



聊天機器人—AI 對話式商務應用 Chatbot: AI Applications in Conversational Commerce

Time: 2018/6/1 (Fri) (15:30-16:15) Place: 台北市民生東路四段133號 (民生科服大樓101會議室) Host: 資策會 數位服務創新研究所



淡江大學 資訊管理學系



http://mail. tku.edu.tw/myday/ 2018-06-01



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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 + FinTech
 把科技力量注入金融業
- 金融業 AI 對話式商務 (conversation commerce)應用
- 智能客服,
 未來主流電子商務服務

Artificial Intelligence **(AI)**



and Cognitive Computing

Source: http://research.ibm.com/cognitive-computing/

FinTech

Robo-Advisors

FinTech high-level classification



Source: Paolo Sironi (2016), "FinTech Innovation: From Robo-Advisors to Goal Based Investing and Gamification", Wiley. 8

Al Chatbot for Conversational Commerce

Chatbots: Evolution of UI/UX



From Algorithmic Trading to Personal Finance Bots: **41 Startups Bringing** Al to Fintech

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

41 Startups Bringing Artificial Intelligence To Fintech



Artificial Intelligence (AI) in Fintech





Artificial Intelligence (AI) in Fintech



Definition of **Artificial Intelligence** (A.I.)

Artificial Intelligence

"... the SCIENCE and engineering of making intelligent machines" (John McCarthy, 1955)

Artificial Intelligence

"... technology that thinks and acts like humans"

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Artificial Intelligence

"... intelligence exhibited by machines or software"

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4 Approaches of Al



4 Approaches of Al

2.	3.
Thinking Humanly:	Thinking Rationally:
The Cognitive	The "Laws of Thought"
Modeling Approach	Approach
1.	4.
Acting Humanly:	Acting Rationally:
The Turing Test	The Rational Agent
Approach (1950)	Approach

Al Acting Humanly: The Turing Test Approach (Alan Turing, 1950)

- Natural Language Processing (NLP)
- Knowledge Representation
- Automated Reasoning
- Machine Learning (ML)
- Computer Vision
- Robotics

Artificial Intelligence (A.I.) Timeline

A.I. TIMELINE



1961



1950

TURING TEST Computer scientist Alan Turing proposes a intelligence' is coined test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence

1955 A.I. BORN

UNIMATE Term 'artificial First industrial robot, Unimate, goes to work by computer scientist, at GM replacing John McCarthy to describe "the science assembly line and engineering of making intelligent machines"

1964

Pioneering chatbot developed by Joseph Weizenbaum at MIT with humans

1966 **A.I.**

The 'first electronic

Shakey is a general-

that reasons about

its own actions

person' from Stanford,

purpose mobile robot

WINTER

playing computer from Many false starts and dead-ends leave A.I. out champion Garry Kasparov

1998

1997

DEEP BLUE

Deep Blue, a chess-

Cynthia Breazeal at MIT introduces KISmet, an IBM defeats world chess emotionally intelligent robot insofar as it detects and responds to people's feelings

🔅 AlphaGo



1999

AIBO

Sony launches first consumer robot pet dog autonomous robotic AiBO (Al robot) with skills and personality that develop over time

2002

ODD

and clean homes

Apple integrates Siri, an intelligent virtual vacuum cleaner from assistant with a voice iRobot learns to navigate interface, into the iPhone 4S

2011



2011

WATSON

IBM's question answering computer Watson wins first place on popular \$1M prize television guiz show

2014

Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene is human

2014

Amazon launches Alexa, Microsoft's chatbot Tay an intelligent virtual assistant with a voice interface that completes inflammatory and shopping tasks

2016

goes roque on social media making offensive racist

2017

ALPHAGO

Google's A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2¹⁷⁰) of possible positions

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Artificial Intelligence Machine Learning & Deep Learning

