

# AI Robo-Advisor and Chatbot for Conversational Commerce in FinTech

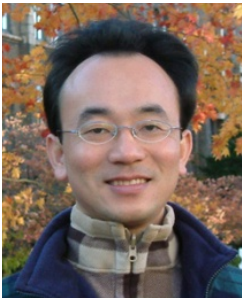
Host: Prof. Yean-Fu Wen

Graduate Institute of Information Management, National Taipei University

Time: 10:00-12:00, 2019/11/20 (Wednesday)

Place: 8F40, Business Building, Sanxia Campus, National Taipei University

Address: No. 151, University Rd., Sanxia Dist., New Taipei City 23741, Taiwan



**Min-Yuh Day**

**Associate Professor**

**Dept. of Information Management,**  
**Tamkang University**

<http://mail.tku.edu.tw/myday/>

2019-11-20





# Min-Yuh Day, Ph.D.

**Associate Professor, Information Management, TKU**

**Visiting Scholar, IIS, Academia Sinica**

**Ph.D., Information Management, NTU**

Publications Co-Chairs, IEEE/ACM International Conference on  
Advances in Social Networks Analysis and Mining (ASONAM 2013- )

Program Co-Chair, IEEE International Workshop on  
Empirical Methods for Recognizing Inference in Text (IEEE EM-RITE 2012- )

Workshop Chair, The IEEE International Conference on  
Information Reuse and Integration (IEEE IRI)



# Outline

- **AI Robo-Advisor in FinTech**
- **AI Chatbot for  
Conversational Commerce**
- **AI Humanoid Robo-Advisor**

# AI Robo-Advisor in FinTech



# AIWISFIN

## AI Conversational Robo-Advisor (人工智慧對話式理財機器人)

First Place, InnoServe Awards 2018



<https://www.youtube.com/watch?v=sEhmyoTXmGk>

# 2018 The 23<sup>th</sup> International ICT Innovative Services Awards (InnoServe Awards 2018)



- Annual ICT application competition held for university and college students
- The largest and the most significant contest in Taiwan.
- More than **ten thousand teachers and students** from over **one hundred universities and colleges** have participated in the Contest.

# 2018 International ICT Innovative Services Awards (InnoServe Awards 2018)

## (2018第23屆大專校院資訊應用服務創新競賽)



第23屆大專校院  
2018 資訊應用服務創新競賽  
International ICT Innovative Services Awards 2018

創意噴發!

InnoServe Awards

總獎金 > 200 萬

■ 報名日期: 2018/10/2(二)~  
2018/10/9(二)pm6 點截止

■ 參賽對象: 大專校院學生、  
碩博士生及高中職學生

■ 決賽時間: 2018/11/3(六)  
■ 決賽地點: 國立臺灣大學  
綜合體育館

☰ 最新消息 ▾

活動訊息

媒體轉載

🌀 競賽緣起

📄 競賽辦法 ▾

👤 競賽報名

💬 活動成果 ▾

🔗 產學媒合 ▾

🔗 媒合

📞 聯絡我們

### 🗨️ 榮譽榜

屆別 23 ▾ 查詢

第23屆

顯示 30 ▾ 筆資料

表格內全文檢索: AIWISFIN

組別	名次	組別編號	學校名稱	專題名稱	指導教授	學生
資訊應用組一	第一名	IP1-06	淡江大學	AIWISFIN 人工智慧對話式理財機器人	戴敏育老師	陳元致、鄧旭廷、王慶宇、邱少文
玉山銀行金融科技趨勢應用組	第一名	E.SUN FINTECH-01	淡江大學	AIWISFIN 人工智慧對話式理財機器人	戴敏育老師	陳元致、鄧旭廷、王慶宇、邱少文

<https://innoserve.tca.org.tw/award.aspx>



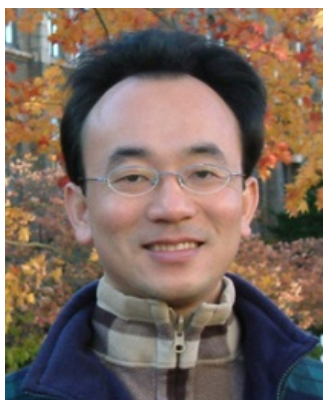
**IMTKU**

**Emotional Dialogue System  
for  
Short Text Conversation  
at**

**NTCIR-14 STC-3 (CECG) Task**

# IMTKU Textual Entailment System for Recognizing Inference in Text at **NTCIR-9** RITE

Department of Information Management  
Tamkang University, Taiwan



Min-Yuh Day

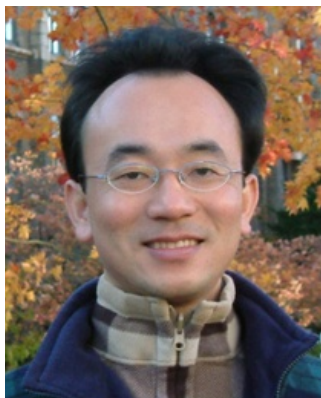
[myday@mail.tku.edu.tw](mailto:myday@mail.tku.edu.tw)



Chun Tu

# IMTKU Textual Entailment System for Recognizing Inference in Text at **NTCIR-10** RITE-2

Department of Information Management  
Tamkang University, Taiwan



Min-Yuh Day



Chun Tu



Hou-Cheng Vong

[myday@mail.tku.edu.tw](mailto:myday@mail.tku.edu.tw)



Shih-Wei Wu



Shih-Jhen Huang

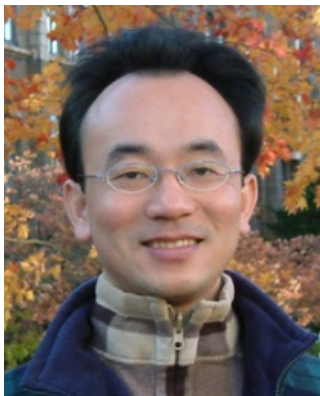


# IMTKU Textual Entailment System for Recognizing Inference in Text at **NTCIR-11** RITE-VAL

**Tamkang University**

淡江大學

# 2014



**Min-Yuh Day**



**Ya-Jung Wang**



**Che-Wei Hsu**



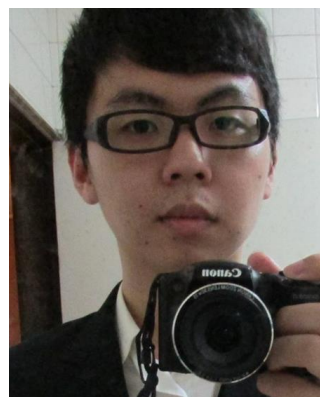
**En-Chun Tu**



**Huai-Wen Hsu**



**Yu-An Lin**



**Shang-Yu Wu**



**Yu-Hsuan Tai**



**Cheng-Chia Tsai**

2016

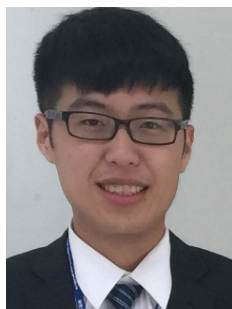
# IMTKU Question Answering System for World History Exams at **NTCIR-12** QA Lab2

Department of Information Management  
Tamkang University, Taiwan

Sagacity Technology



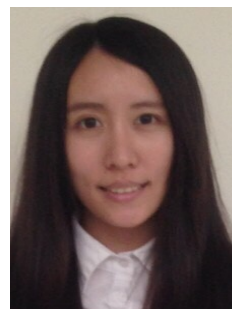
Min-Yuh Day



Cheng-Chia Tsai



Wei-Chun Chung



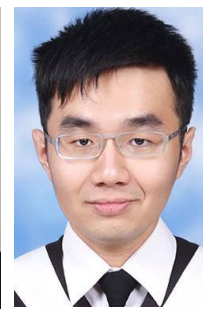
Hsiu-Yuan Chang



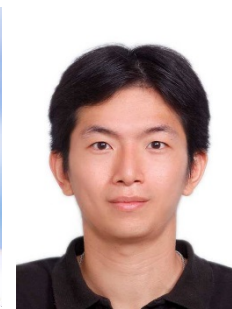
Tzu-Jui Sun



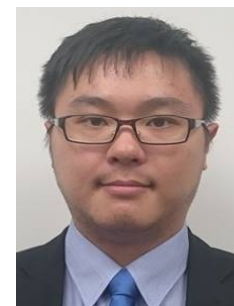
Yuan-Jie Tsai



Jin-Kun Lin



Cheng-Hung Lee



Yu-Ming Guo



Yue-Da Lin



Wei-Ming Chen



Yun-Da Tsai



Cheng-Jhih Han



Yi-Jing Lin



Yi-Heng Chiang



Ching-Yuan Chien

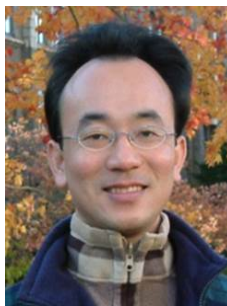
[myday@mail.tku.edu.tw](mailto:myday@mail.tku.edu.tw)

NTCIR-12 Conference, June 7-10, 2016, Tokyo, Japan



# IMTKU Question Answering System for World History Exams at **NTCIR-13** QALab-3

Department of Information Management  
Tamkang University, Taiwan



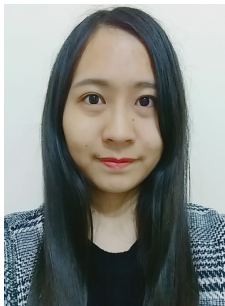
Min-Yuh Day



Chao-Yu Chen



Wanchu Huang



Shi-Ya Zheng



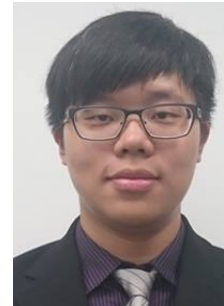
I-Hsuan Huang



Tz-Rung Chen



Min-Chun Kuo



Yue-Da Lin



Yi-Jing Lin

[myday@mail.tku.edu.tw](mailto:myday@mail.tku.edu.tw)

# IMTKU Emotional Dialogue System for Short Text Conversation at **NTCIR-14** STC-3 (CECG) Task

Department of Information Management  
Tamkang University, Taiwan



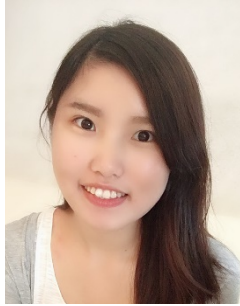
Min-Yuh Day



Chi-Sheng Hung



Yi-Jun Xie



Jhih-Yi Chen



Yu-Ling Kuo



Jian-Ting Lin

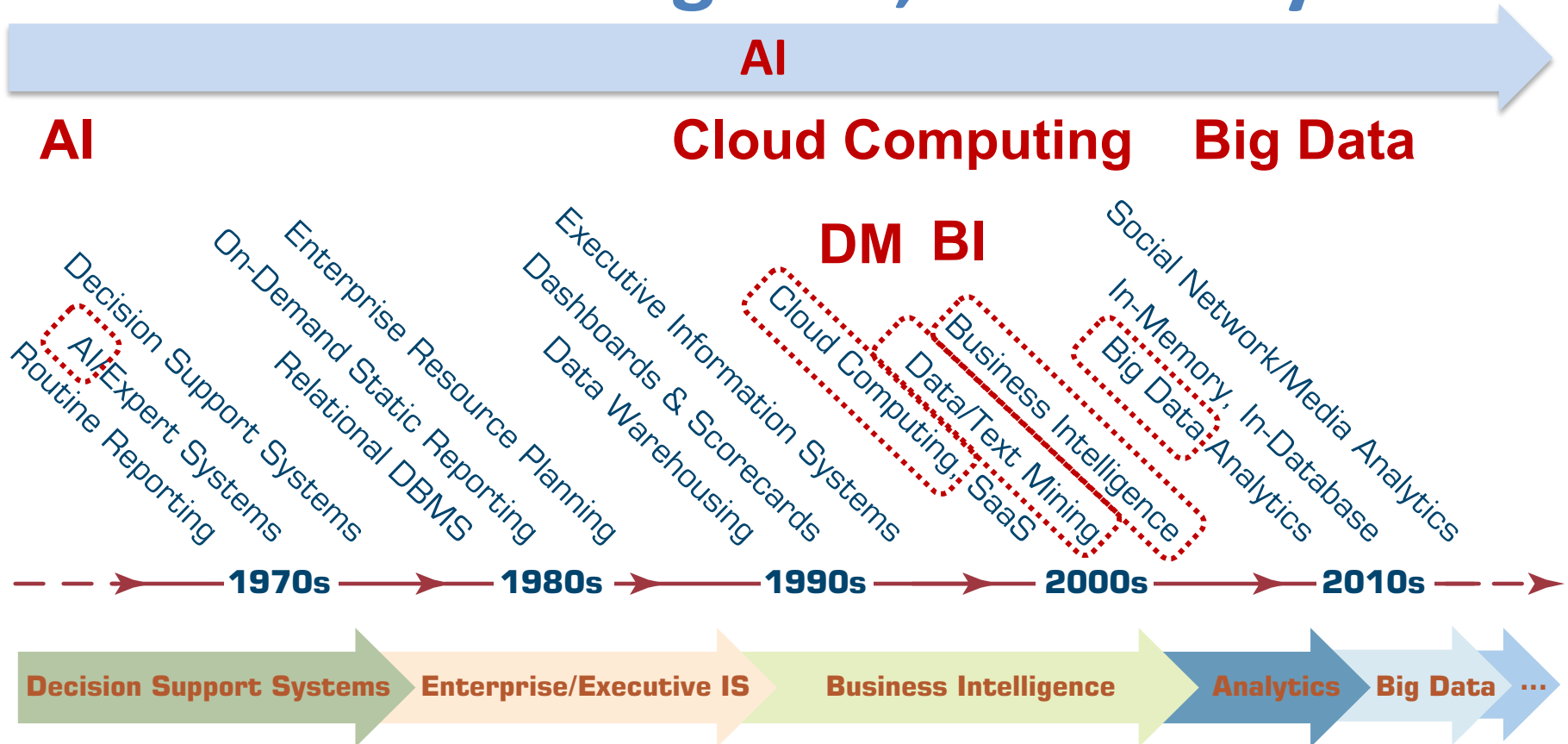
[myday@mail.tku.edu.tw](mailto:myday@mail.tku.edu.tw)

NTCIR-14 Conference, June 10-13, 2019, Tokyo, Japan

# Artificial Intelligence (AI)

# AI, Big Data, Cloud Computing

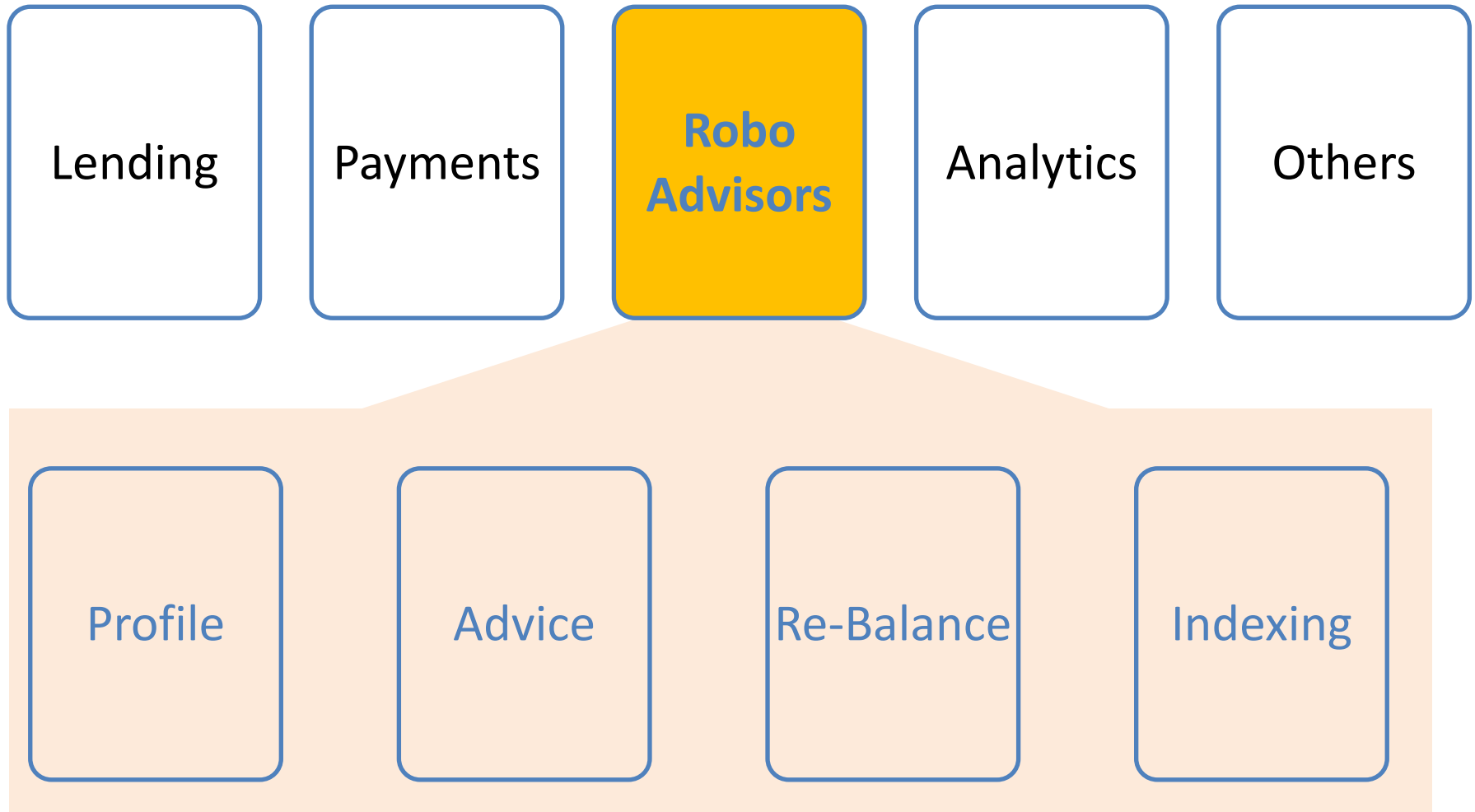
## Evolution of Decision Support, Business Intelligence, and Analytics



# AI in FinTech

# Robo-Advisors

# FinTech high-level classification



# Wealthfront

## Financial Planning & Robo-Investing for Millennials

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WEALTHFRONT

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[GET STARTED](#)

<https://www.wealthfront.com/>



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Betterment

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How it works

What we offer

Pricing

FAQs



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## HELLO, INVESTOR

Betterment is an online financial advisor built for people who refuse to settle for average investing. People who demand better. People like you.

