苏宁智能机器人平台设计与应用实践

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WOTD

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Conversational Commerce Suning Bot Platform

Suning Research AI Lab

Wei Li

Agenda

- Overview of Dialogue System
- Search-based Question Answering
- Slot Filling-based Intent Understanding
- Regression-based Smart Customer Service
- AI + HI Architecture
- Suning Bot Platform
- Demo

Information Retrieval Trend
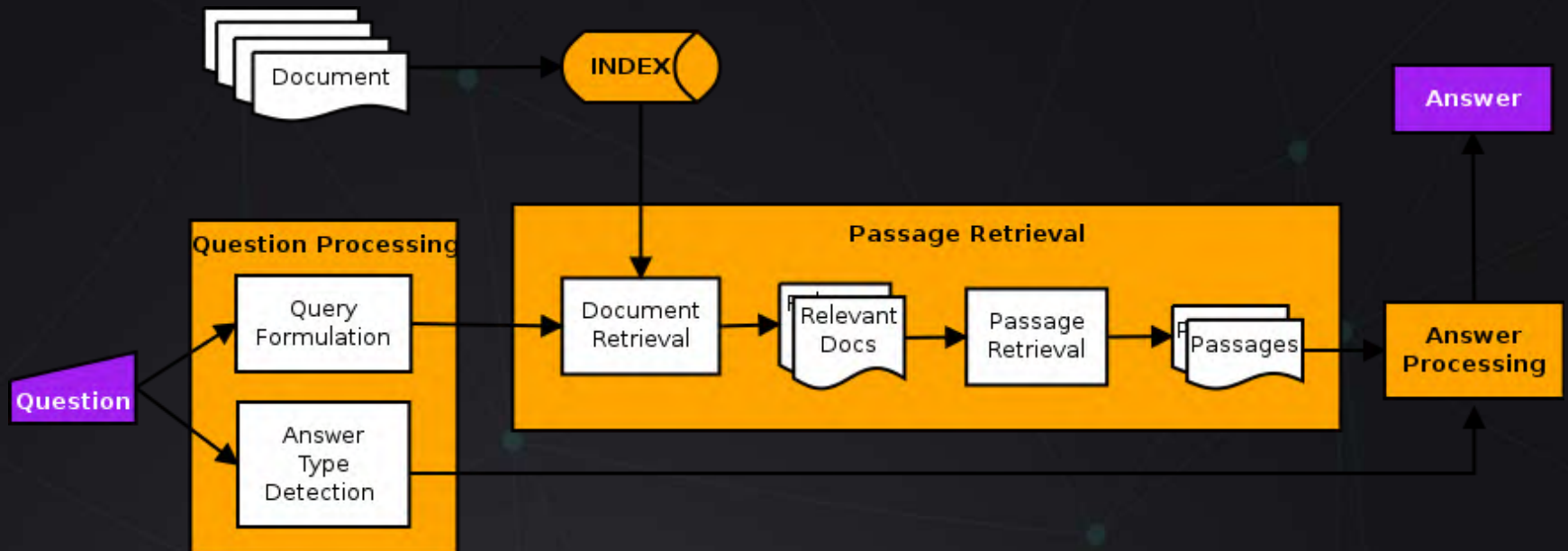
Dialogue System, 2015