ARTIFICIAL INTELLIGENCE



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

FinTech

Financial Technology FinTech

"providing financial services by making use of software and modern technology"

Financial

Services

Financial Services



Source: http://www.crackitt.com/7-reasons-why-your-fintech-startup-needs-visual-marketing/

FinTech: Financial Services Innovation



Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

FinTech:

Financial Services Innovation

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

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

FinTech: Investment Management



5 FinTech: Investment Management Empowered Investors Process Externalization



圖表來源:Fugle團隊整理

FinTech: Market Provisioning



Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf

6 FinTech: Market Provisioning Smarter, Faster Machines New Market Platforms



圖表來源:Fugle團隊整理

Fintech: Financial Technology

Disrupting Banking: The Fintech Startups That Are Unbundling Wells Fargo, Citi and **Bank of America**

Source: https://www.cbinsights.com/blog/industry-market-map-landscape/

Fintech: Unbunding the Bank

Unbundling of a Bank



Source: https://www.cbinsights.com/blog/disrupting-banking-fintech-startups-2016/

Fintech: Unbunding the Bank Wealth Management: Wealthfront

Unbundling of a Bank 🖻 WiseBanvan *SparkFund ARTIVEST APITAL everplans STREET SHARES Propellr II PERSONAL CAPITAL Polly Portfolio motifuvesting H E R O Stockpile about leife wealthfront 🔷 SprinkleBit SIGFIG smartasset ARGO obinhood Aspiration Betterment 🗤 LearnVest EVEN Personal nerdwallet **Financial Education** PPLIED ATA NANCE AssetAvenue Insurance Investing and Retirer Wealth Management **Rewards and Benefit** zest finance= View Your Accounts sindeo 📳 . Account Sommary LoanNo Buying a house? Landed Go lenda Estimate how much you may be able to borrow blooom Password/Username? LENG **Get Pregualified** oline access? the zebra AVANT Sign Up Now or Take a Tour CREDI Lend TUITION.IO
Fintech: Financial Technology Disrupting **European Banking: The FinTech Startups That Are Unbundling** HSBC, Santander, and **BNP**

Source: https://www.cbinsights.com/blog/industry-market-map-landscape/

Unbundling of a European Bank



Source: https://www.cbinsights.com/blog/disrupting-european-banking-fintech-startups/

Unbundling of a European Bank



Source: https://www.cbinsights.com/blog/disrupting-european-banking-fintech-startups/

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



Source: https://www.cbinsights.com/blog/alternative-data-startups-market-map-company-list/

Lending, Investments, And Personal Finance: 102 Startups Attacking The Retail Banking Value Chain

The Digital Banking Market Map



Source: https://www.cbinsights.com/blog/industry-market-map-landscape/

From Point-Of-Sale To Money Transfers: 109 Startups Disrupting The Payments Industry

The Payments Market Map



Insurance Tech Rising: 135+ Insurance Startups Across P2P, Life, Commercial & More

Life/Annuity Auto (Distribution/Comparison) SMB Mobile Insurance Management EM FOUNDER Knip @GetSale next Ъ insureon ~ EVEROUTE OIO IMATI CLARK CW mpara OPCHECK Renters/Homeowners Sharing economy R -easypolicy CompareAsia RB Abaris Slice Y RISK Harbor Quilt T Auto Telematics/UBI Auto Claims SURE. poncho ()MATIC snapsheet GUILD 0 0 C LeaseLock BIMA P2P (Re)Insurance Software/Analytics/IaaS **DCTD** 众安保险 acculitx 0 PD 0 Lemonade GUEVARA Healthcare/Dental (Full-stack/SMB/Individual) Contercentero) bb **(**G) oscar Clover ZENEFITS GUSTO PEER inspool O ONE H zipari 0 LUMITY + Ø **X**同聚保 encred miEdge Dynamis ethic Pet Collector Q C £ FIGO Unwight Hulth ClaimKi E Stride LAPETUS Hixme Stock AVYST . (unirisx For more insurance tech research, check out: pablow Ø Product cbi.vc/insurance-tech ō CBINSIGHTS V Н fadata mh www.cbinsights.com C simple Array acturis 000