Get started

► Watch our video

Right for every type of investor

### New investor

I'm new to investing, or am looking for some guidance.

### Hands-off investor

I invest, but don't have the time or desire to do it myself.

### Hands-on investor

I'm a confident, hands-on investor looking for an optimal solution.

<https://www.betterment.com/>

# Financial Advisor FinTech Solutions Map

## Financial Advisor FinTech Solutions Map



# From Algorithmic Trading to Personal Finance Bots: 41 Startups Bringing AI to Fintech

# From Algorithmic Trading To Personal Finance Bots: 41 Startups Bringing AI To Fintech

## AI in Fintech

41 Startups Bringing Artificial Intelligence To Fintech

### General Purpose/ Predictive Analytics



### Market Research & Sentiment Analysis



### Search Engine



### Quantitative Trading



### Blockchain



### Debt Collection



### AI Assistants/Bots



### Fraud Detection



### Credit Scoring



### Personal Banking



# Artificial Intelligence (AI) in Fintech

## General Purpose/ Predictive Analytics



## Market Research & Sentiment Analysis



## Search Engine



# Artificial Intelligence (AI) in Fintech

## Quantitative Trading



## AI Assistants/Bots



## Credit Scoring



## Blockchain



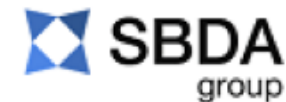
## Debt Collection



## Fraud Detection



## Personal Banking



# FinTech



# Financial Technology

## FinTech

“providing  
financial services  
by making use of  
software and  
modern technology”



# Financial Services

# Financial Services



# FinTech: Financial Services Innovation

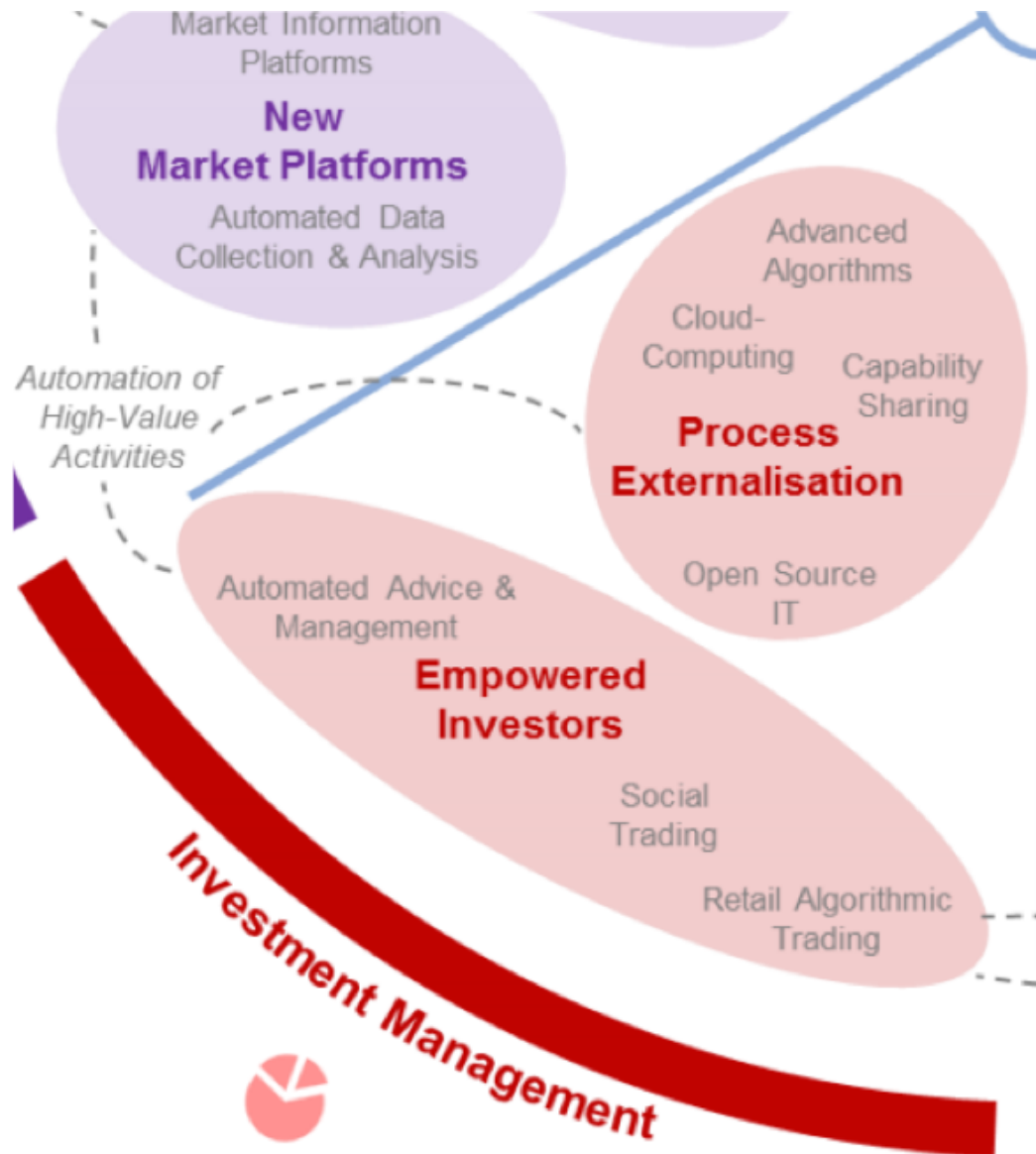


# **FinTech:**

## **Financial Services Innovation**

- 1. Payments**
- 2. Insurance**
- 3. Deposits & Lending**
- 4. Capital Raising**
- 5. Investment Management**
- 6. Market Provisioning**

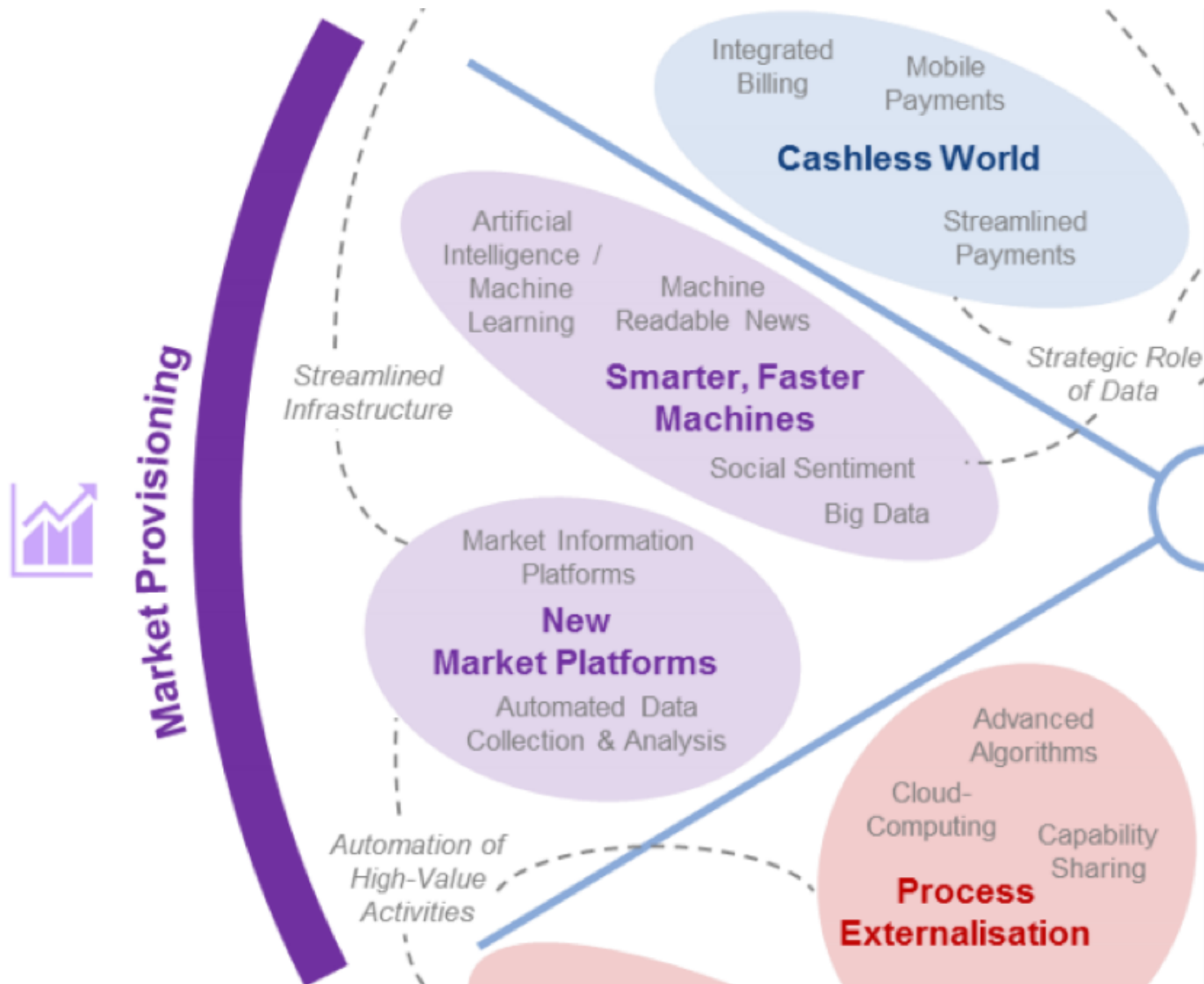
# 5 FinTech: Investment Management



# **5 FinTech: Investment Management Empowered Investors Process Externalization**

## 6

# FinTech: Market Provisioning



# 6

## **FinTech: Market Provisioning Smarter, Faster Machines New Market Platforms**



# The **New Alpha**: 30+ Startups Providing Alternative Data For Sophisticated Investors

New sources of **data mined** by startups like **Foursquare**, **Premise**, and **Orbital Insight** are letting investors understand **trends** before they happen.

# The New Alpha: 30+ Startups Providing Alternative Data For Sophisticated Investors

## Alternative Data Sources



# AI Chatbot for Conversational Commerce

# Conversational Commerce

# Chatbots: Evolution of UI/UX

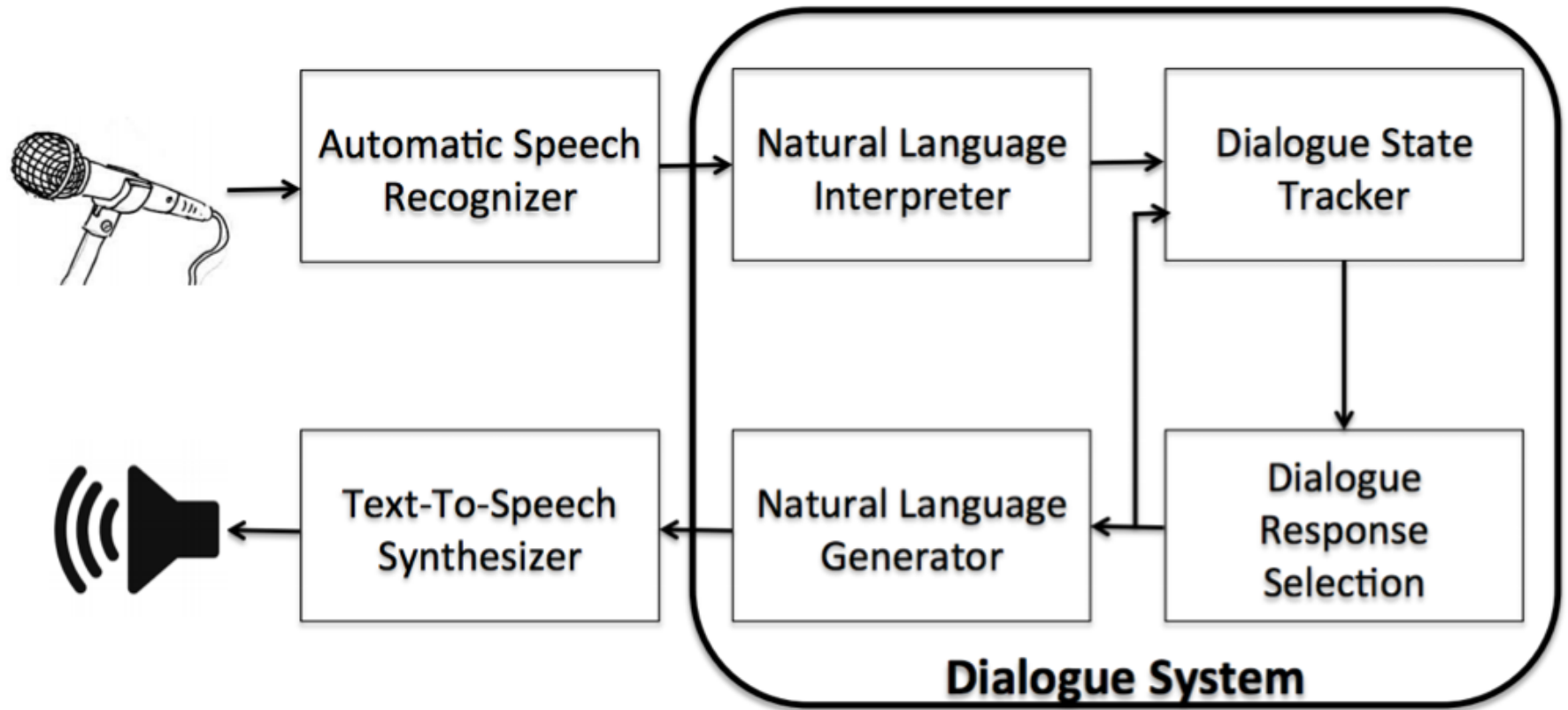
Paradigm	mid - 80s PC	mid - 90s Web	mid - 00s Smartphone	mid - 10s Messaging
Platform Examples	Desktop DOS, Windows, Mac OS	Browser Mosaic, Explorer, Chrome	Mobile OS iOS, Android	Messaging Apps WhatsApp, Messenger, Slack
Applications Examples	Clients Excel, PPT, Lotus	Website Yahoo, Amazon	Apps Angry Birds, Instagram	Bots Weather, Travel
UI/UX	Native Screens	Web Pages	Native Mobile Screens	Message
S/w Dev	Client-side	Server-side	Client-side	Server-side

