful), e.g. movie lines, Weibo posts
 - End-to-end, highly data-driven, hard to evaluate

Task-oriented Dialog System

- Modular: often 4 modules

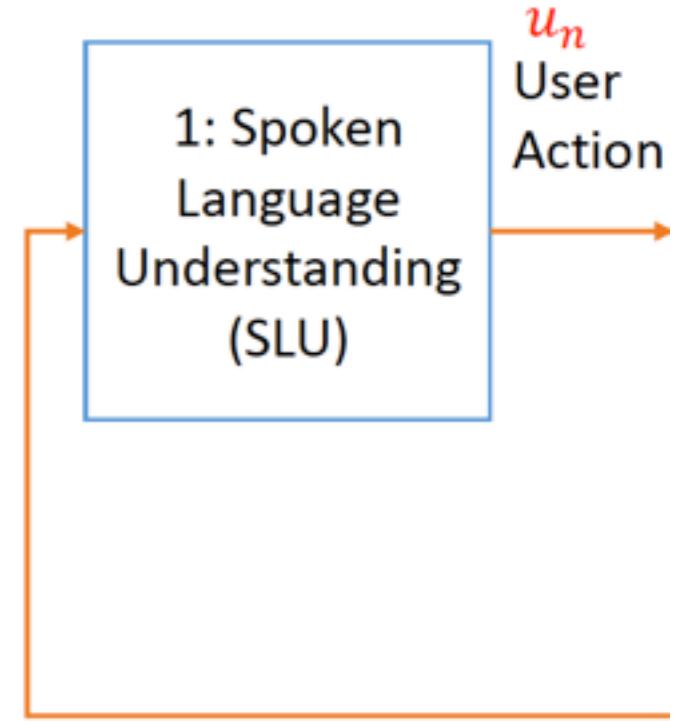


Task-oriented Dialog System

- Modular: often 4 modules
- Sub-modules, sub-tasks:
 - Spoken Language Understanding (SLU)
 - Dialogue State Tracking (DST)
 - Dialogue Policy Learning (DPL)
 - Natural Language Generation (NLG)

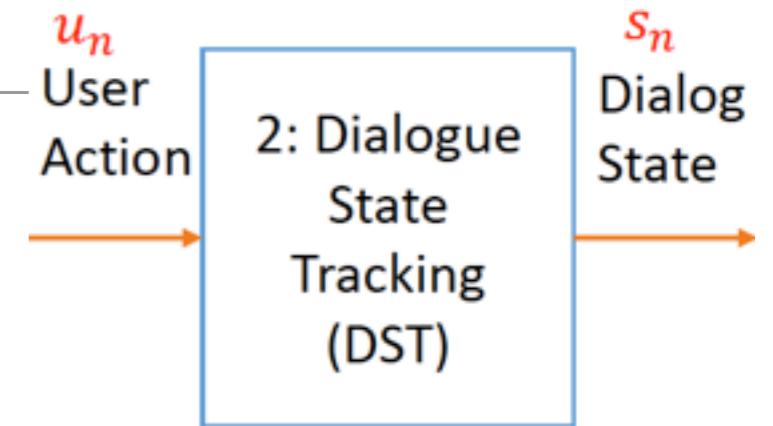
Task-oriented Dialog System

- Modular: often 4 modules
- Sub-modules, sub-tasks:
 - Spoken Language Understanding (SLU)
 - SLU turns natural language into user intention and slot-values, and it takes input and outputs structured user action
 - Dialogue State Tracking (DST)
 - Dialogue Policy Learning (DPL)
 - Natural Language Generation (NLG)



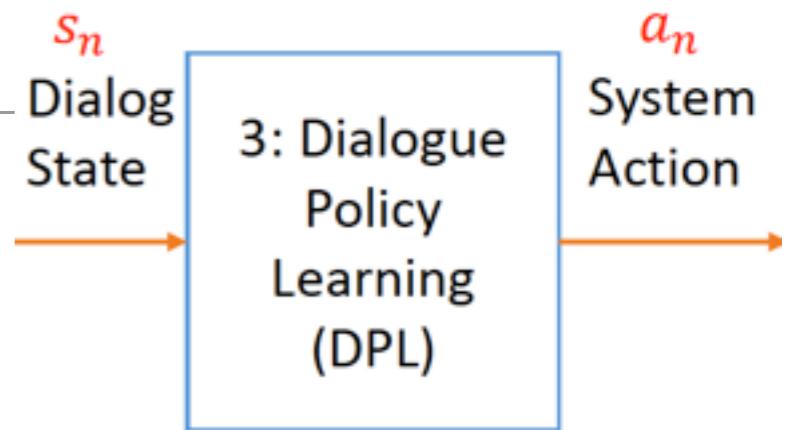
Task-oriented Dialog System

- Modular: often 4 modules
- Sub-modules, sub-tasks:
 - Spoken Language Understanding (SLU)
 - Dialogue State Tracking (DST)
 - DST tracks the current dialogue state, and outputs dialogue state
 - Dialogue Policy Learning (DPL)
 - Natural Language Generation (NLG)



