個人學術分享

研究分享與計畫撰寫

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專案助理教授

個人簡介

- National Cheng Kung University (2017/1-PhD)
  - Department of Engineering Science
  - Group of Computer Science and its Applications
- Research Fields
  - Natural Language Processing
    - Semantic Analysis (2009-Now)
    - Recommendation systems (2015-Now)
    - Chatbot (2019-Now)
  - Data Mining
    - Social Network Analysis (2013-2015)
    - Sentiment Analysis via Deep learning – CNN (2016-Now)
    - Air Quality Prediction (2018-Now)
- More on jiaweichang.github.io/biography

201808-NOW於臺中科大服務期間之發表

論文名稱	投稿期刊	期刊等級	狀態
Music Recommender using Deep Embedding-based Features and Behavior-based Reinforcement Learning	Multimedia Tools and Applications	SCIE, **Impact Factor: 1.541 (Q2)**	Under Review
A Study of Using Syntactic Cues in Short-text Similarity Measure	Journal of Internet Technology	SCIE, **Impact Factor: 1.301 (Q3)**	In Press
Design and Development of the Sentence-based Collocation Recommender with Error Detection for Academic Writing	Journal of Internet Technology	SCIE, **Impact Factor: 1.301 (Q3)**	Published
Email security level classification of imbalanced data using artificial neural network: The real case in a world-leading enterprise	Engineering Applications of Artificial Intelligence	SCIE, **Impact Factor: 2.819 (Q1)**	Published
The Effects of the Alternate Writing and Sketching Brainstorming Method on the Creativity of Industrial Design	Thinking Skills and Creativity	SSCI, **Impact Factor: 1.333 (Q3)**	Published

EMAIL SECURITY LEVEL CLASSIFICATION

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Outline

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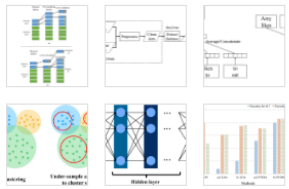
Figures (11)



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Tables (23)

ELSEVIER

Engineering Applications of Artificial Intelligence
Volume 75, October 2018, Pages 11-21

Email security level classification of imbalanced data using artificial neural network: The real case in a world-leading enterprise

Jen-Wei Huang [a], Chia-Wen Chiang [b], Jia-Wei Chang [c]

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https://doi.org/10.1016/j.engappai.2018.07.010

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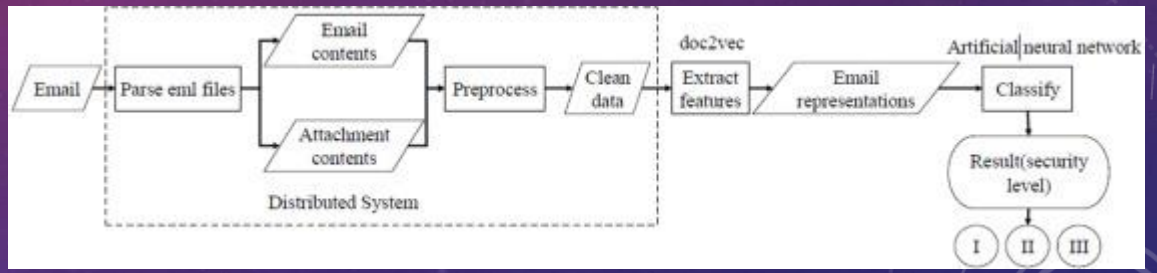
Highlights

- An effective and efficient model to classify the Email Security Level.
- Address the data imbalance problem which is common in a real-world application.
- The experimental dataset that collected from a world-leading enterprise.
- The experiments compared the well-known approaches of the semantic representation.
- The proposed system is now utilized in a world-leading enterprise.

