

# Artificial Intelligence Platforms and Applications in Suning

Suning Research AI Lab

Wei Li



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# 人工智能基础课

“通俗易懂的人工智能入门课”

王天一  
博士 副教授



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Etsy 数据科学主管



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# QCon

## 全球软件开发大会

# 成为软件技术专家 的必经之路

### [北京站] 2018

会议：2018年4月20-22日 / 培训：2018年4月18-19日

北京·国际会议中心

# 8折

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# ArchSummit

## 全球架构师峰会

2018 · 深圳站

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





# TABLE OF CONTENTES

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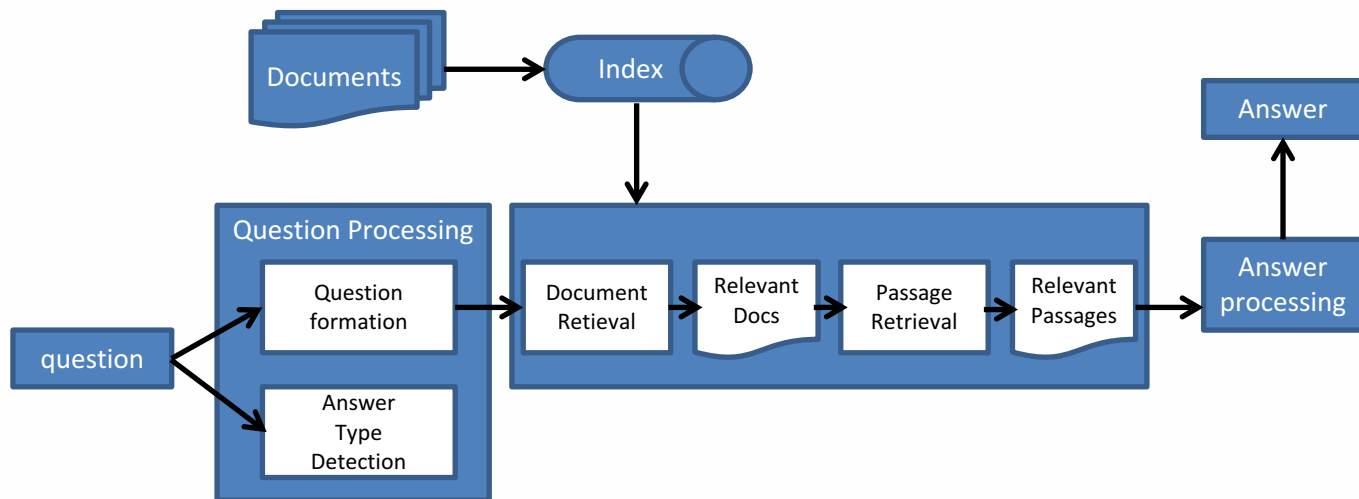
- Overview of Question Answering and Dialogue System
- Search-based Question Answering
- Slot Filling-based Intent Understanding
- Suning Bot Platform Architecture
- Smart Customer Service Bot
- Smart Screen Bullet Bot
- Demo