**Chatbot**  
**Dialogue System**  
**Intelligent Agent**

# Chatbot

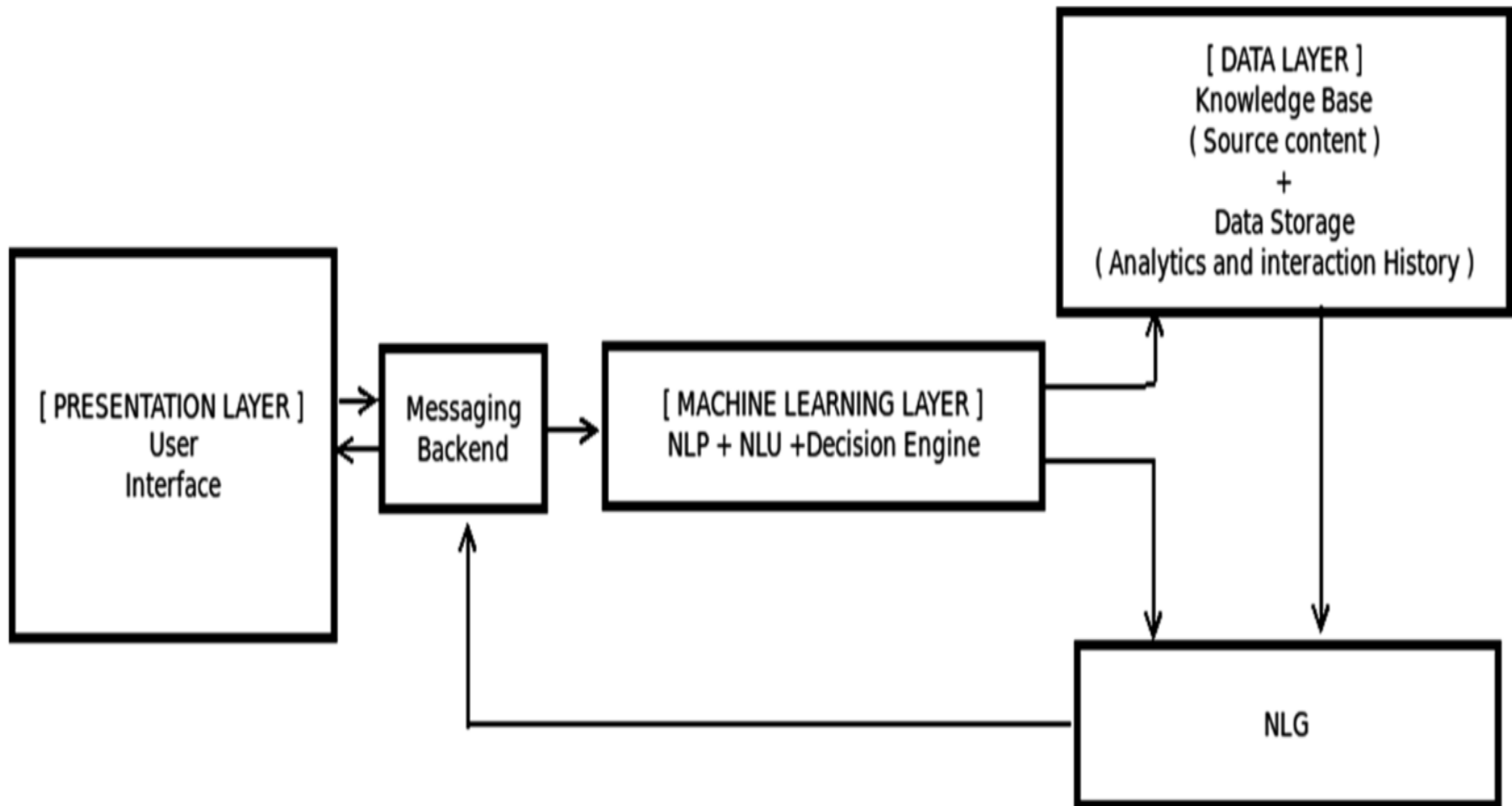


# Dialogue System





# Overall Architecture of Intelligent Chatbot



# Dialogue Subtasks

Browse > Natural Language Processing > Dialogue

## Dialogue subtasks

### Dialogue Generation

Dialogue Generation

8 leaderboards

27 papers with code



Dialogue State Tracking

2 leaderboards

21 papers with code



Goal-Oriented Dialog

13 papers with code

### Task-Oriented Dialogue Systems

Task-Oriented Dialogue Systems

10 papers with code

Dialogue Management

8 papers with code



Dialogue Understanding

5 papers with code

### Short-Text Conversation

Short-Text Conversation

4 papers with code



Goal-Oriented Dialogue Systems

2 papers with code



Task-Completion Dialogue Policy Learning



Visual Dialogue

2 papers with code

# Can machines think?

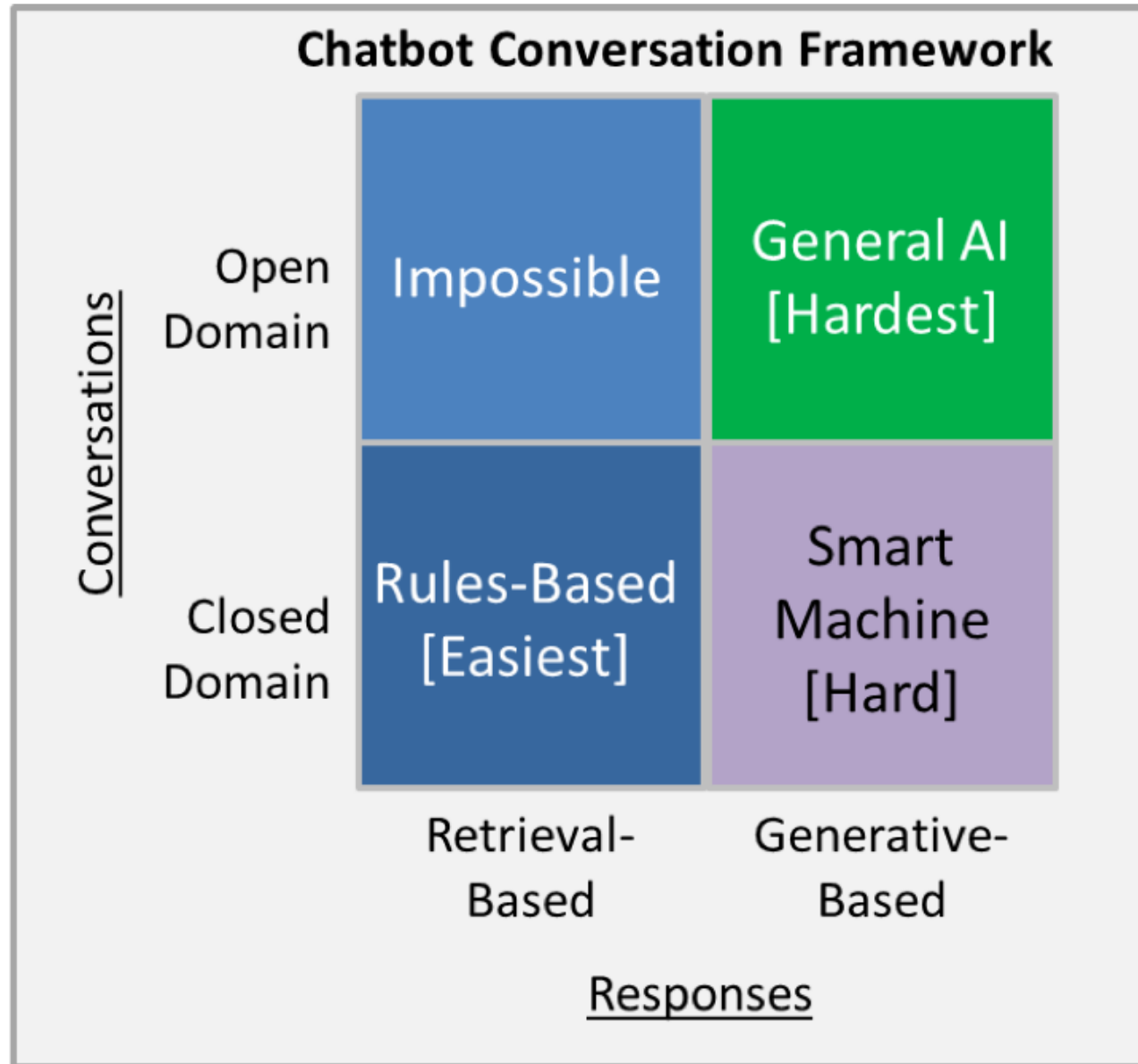
**(Alan Turing ,1950)**

Source: Cahn, Jack. "CHATBOT: Architecture, Design, & Development."  
PhD diss., University of Pennsylvania, 2017.

# Chatbot

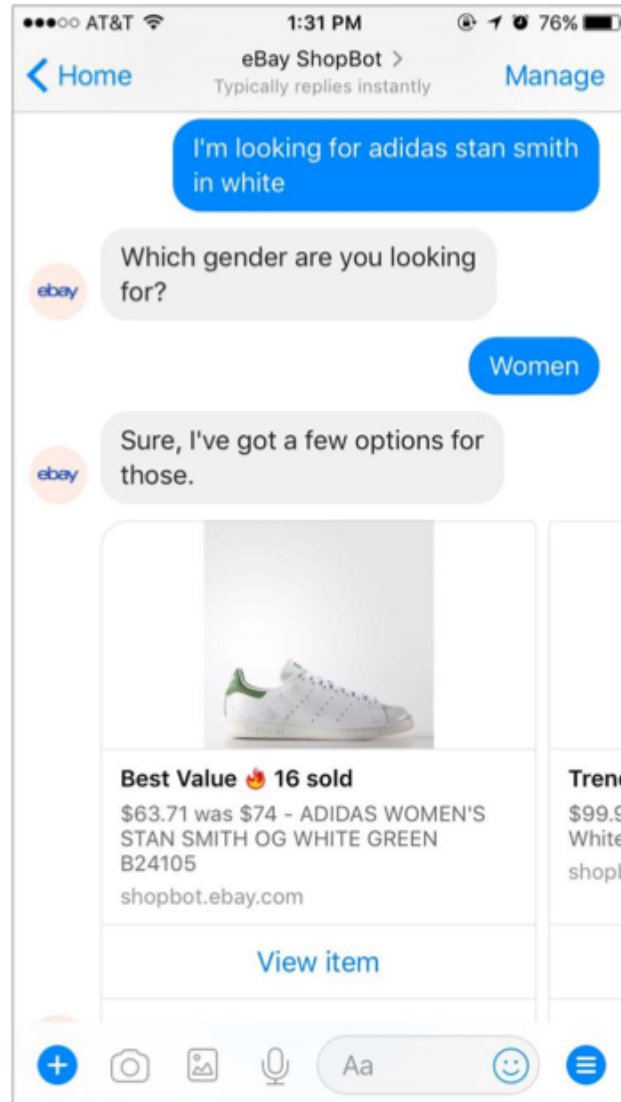
**“online human-computer  
dialog system  
with  
natural language.”**