Web Search, 1990

Library Search, 1970

Question Answering Overview

- Definition
  - Automatically answer a user's question by machine
- Types of QA
  - Types of questions
    - Factoid, who is the wife of Obama
    - Opinion, what is your point to air pollution
    - Yes-no, are you happy?
    - Comparison, what are the differences between mac and windows?
  - Types of content
    - Textual QA
    - Visual QA
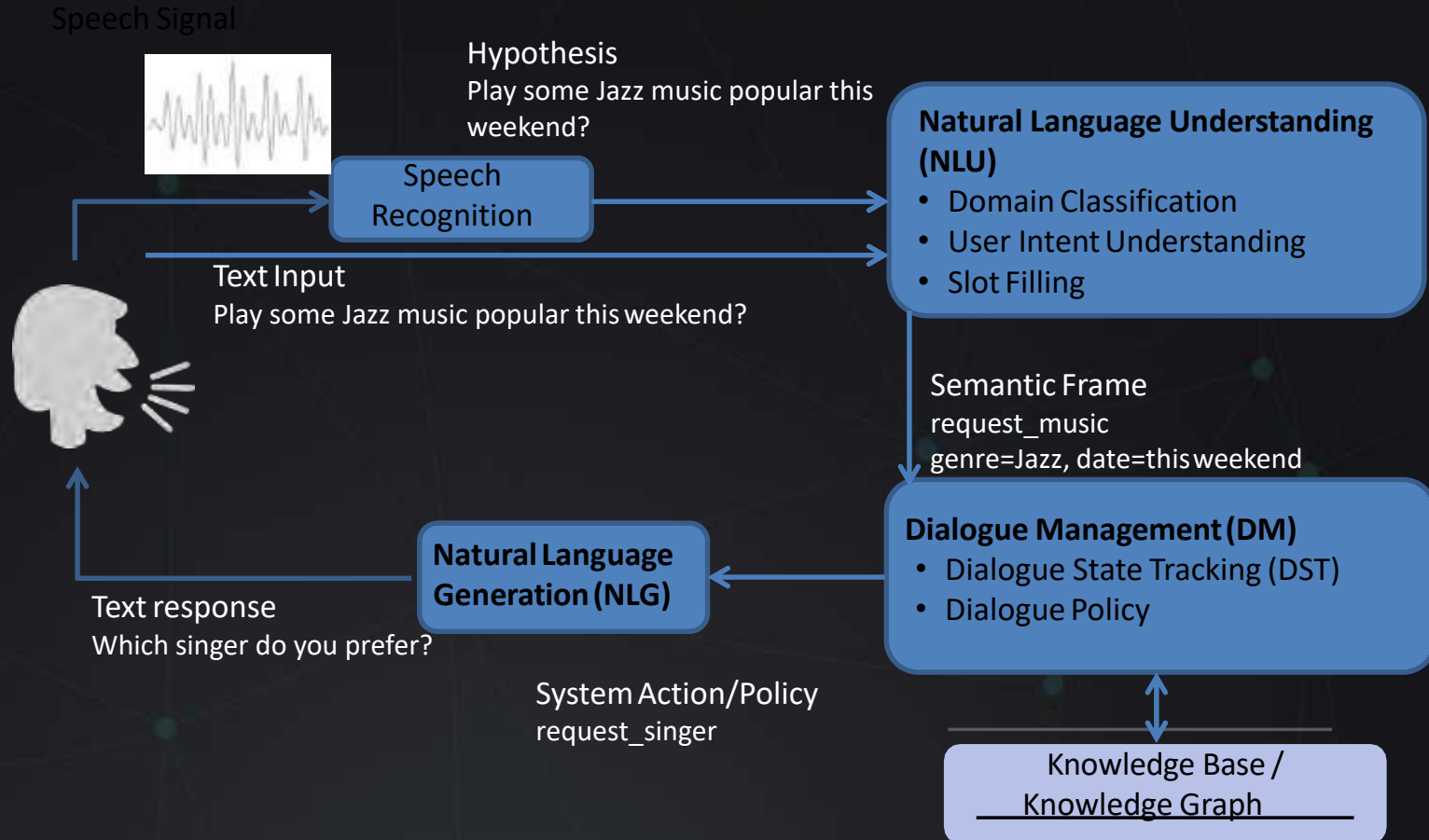- Key technology behind Dialogue System
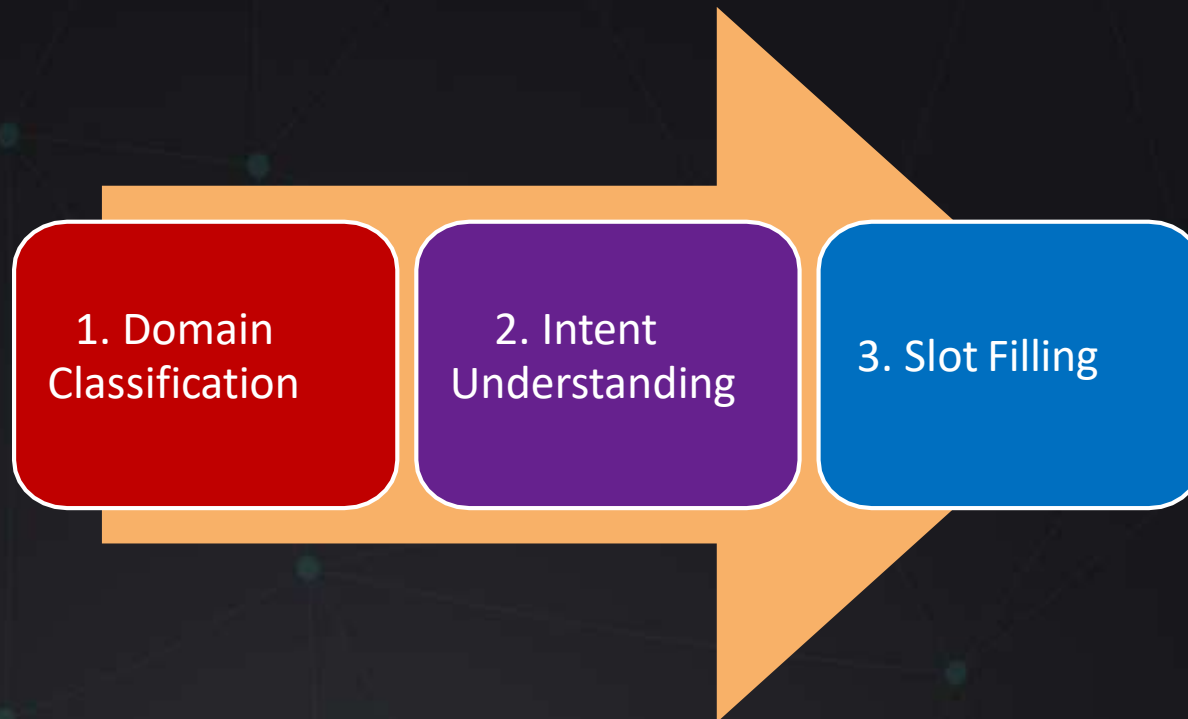
QA Architecture