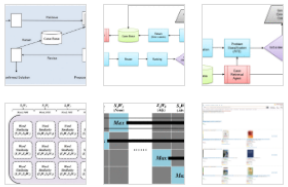


SEMANTIC-BASED RECOMMENDER FOR ONLINE BOOKSTORE

Outline

Show full outline

Figures (11)



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Tables (10)

ELSEVIER

Computers in Industry
Volume 78, May 2016, Pages 29-42

Integrating a semantic-based retrieval agent into case-based reasoning systems: A case study of an online bookstore

Jia Wei Chang [a], Ming Che Lee [b], Tzone I Wang [a]

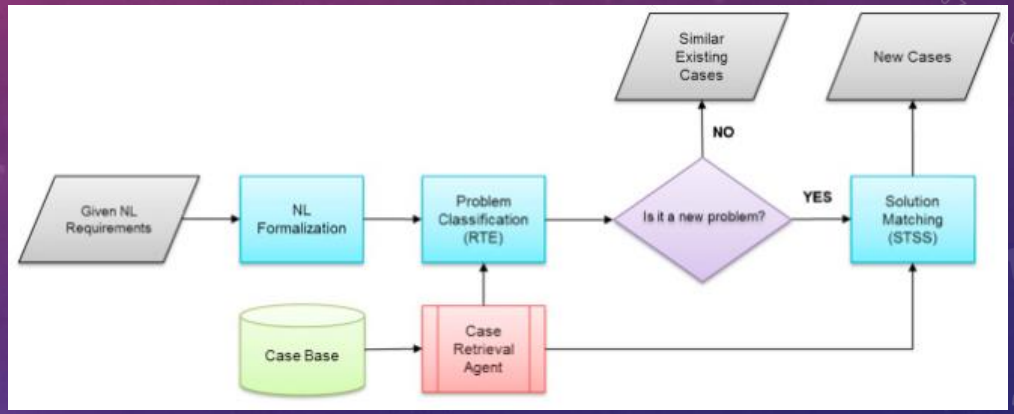
Show more

https://doi.org/10.1016/j.compind.2015.10.007

Get rights and content

Highlights

- This paper integrates techniques of natural language processing into a case retrieval agent.
- The use of semantic and syntactic information defines the meanings more accurately.
- Integrating semantic-based retrieval agent into the CBR system improves performance at initial state.
- The proposed CBR system with collaborative filtering constantly improves recommendation quality.
- The proposed CBR model outperforms the compared systems in the case study of an online bookstore.