# Chatbot Conversation Framework

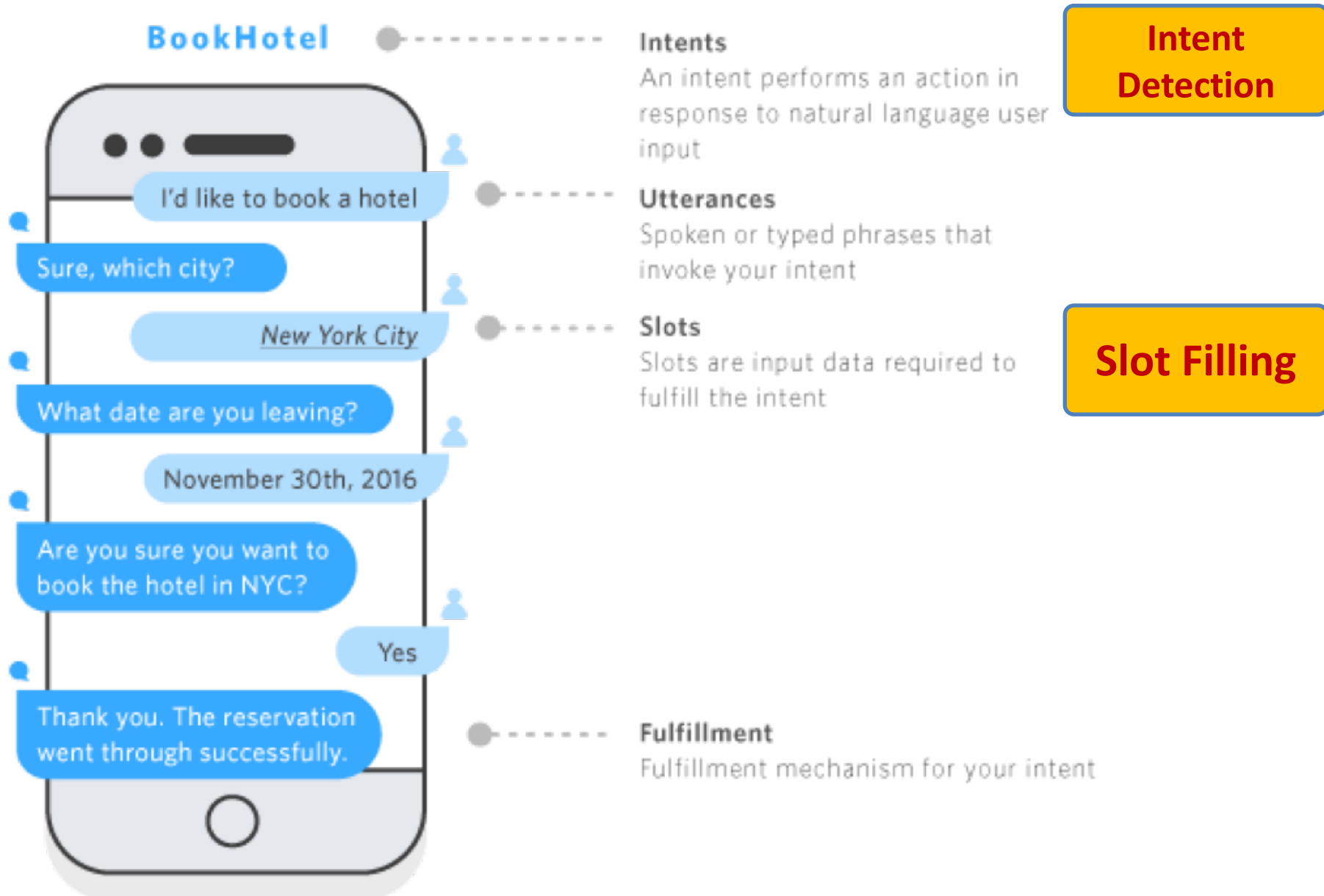


**From  
E-Commerce  
to  
Conversational Commerce:  
Chatbots  
and  
Virtual Assistants**

# Conversational Commerce: eBay AI Chatbots

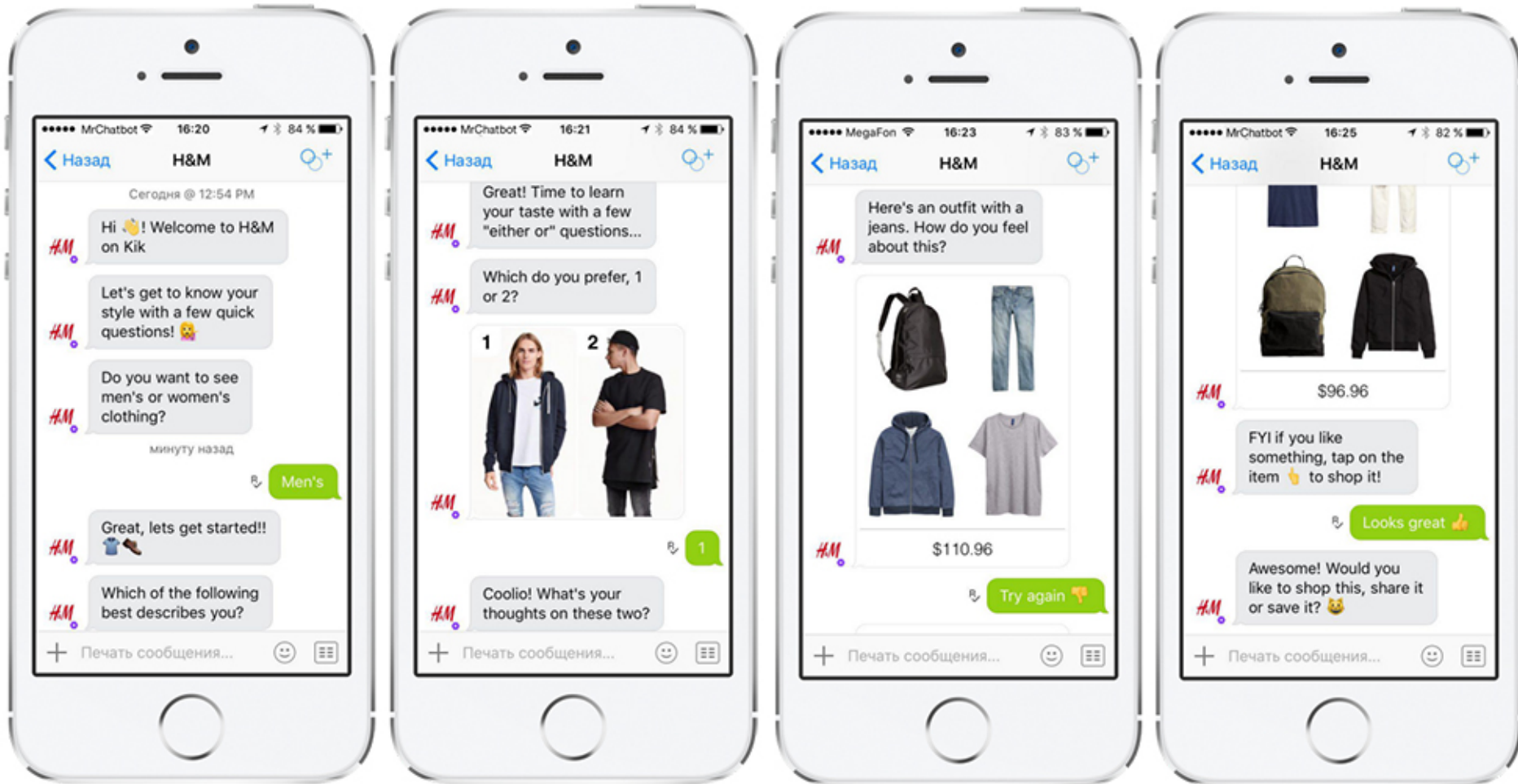


# Hotel Chatbot

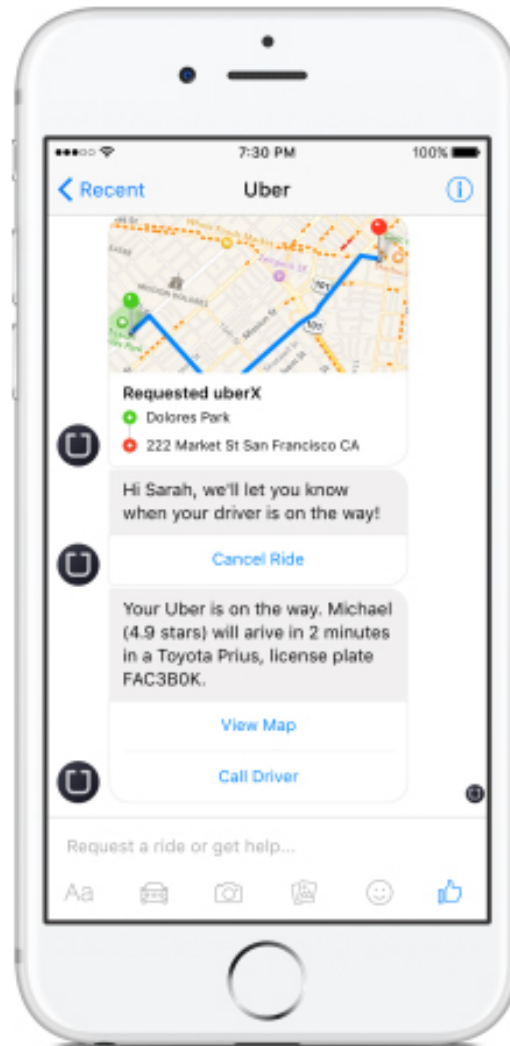




# H&M's Chatbot on Kik



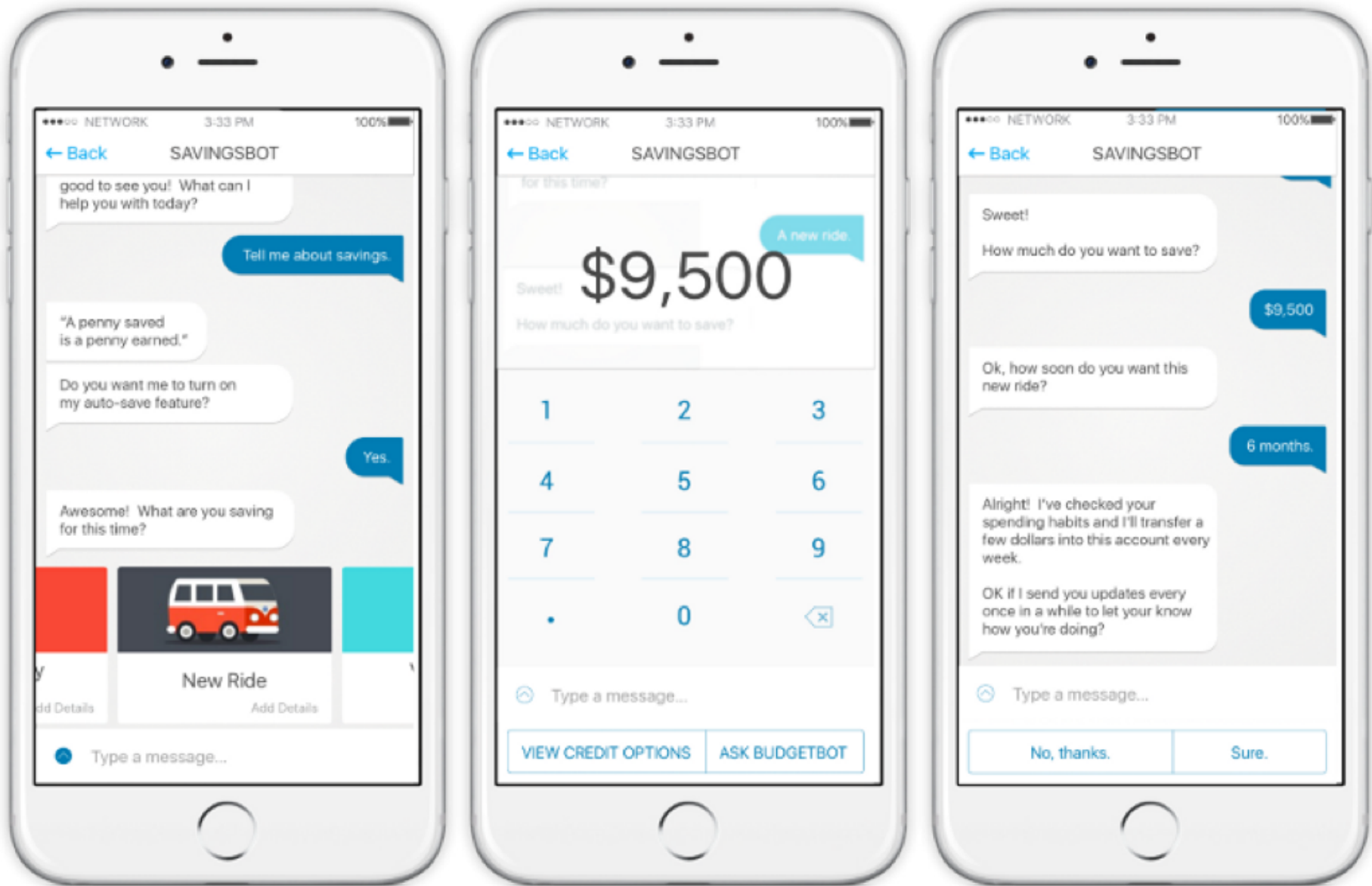
# Uber's Chatbot on Facebook's Messenger



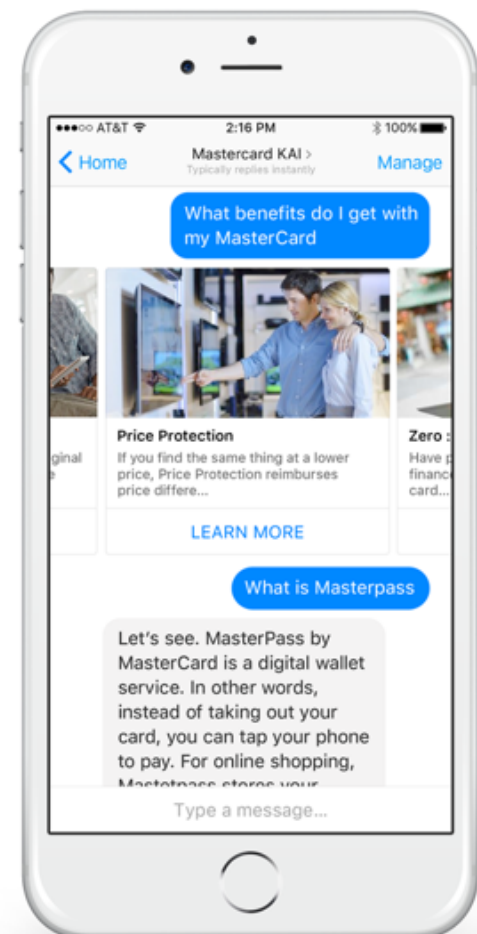
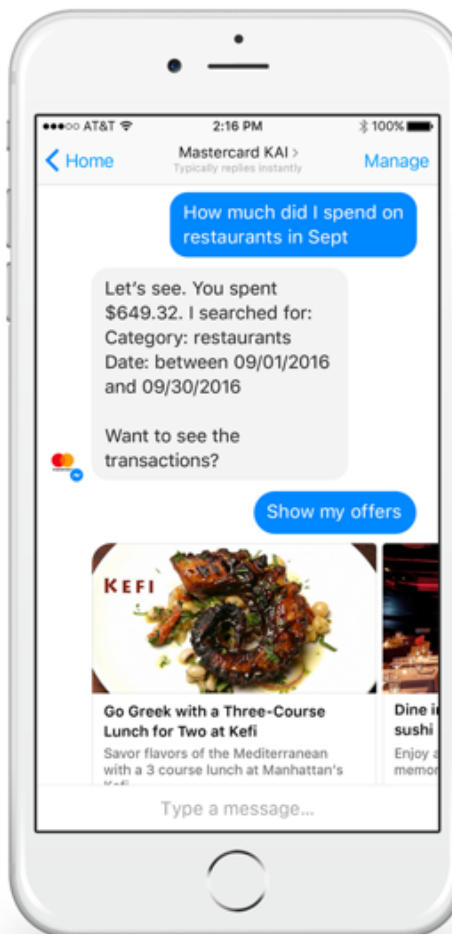
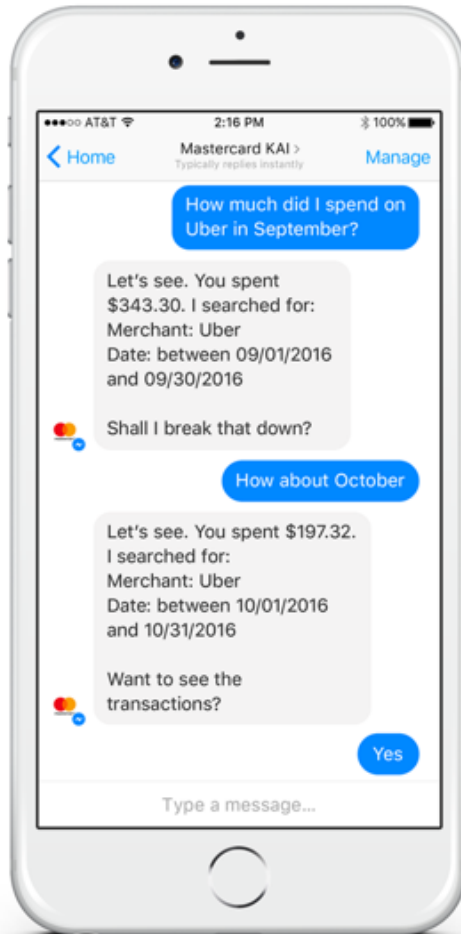
- Uber's chatbot on Facebook's messenger
- one main benefit: it loads much faster than the Uber app

Source: <http://www.guided-selling.org/from-e-commerce-to-conversational-commerce/>