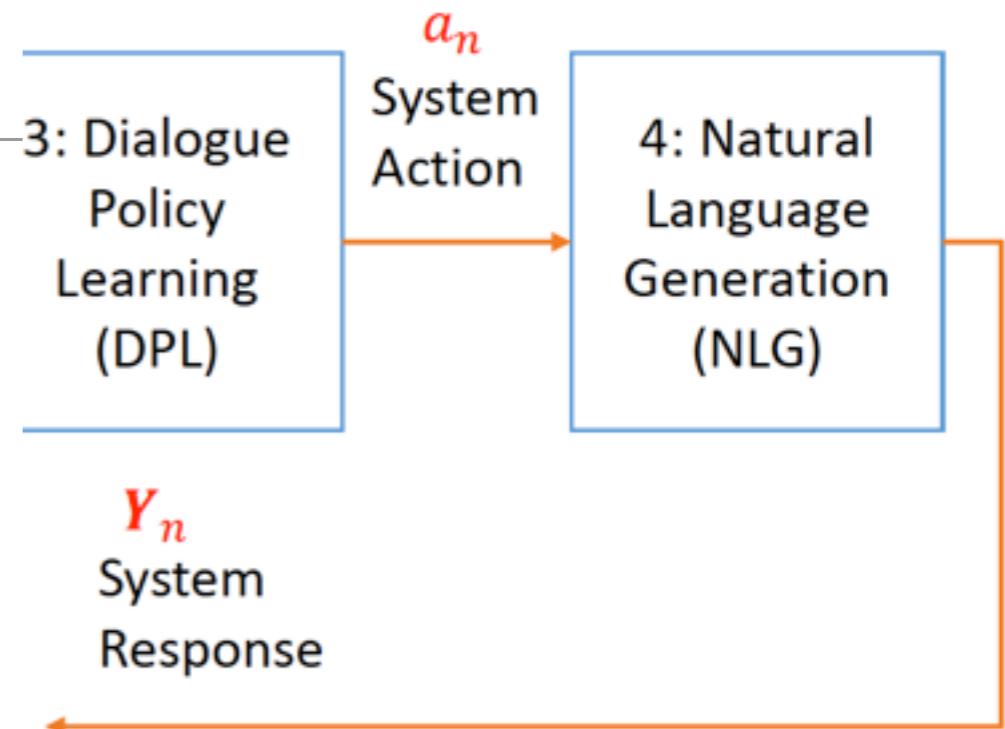
Task-oriented Dialog System

- Modular: often 4 modules
- Sub-modules, sub-tasks:
 - Spoken Language Understanding (SLU)
 - Dialogue State Tracking (DST)
 - Dialogue Policy Learning (DPL)
 - Policy decides which system action to take based on the dialogue state, and it takes dialogue state as input and outputs system action
 - Natural Language Generation (NLG)



Task-oriented Dialog System

- Modular: often 4 modules
- Sub-modules, sub-tasks:
 - Spoken Language Understanding (SLU)
 - Dialogue State Tracking (DST)
 - Dialogue Policy Learning (DPL)
 - Natural Language Generation (NLG)
 - NLG turns a system action into natural language, and it takes the system action as input and outputs the system response

