

Artificial Intelligence Platforms and Applications in Suning

Suning Research AI Lab

Wei Li



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“通俗易懂的人工智能入门课”

王天一
博士 副教授



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从2012年开始算起，InfoQ已经举办了9场ArchSummit全球架构师峰会，有来自Microsoft、Google、Facebook、Twitter、LinkedIn、阿里巴巴、腾讯、百度等技术专家分享过他们的实践经验，至今累计已经为中国技术人奉上了近千场精彩演讲。

限时7折报名中，名额有限，速速报名吧！

● 2012.08.10-12 深圳站



● 2018.07.06-09 深圳站

会议：07.06-07.07

培训：07.08-07.09



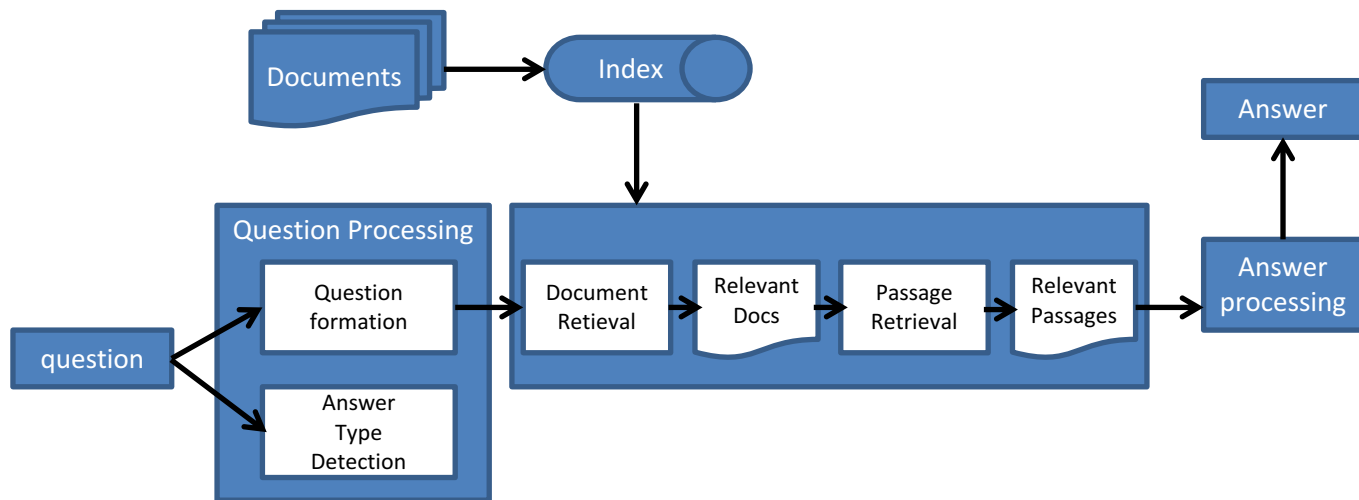
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- Overview of Question Answering and Dialogue System
- Search-based Question Answering
- Slot Filling-based Intent Understanding
- Suning Bot Platform Architecture
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- Smart Screen Bullet Bot
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Question 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