# Savings Bot



# Mastercard Makes Commerce More Conversational

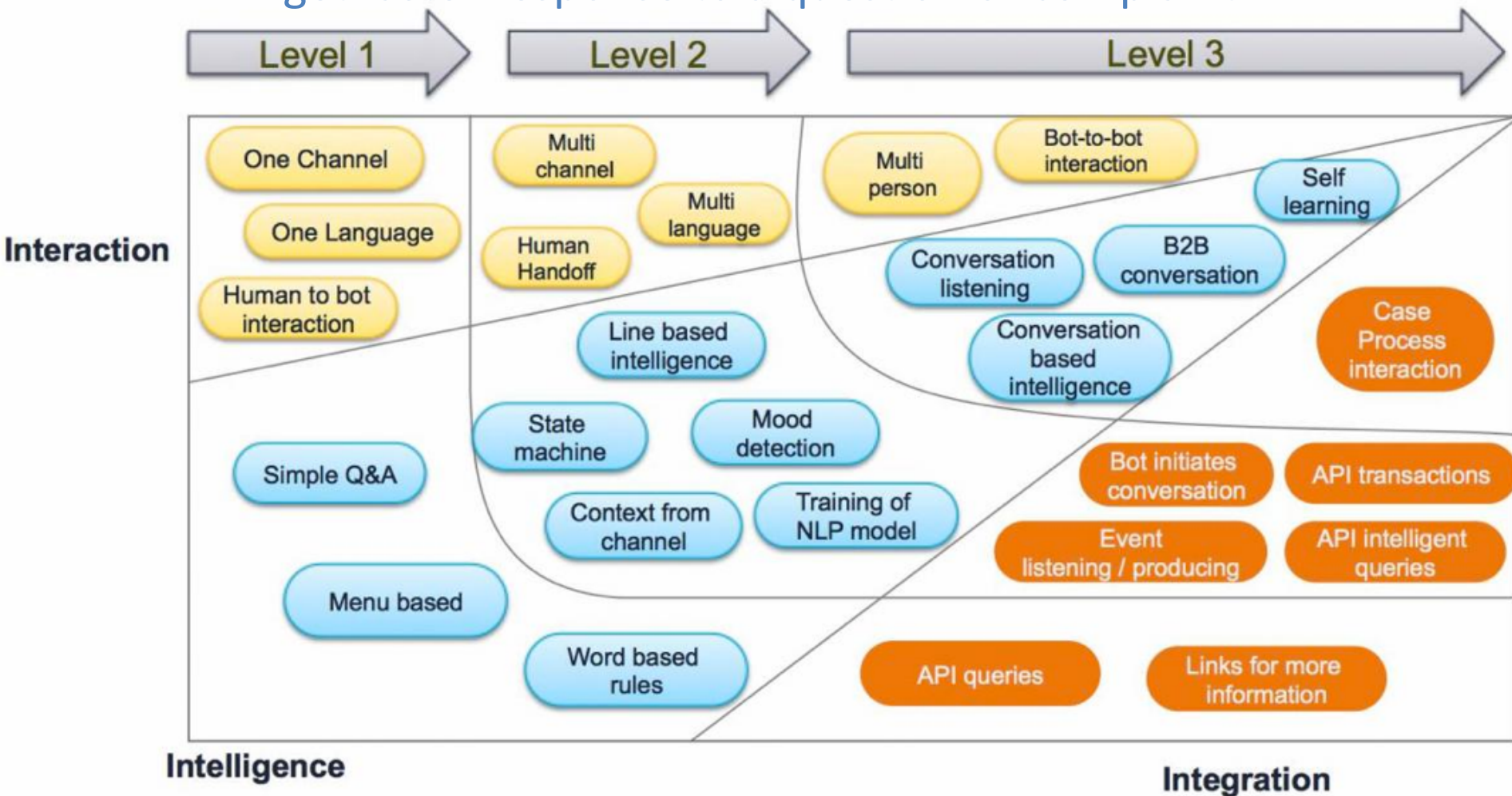


POWERED BY  
**Kasisto**

# Chatbots

## Bot Maturity Model

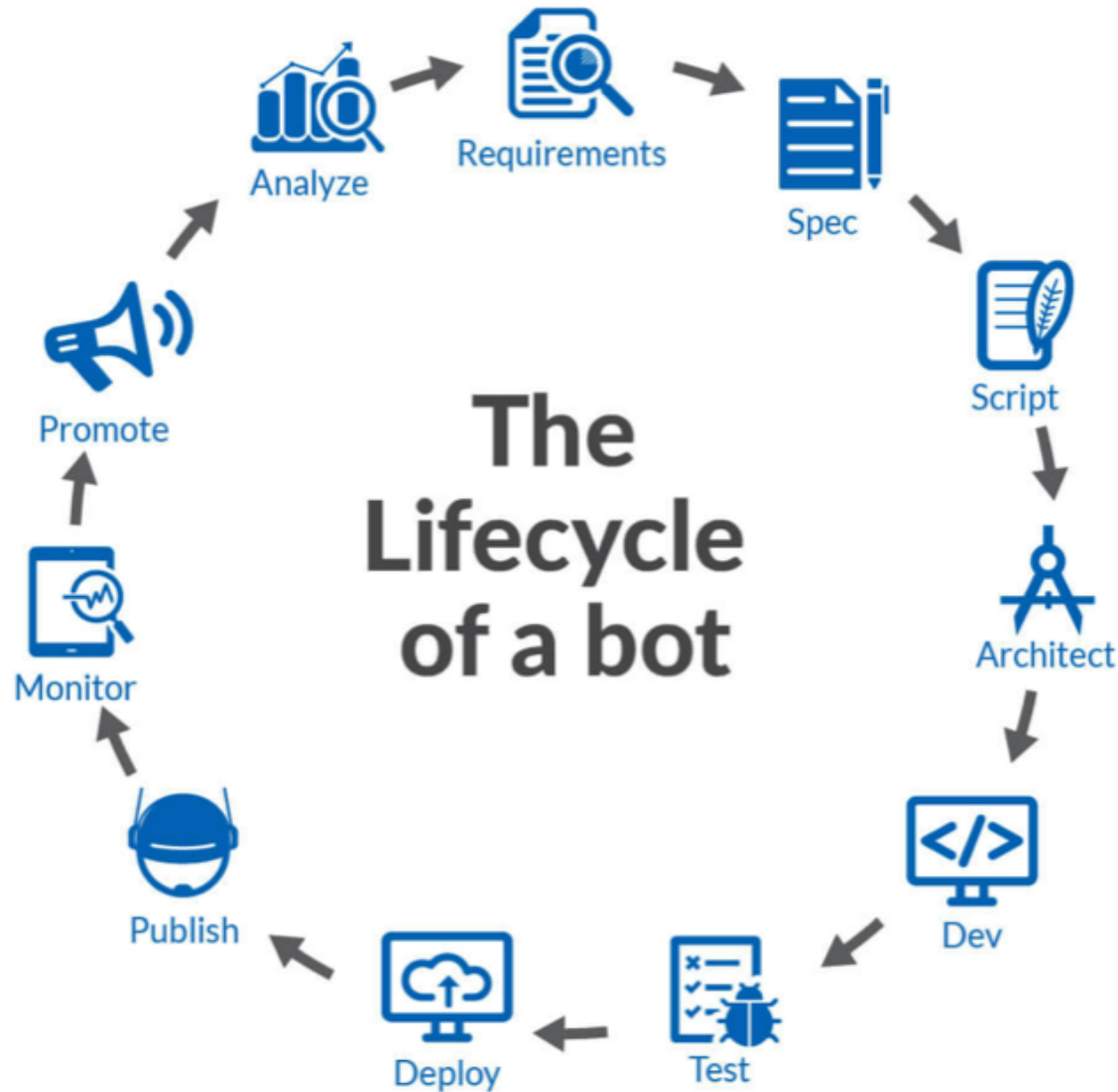
Customers want to have simpler means to interact with businesses and get faster response to a question or complaint.



# Bot Life Cycle and Platform Ecosystem



# The Bot Lifecycle

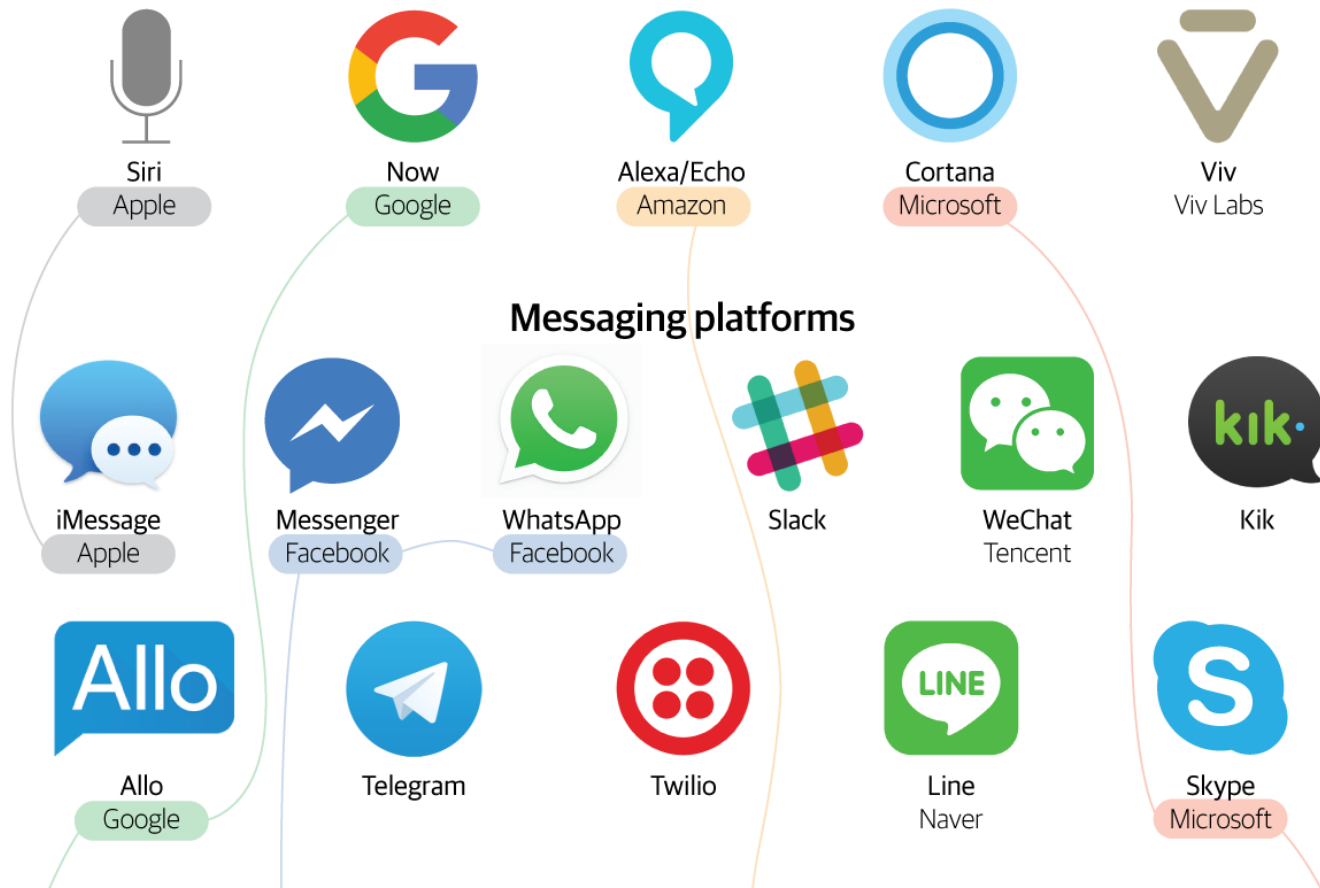


# The bot platform ecosystem and the emerging giants

Nearly every large software company has announced some sort of bot strategy in the last year. Here's a look at a handful of leading platforms that developers might use to send messages, interpret natural language, and deploy bots, with the emerging bot-ecosystem giants highlighted.

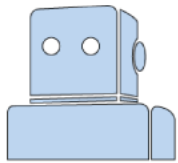
## General AI agents with platforms

Developer access available now or announced





## Bot frameworks and deployment platforms



Wit.ai  
Facebook



BotKit  
Howdy



Chatfuel

AUTOMAT

Automat



Bot Framework  
Microsoft



Api.ai  
Google



Pandorabots



MindMeld



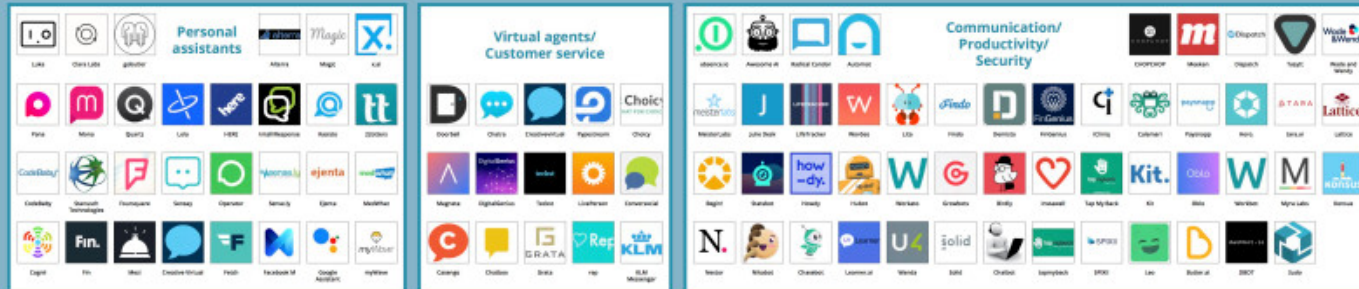
Gupshup



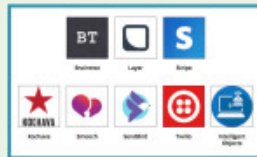
Sequel

# Bots Landscape

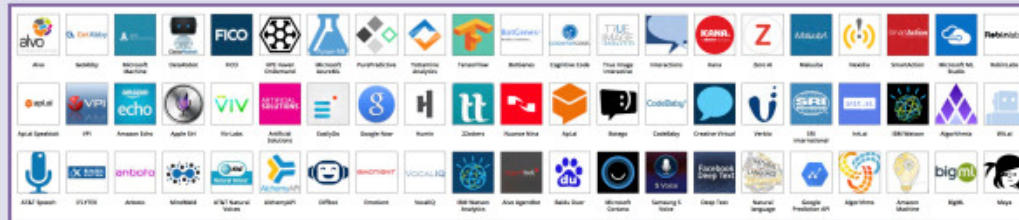
## Bots with traction



## Connectors/ Shared Services



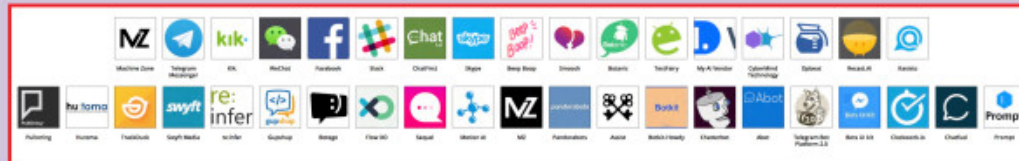
## AI Tools: Natural Language Processing, Machine Learning, Speech & Voice Recognition