# 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



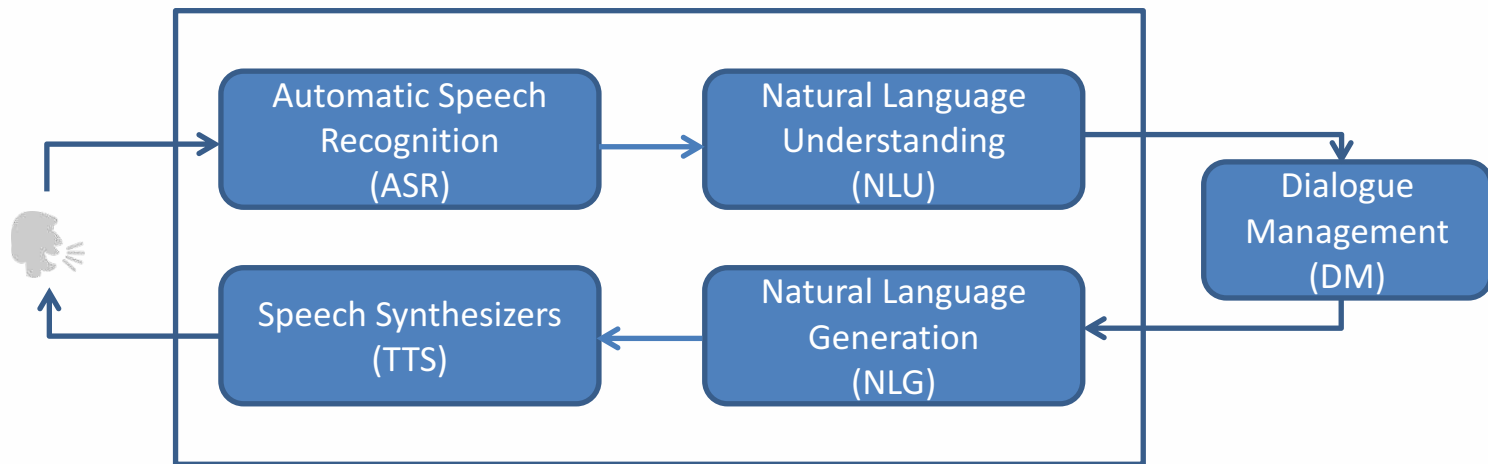
# Search-based QA Architecture



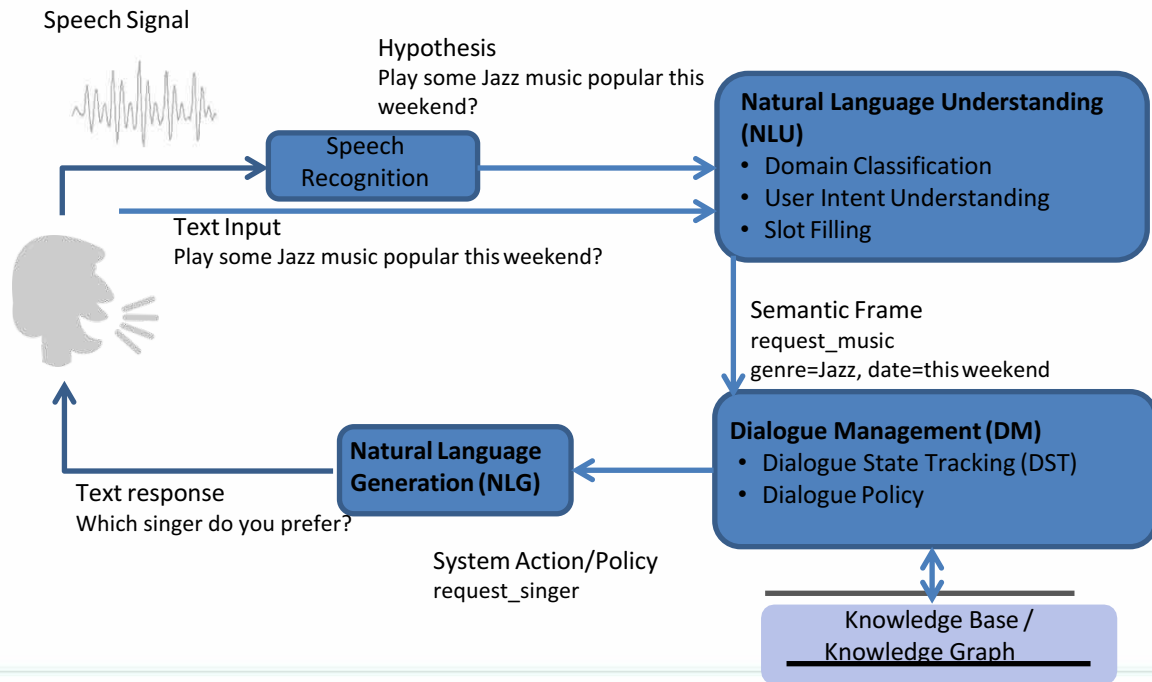
# Dialogue System Overview

- 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

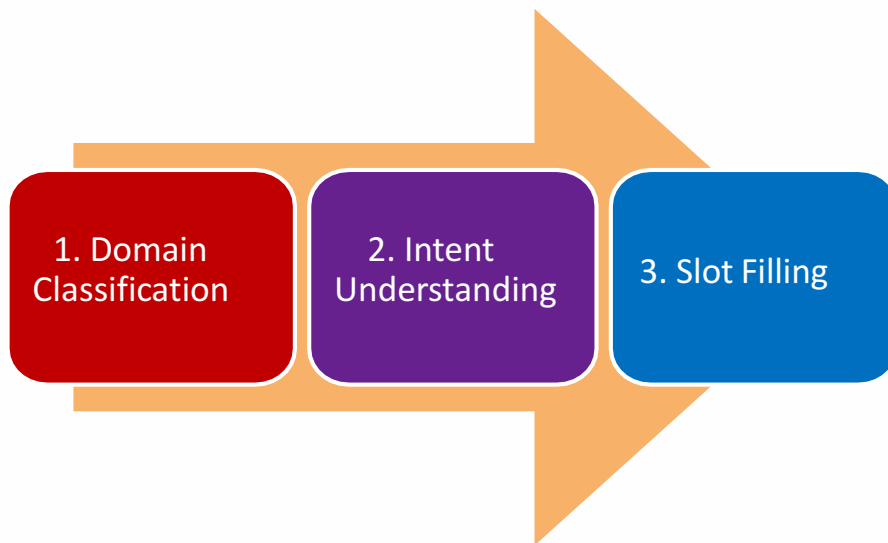