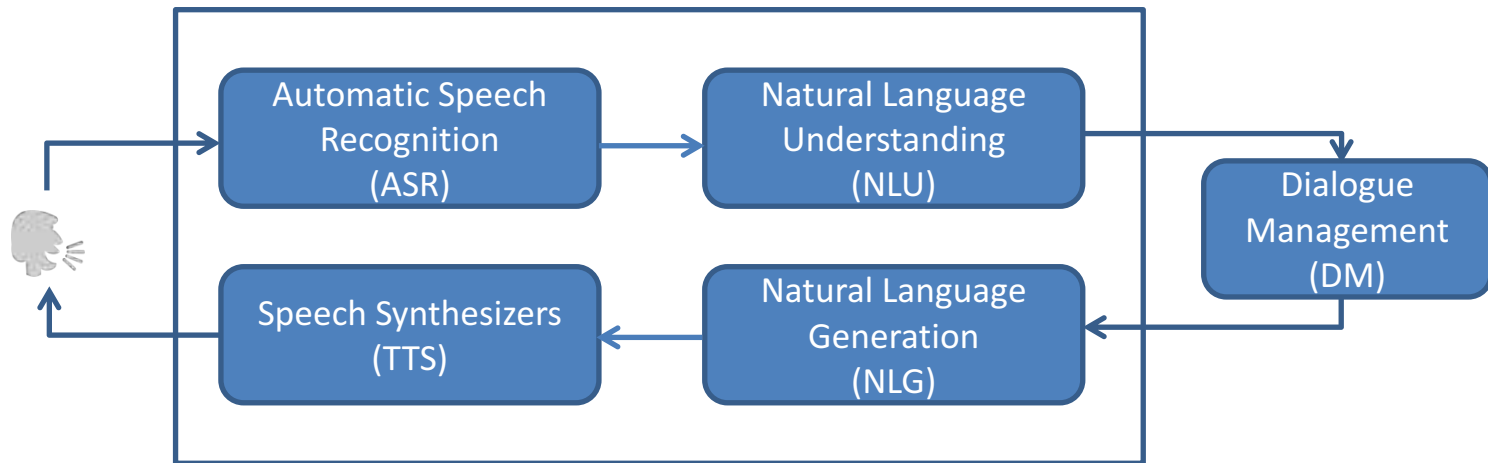
Search-based QA Architecture



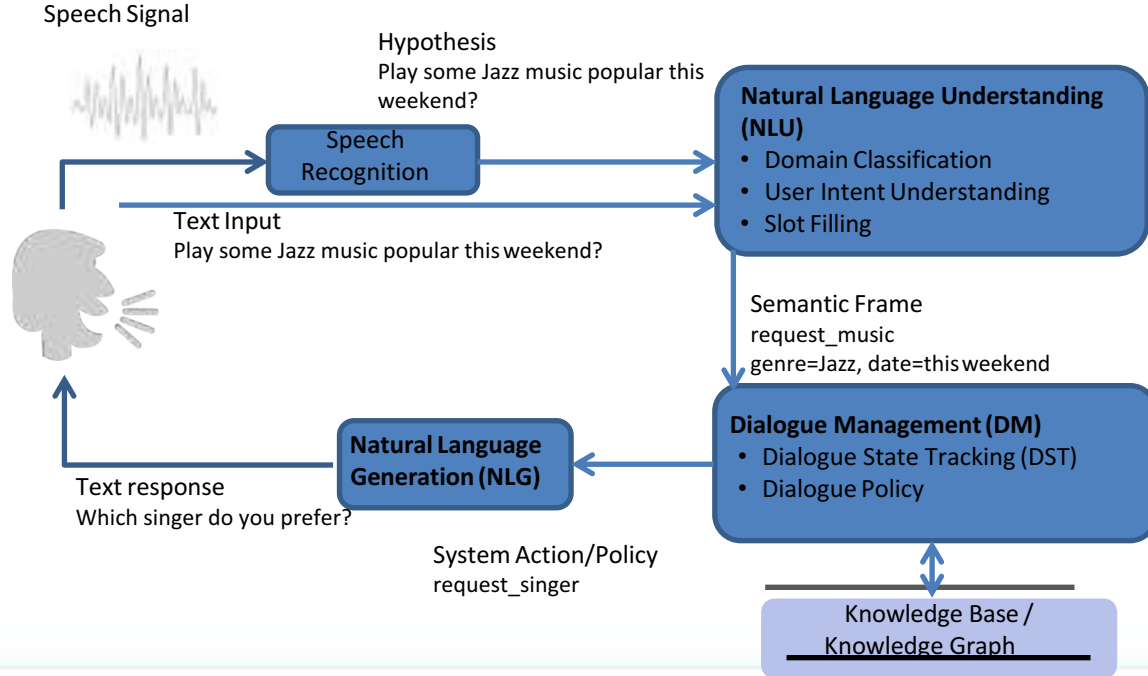
Dialogue System Overview

- Definition
 - A dialog system or conversational bot is a computer system intended to converse with a human, with a coherent structure
- Types of bots
 - Chat Bot
 - Free chat on specific or open domain topics
 - Xiaolce, Microsoft
 - Duer, Baidu
 - Task Bot
 - Task completion on vertical domains
 - Cortana, Microsoft
 - Siri, Apple
- Key technology behind conversational user interface

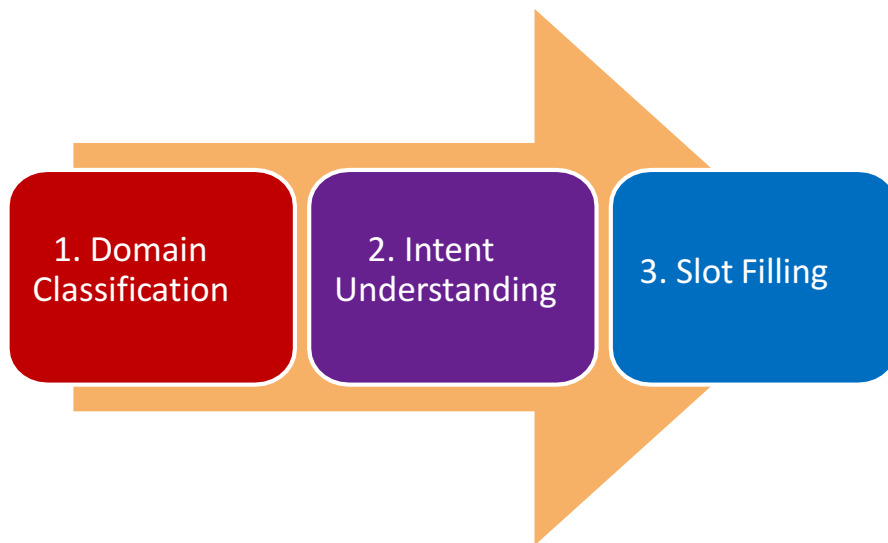
Dialogue System Architecture



Task Bot Architecture

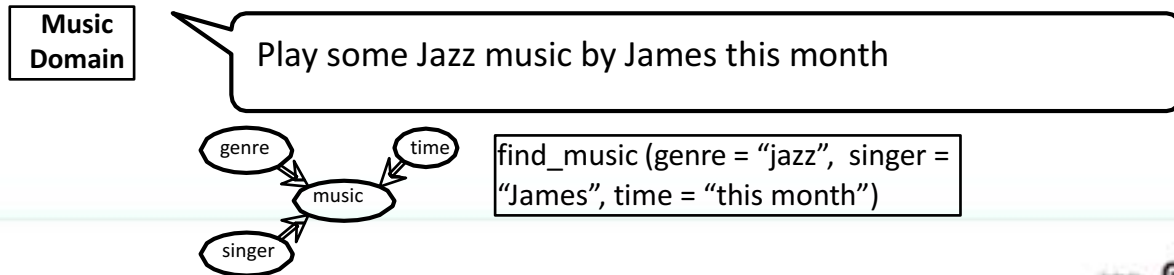
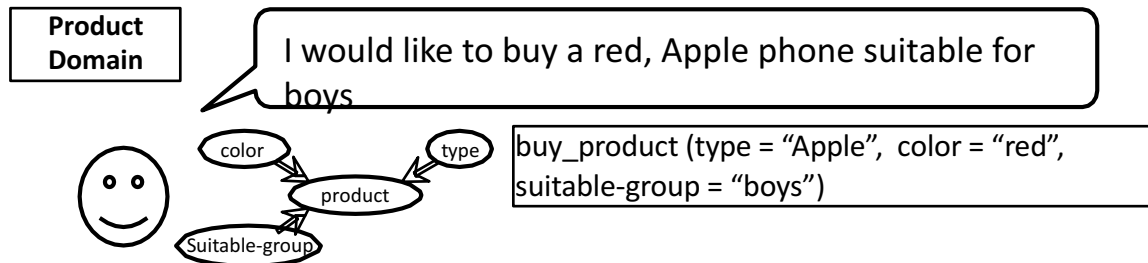