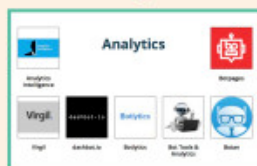
## Bot Discovery



## Bot developer frameworks and tools



## Analytics



## Messaging



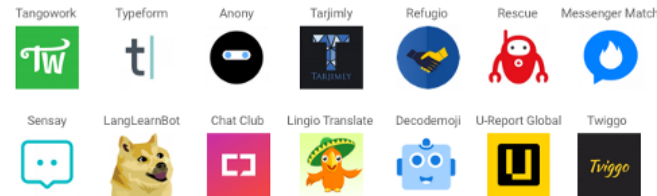
# RECAST.AI Messenger Bot Landscape

May 2017

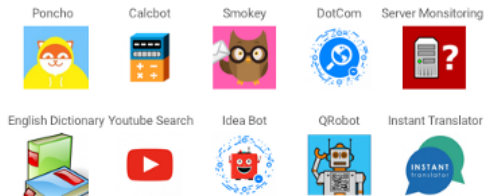
## Food



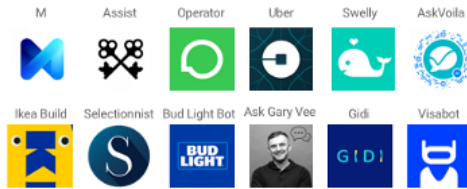
## Communication



## Utilities



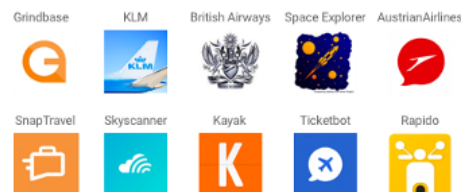
## Personal



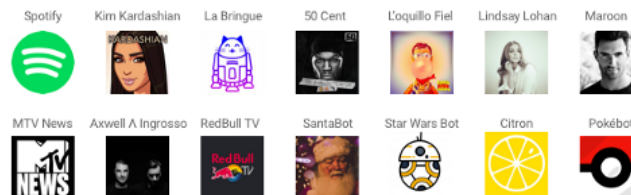
## Analytics



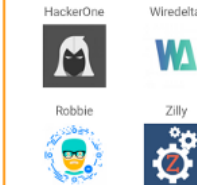
## Travel



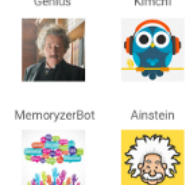
## Entertainment



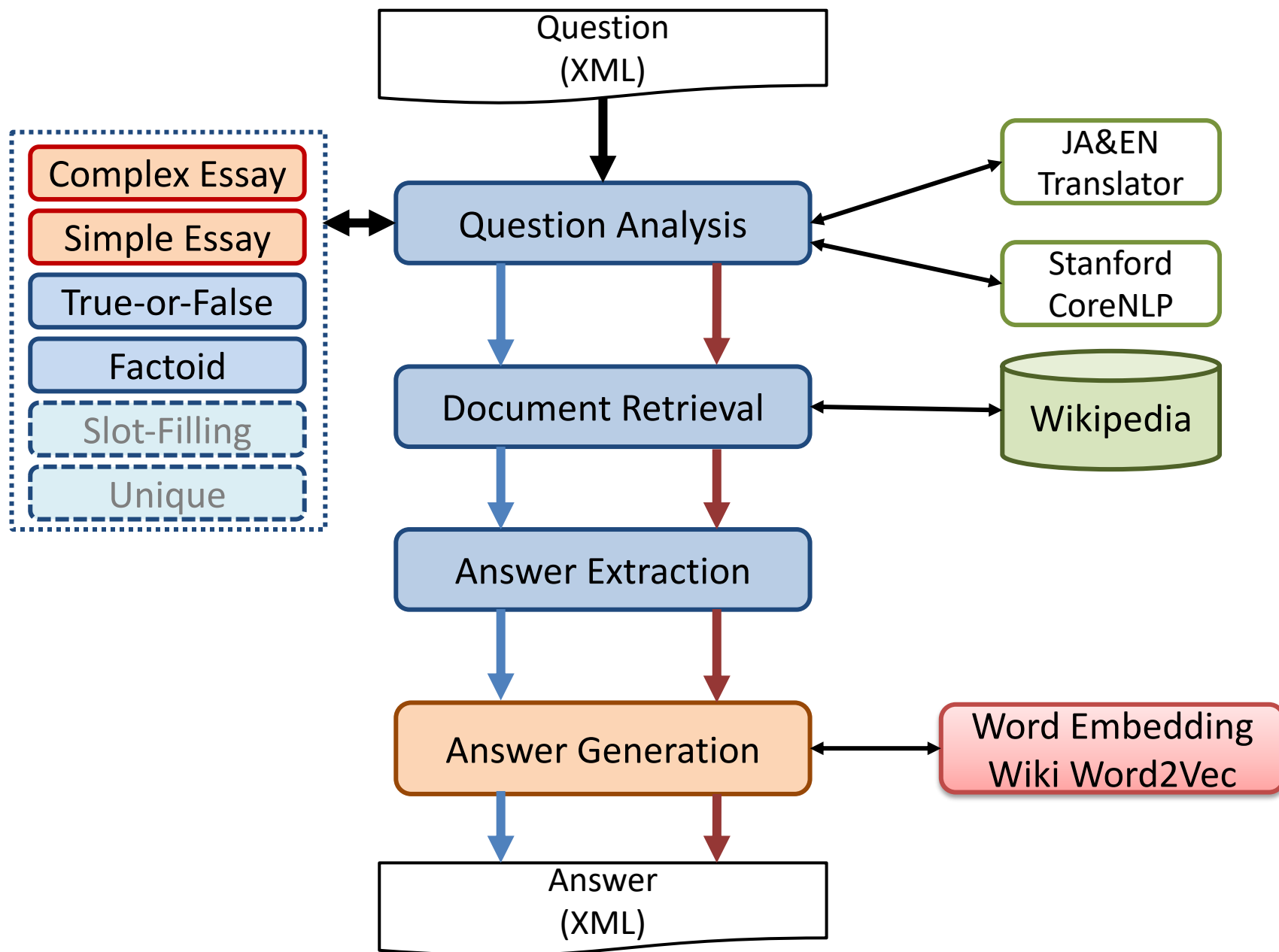
## Developer Tools



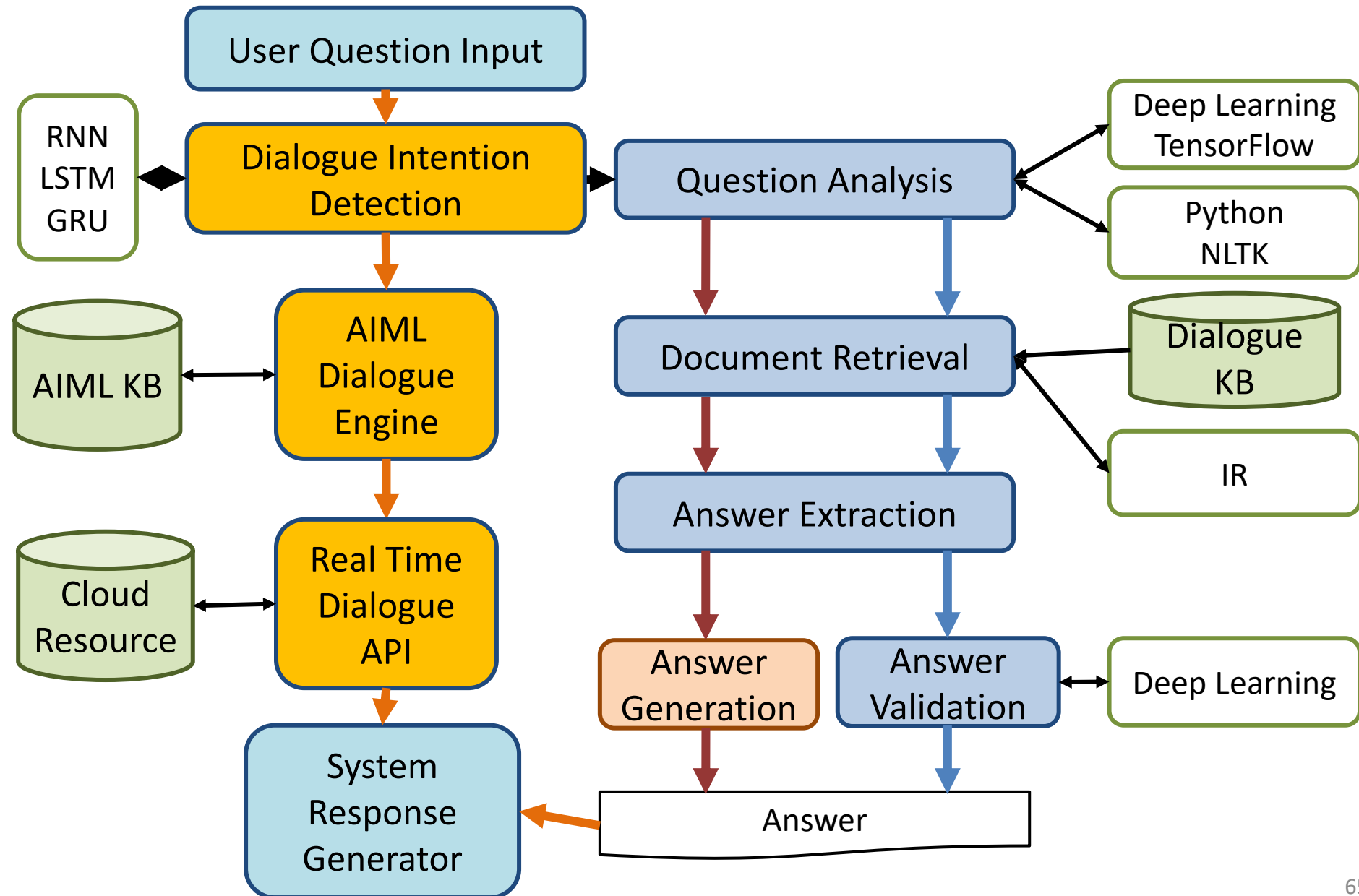
## Education



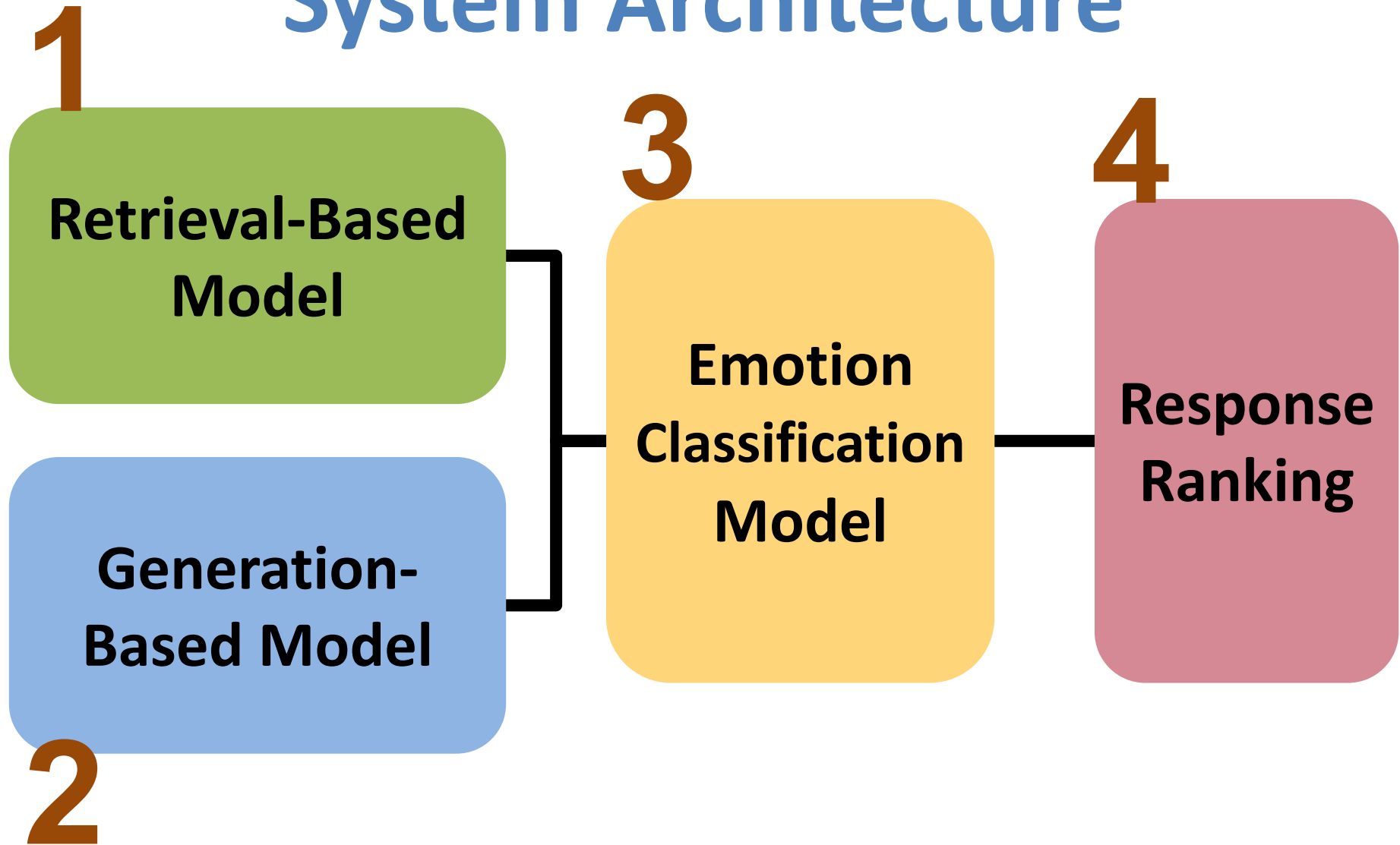
# IMTKU System Architecture for NTCIR-13 QALab-3



# System Architecture of Intelligent Dialogue and Question Answering System



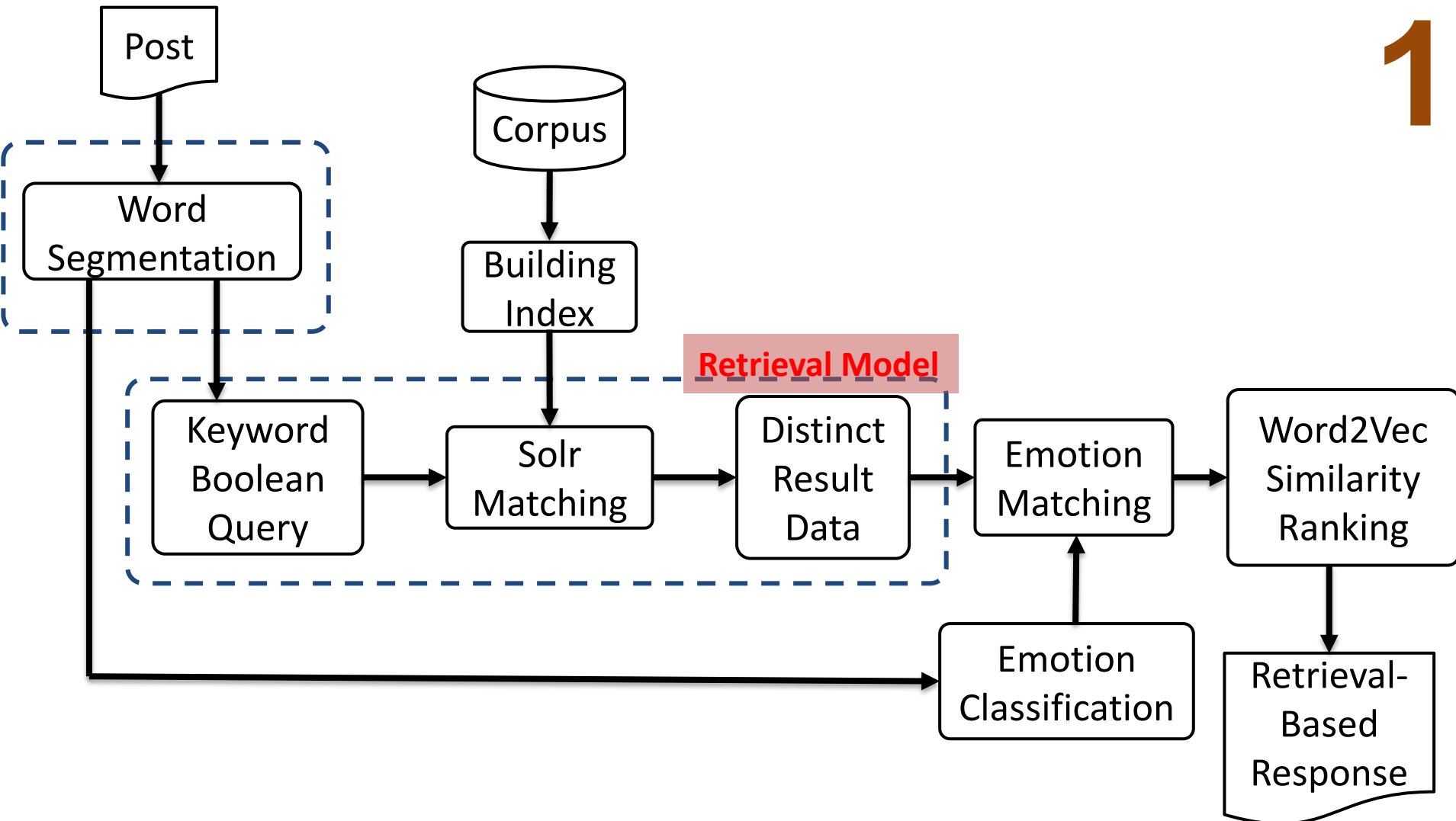
# IMTKU Emotional Dialogue System Architecture