Dialogue System Type

- Chat Bot
  - Free chat on specific or open domain topics
  - XiaoIce, Microsoft
  - Duer, Baidu
- Task Bot
  - Task completion on vertical domains
  - Cortana, Microsoft
  - Siri, Apple

Task Bot Architecture

Speech Signal

Hypothesis
Play some Jazz music popular this weekend?

Speech Recognition

Text Input
Play some Jazz music popular this weekend?

Natural Language Understanding (NLU)
- Domain Classification
- User Intent Understanding
- Slot Filling

Semantic Frame
request_music
genre=Jazz, date=this weekend

Dialogue Management (DM)
- Dialogue State Tracking (DST)
- Dialogue Policy

Natural Language Generation (NLG)

Text response
Which singer do you prefer?

System Action/Policy
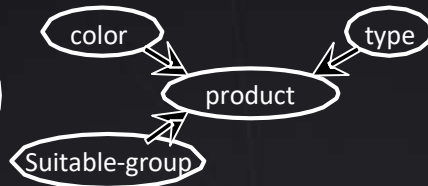request_singer

Knowledge Base / Knowledge Graph

Natural Language Understanding

Semantic Frame Model

- Requires a domain ontology

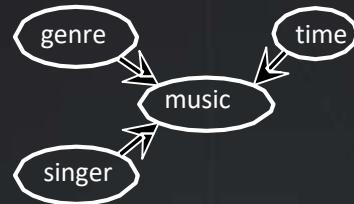- Contains **core content (intent, a set of slots with fillers)**

Domain Classification

Intent Understanding

User

find me a red mobile phone suitable for girls

Classification

Smart
Assistant

Product DB

BUY_Mobile_Phone
BUY_CLOTHES
BUY_BOTTLED_WATER
:

Slot Filling

User

O   O   O B-color O   O   O   B-suitable-group

find me a red mobile phone suitable for girls
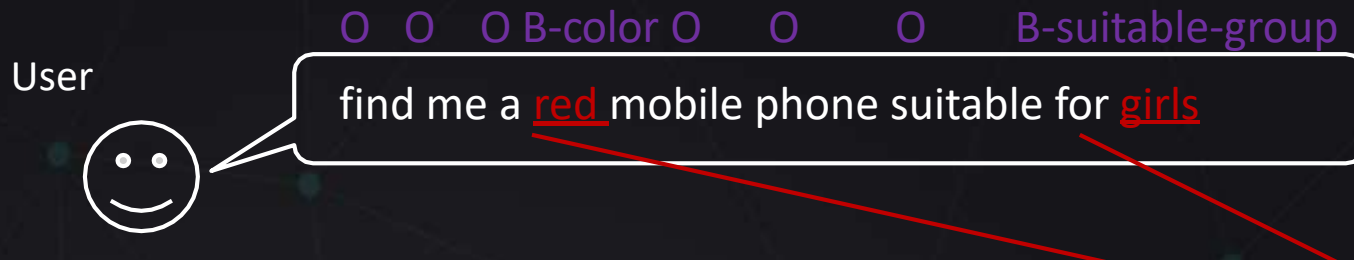
Product	Color	Suitable-group
mobile phone 1	red	girl
mobile phone 2	blue	boy
:	:	:

Product DB

Smart Assistant
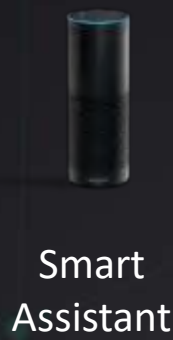
BUY_MOBILE_PHONE
  color="red"
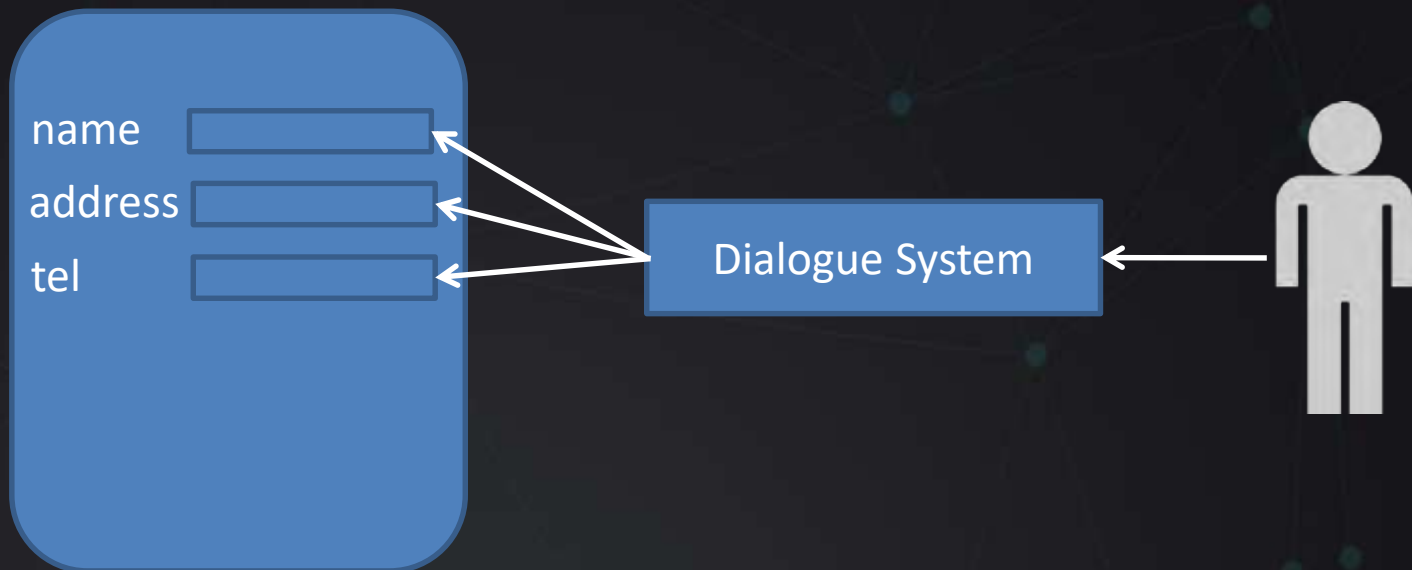 suitable-group="girl"