Insurance Tech Rising: 130+ Startups Across P2P, Life, Renters, & More

Source: https://www.cbinsights.com/blog/industry-market-map-landscape/

Millennial Personal Finance: 63 Fintech Startups Targeting Millennials

Fin Tech Startups for Millennials



Source: https://www.cbinsights.com/blog/fin-tech-startups-millennials/

Fintech for Millennials

Fintech Category	#Company
Crowdfunding	2
Insurance (Non-Health)	4
Loans & Credit Risk	20
Mobile Banking & Payments	8
Personal Investing	10
Savings & Finances Tracking	10
Wealth Management	9
Total	63

Fintech: Wealth Management

Company	Select Investors
Wealthfront	DAG Ventures, Index Ventures, Greylock Partners, The Social+Capital Partnership
Betterment	Bessemer Venture Partners, Athemis Group, Menlo Ventures
SigFig	Doll Capital Management, Union Square Ventures, Bain Capital Ventures
Aspiration	Renren, GSV Capital, Capricorn Investment Group, IGSB
Blooom	Commerce Ventures, DST Systems, Hyde Park VP, QED Investors, UMB Financial
Rebalance IRA	N/A
Hedgeable	SixThirty
WiseBanyan	VegasTech Fund
Personal Capital	Institutional Venture Partners, Venrock, Crosslink Capital

Fintech: Personal Investing

Company	Select Investors
eToro	BRM Group, Ping An Ventures, Spark Capital
Openfolio	FinTech Collective
DriveWealth	Route 66 Ventures
Tip'd Off	Raj Parekh, Bill Crane, Shaun Coleman
Kapitall	Bendigo Partners, Linden Venture Fund
Stash	N/A
Stox	SingulariTeam
Robinhood	Google Ventures, Index Ventures, Andreessen Horowitz, Ribbit Capital, NEA
Motif Investing	Norwest Venture Partners, Foundation Capital, Ignition Capital, Goldman Sachs
Loyal3	DNS Capital

Chatbot **Dialogue System** Intelligent Agent

Chatbot



Dialogue System





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."

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

Chatbot Conversation Framework



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

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

Conversational Commerce: eBay AI Chatbots

••••• A	T&T 穼 1:31 PM 🕑 🕇 🛈	76% 🔳
< Hor	me eBay ShopBot > N Typically replies instantly	lanage
	I'm looking for adidas stan s in white	mith
ebay	Which gender are you looking for?	
	Wo	omen
ebay	Sure, I've got a few options for those.	
	Insert all	
	Best Value 🤚 16 sold \$63.71 was \$74 - ADIDAS WOMEN'S STAN SMITH OG WHITE GREEN B24105 shopbot.ebay.com	Trend \$99.99 White shopb
	View item	
ŧ		

Hotel Chatbot



Source: https://sdtimes.com/amazon/guest-view-capitalize-amazon-lex-available-general-public/

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



	•	-
NETWORK Gack	3:33 P SAVINGS	M 100%
Saveett	9,5	
1	2	3
4	5	6
7	8	9
· ·	0	×
 Type a r 	nessage	
VIEW CREDI	T OPTIONS	ASK BUDGETBOT
	С	



Mastercard Makes Commerce More Conversational











Bot Platform Ecosystem

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.



Source: https://www.oreilly.com/ideas/infographic-the-bot-platform-ecosystem



DESIGNED BY JON CIFUENTES

Bots Landscape





Connectors/ Shared Services



Bot Discovery



Analytics

Analytics

-

鹵

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





	Messaging								
			*	kik	Allo	Solution		•	9

🕁 RECAST.AL Messenger Bot Landscape

May 2017



Source: https://medium.com/@RecastAl/2017-messenger-bot-landscape-a-public-spreadsheet-gathering-1000-messenger-bots-f017fdb1448a /

The Bot Lifecycle



Chatbots

Bot Maturity Model

Customers want to have simpler means to interact with businesses and

get faster response to a question or complaint.