# The system architecture of IMTKU retrieval-based model for NTCIR-14 STC-3

## Retrieval-Based Model

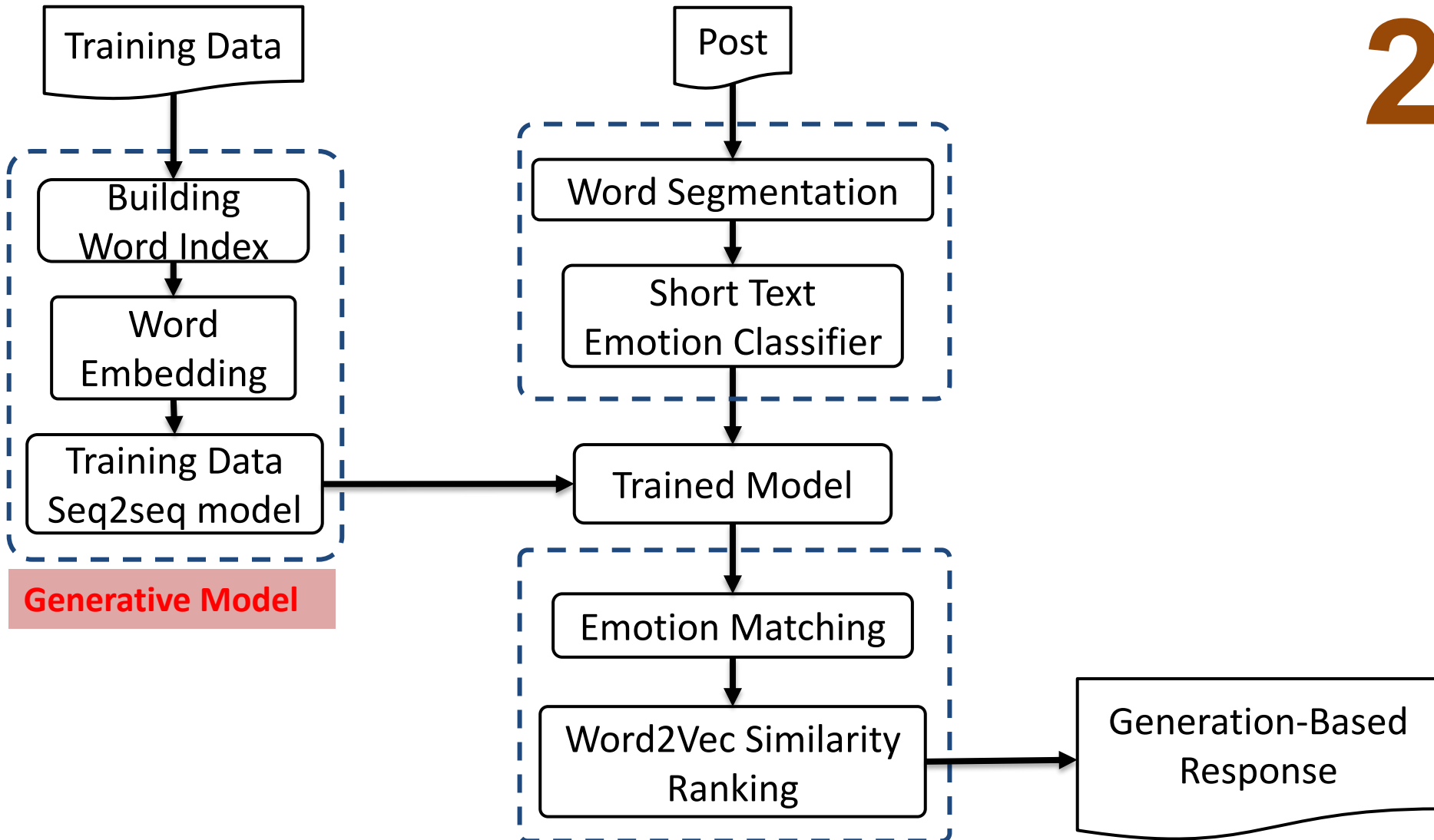
1



# The system architecture of IMTKU generation-based model for NTCIR-14 STC-3

## Generation-Based Model

2



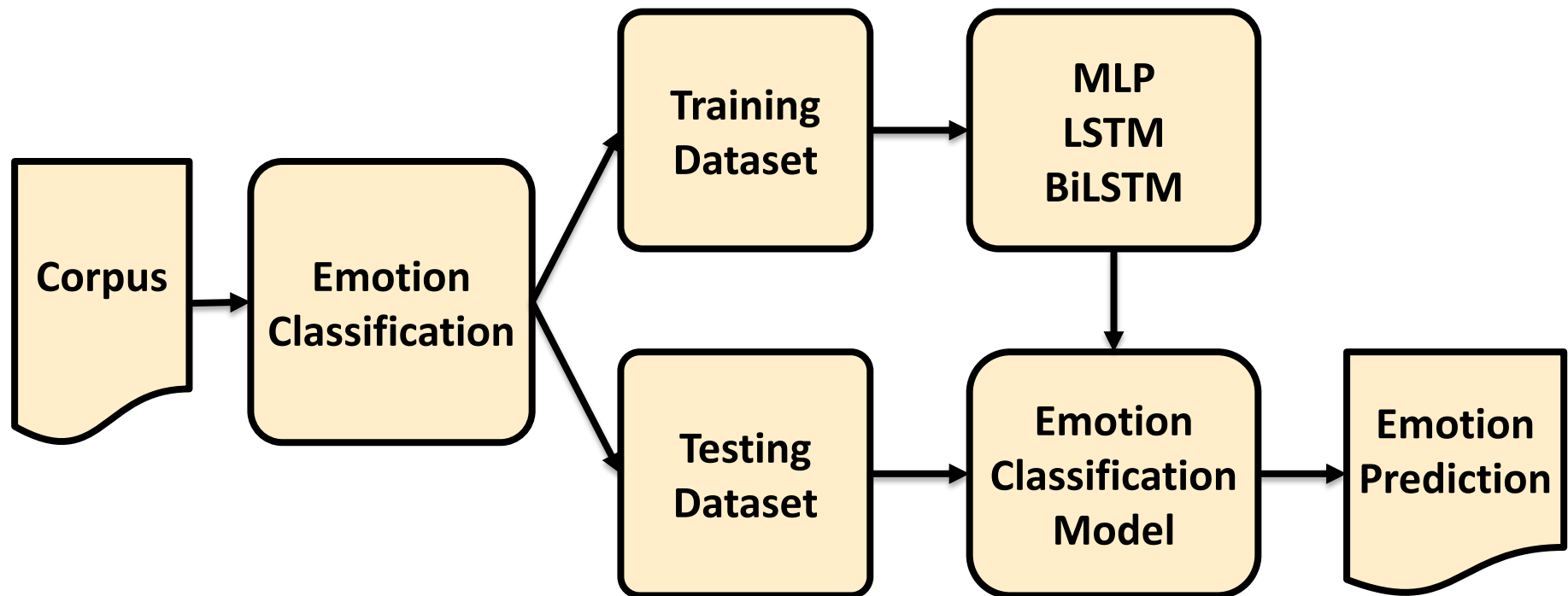


# The system architecture of IMTKU emotion classification model for NTCIR-14 STC-3



## Emotion Classification Model

3

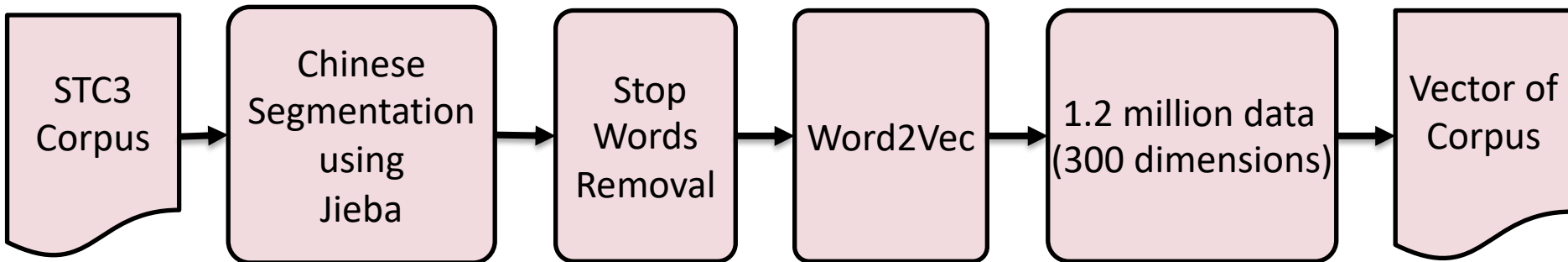


# The system architecture of IMTKU Response Ranking for NTCIR-14 STC-3



## Response Ranking

4





**Short Text Conversation Task  
(STC-3)  
Chinese Emotional Conversation  
Generation (CECG) Subtask**

# NTCIR Short Text Conversation

## STC-1, STC-2, STC-3

	Japanese	Chinese	English	
NTCIR-12 STC-1 22 active participants	Twitter, Retrieval	Weibo, Retrieval		Single-turn, Non task-oriented
NTCIR-13 STC-2 27 active participants	Yahoo! News, Retrieval+ Generation	Weibo, Retrieval+ Generation		
NTCIR-14 STC-3		Weibo, Generation for given emotion categories		Multi-turn, task-oriented (helpdesk)
Chinese Emotional Conversation Generation (CECG) subtask				
Dialogue Quality (DQ) and Nugget Detection (ND) subtasks		Weibo+English translations, distribution estimation for subjective annotations		

Source: <https://waseda.app.box.com/v/STC3atNTCIR-14>

**Dialogue  
on  
Airline Travel  
Information System  
(ATIS)**

# The ATIS (Airline Travel Information System) Dataset

<https://www.kaggle.com/siddhadev/atis-dataset-from-ms-cntk>

<b>Sentence</b>	what	flights	leave	from	phoenix
<b>Slots</b>	O	O	O	O	B-fromloc
<b>Intent</b>	atis_flight				

Training samples: 4978

Testing samples: 893

Vocab size: 943

Slot count: 129

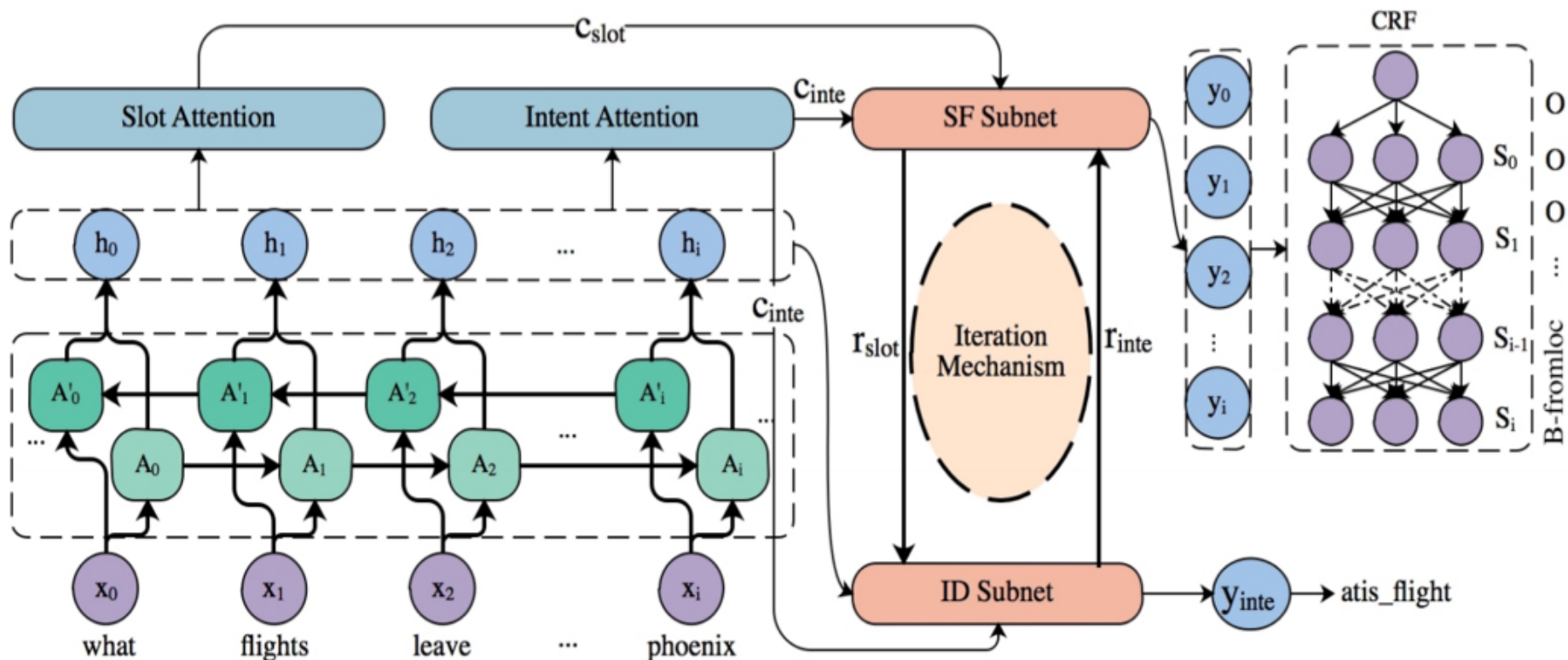
Intent count: 26

# SF-ID Network (E et al., 2019)

## Slot Filling (SF)

## Intent Detection (ID)

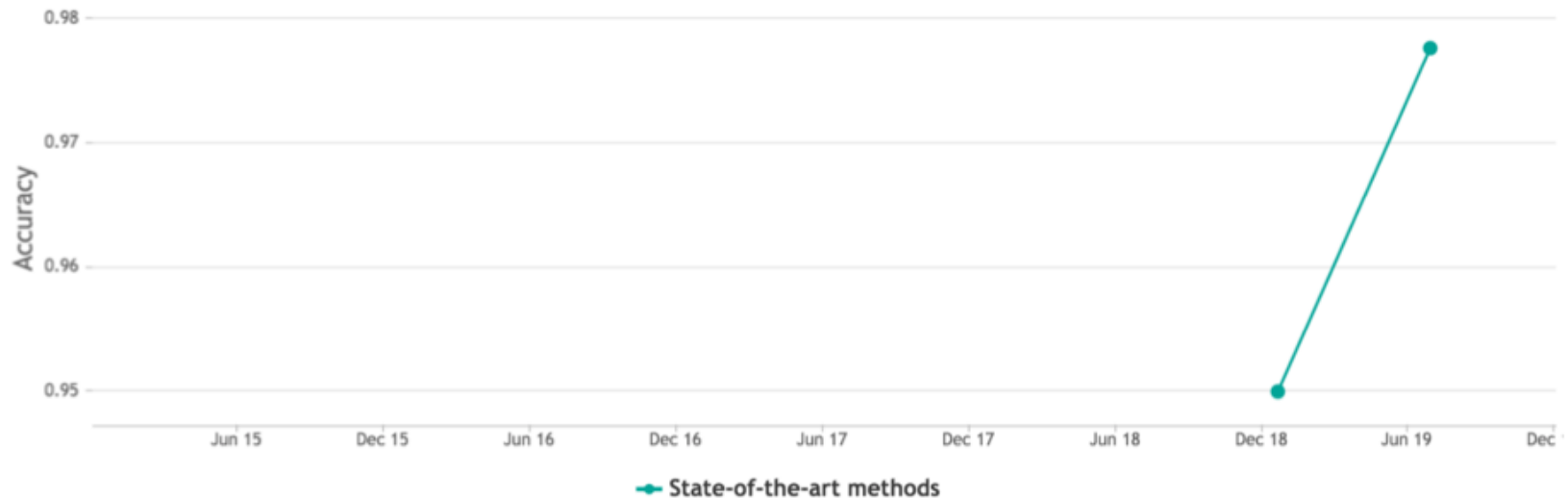
A Novel Bi-directional Interrelated Model for Joint Intent Detection and Slot Filling







# Intent Detection on ATIS

## State-of-the-art

Intent Detection on ATIS



<div>Edit</div>						
RANK	METHOD	ACCURACY	PAPER TITLE	YEAR	PAPER	CODE
1	SF-ID	0.9776	A Novel Bi-directional Interrelated Model for Joint Intent Detection and Slot Filling	2019		
2	Capsule-NLU	0.950	Joint Slot Filling and Intent Detection via Capsule Neural Networks	2018		

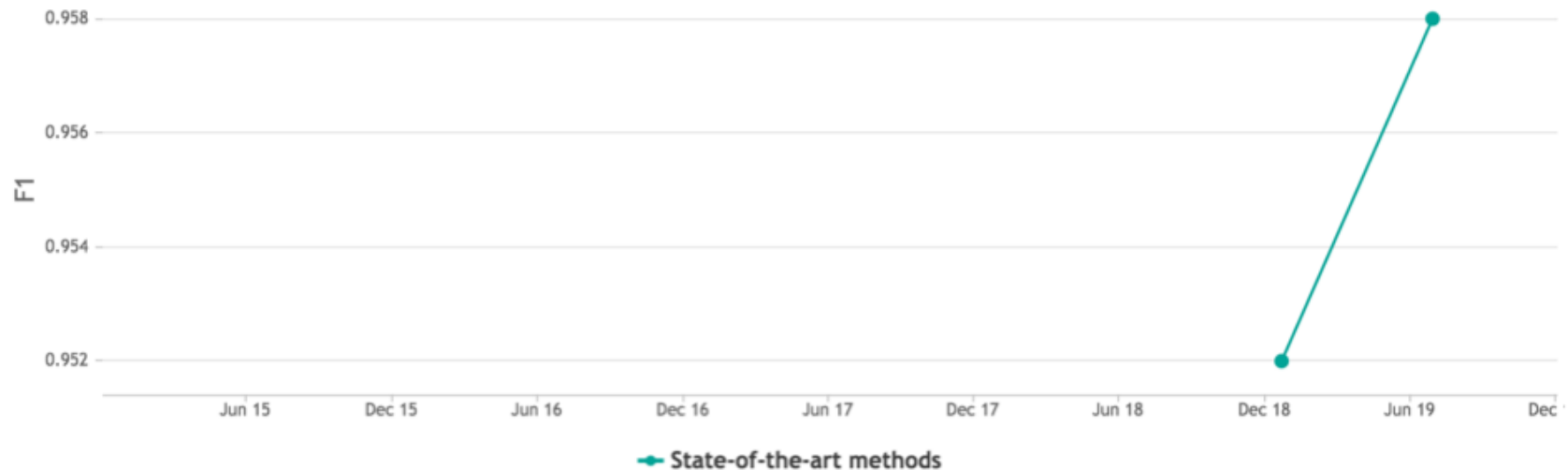
Source: <https://paperswithcode.com/sota/intent-detection-on-atis>







# Slot Filling on ATIS

## State-of-the-art

### Slot Filling on ATIS

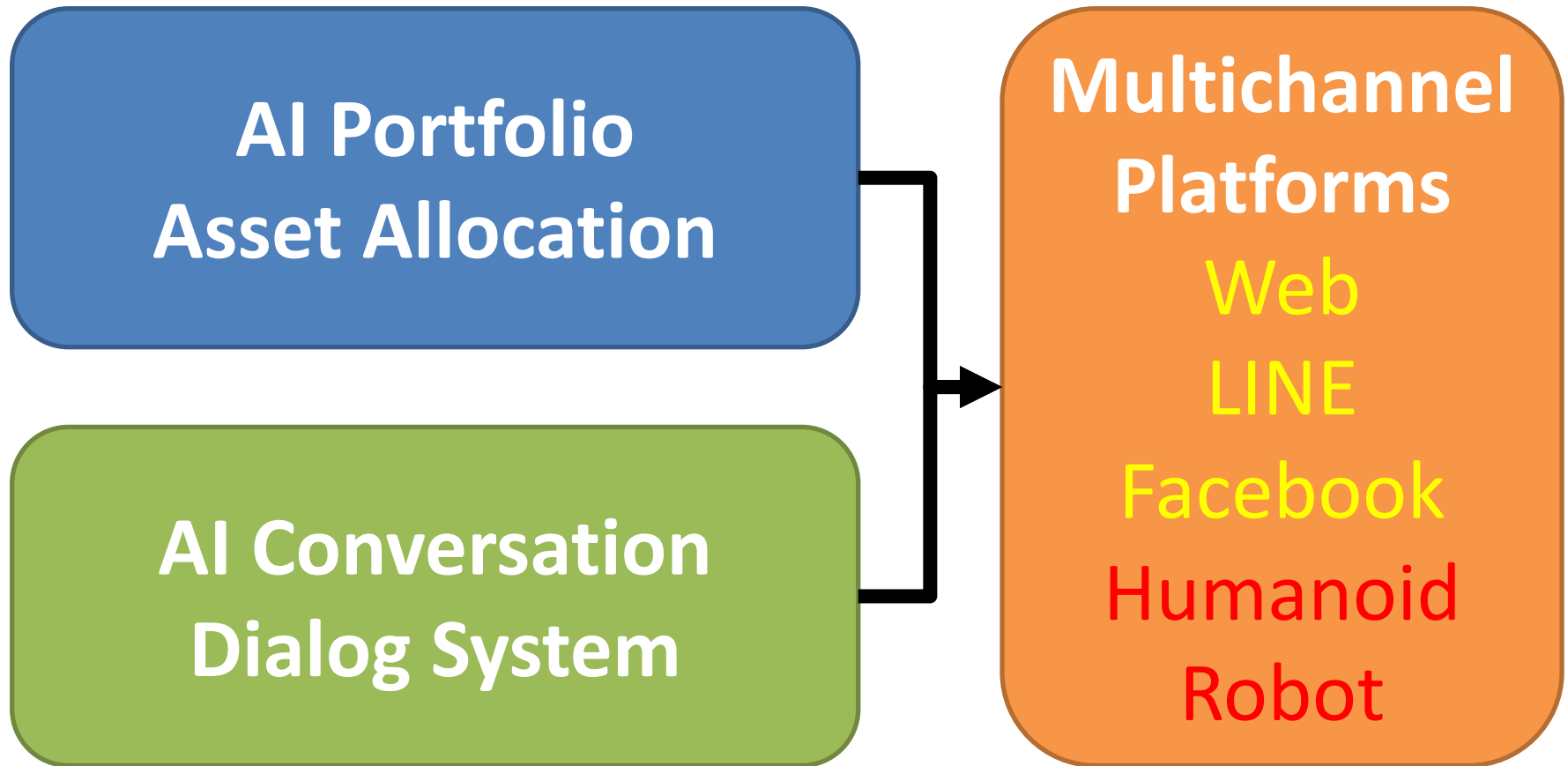


RANK	METHOD	F1	PAPER TITLE	YEAR	PAPER	CODE
1	SF-ID	0.958	<a href="#">A Novel Bi-directional Interrelated Model for Joint Intent Detection and Slot Filling</a>	2019		
2	Capsule-NLU	0.952	<a href="#">Joint Slot Filling and Intent Detection via Capsule Neural Networks</a>	2018		