Semantic Frame

Search mobile phone {
  mp.color = "red"
  mp.suitable-group="girl"
}

Sequence Labeling

Slot Filling

- Definition
  - Fill the missing information or attributes about a given entity or task, (entity/task, slot, filler)

name

address

tel

Dialogue System

Slot-filling Application Scenarios

- Dialogue System
  - Filling slots via single-turn, multi-turn interaction
- Product attributes refinement
  - Correcting or filling missing attributes based on the information of aligned products
- Entity profile completion
  - Complete entity properties from web text mining

Slot Filling Approaches

- Pattern-based methods
  - Fixed response template set
  - Example: I [love/like] [NER]'s song
- Classifier/model-based methods
  - Formulated as sequence labeling task
  - Example: buy me a ticket from Beijing to Shanghai tomorrow morning

Slot Filling Examples

Is there a cheap restaurant in the center of town please?

Sequence Labeling Task	Classification Task
CRF for tagging each utterance	Regression for each slot value pair

Is there a cheap place in the centre of town please?

O O B-price O O O O B-area I-area I-area O

slot value pairs

(price, cheap) ✔
(price, center) ✘
(price, town) ✘
(area, center) ✔
(area, cheap) ✘

Smart Home Control

- ## Smart Home Appliance Control
  - ### Some metrics

指标	数值
#Home Appliance	15
QPS	3ms
Precision	>84%
Recall	>88%

Suning Smart Control Demo

苏宁智能机器人平台，技术研究院人工智能实验室

服务体验

把空调调成20度   测试

JSON表格

device_type		AC
tts		设置空调温度为20摄氏度
cmd		SET_TEMPERATURE
cmd_args	arg_name1	temperature
	arg_value1	20

Smart Customer Service

- Smart Customer Service
  - Definition
    - Bot assistant customer service, to help human customer service to satisfy users
  - Scenarios
    - Bot first
    - Bot assistant
    - Queue
    - Offline

Regression-based Smart Customer Service

- Problem formulation
  - Data: (Q, SQ, A, Tag)
  - Example:
    - (差旅费有哪些内容，差旅费有哪些，A，Tag)
    - (差旅费有哪些内容，差旅费有些啥，A，Tag)
    - (差旅费有哪些内容，哪些项目是差旅费的，A，Tag)
  - Model
    - Binary regression model

Regression-based Smart Customer Service

- Architecture
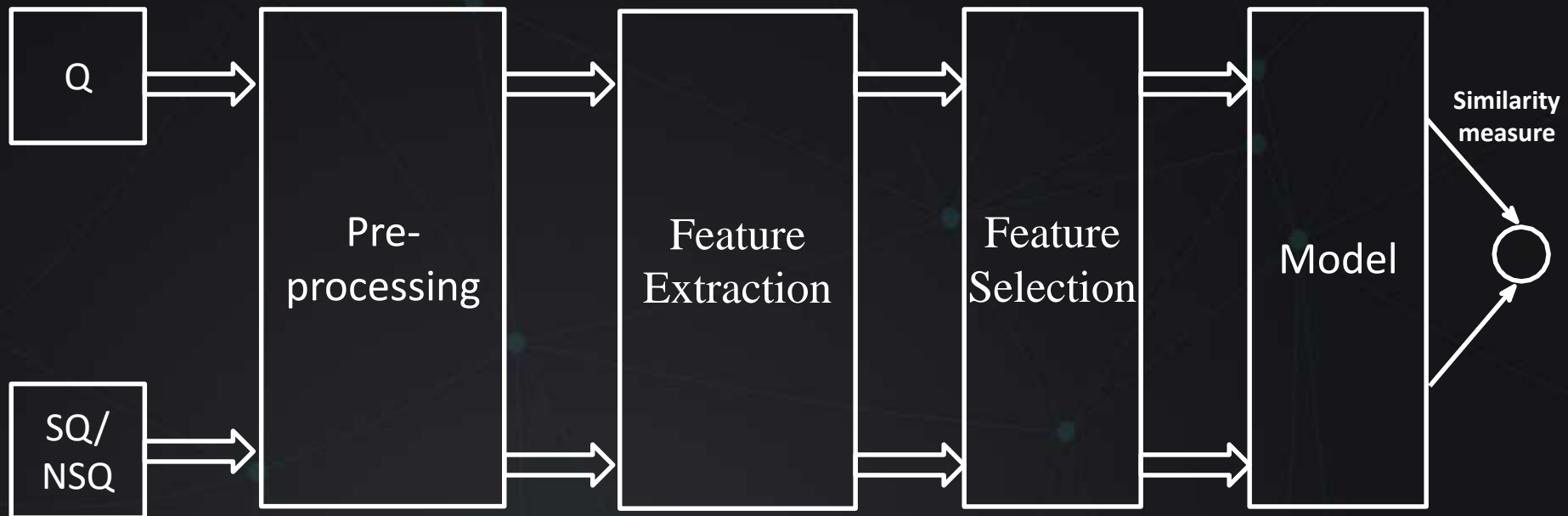
Smart Customer Service Demo