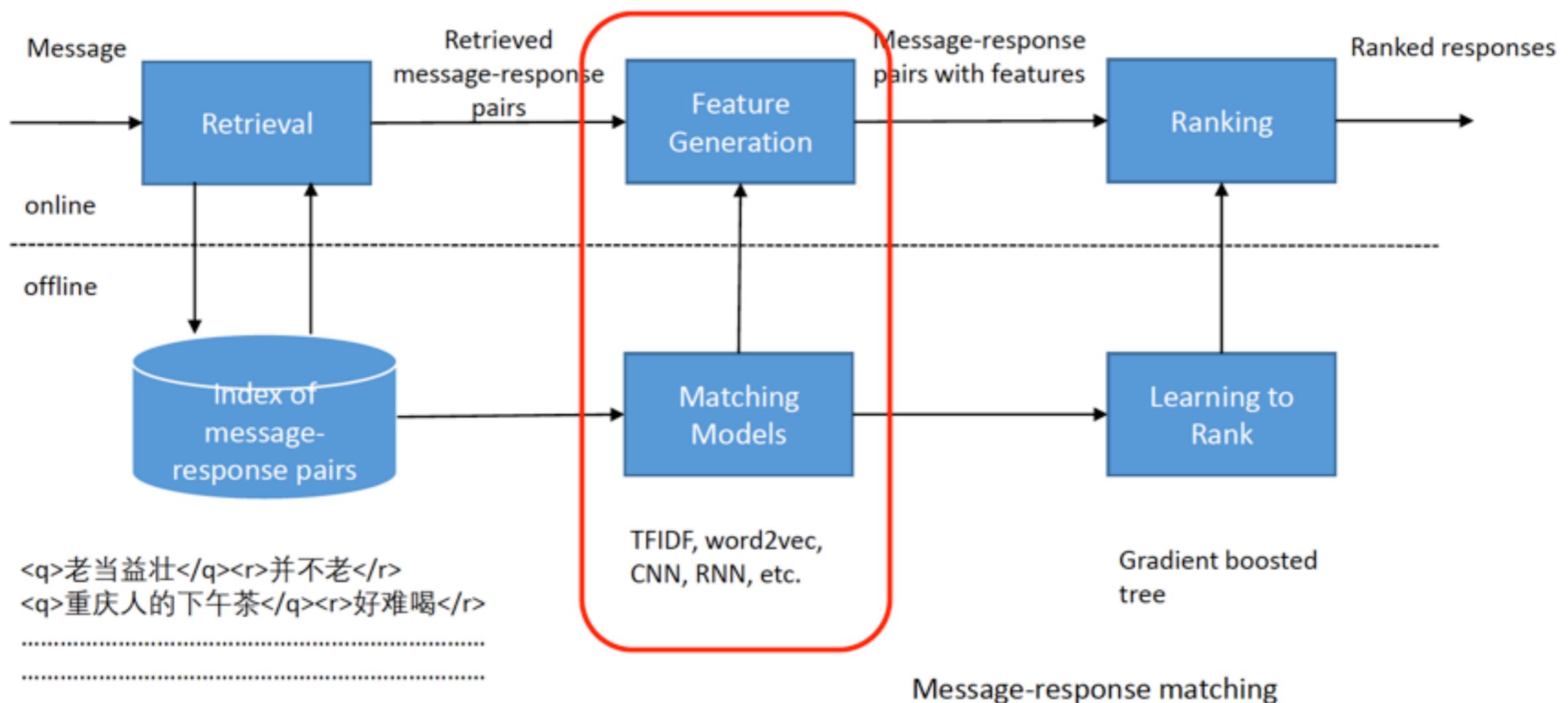


Chit-chat Conversational Agent

- Retrieval-based
- Generation-based

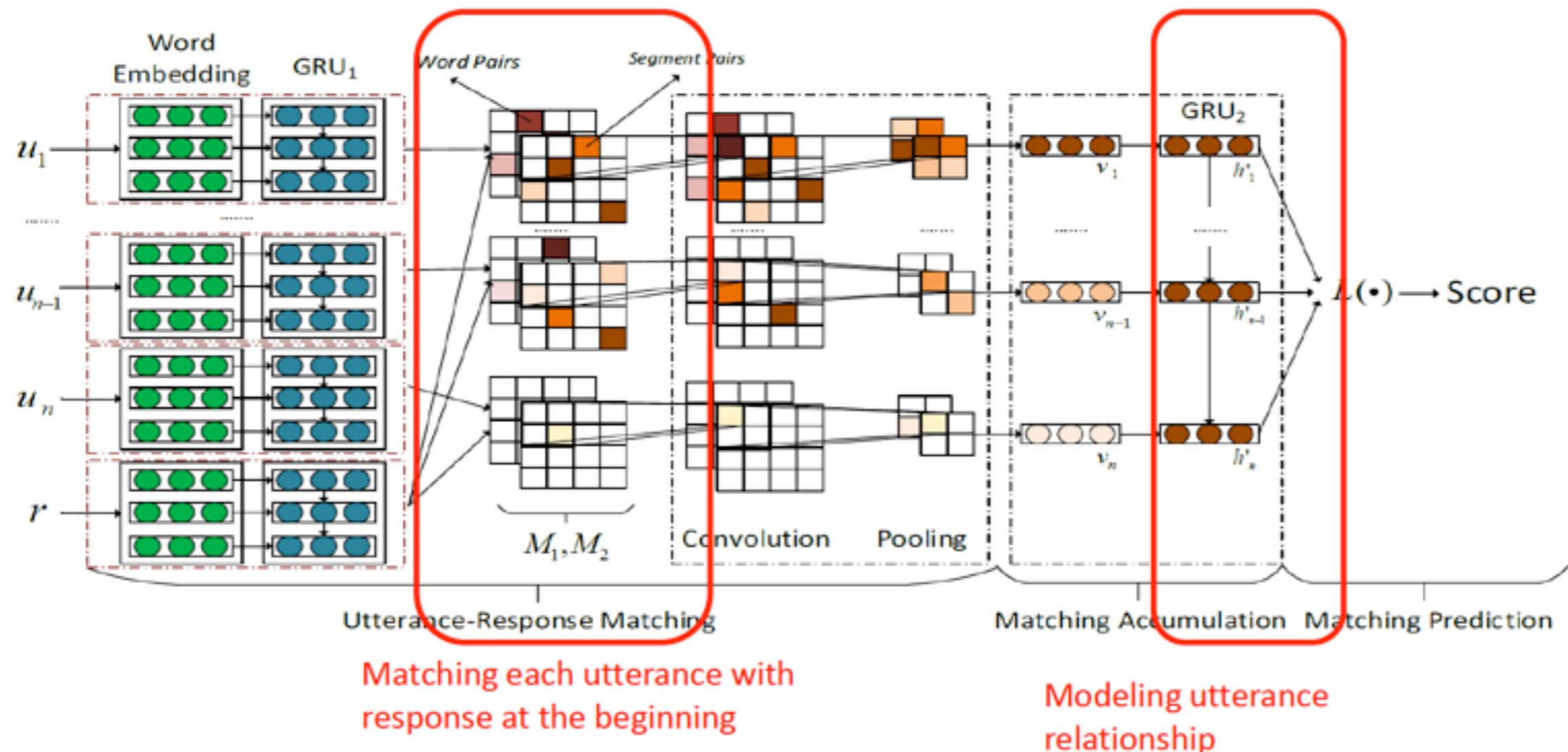