# Dialogue System Architecture



# Task Bot Architecture

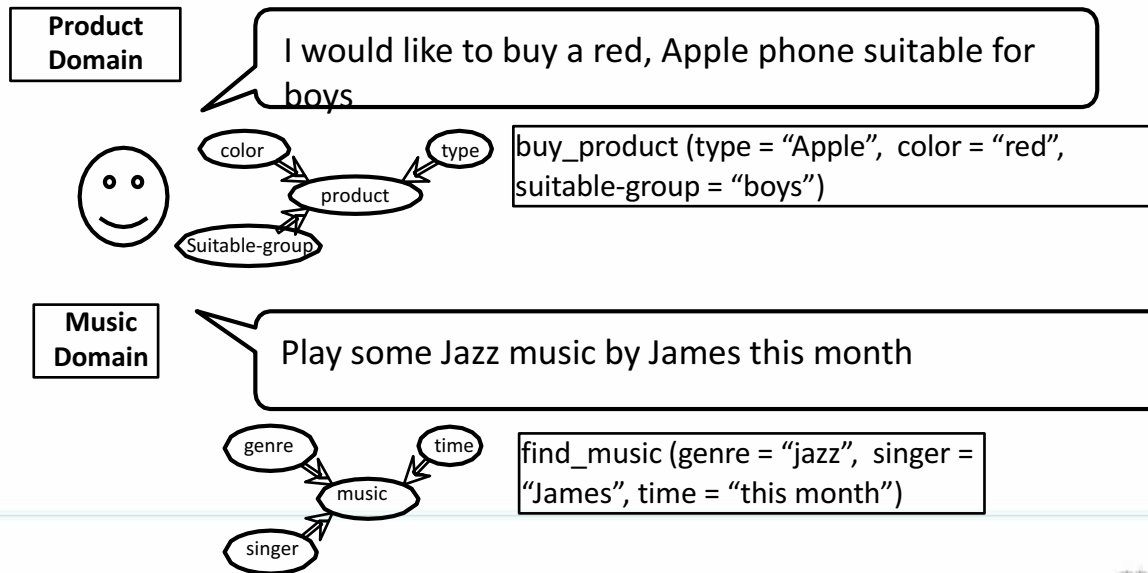


# Natural Language Understanding



# Semantic Frame Model

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



# Domain Classification

User

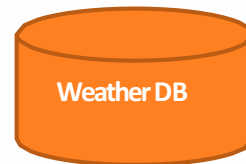
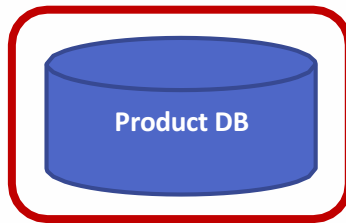