Natural Language Understanding

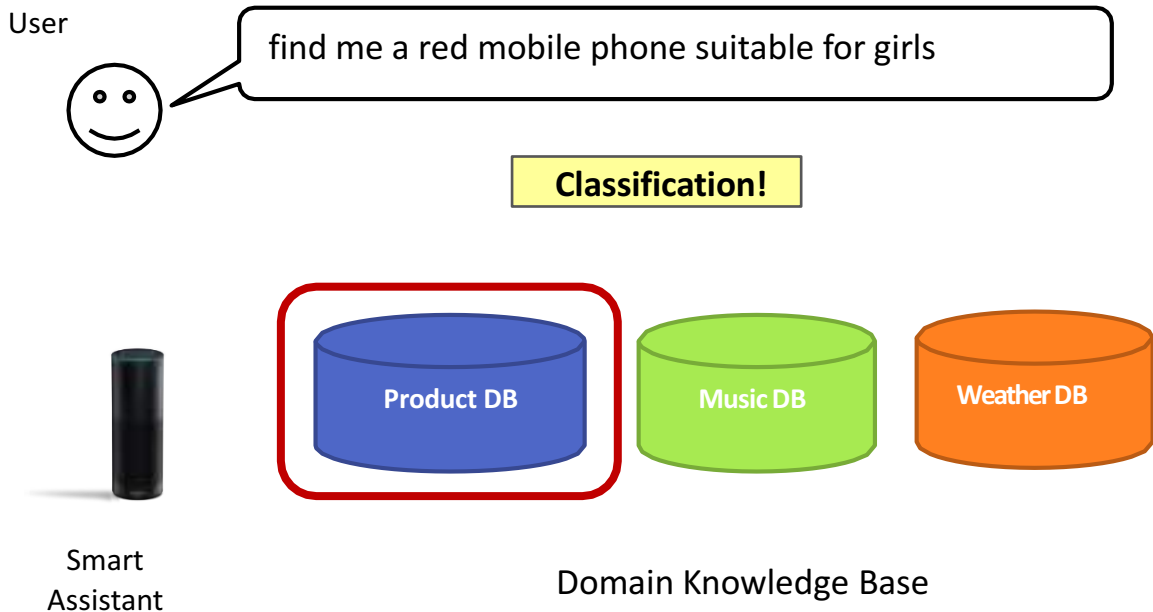


Semantic Frame Model

- 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

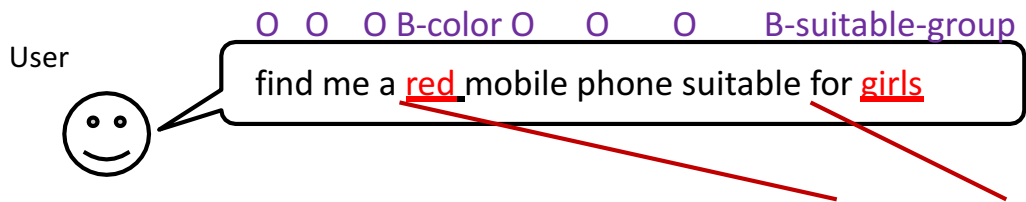


Product DB

BUY_Mobile_Phone
BUY_CLOTHES
BUY_BOTTLED_WATER

:

Slot Filling



Product	Color	Suitable-group
mobile phone 1	red	girl
mobile phone 2	blue	boy
:	:	:

BUY_MOBILE_PHONE
color="red"
suitable-group="girl"
Semantic Frame

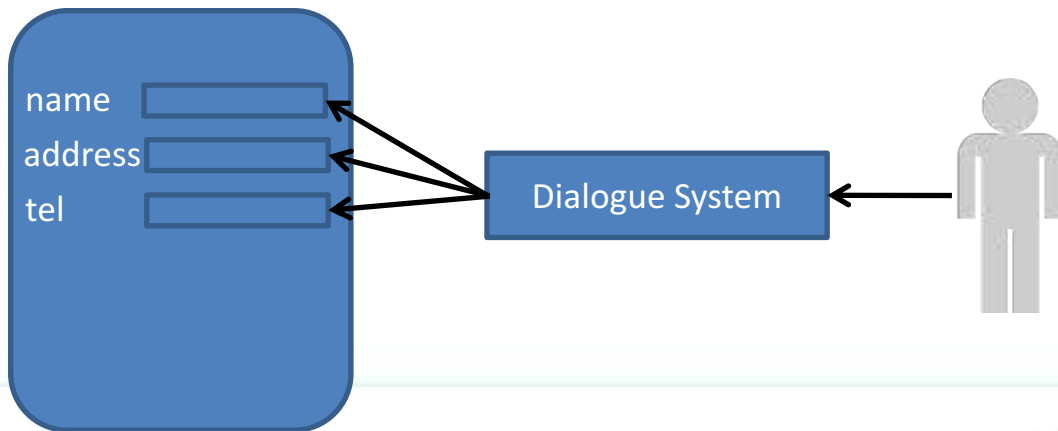


Search mobile phone {
mp.color = "red"
mp.suitable-group="girl"
}

Sequence Labeling

Slot Filling

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



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?