Chit-chat Conversational Agent

- Retrieval-based



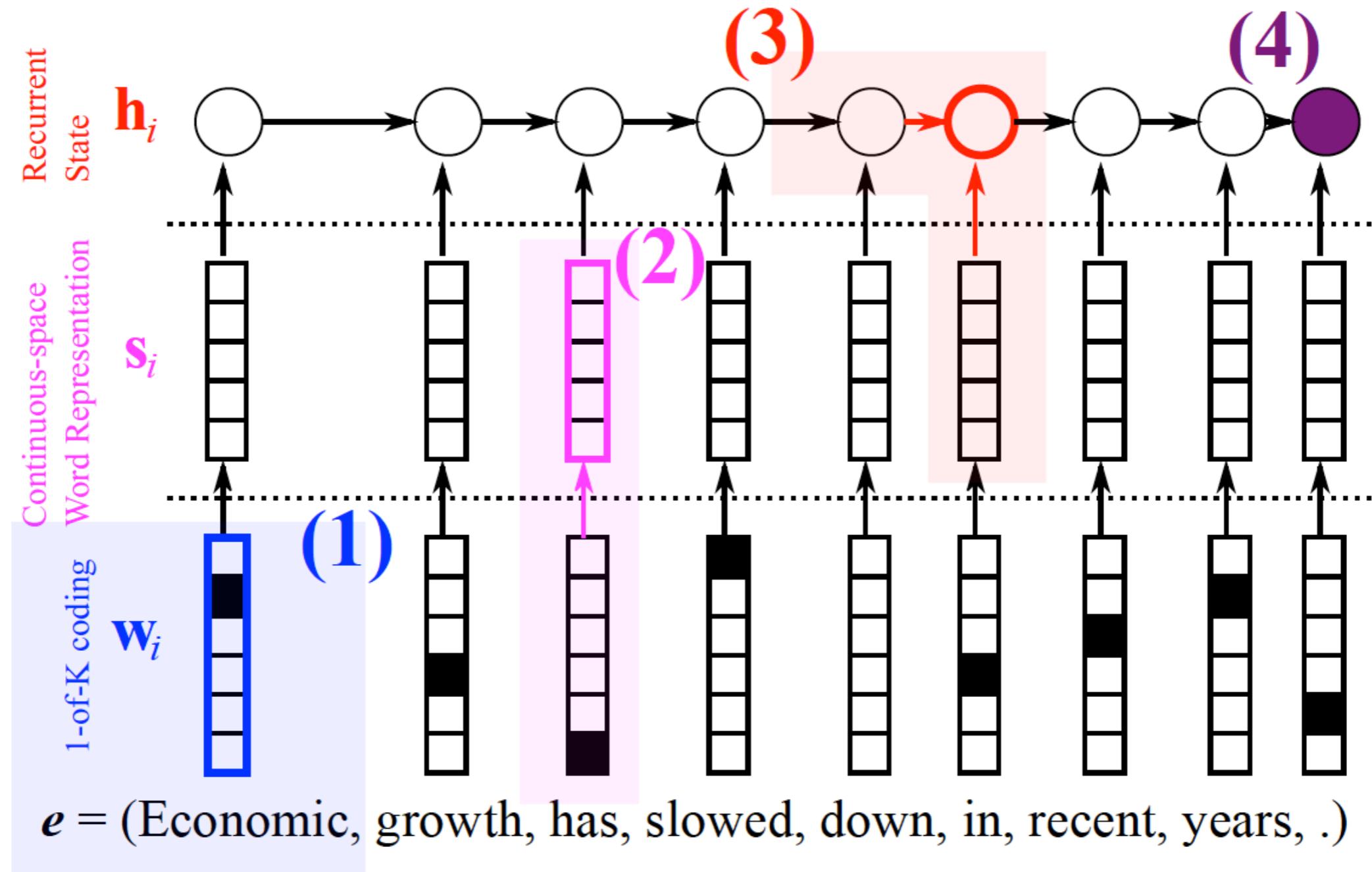
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- Retrieval-based