find me a red mobile phone suitable for girls

**Classification!**



Smart  
Assistant



Domain Knowledge Base



# Intent Understanding

User



find me a red mobile phone suitable for girls

Classification



Smart  
Assistant

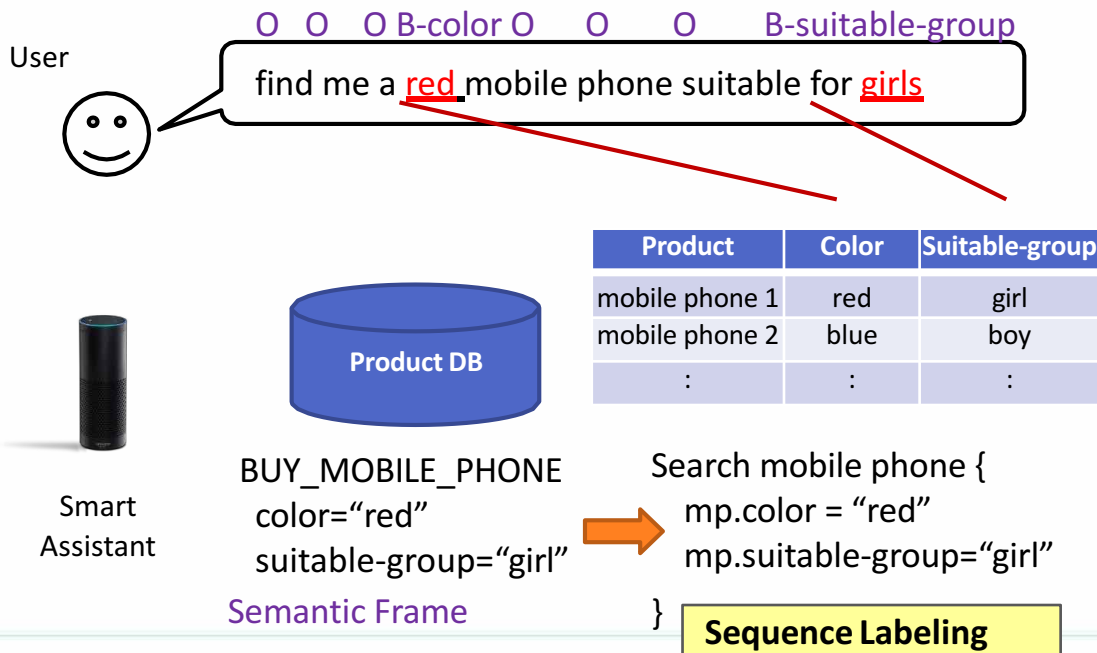


Product DB

BUY\_Mobile\_Phone  
BUY\_CLOTHES  
BUY\_BOTTLED\_WATER

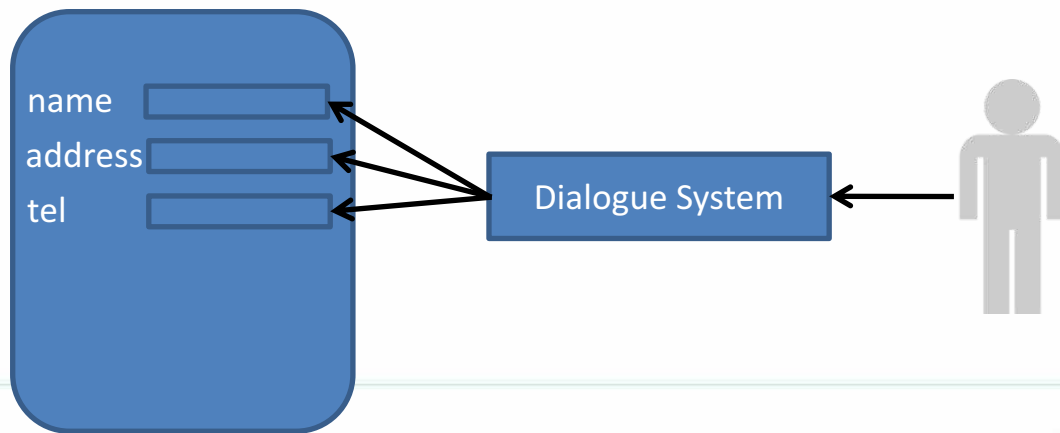
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# Slot Filling