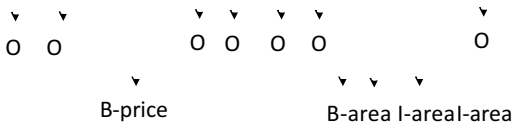
Sequence Labeling Task

CRF for tagging each utterance

Classification Task

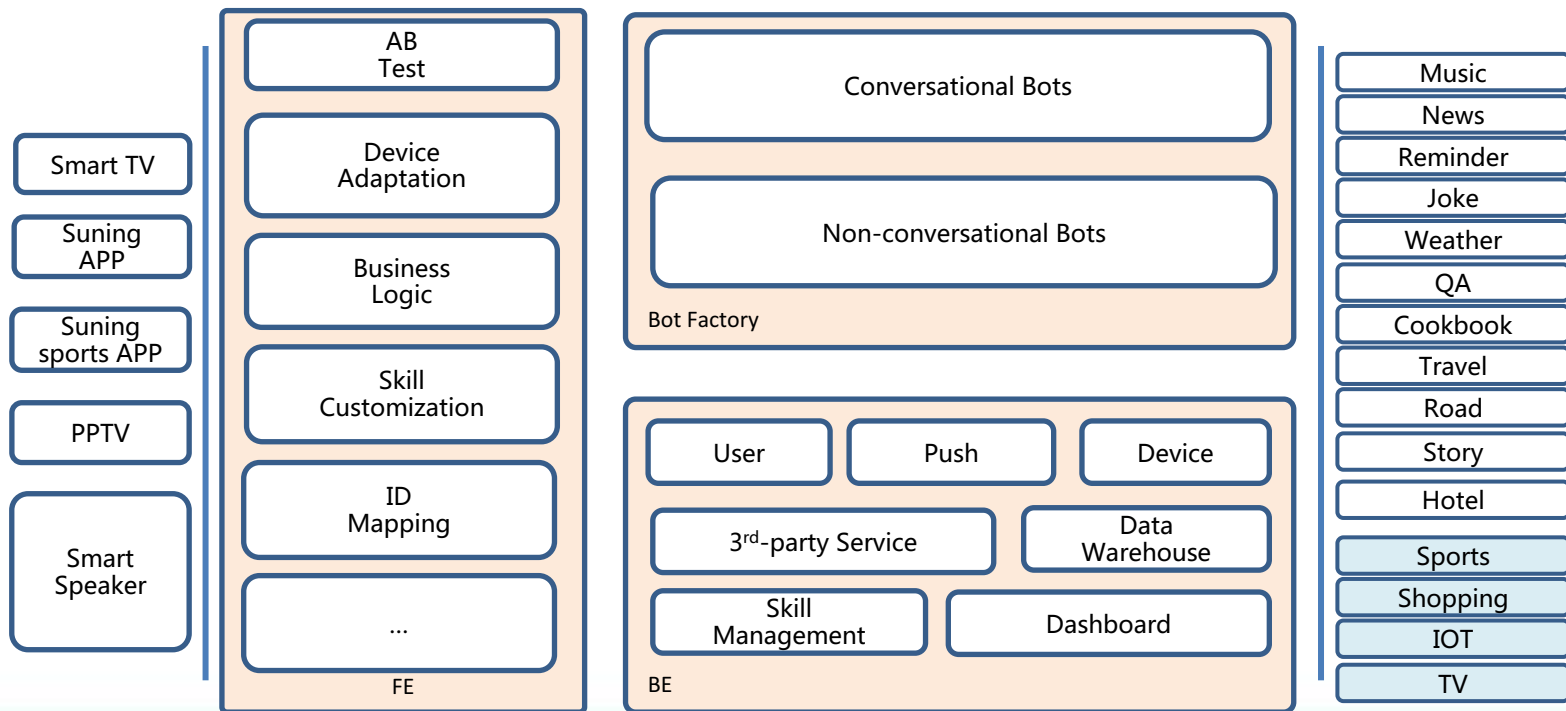
Regression for each slot value pair

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

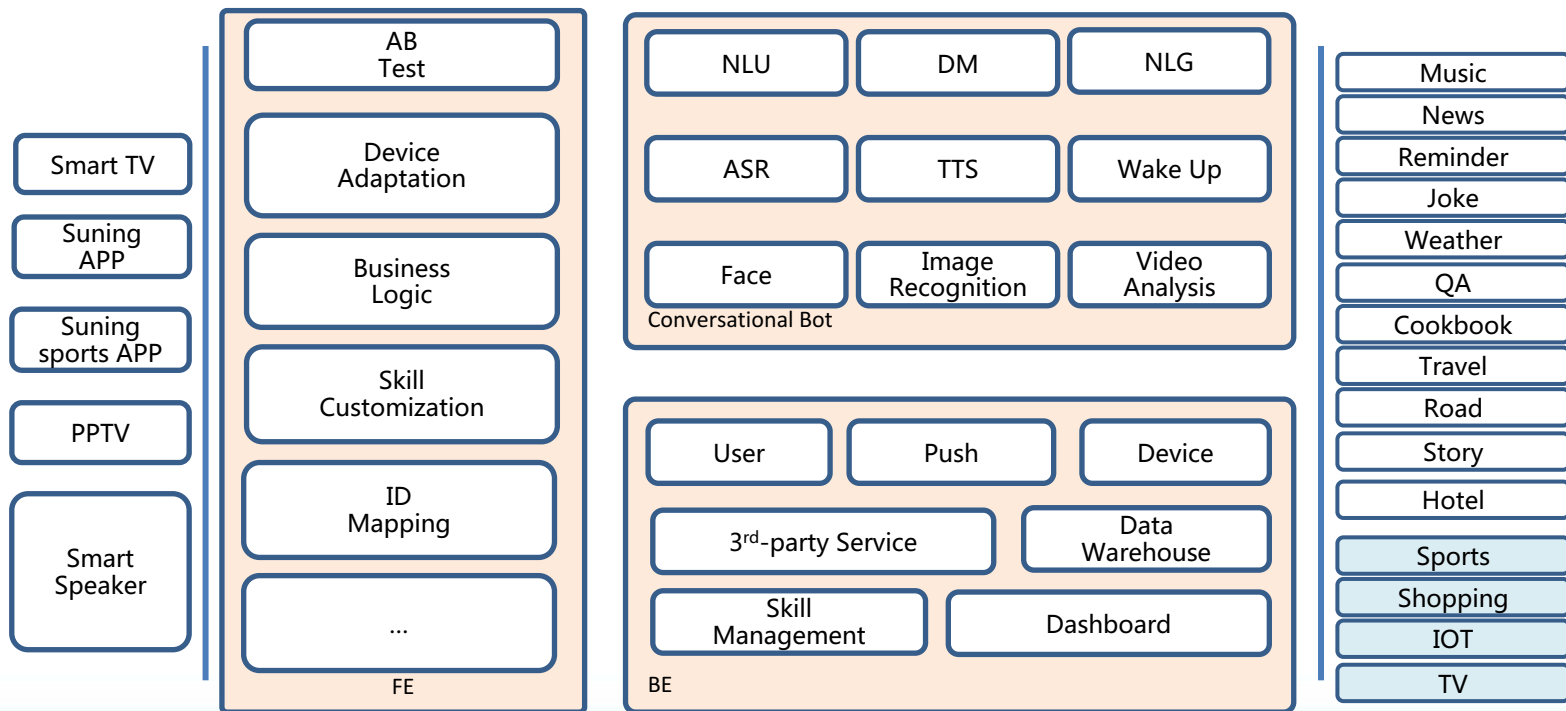


(price, cheap)	✓
(price, center)	✗
(price, town)	✗
(area, center)	✓
(area, cheap)	✗