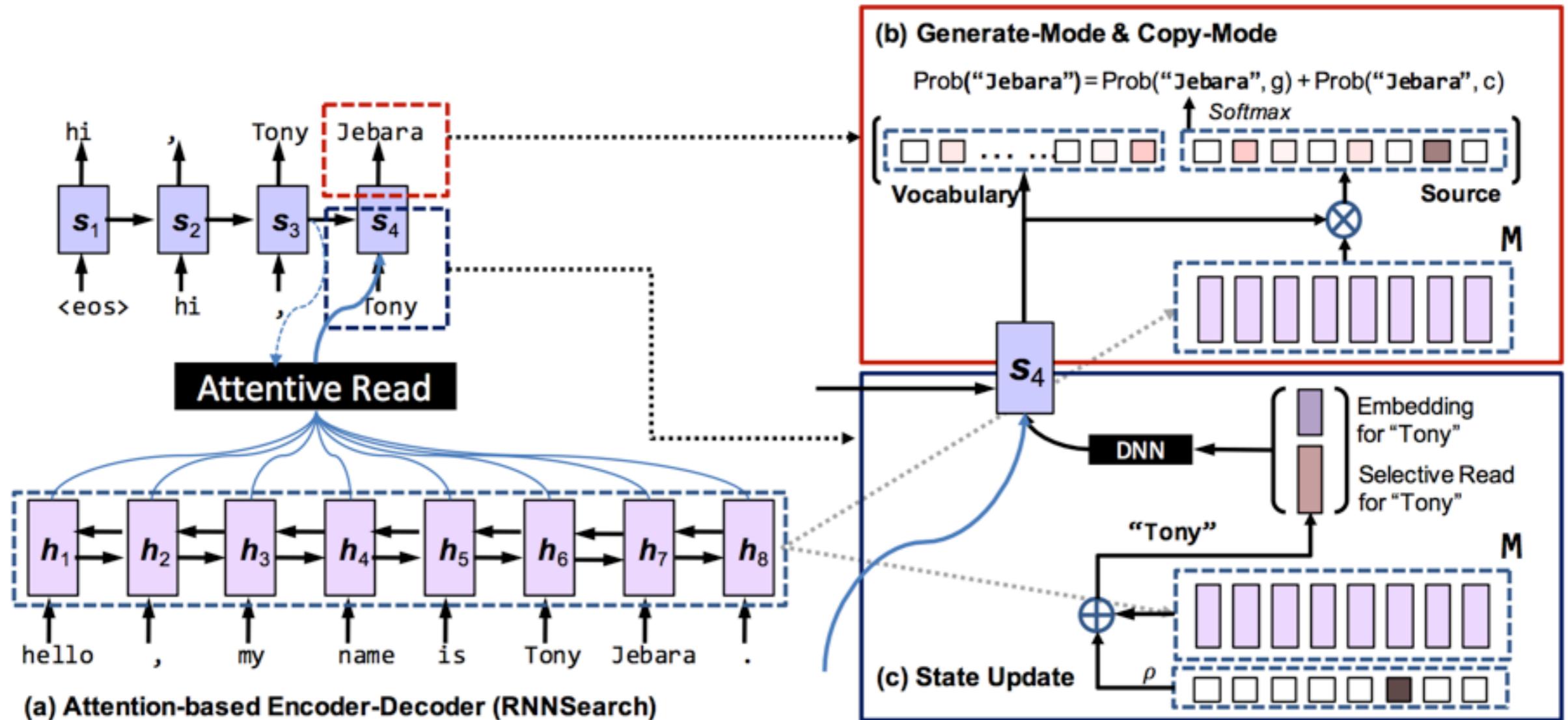
Chit-chat Conversational Agent

- Generation-based