# 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?

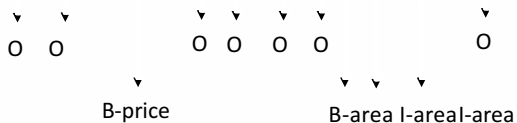
Sequence Labeling Task

CRF for tagging each utterance

Classification Task

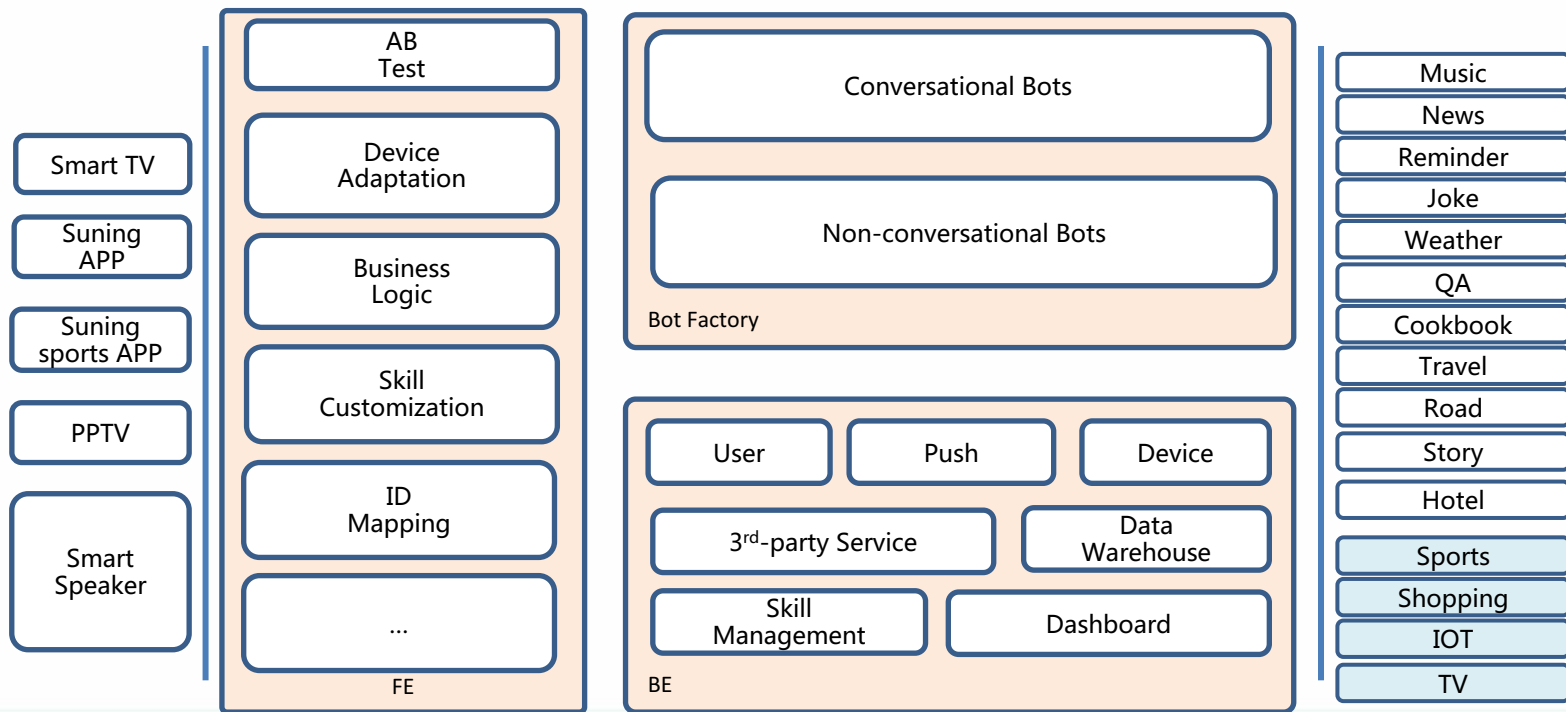
Regression for each slot value pair

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



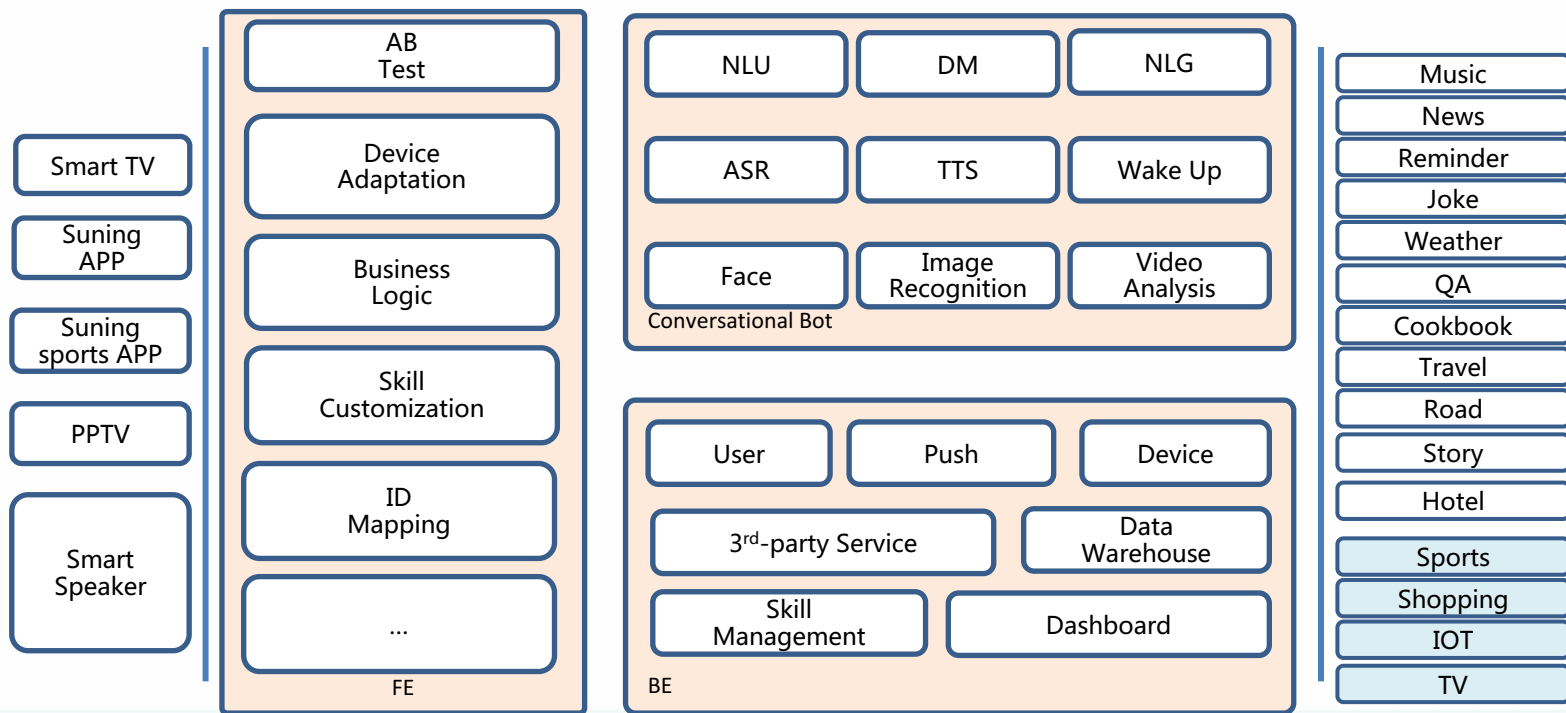
(price, cheap)	✓
(price, center)	✗
(price, town)	✗
(area, center)	✓
(area, cheap)	✗