Suning Bot Factory Architecture



Suning Conversational Bot Architecture



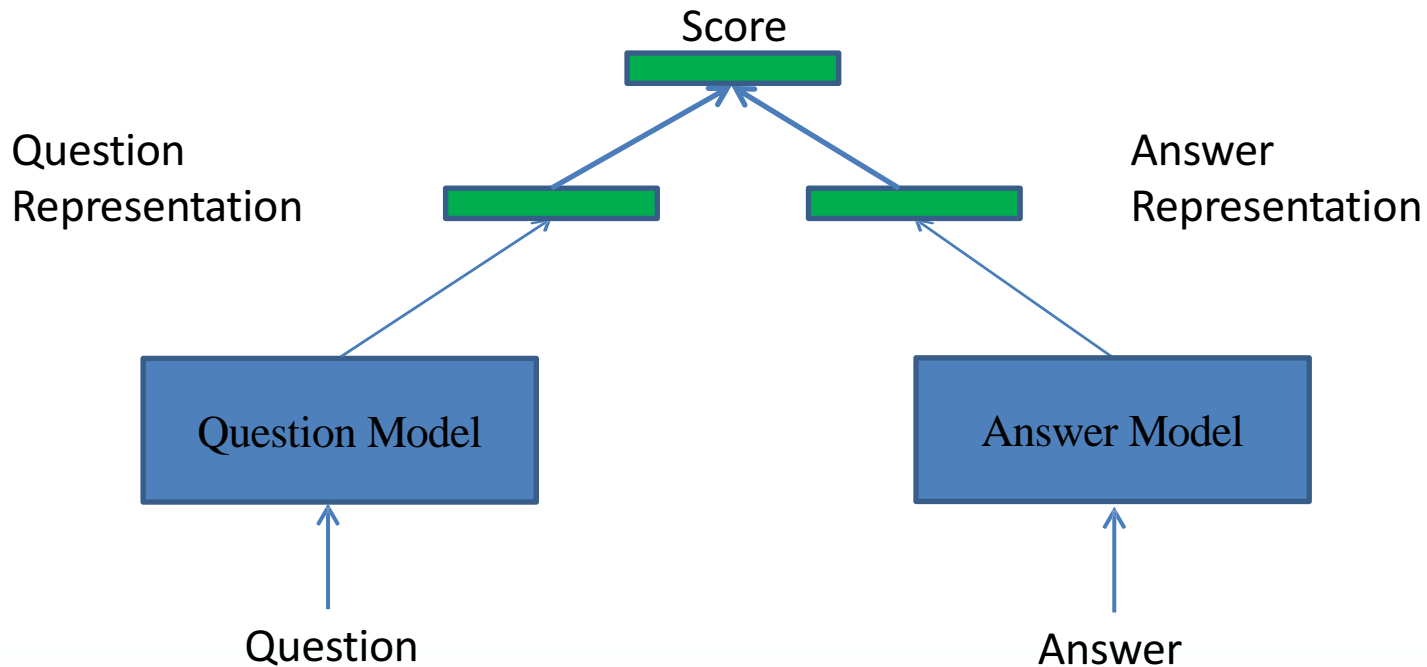
Smart Customer Service Bot

- Smart Customer Service
 - Motivation
 - X (Bots) + Y (humans) to replace Z (humans), $Y \ll Z$
 - Definition
 - Bot assistant customer service, to help human customer service to satisfy users
 - Scenarios
 - Bot first
 - Bot assistant
 - Queue
 - Offline