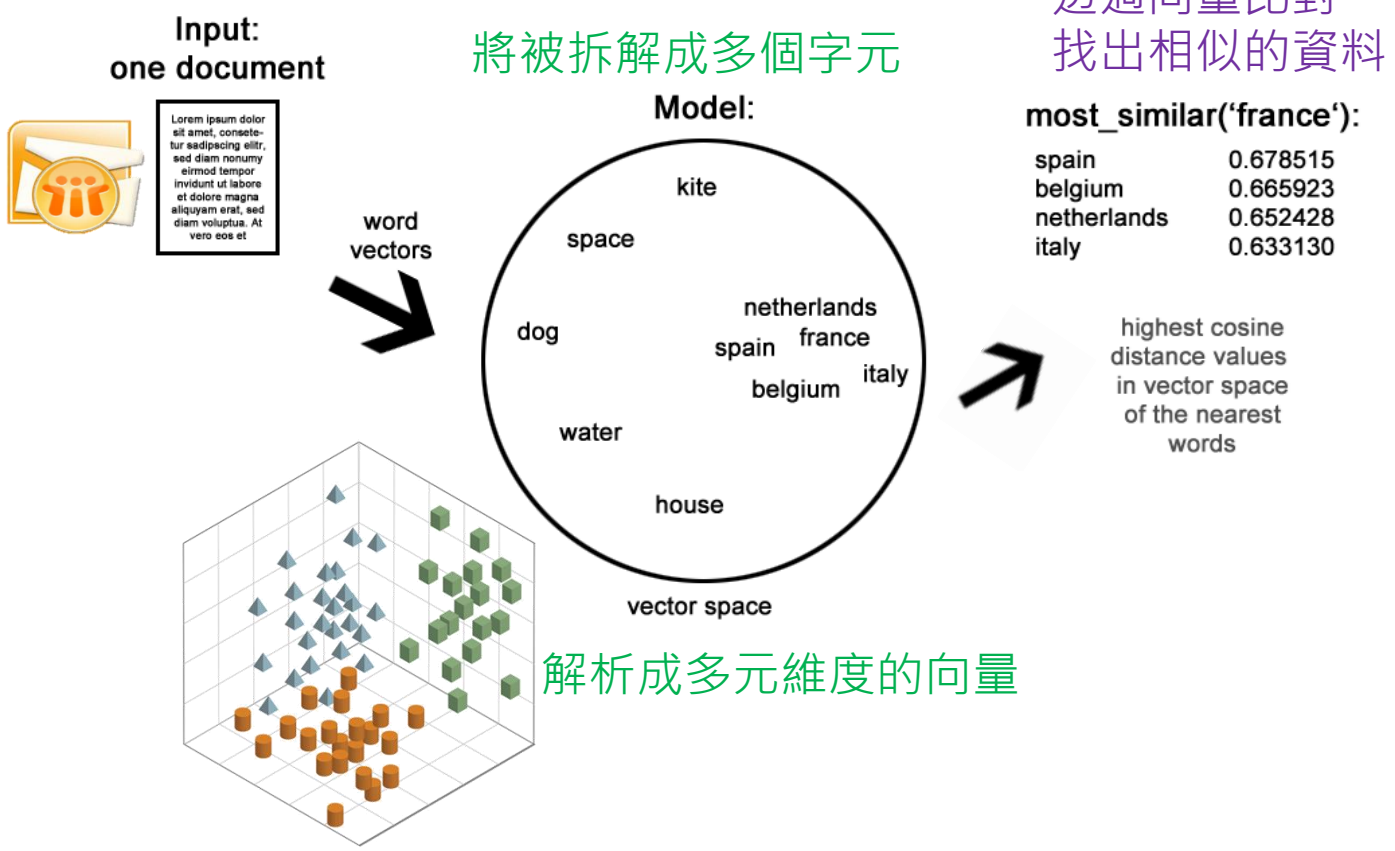
自然語言理解

NATURAL LANGUAGE UNDERSTANDING

文字檔案

word2vec

透過向量比對
找出相似的資料



將被拆解成多個字元

解析成多元維度的向量

VECTOR REPRESENTATION

	w_1	w_2	w_3	..	..	..	w_{n-1}	w_n	label
D_1	0.11	0.23	0	..	..	..	0.57	0	0
D_2	0	0	0	..	..	..	0.29	0.7	1
D_3	0	0.81	0.44	..	..	..	0	0	0
D_4	0	0.37	0	..	..	..	0	0.16	1
..	..	..	..	..	..	..	..	..	..
D_k	..	..	..	..	..	..	..	..	1

潛藏語意分析

- 奇異值分解
  - Singular Value Decomposition (SVD)

Index Words	Titles								
	T1	T2	T3	T4	T5	T6	T7	T8	T9
book			1	1					
dads						1			1
dummies		1						1	
estate							1		1
guide	1					1			
investing	1	1	1	1	1	1	1	1	1
market	1		1						
real							1		1
rich						2			1
stock	1		1					1	
value				1	1				

=

book	0.15	-0.27	0.04
dads	0.24	0.38	-0.09
dummies	0.13	-0.17	0.07
estate	0.18	0.19	0.45
guide	0.22	0.09	-0.46
investing	0.74	-0.21	0.21
market	0.18	-0.30	-0.28
real	0.18	0.19	0.45
rich	0.36	0.59	-0.34
stock	0.25	-0.42	-0.28
value	0.12	-0.14	0.23