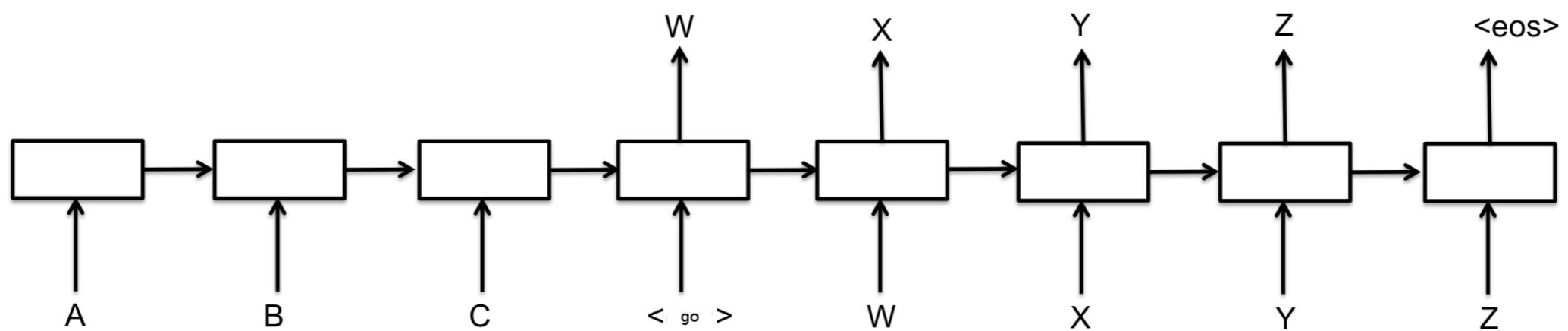
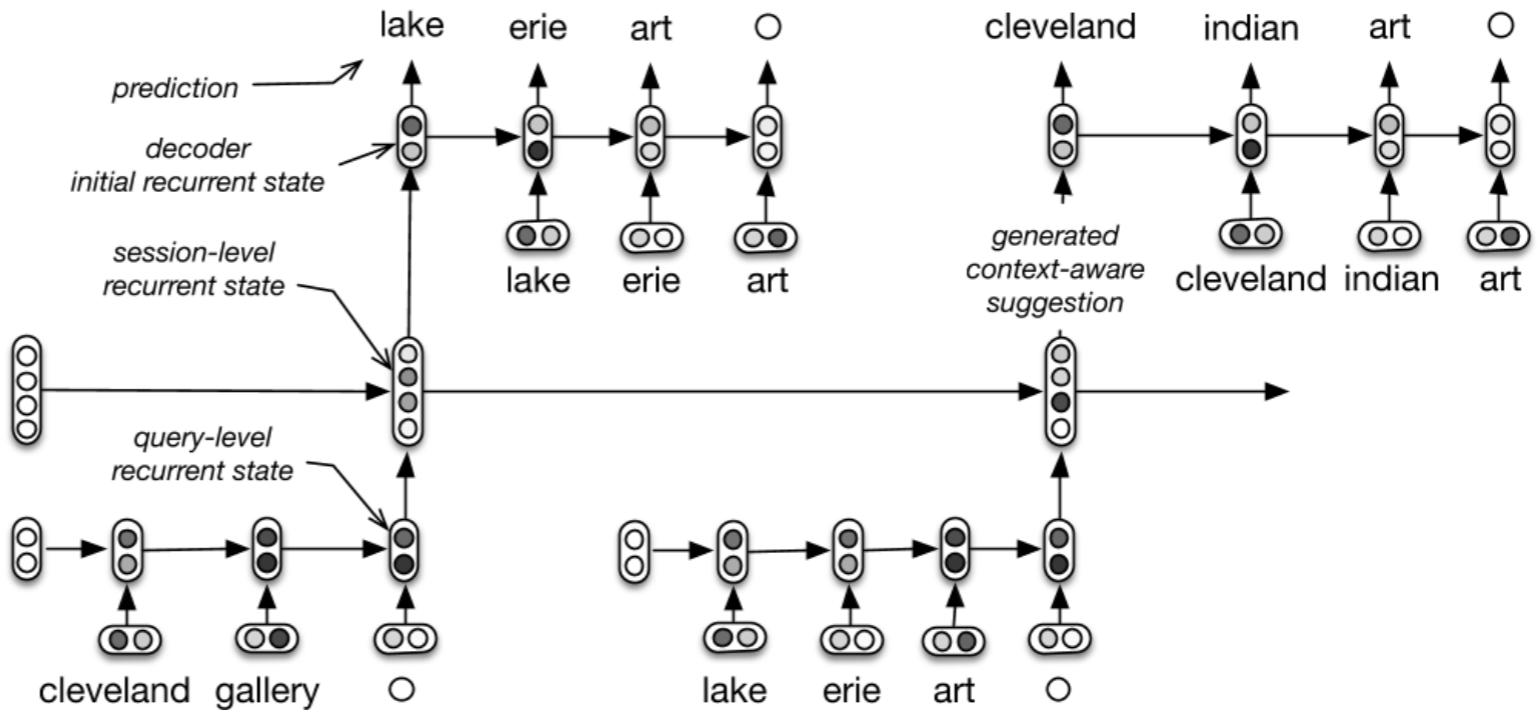
Chit-chat Conversational Agent