Smart Customer Service Formulation

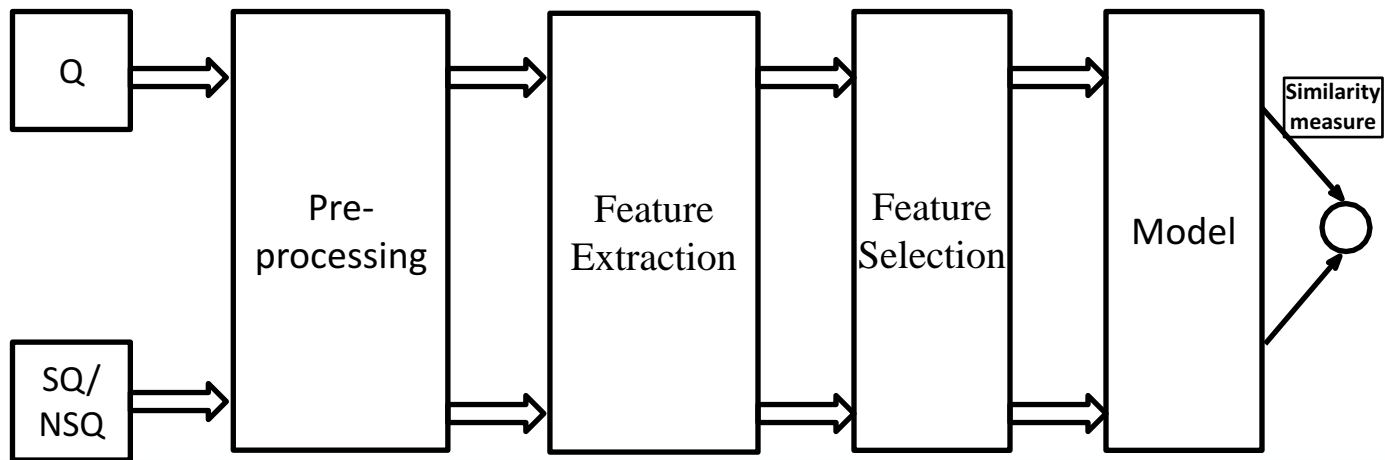
- Problem formulation
 - Data: (Q, SQ, A, Tag)
 - Example:
 - (差旅费有哪些内容, 差旅费有哪些, A, Tag)
 - (差旅费有哪些内容, 差旅费有些啥, A, Tag)
 - (差旅费有哪些内容, 哪些项目是差旅费的, A, Tag)
 - Model
 - Binary regression model
 - Neural matching model

Learning to Rank Short Text Pairs



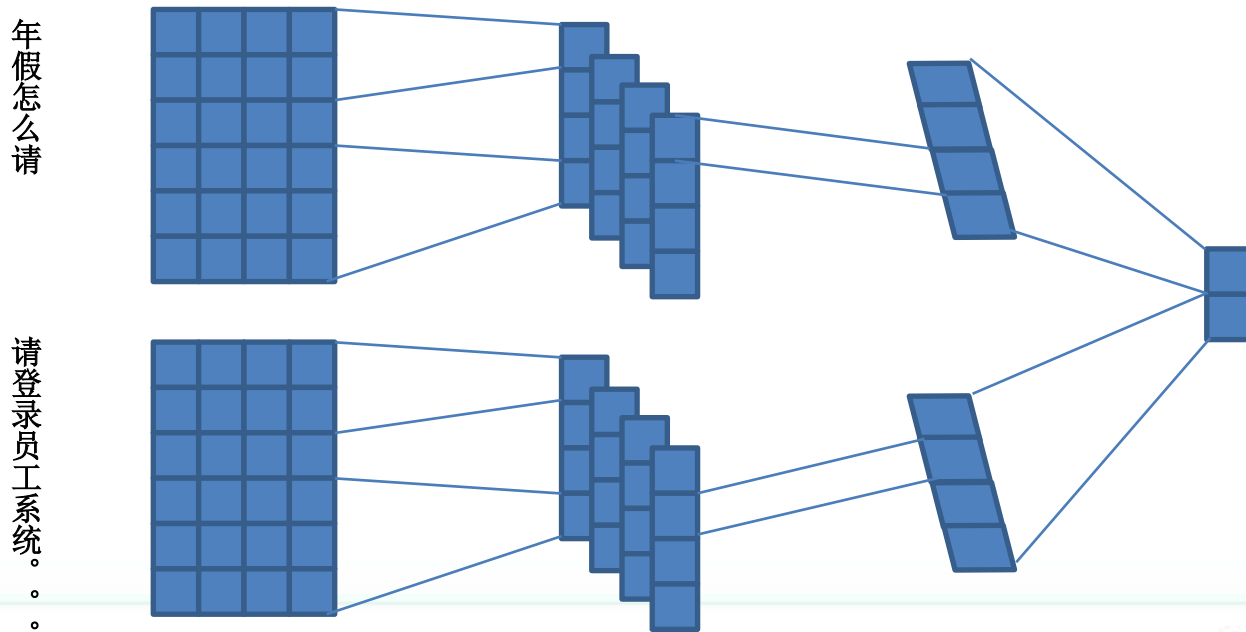
Regression-based Smart Customer Service

- Architecture



CNN-based Neural Matching Model

- Architecture



Smart Customer Service Evaluation

- Suning Internal Smart Customer Service
 - Some metrics

Model	Precision	Recall	QPS
Regression Model	82%	81%	3ms
Neural Matching Model	88%	83%	5ms