# Suning Bot Factory Architecture





# Suning Conversational Bot Architecture



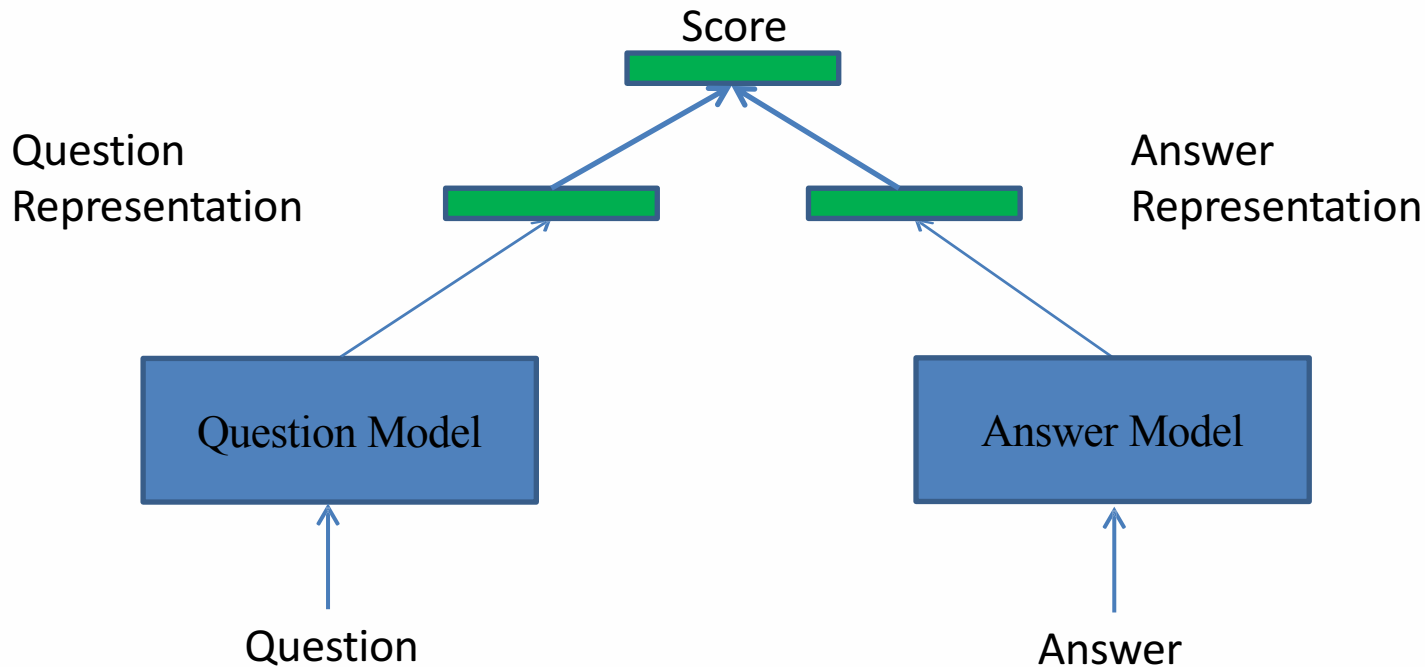
# Smart Customer Service Bot

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

# Smart Customer Service Formulation

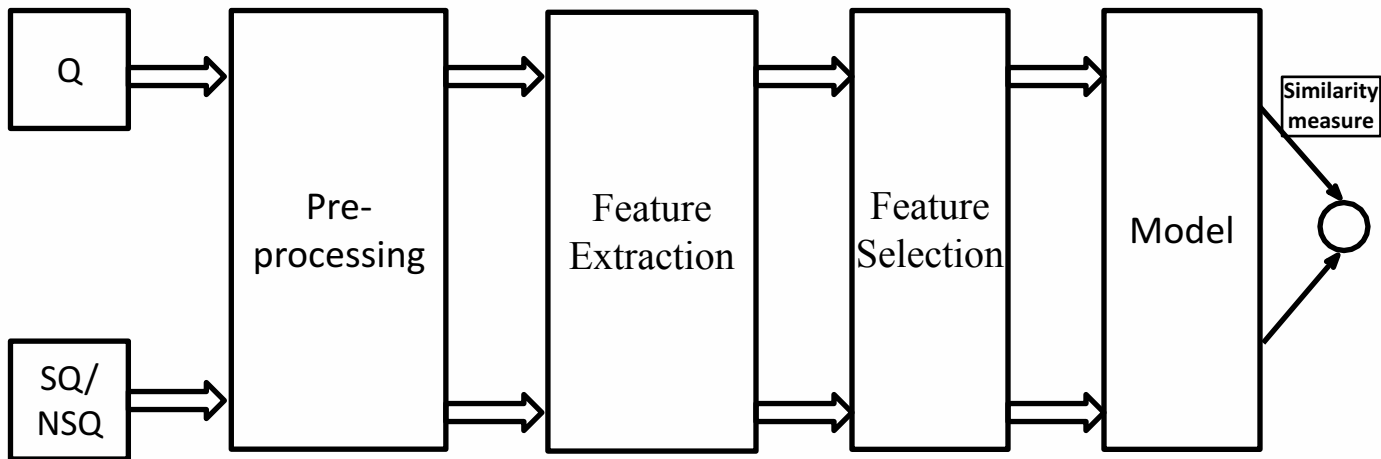
- Problem formulation
  - Data: (Q, SQ, A, Tag)
  - Example:
    - (差旅费有哪些内容, 差旅费有哪些, A, Tag)
    - (差旅费有哪些内容, 差旅费有些啥, A, Tag)
    - (差旅费有哪些内容, 哪些项目是差旅费的, A, Tag)
  - Model
    - Binary regression model
    - Neural matching model

# Learning to Rank Short Text Pairs



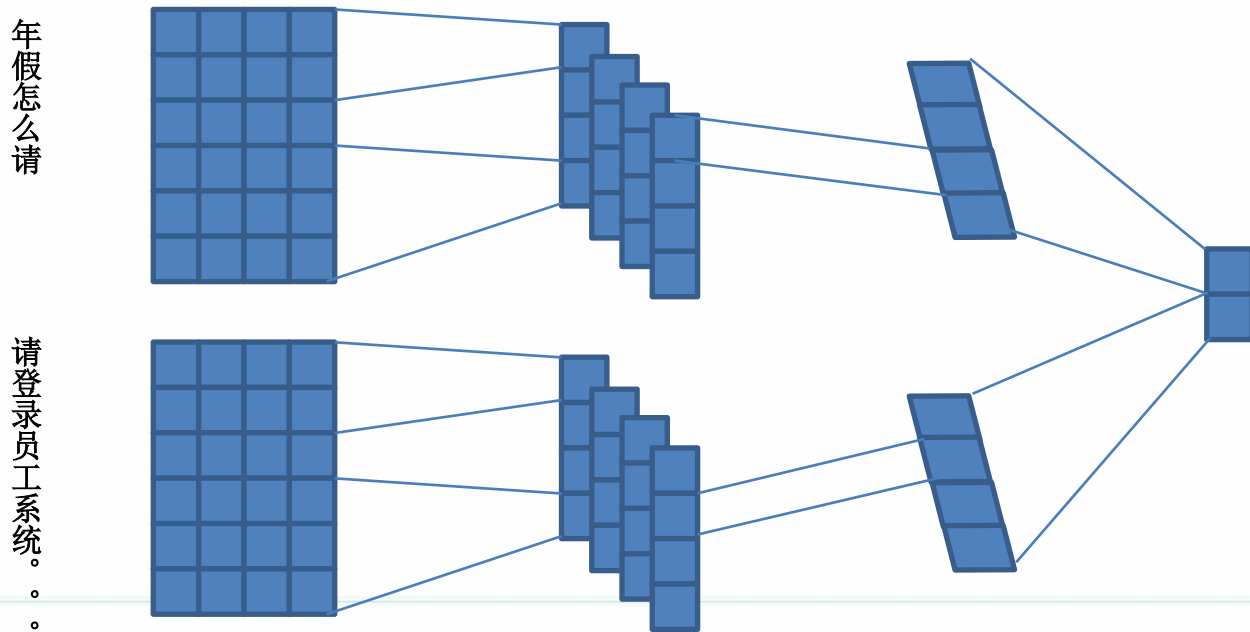
# Regression-based Smart Customer Service