- Generation-based



Chit-chat Conversational Agent

- Generation-based



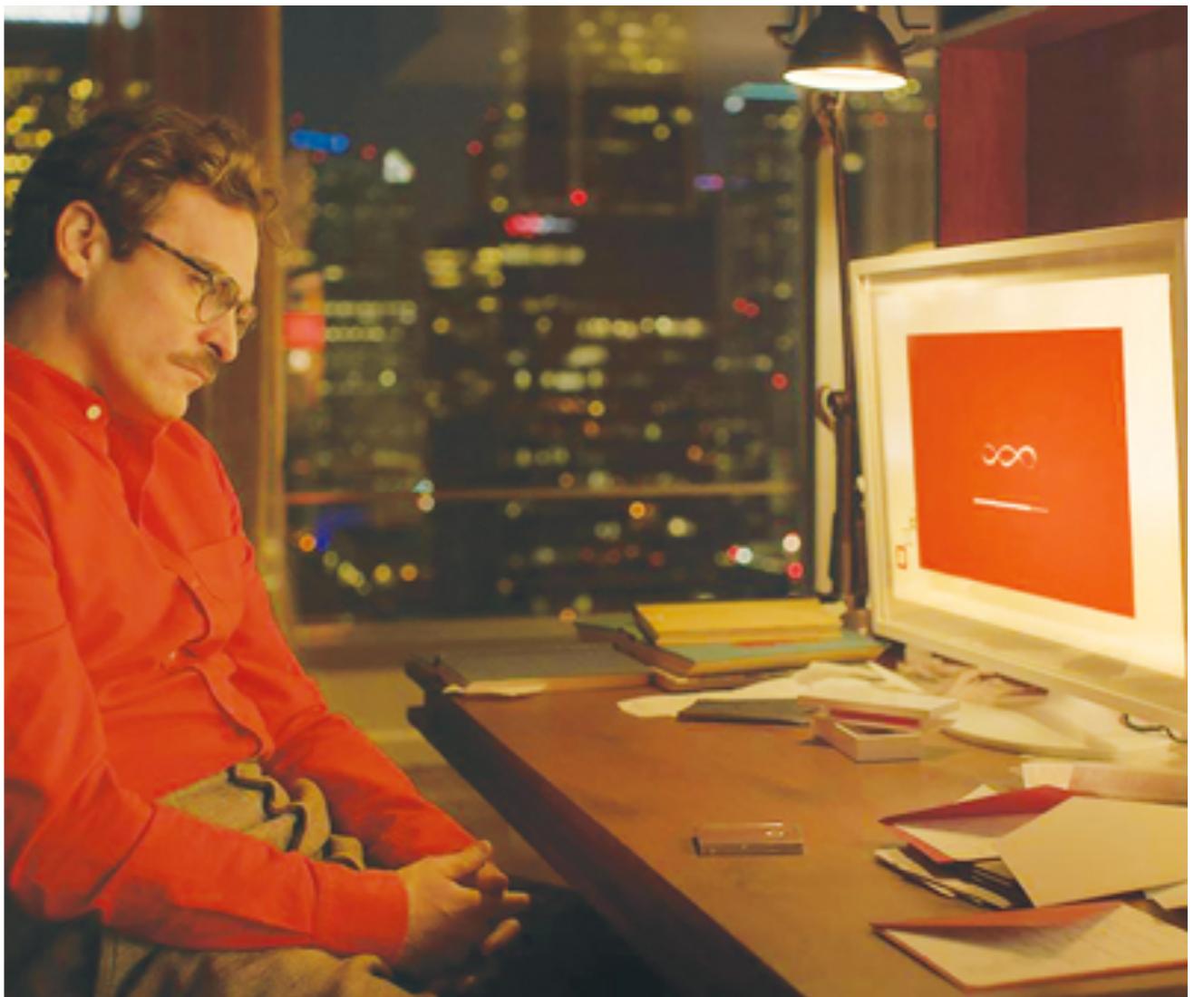


Key Issues

And Future Directions

Human-like, Careful, Friendly

- Emotional
 - “Her” in the science fiction film
 - “smart-aging”