- Smart Financial Customer Service

Smart Customer Service

- Suning Internal Smart Customer Service
  - Some metrics

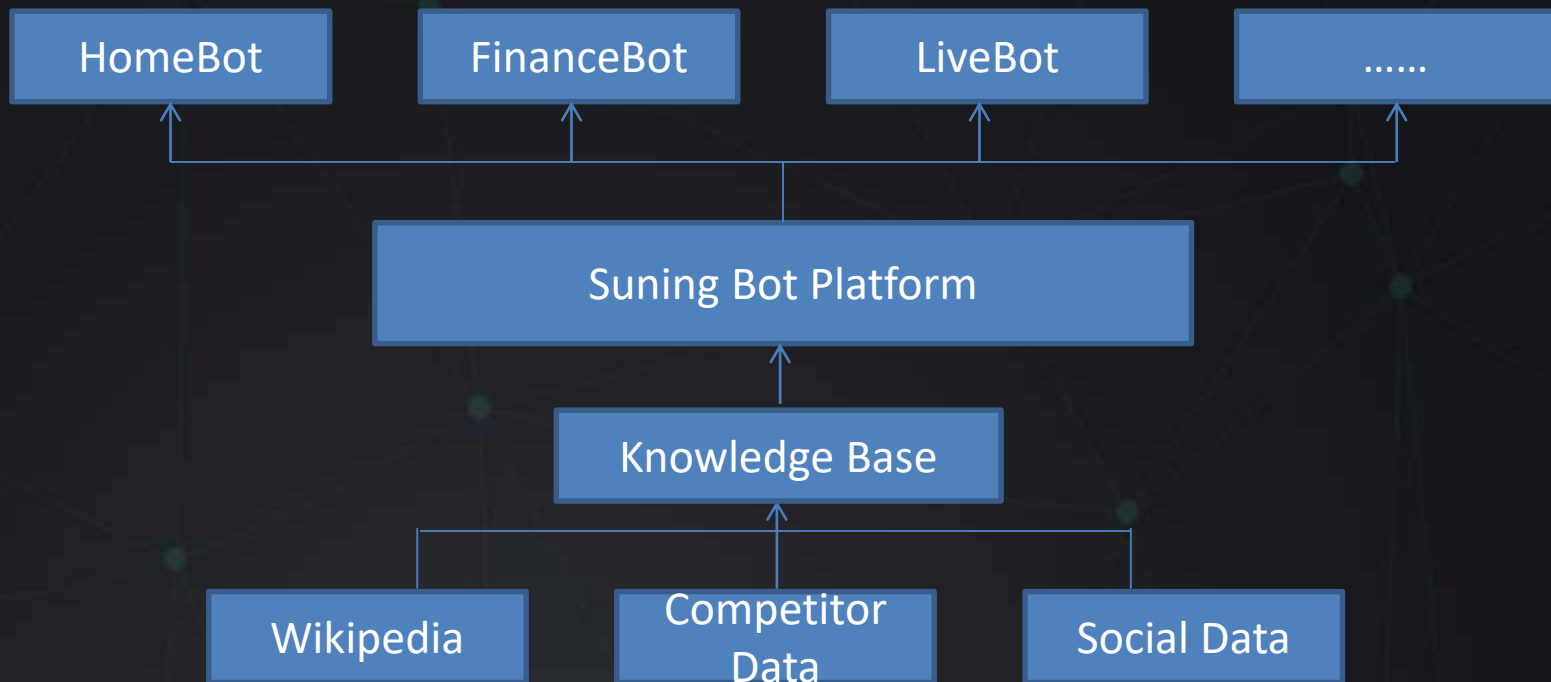| 指标	数值
Types	IT, Finance, HR
QPS	3ms
Precision	>64%
Recall	>72%