Source: https://www.capgemini.com/2017/04/how-can-chatbots-meet-expectations-introducing-the-bot-maturity/

Integration

Question Answering (QA)



2017





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

Department of Information Management Tamkang University, Taiwan





Min-Yuh Day

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NTCIR-13 Conference, December 5-8, 2017, Tokyo, Japan



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

NTCIR-13 Conference, December 5-8, 2017, Tokyo, Japan

Tamkang University







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

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NTCIR-9 Workshop, December 6-9, 2011, Tokyo, Japan
Tamkang University







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

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Shih-Jhen Huang

NTCIR-10 Conference, June 18-21, 2013, Tokyo, Japan

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

Tamkang University



2014





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淡江大學 2016 **IMTKU Question Answering System for** World History Exams at NTCIR-12 QA Lab2

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2017





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

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IMTKU System Architecture for NTCIR-13 QALab-3







IMTKU System Description



NTCIR-13 Conference, December 5-8, 2017, Tokyo, Japan

JA & EN Translator

Japanese:



古代メソポタミアと古代エジプトにおける 暦とその発達の背景について, 3 行以内で 説明しなさい。

English (JA & EN Translator by Google Translate): Explain the calendar in ancient Mesopotamia and ancient Egypt and the background of its development within 3 lines.



NER & POS tagger

Stanford CoreNLP

Raw Data:

Wang Anshi, who lived during the Song period, carried out reforms called the New Policies (xin fa).

POS tagger and NER:

Wang/PERSON/NNP Anshi/PERSON/NNP ,/O/, who/O/WP lived/O/VBD during/O/IN the/O/DT Song/O/NN period/O/NN ,/O/, carried/O/VBD out/O/RP reforms/O/NNS called/O/VBD the/O/DT New/O/JJ Policies/O/NNS -LRB-/O/-LRB- xin/O/FW fa/O/FW -RRB-/O/-RRB- ./O/.



Document Retrieval

2





NTCIR-13 Conference, December 5-8, 2017, Tokyo, Japan

Answer Generation





Answer Generation



System Architecture of

Intelligent Dialogue and Question Answering System



Short Text Conversation **(STC)**



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

Source: http://coai.cs.tsinghua.edu.cn/hml/challenge.html

NTCIR Short Text Conversation STC-1, STC-2, STC-3

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

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



Source: http://ntcirstc.noahlab.com.hk/STC2/stc-cn.htm



Source: http://ntcirstc.noahlab.com.hk/STC2/stc-cn.htm

Short Text Conversation (STC-3)

- Emotional Conversation Generation
- Dialogue Quality
- Nugget Detection subtasks using Chinese and English dialogue data

NTCIR-14 Short Text Conversation Task (STC-3)

- Three new subtasks
 - Chinese Emotional Conversation Generation (CECG)
 - Dialogue Quality (DQ)
 (for Chinese and English)
 - Nugget Detection (ND) (for Chinese and English)

NTCIR-14 STC-3 CECG Time Schedule

- CECG
 - Aug 31, 2018 CECG registration due
 - Sep 15, 2018 Training data released
 - Nov 15, 2018 Test data released
 - Nov 25, 2018 Run submissions due
- ALL
 - Dec 20, 2018 Evaluation results and draft overview released
 - Feb 1, 2019 Participant paper submissions due
 - Mar 1, 2019 Acceptance notification
 - Mar 20, 2019 All camera-ready papers due
 - Jun 2019 NTCIR-14 Conference & EVIA 2019 in NII, Tokyo

Given post:

爱狗还会做饭的男人,最帅了!

The man who cooks and loves dogs is very handsome!