- 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



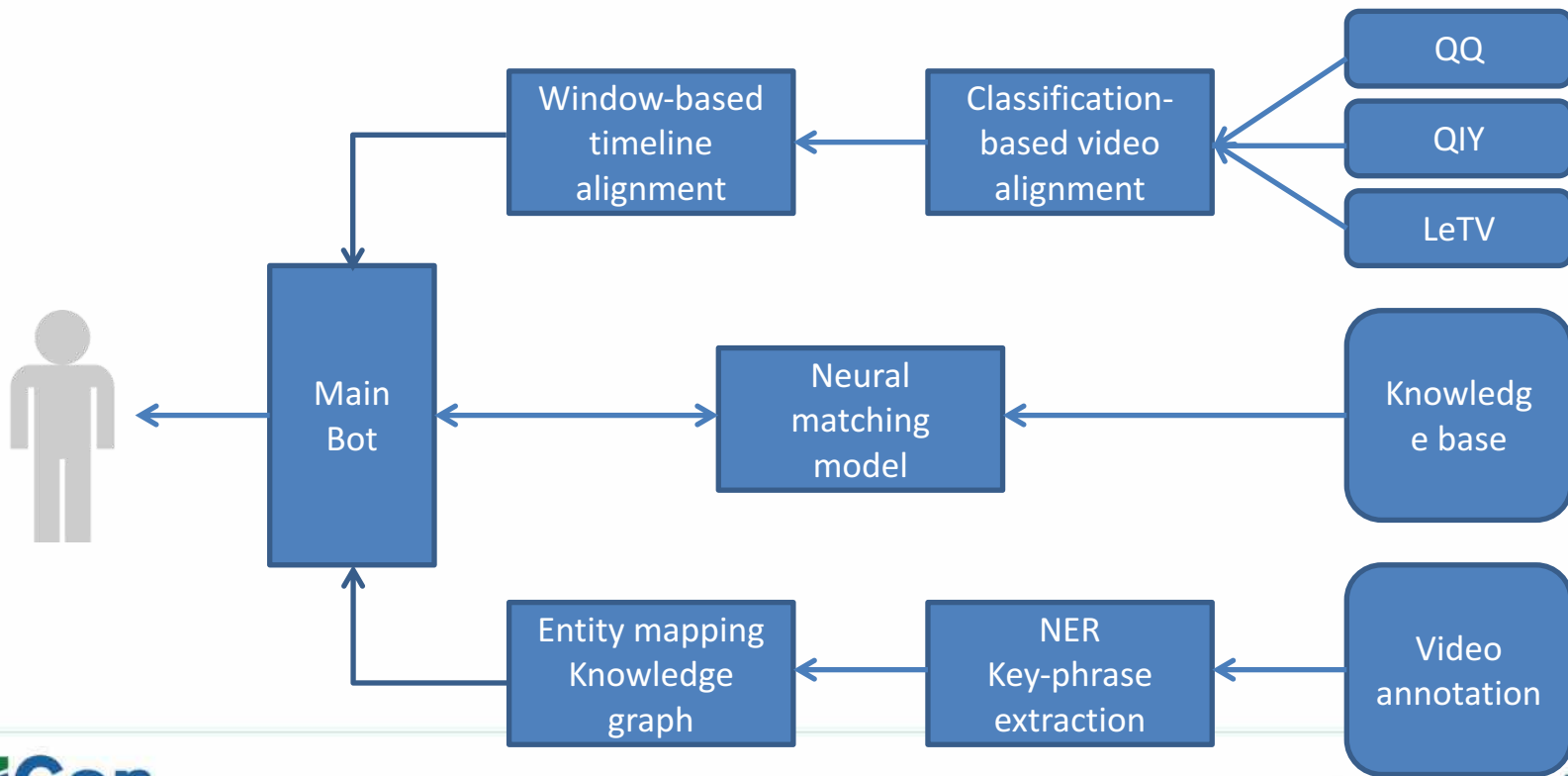
# Hybrid model-based Screen Bullet Bot

- 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 3<sup>rd</sup>-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