Suning Chat Bot Demo
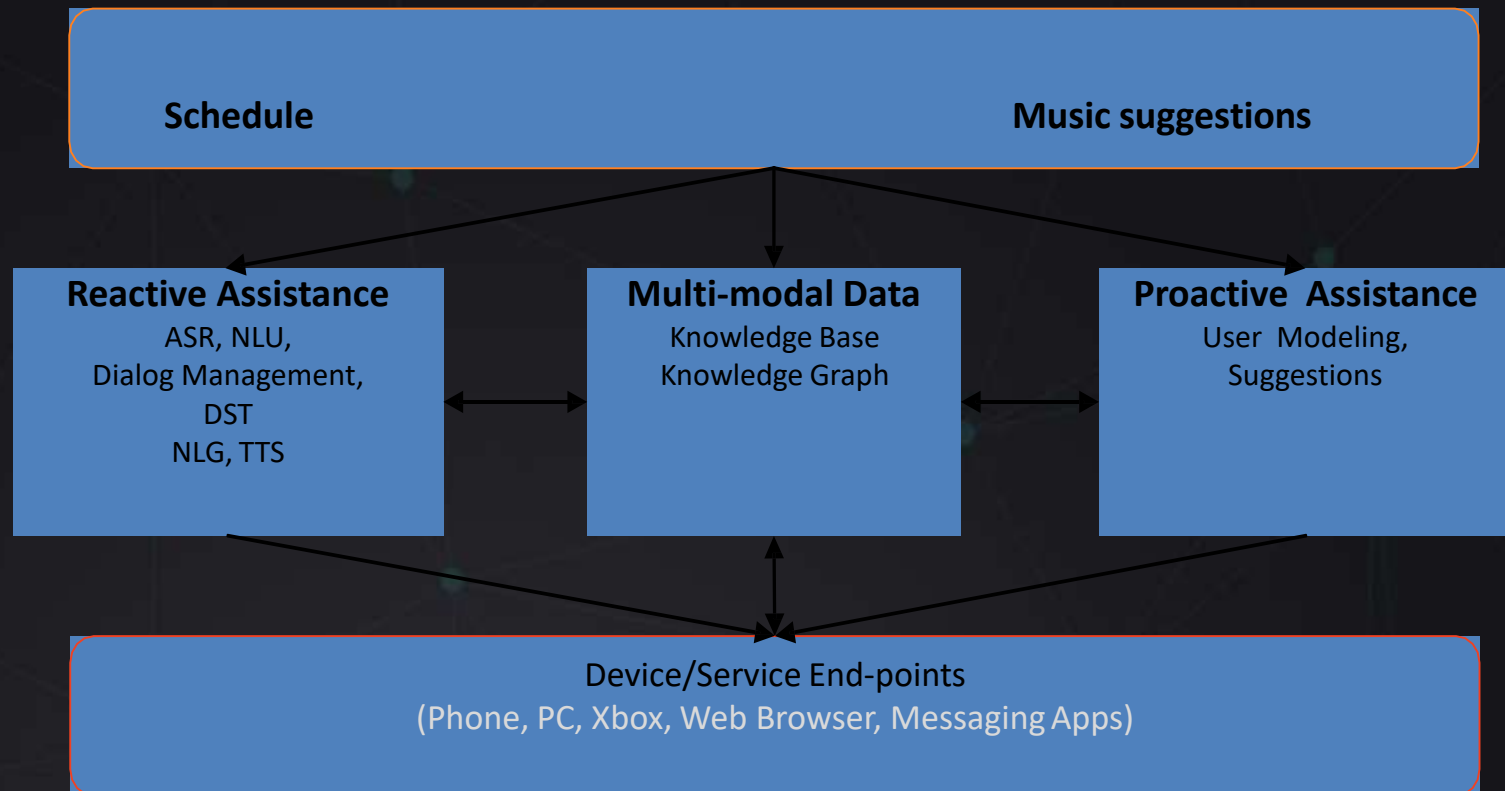
AI + HI = MI

- ## MI Architecture
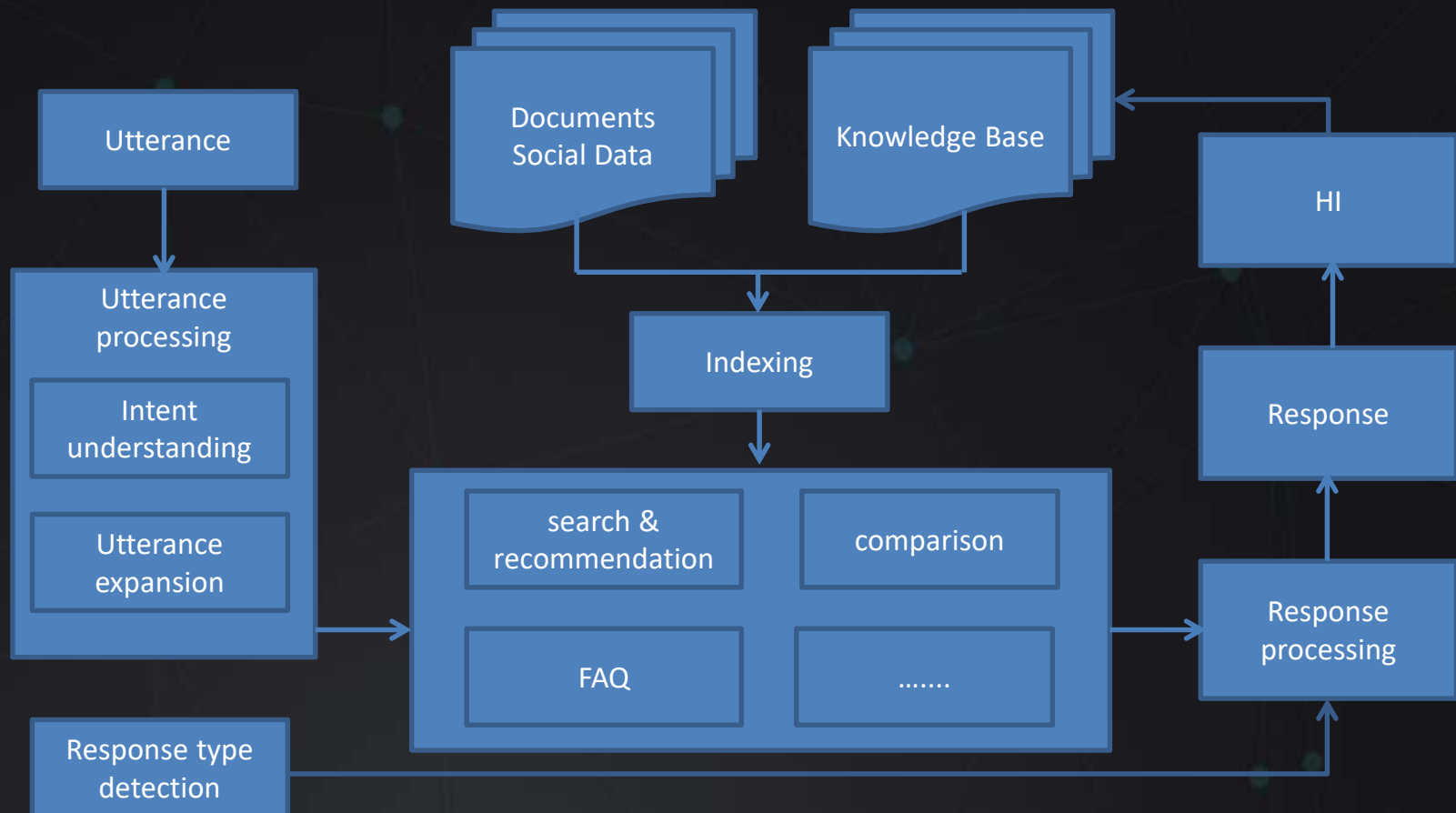
Suning Bot Platform

- Architecture

Smart Assistant Architecture

THANK YOU

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