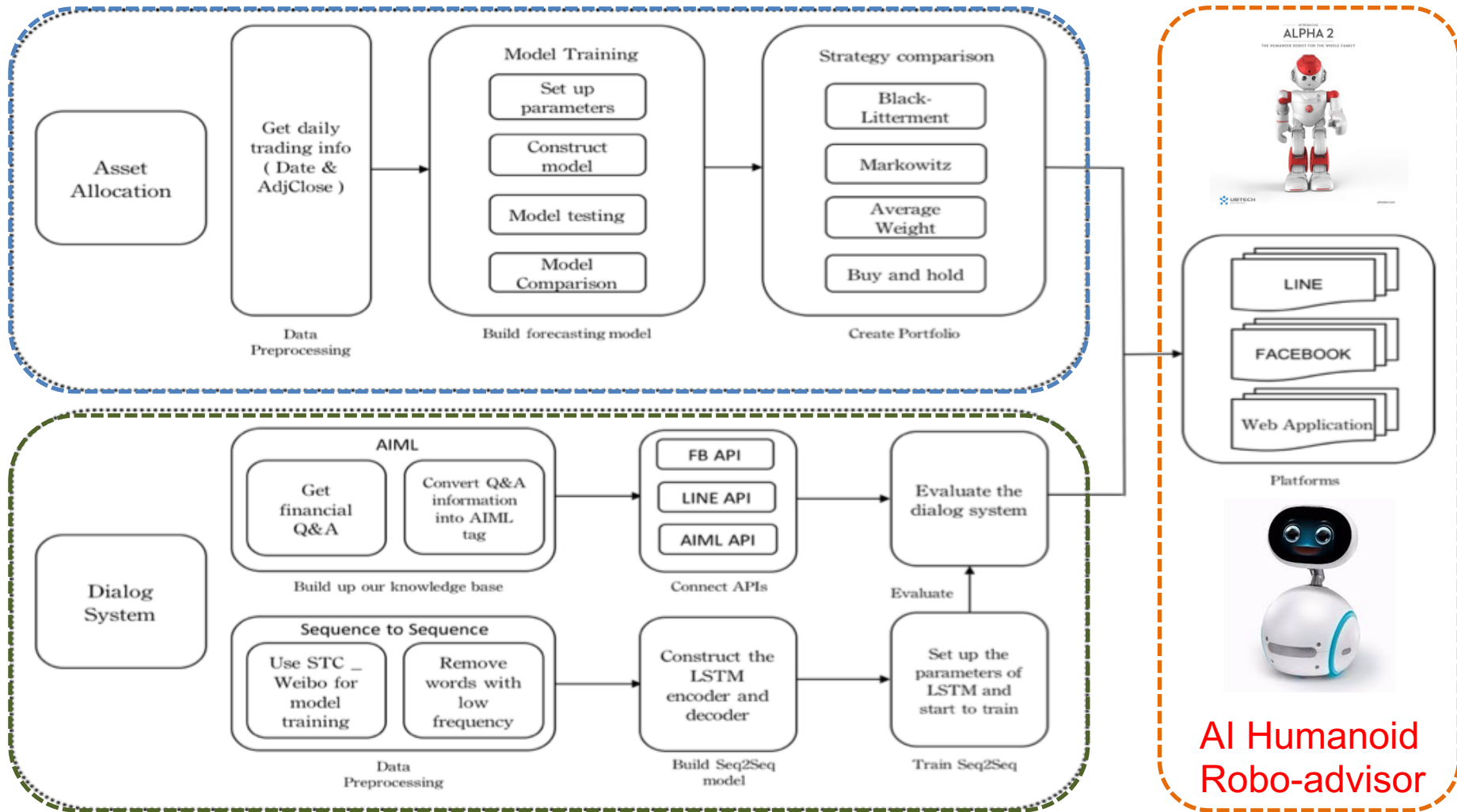
Source: <https://paperswithcode.com/sota/slot-filling-on-atis>

# **AI Humanoid Robo-Advisor**

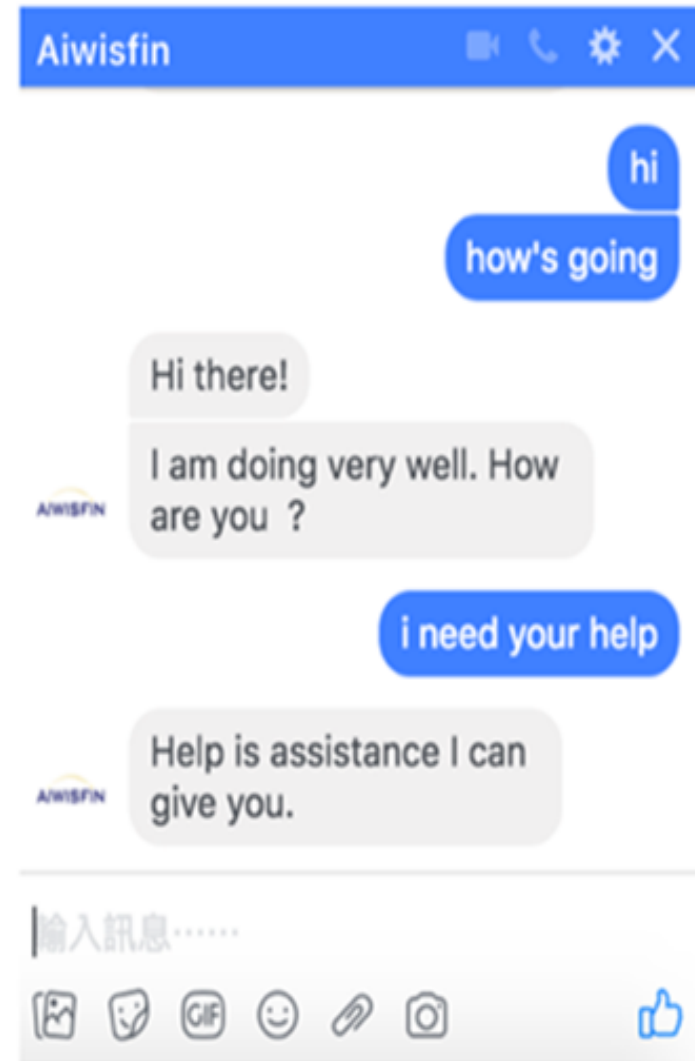
# AI Humanoid Robo-Advisor for Multi-channel Conversational Commerce



# System Architecture of AI Humanoid Robo-Advisor



# Conversational Model (LINE, FB Messenger)



# Conversational Robo-Advisor

## Multichannel UI/UX

### Robots



**ALPHA 2**

**ZENBO**

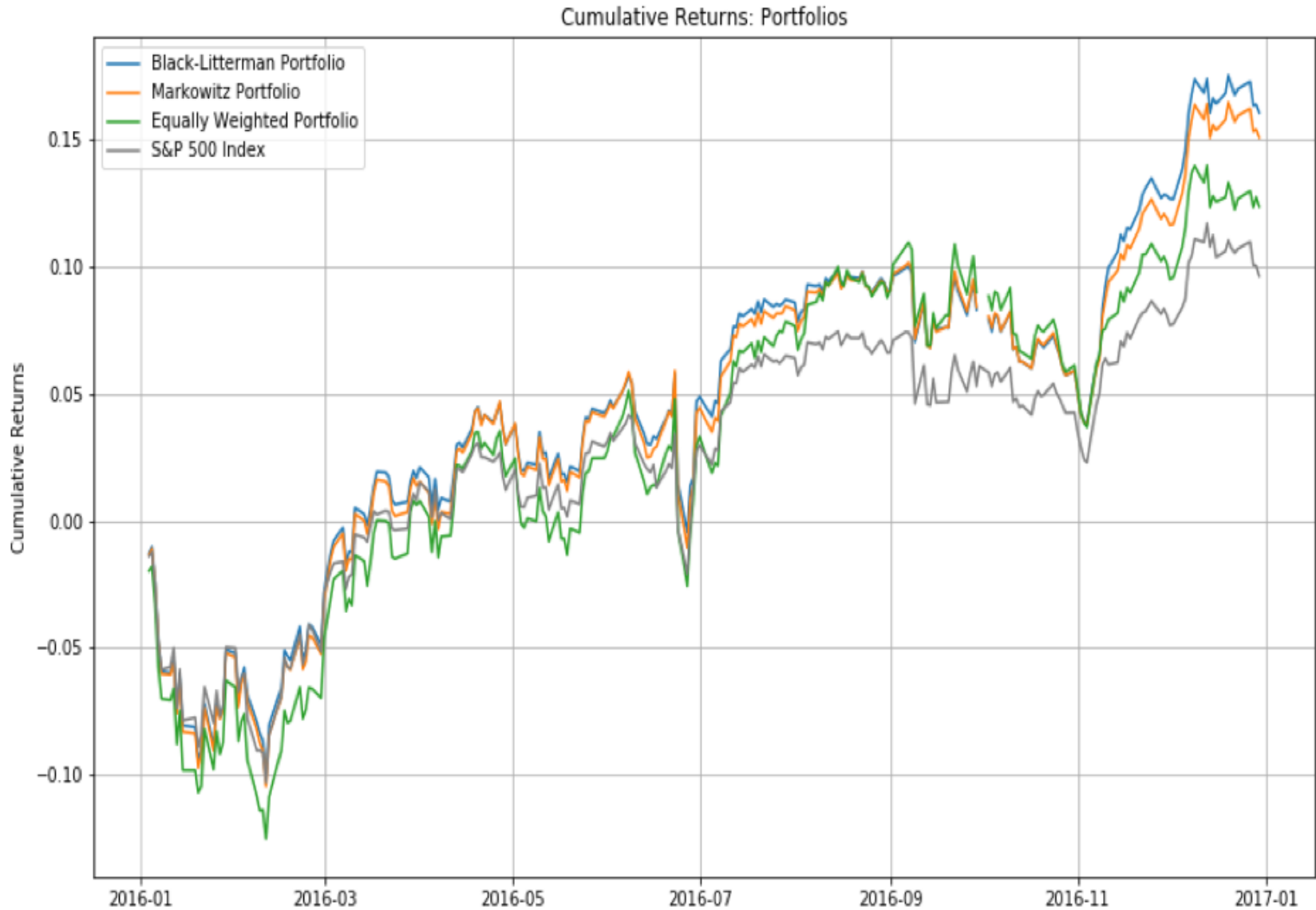


# Portfolio Performance in 2016

## Annual Portfolio Statistics

	Black-Litterman Portfolio - the LSTM Investor Views	Markowitz Portfolio	Equally Weighted Portfolio	S&P 500 Index
Annual return	16.151%	15.172%	12.428%	9.643%
Annual volatility	13.897%	14.365%	15.870%	13.169%
Sharpe ratio	1.14697	1.05534	0.81762	0.76492
Stability	0.82500	0.82515	0.82514	0.78754
Max drawdown	-10.105%	-10.465%	-12.529%	-10.306%
Skew	-0.35652	-0.52985	-0.56976	-0.36795
Kurtosis	2.49845	3.00613	2.41894	2.21958
Daily value at risk	-1.688%	-1.750%	-1.948%	-1.619%
Alpha	0.06445	0.05354	0.02158	0.00000
Beta	1.01485	1.04816	1.15631	1.00000
Information ratio	0.10935	0.09129	0.04655	-

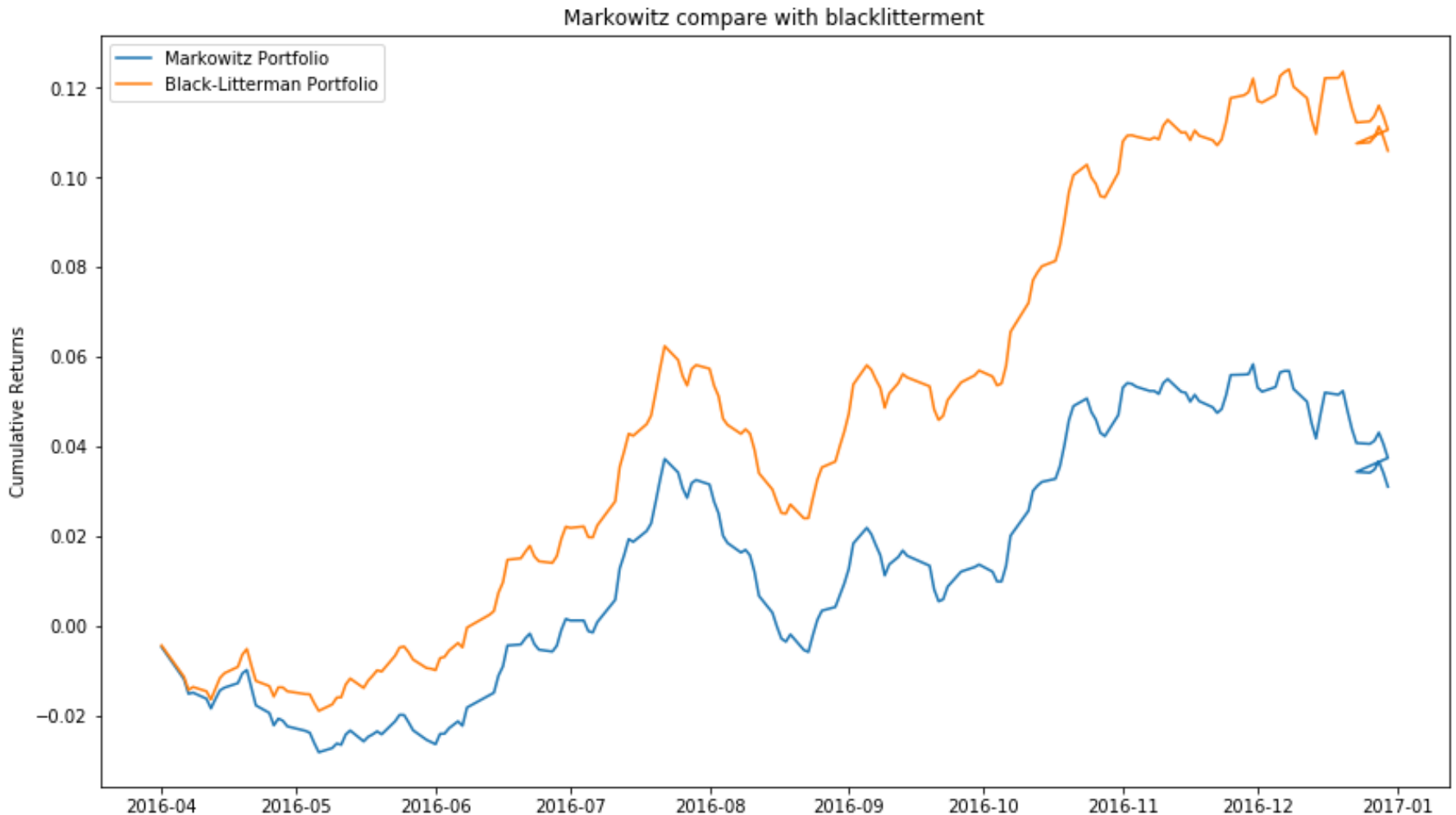
# Portfolio Cumulative Returns





# Cumulative Returns

## Markowitz v.s. Black-litterment



Source: Min-Yuh Day, Jian-Ting Lin and Yuan-Chih Chen (2018), "Artificial Intelligence for Conversational Robo-Advisor", in Proceedings of the 2018 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2018), Barcelona, Spain, August 28-31, 2018

# Summary

- **AI Robo-Advisor in FinTech**
- **Chatbot for Conversational Commerce**
- **AI Humanoid Robo-Advisor**

# References

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# Q & A



Tamkang  
University  
淡江大學

# AI Robo-Advisor and Chatbot for Conversational Commerce in FinTech

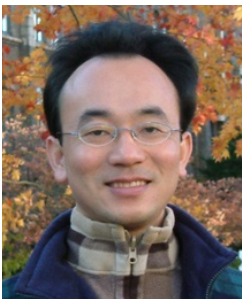
Host: Prof. Yean-Fu Wen

Graduate Institute of Information Management, National Taipei University

Time: 10:00-12:00, 2019/11/20 (Wednesday)

Place: 8F40, Business Building, Sanxia Campus, National Taipei University

Address: No. 151, University Rd., Sanxia Dist., New Taipei City 23741, Taiwan



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2019-11-20