Response	Chinese / Translated English	Emotion Class	Coherence and Fluency	Emotion Consistency	Label
Response 1	会做饭的男人是很帅的啊。	喜欢	Yes	Yes	2
	The man who cooks is handsome.	Like			
Response 2	哈哈,我也觉得。	喜欢	Yes	No	1
	Haha, I feel the same way.	Like			
Response 3	这是哪部电影里的?	厌恶	No	Yes	0
	Which movie is this from?	Disgust			
Response 4	哈哈,你也是。	喜欢	No	No	0
	Haha, the same to you.	Like			
Response 5	我爱你会。	厌恶	No	Yes	0
	l love you, will you.	Disgust			
Response 6	这是同主义同的道!	厌恶	No	No	0
	This is the same way of the same doctrine!	Disgust			

Source: http://coai.cs.tsinghua.edu.cn/hml/challenge/evaluation_metric/

NLPCC Emotion Classification Challenge 6 classes (64%)

- 0: Other
- 1: Like
- 2: Sadness
- 3: Disgust
- 4: Anger
- 5: Happiness

Chinese Emotional Conversation Generation (CECG)

Post	Emotion	Response
(Given)	Category (Given)	(to be generated)
爱狗还会做饭的男人,最帅了!	喜欢	会做饭的男人是很帅的啊。
The man who cooks and loves dogs is very handsome!	Like	The man who cooks is handsome.
爸爸,明天是六一啦,带我出去玩吧!	喜欢	好,一定带。
Daddy, tomorrow is June 1th Children's Day. Please take me out to play!	Like	Yes, of course.
被特别在乎的人忽略,会很难过,而装做不在乎,会更难	悲伤	因为在乎,所以在乎。
过。	Sadness	I am concerned with it, because I care
It's sad to be ignored by someone that you really care, and it's harder to pretend that you don't care.		about it.
冰天雪地的哈尔滨!你要冻死我咋地?!?!	喜欢	注意保暖,小心别感冒!
Harbin is in the snow! Are you going to freeze me to death?!?!	Like	Keep warm. Watch out for getting cold!
本来想学一把沧桑,结果令我更忧伤。	悲伤	这是一个悲伤的故事。
I wanted to learn the vicissitudes of life, but I became sadder.	Sadness	It a sad story.
今天一整天都在海边训练。虽然很累,但还是很开心的!	快乐	是的呢,开心!
I have been training at the seaside all day. Though very tired, I still very happy!	Happiness	Yeah, happy!

Source: http://coai.cs.tsinghua.edu.cn/hml/challenge/task_definition/

Chinese Emotional Conversation Generation (CECG) Dataset

- 1,110,000 Weibo post-response pairs
 - [[post,post_label],[response,response_label]], [[post,post_label],[response,response_label]],...].

Fluency judgement on responses with repetitive words

Response	Fluency
悲哀,悲哀,悲哀。	Yes
飘逸,飘逸,飘逸!	Yes
好可爱,好可爱!	Yes
哈哈哈,当然啦	Yes
疯了。疯了。全疯了	Yes
对的对的对的对的对的对的对的对的对的对的对的	No
我骗骗骗骗我骗你信不信不信不信我反正信了	No
中国的教育教育教育教育教育教育教育教育教育教育	No
教育教育教育教育教育教育教育教育教育教育教育	110
矮贱贱贱贱贱贱贱,你爱你,我也不爱你了	No
不关我事不关我事不关我事不关我事不关我事!	No

Source: Huang, Minlie, Zuoxian Ye, and Hao Zhou. "Overview of the NLPCC 2017 Shared Task: Emotion Generation Challenge." In *National CCF Conference on Natural Language Processing and Chinese Computing (NLPCC)*, pp. 926-936. Springer, Cham, 2017.