Smart Customer Service Bot

- Smart Financial Customer Service

小苏-智能机器人 服务号 

李伟  差旅费有哪些内容

 差旅费是指前往异地，开展公务活动所产生的相关费用，主要包含交通费、住宿费、出差综合补贴、其他费用。

- 1、交通费：出发地至目的地之间以及出差过程中至远郊区、县发生的长途交通费。
- 2、住宿费：出差期间发生的住宿费用。
- 3、综合补贴：包括在出差期间因公产生的市内交通费、餐费等。
- 4、其他费用：包括出差乘坐各类交通工具所产生的强制性保险、订票手续费、签证费、托运费、订票、过路费、飞机改签费、签证费等。

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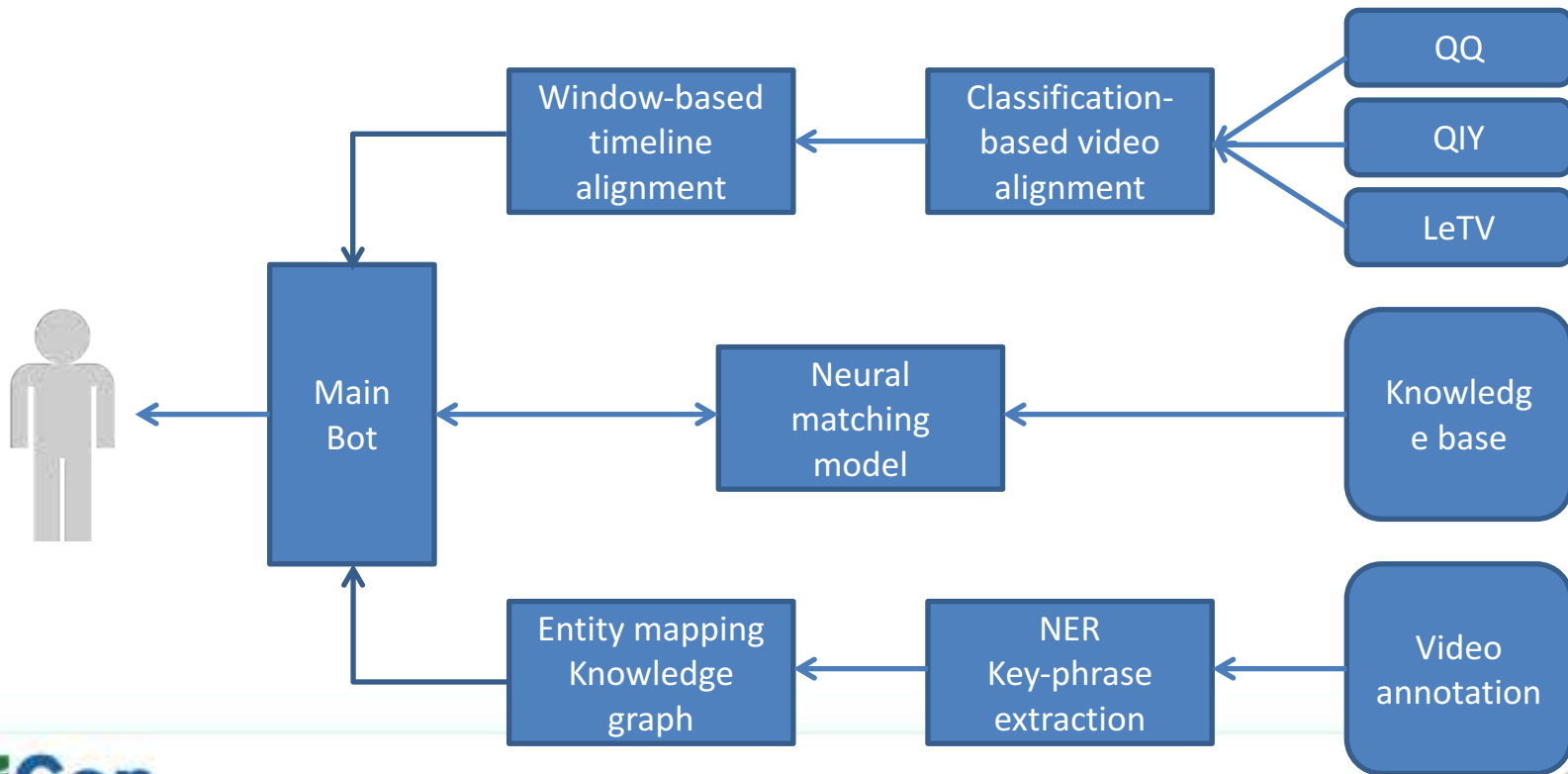
Hybrid model-based Screen Bullet Bot

- Motivation
 - Drive the activeness of the chatting room
- Definition
 - Generate streaming texts from the contexts
- Goal
 - Increase the density
 - Improve the quality

Hybrid Model Formulation

- Topic Generation
 - Automatically generate a topic or utterance when no streaming text
- Automatic Reply
 - Automatically respond to users' questions as an assistant
- Hybrid model
 - Crawl bot for mining 3rd-party bullet screen resources
 - QA bot for giving relevant responses
 - Extraction bot for detecting the key-phrases in video annotation
 - Main bot for business logic