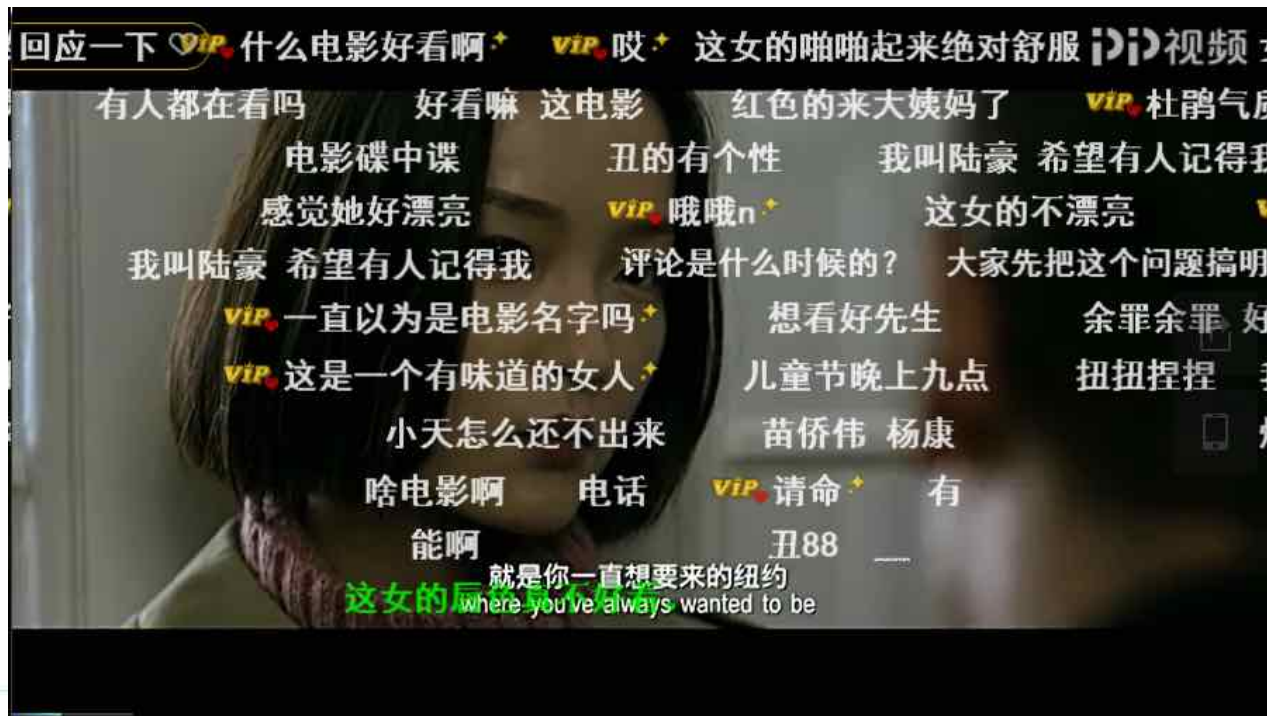
# Hybrid Model Architecture



# 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

服务体验

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	

# 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%

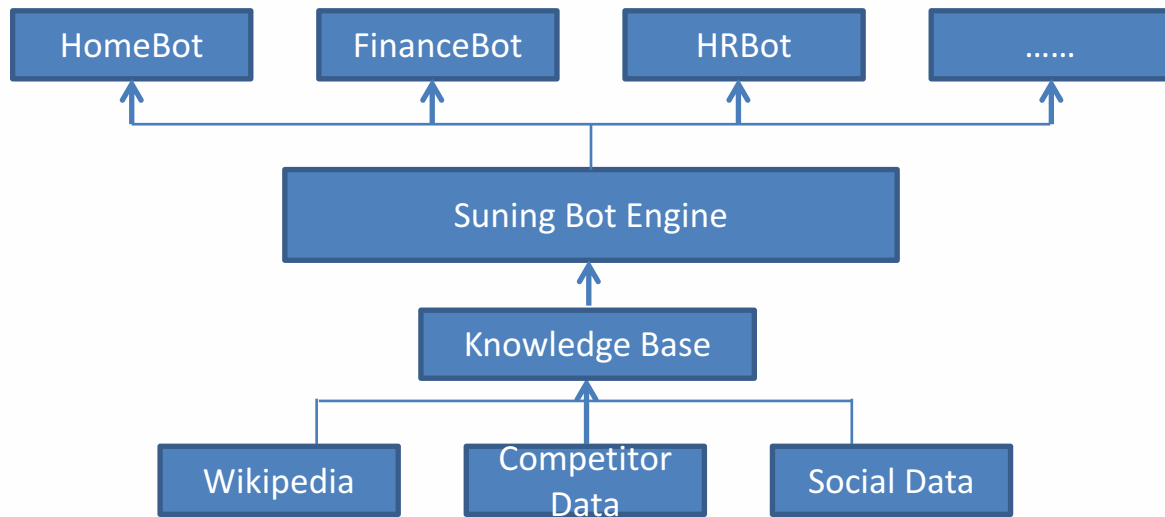
# Bots for Other Application Scenarios

- Free chat bots



# Suning Bot Platform

- Architecture



# Suning Bot Platform Demo

# Q&A