Sample responses generated by Seq2Seq and ECM (Emotional Chatting Machine)

Post Model		odel	Response(Original)	Response(Translated)	
	Seq2Seq		承诺,就是一个骗子说给一个傻子听的。	A promise is what a cheater says to a fool.	
承诺 计是一个电子说经	ECM	Like	承诺是一个专一的傻子	Promise is a single-minded fool	
一个傻子听的。		Нарру	我就是一个 <mark>开心</mark> 的傻子	I'm just a happy fool	
A promise is what a cheater		Sad	我就是一个 <mark>悲伤</mark> 的傻子	I am a sad fool	
says to a 1001.		Disgust	一个骗子说给一个傻子听	A cheater says to a fool	
		Angry	不管你信不信,反正我信了!	Whatever you believe or not, I trust in it!	
	Seq2Seq		知道真相的我眼泪掉下来。	After knowing the truth, I burst into tears.	
	ECM	Like	太可爱了,太可爱了!	Too lovely, it's too lovely.	
知道真相的我眼泪笑下来 Knowing the truth Llaughed		Нарру	笑得我眼泪都出来了。	I can't help laugh myself to tears.	
myself to tears		Sad	知道真相的我眼泪掉下来。	After knowing the truth, I burst into tears.	
		Disgust	这是真的还是假的?	Is this true?	
		Angry	什么意思?没看懂。	What do you mean? I don't understand.	

Sample responses generated by Seq2Seq and ECM (Emotional Chatting Machine)

Post	М	odel	Response(Original)
	Seq2Seq		承诺,就是一个骗子说给一个傻子听的。
承诺 前县一个喧子道经	ECM	Like	承诺是一个专一的傻子
一个傻子听的。		Нарру	我就是一个 <mark>开心</mark> 的傻子
A promise is what a cheater		Sad	我就是一个 <mark>悲伤</mark> 的傻子
says to a 1001.		Disgust	一个骗子说给一个傻子听
		Angry	不管你信不信,反正我信了!

Emotional Short Text Conversation (ESTC) Dataset



Conversations

with/without considering emotion Emotional Chatting Machine (ECM)

- User: Worst day ever. I arrived late because of the traffic.
 - 1. Basic Seq2Seq: You were late.
 - 2. ECM (Like): I am always here to support you.
 - 3. ECM (Happy): Keep smiling! Things will get better.
 - 4. ECM (Sad): It's depressing.
 - 5. ECM (Disgust): Sometimes life just sucks.
 - 6. ECM (Angry): The traffic is too bad!

Overview of Emotional Chatting Machine (ECM)



Overview of Emotional Chatting Machine (ECM)



Overview of Emotional Chatting Machine (ECM)



Data flow of the decoder with an internal memory



Data flow of the decoder with an external memory


Sample responses generated by Seq2Seq and ECM (Emotional Chatting Machine)

Post	Model		Response(Original)
知道真相的我眼泪笑下来 Knowing the truth, I laughed myself to tears	Seq2Seq		知道真相的我眼泪掉下来。
	ECM	Like	太可爱了,太可爱了!
		Нарру	笑得我眼泪都出来了。
		Sad	知道真相的我 <mark>眼泪</mark> 掉下来。
		Disgust	这是真的还是假的?
		Angry	什么意思?没看懂。

Source: Zhou, Hao, Minlie Huang, Tianyang Zhang, Xiaoyan Zhu, and Bing Liu. "Emotional chatting machine: emotional conversation generation with internal and external memory." *arXiv preprint arXiv:1704.01074* (2017).

Chinese Emotional Conversation Generation (CECG) Evaluation Metric

- Emotion Consistency
 - whether the emotion class of a generated response is the same as the pre-specified class.
- Coherence
 - whether the response is appropriate in terms of both logically coherent and topic relevant content.
- Fluency
 - whether the response is fluent in grammar and acceptable as a natural language response.