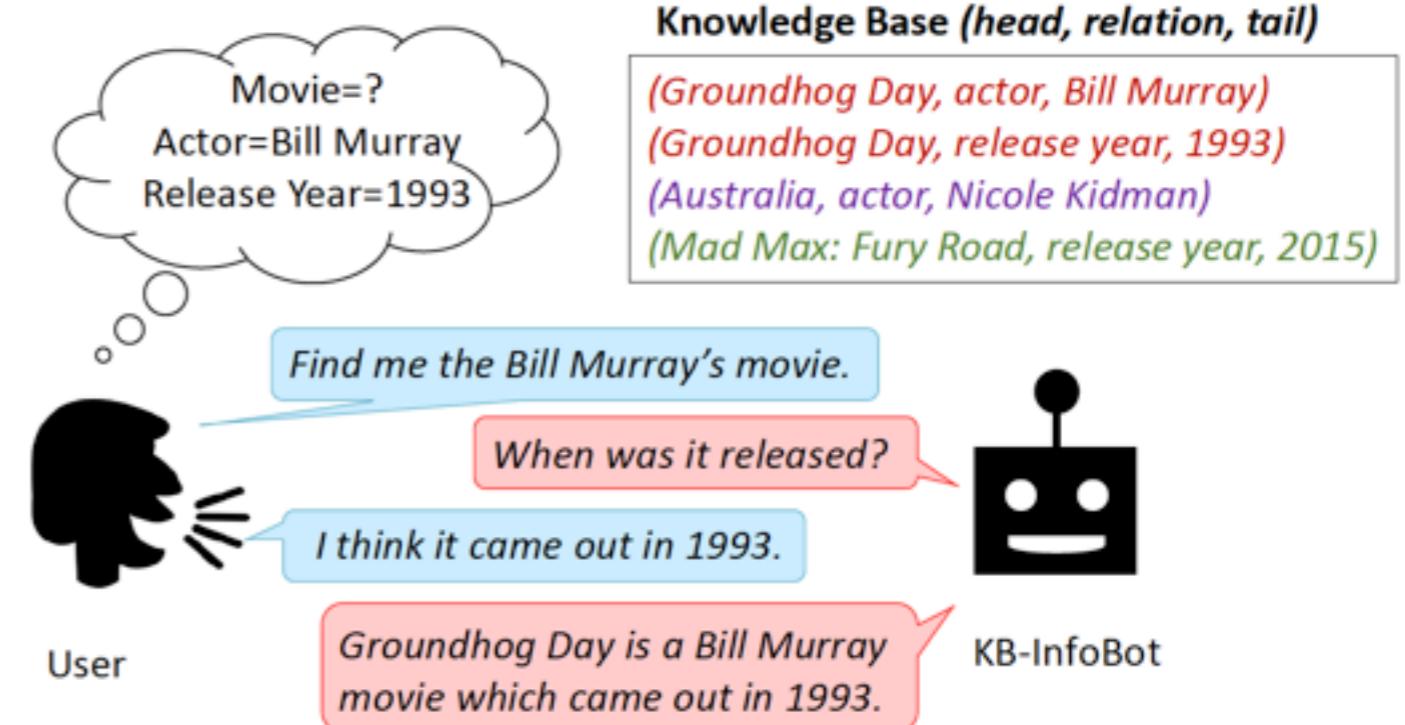


Knowledgable

- Commonsense Knowledge
- Other Knowledge

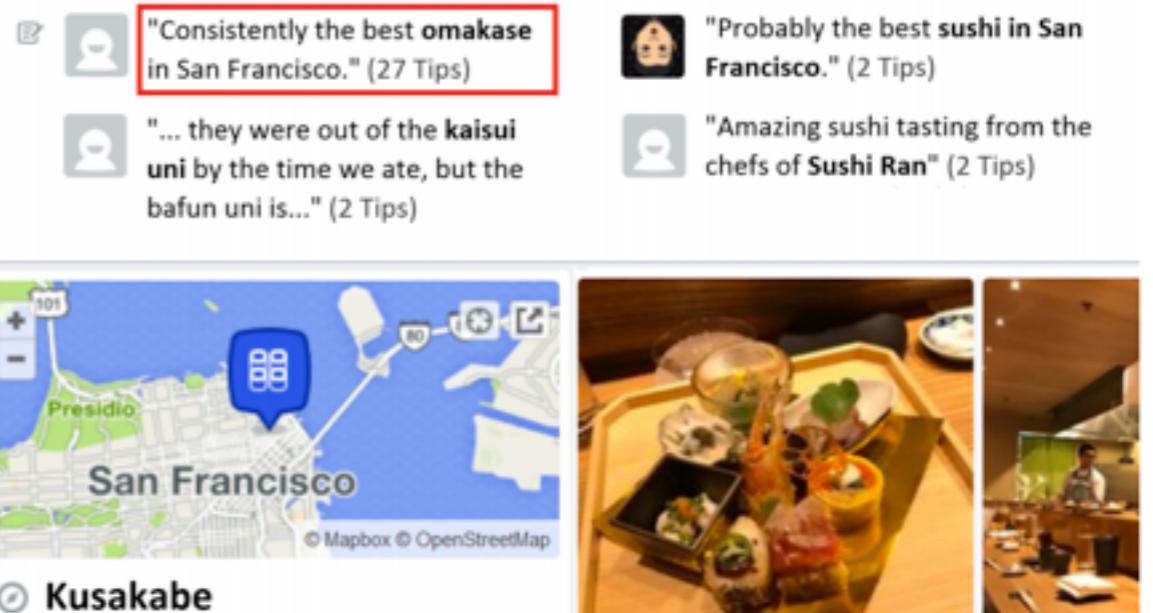
Commonsense Knowledge Augmentation

- Fact
- Entity
- *Linguistic knowledge
- Knowledge base and knowledge graph



Other Knowledge Augmentation

- Topic
- History
- Scenario (e.g. image)
- News/Articles/Rationales



User input: Going to Kusakabe tonight.
Neural model: Have a great time!
Human: You'll love it! Try omasake, the best in town.

Personalized

- Transfer Learning
- Lifelong Learning
- *Lack of Personal Data

Personalized Bot Flows



Mike



Sofia



Alex



Jen

Lives in NYC
Buys: Dress
Shirts & Jeans

Awesome, thanks! Here are five items we think you'll dig.

Polo Classic Dress Shirt
Part of our autumn collection

[Buy this item](#)
[See more like this](#)
[Ask a question](#)

Lives in DC
Buys: Shoes
& Dresses

Awesome, thanks! Here are five items we think you'll dig.

Back Dress Collection
Part of our autumn collection

[Buy this item](#)
[See more like this](#)
[Ask a question](#)

Lives in Miami
Buys: 'Big
Pony' Polos

Awesome, thanks! Here are five items we think you'll dig.

Big Pony Polo 25% Off
Part of our autumn collection

[Buy this item](#)
[See more like this](#)
[Ask a question](#)

Lives in SF
Buys: Home
Decor

Awesome, thanks! Here are five items we think you'll dig.

Blue Designer Sofa
Part of our autumn collection

[Buy this item](#)
[See more like this](#)
[Ask a question](#)



Thanks for your attention!

Q&A