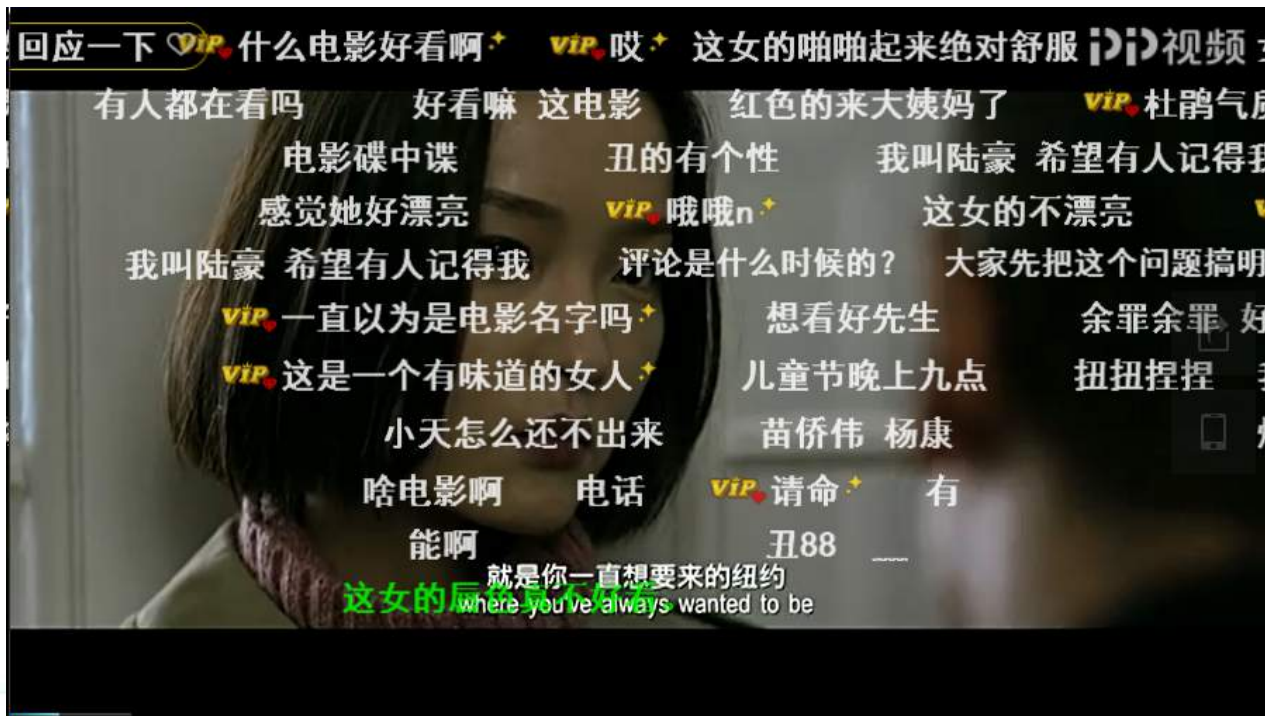
Hybrid Model Architecture



Hybrid Model Evaluation

Metrics	Value
Video Coverage	77%
Video Alignment Accuracy	96%
Density	99%
Quality	92%
QPS	2ms

Video Demand Screen Bullet Bot for PPTV



Bots for Other Application Scenarios

- Live assistant bot for Suning sports



Bots for Other Application Scenarios

- Life assistant bot for Suning pay



Bots for Other Application Scenarios

- Suning Smart Home Appliance Control

苏宁智能机器人平台，技术研究院人工智能实验室

服务名称

设备名称: [输入框] 发送

JSON:

device_type	AC	
tts	语音控制温度为20摄氏度	
cmd	SET_TEMPERATURE	
cmd_args	arg_name1	temperature
	arg_value1	20

Bots for Other Application Scenarios

- Suning Smart Home Appliance Control
 - Evaluation metrics

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

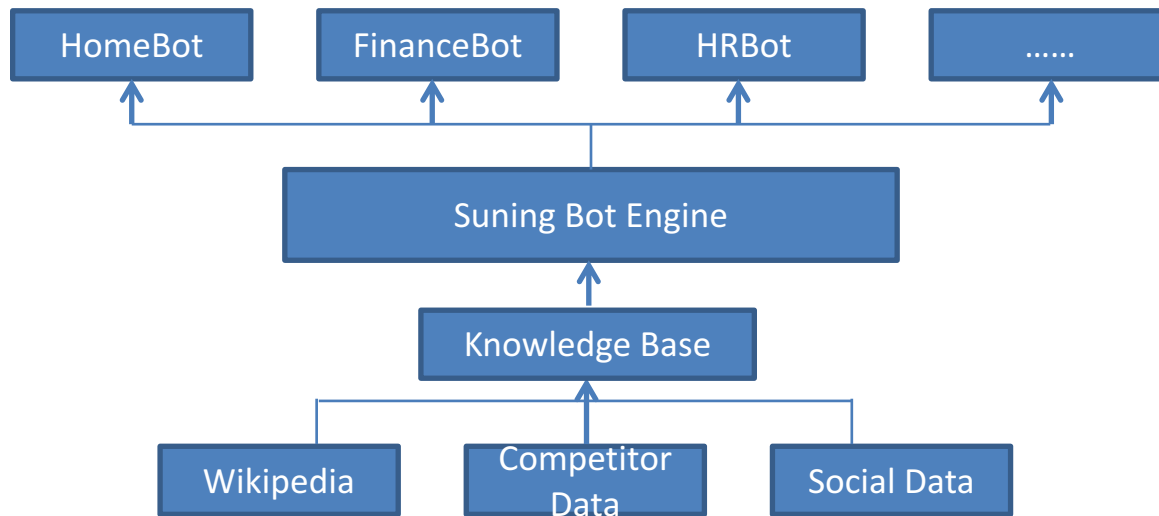
Bots for Other Application Scenarios

- Free chat bots



Suning Bot Platform

- Architecture



Suning Bot Platform Demo

Q&A