Source: <u>http://coai.cs.tsinghua.edu.cn/hml/challenge/evaluation_metric/</u>

Chinese Emotional Conversation Generation (CECG) Evaluation Metric

IF Coherence and Fluency

IF Emotion Consistency

LABEL 2

ELSE

LABEL 1

ELSE

LABEL O

Sequence-to-sequence Learning with Attention for Generation-based STC



Source: Yu, Kai, Zijian Zhao, Xueyang Wu, Hongtao Lin, and Xuan Liu. "Rich Short Text Conversation Using Semantic Key Controlled Sequence Generation." *IEEE/ACM Transactions on Audio, Speech, and Language Processing* (2018).

General Framework of Controllable Short-Text-Conversation Generation with External Memory



Source: Yu, Kai, Zijian Zhao, Xueyang Wu, Hongtao Lin, and Xuan Liu. "Rich Short Text Conversation Using Semantic Key Controlled Sequence Generation." *IEEE/ACM Transactions on Audio, Speech, and Language Processing* (2018).

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Controllable Short Text Conversation Examples

Deat	t 李娜太牛了!中国第一个世界网球大满贯冠军! Li Na is great! China's first World Tennis Grand Slam champion!			
Post				
NIDM	李娜是世界冠军!			
INKIM	Li Na is the world champion!			
M.DNN	李娜加油,加油!			
WITKININ	Come on, Li Na. Come on!			
	Key-Word	Response		
	世界	李娜是世界上最棒的!		
ESED	world	Li Na is the best in the world!		
ESED -	中国	李娜是中国的骄傲!		
	China	Li Na is the pride of China!		
	网球 中国网球公开赛,加油!			
	tennis	China Tennis Open, come on!		
Doct	感人器官捐献广告,请感谢那些给你第二次生命的人.			
rost	A touching organ donation advertisement, please thank those who gave you a second life.			
NPM	给我第二次生命	给我第二次生命的人。		
INKIVI	A man who gives me a second life.			
M. DNN	NNI 感谢每一个人!			
WITKINN	Thanks for everyone!			
	Key-Word	Response		
ESED	生命	感谢生命给予的一切!		
	life	Thanks for everything given by life!		
	器官	感谢那些器官捐赠者。		
	organ	Thanks for those organ donors.		
	广告	很感人的广告!		
	advertisement	A very touching advertisement!		

Source: Yu, Kai, Zijian Zhao, Xueyang Wu, Hongtao Lin, and Xuan Liu. "Rich Short Text Conversation Using Semantic Key Controlled Sequence Generation." *IEEE/ACM Transactions on Audio, Speech, and Language Processing* (2018).

Comments Generated Using Different Semantic key Mapping Methods

Doct	美好的社会应该由善良的人组成。			
POSt	A good society should be composed of people of kindness.			
Mapping-Method	Key-Word Response			
Identity Mapper	善良	善良是一种信仰。		
	kindness	Kindness is a belief.		
Cunonum	友善	善良是一种美德。		
Synonym	friendliness	Kindness is a virtue.		
Antonym	丑恶	没有丑恶的社会,更可怕。		
	evil	A society without evils is more terrifying.		
Embedding	乐观	乐观是一种生活态度。		
	optimism	Optimism is an attitude of life.		
Common-Reply	真	真的吗?		
	really	Really?		
	对	对的,对的。		
	right	Right, right.		
Random	人	每个人都有善良的一面。		
	person	Every person has a side of kindness.		
	中国	中国的贫富差距太大了。		
	China	The gap between the wealthy and the poor in China is too big.		

Source: Yu, Kai, Zijian Zhao, Xueyang Wu, Hongtao Lin, and Xuan Liu. "Rich Short Text Conversation Using Semantic Key Controlled Sequence Generation." *IEEE/ACM Transactions on Audio, Speech, and Language Processing* (2018).

Generated Responses of Knowledge Introduction by External Memory

Dest	你最喜欢那个星座?		
POSt	What is your favorite constellation?		
	Key-Word Response		
	摩羯座	我最喜欢摩羯座。	
Semantic-Key	Capricorn	I love Capricorn.	
Semantie-Rey	射手座	我是射手座,我喜欢。	
	Sagittarius	I am a Sagittarius and I like it.	
Dest	今天周杰伦的电影,太好看了。		
Post	Jay Chou's movie is so nice today.		
Semantic-Key	Key-Word	Response	
	歌	杰伦的歌也很好听。	
	song	Jay Chou's songs are nice too.	
Dost	梵高的画,很漂亮。		
POSt	Van Gogh's paintings are very beautiful.		
Semantic-Key	Key-Word	Response	
	向日葵	梵高笔下的向日葵。	
	sunflower	The Sunflower by Van Gogh.	
	荷兰	梵高的画,很漂亮。	
	Holland	Van Gogh's paintings are very beautiful.	

Source: Yu, Kai, Zijian Zhao, Xueyang Wu, Hongtao Lin, and Xuan Liu. "Rich Short Text Conversation Using Semantic Key Controlled Sequence Generation." *IEEE/ACM Transactions on Audio, Speech, and Language Processing* (2018).

How to Build Chatbots



Source: Igor Bobriakov (2018), https://activewizards.com/blog/a-comparative-analysis-of-chatbots-apis/

Chatbot Frameworks and AI Services

- Bot Frameworks
 - Botkit
 - Microsoft Bot Framework
 - Rasa NLU
- Al Services
 - –Wit.ai
 - -api.ai
 - LUIS.ai
 - –IBM Watson

Source: Igor Bobriakov (2018), https://activewizards.com/blog/a-comparative-analysis-of-chatbots-apis/

Chatbot Frameworks

Comparison Table of Most Prominent Bot Frameworks

	🛞 Botkit	Microsoft Bot Framework	
Built-in integration with messaging platforms	\odot	\otimes	8
NLP support	(X) but possible to integrate with middlewares	(X) but have close bonds with LUIS.ai	\otimes
Out-of-box bots ready to be deployed	\odot	\otimes	\otimes
Programming Language	JavaScript (Node)	JavaScript (Node), C#	Python
			Created by ActiveWizards

Comparison of Most Prominent Al Services

	wit.ai	api.ai	LUIS.ai	IBM Watson	
Free of charge	\odot	Sut has paid enterprise version	it is in beta and has transaction limits	30 days trial then priced for enterprise use	
Text and Speech processing	\odot	\bigcirc	⊘ with use of Cortana	\odot	
Machine Learning Modeling	\odot	${ \bigcirc }$	\odot	\odot	
Support for Intents, Entities, Actions	Intents used as trait entities, actions are combined operations	Solution Intents is the main prediction mechanism. Domains of entities, intents and actions	\bigcirc	\odot	
Pre-build entities for easy parsing of numbers, temperature, date, etc.	\odot	${ \bigcirc }$	\odot	\odot	
Integration to messaging platforms	(X) web service API	⊘ also has facility for deploying to heroku. Paid environment	⊘ integrated to Azure	⊘ possible via API	
Support of SDKs	includes SDKs for Python, Node.js, Rust, C, Ruby, iOS, Android, Windows Phone	⊘ C#, Xamarin, Python, Node.js, iOS, Android, Windows Phone	⊘ enables building with Web Service API, Microsoft Bot Framework integration	Proprietary language "AlchemyLanguage"	
Created by ActiveWizards					

Summary

- Al + FinTech 把科技力量注入金融業
- 金融業 AI 對話式商務 (conversation commerce)應用
- · 智能客服, 未來主流電子商務服務

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聊天機器人—AI 對話式商務應用 Chatbot: AI Applications in Conversational Commerce

O & A

Time: 2018/6/1 (Fri) (15:30-16:15) Place: 台北市民生東路四段133號 (民生科服大樓101會議室) Host: 資策會 數位服務創新研究所



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