*

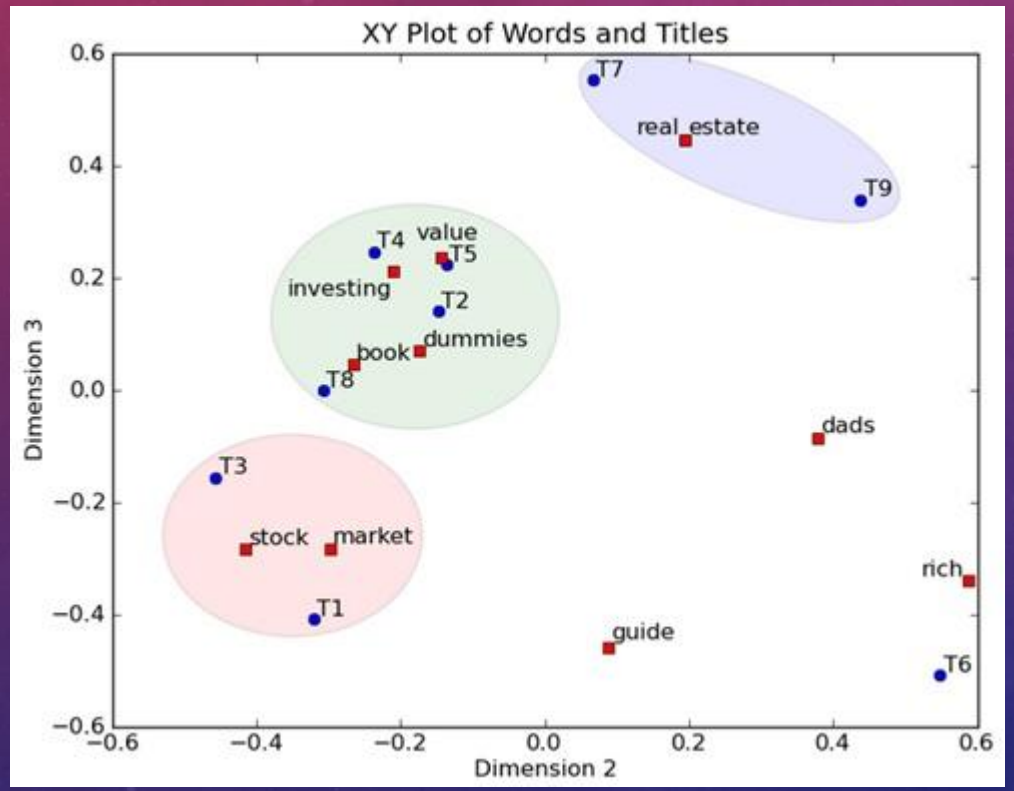
3.91	0	0
0	2.61	0
0	0	2.00

*

T1	T2	T3	T4	T5	T6	T7	T8	T9
0.35	0.22	0.34	0.26	0.22	0.49	0.28	0.29	0.44
-0.32	-0.15	-0.46	-0.24	-0.14	0.55	0.07	-0.31	0.44
-0.41	0.14	-0.16	0.25	0.22	-0.51	0.55	0.00	0.34

潛藏語意分析

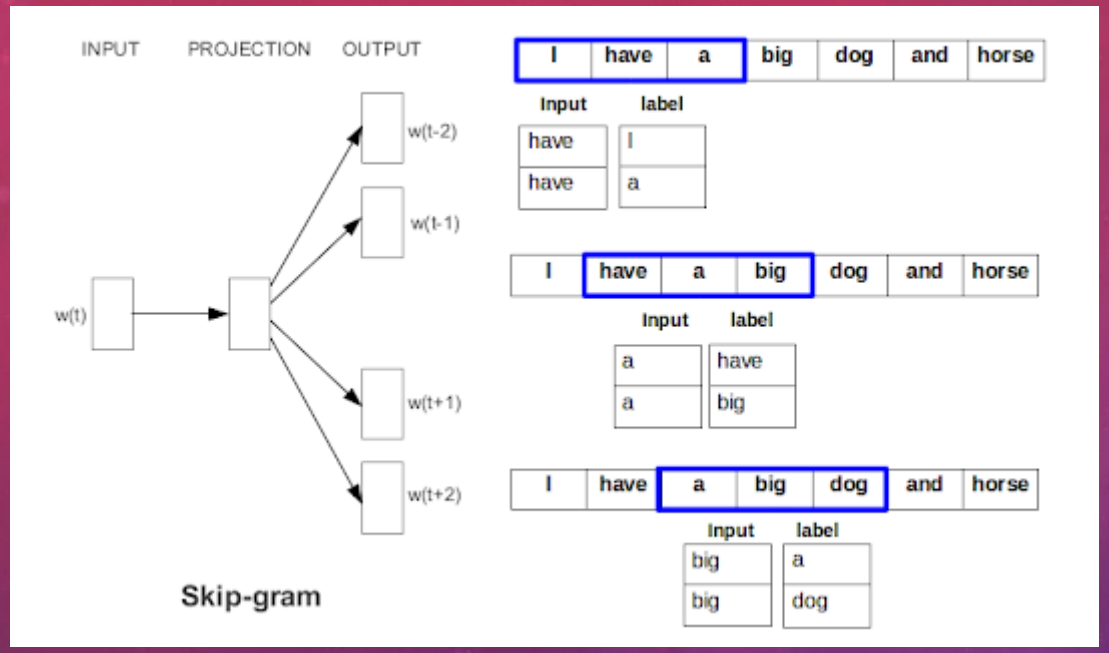
- 奇異值分解
  - Singular Value Decomposition (SVD)



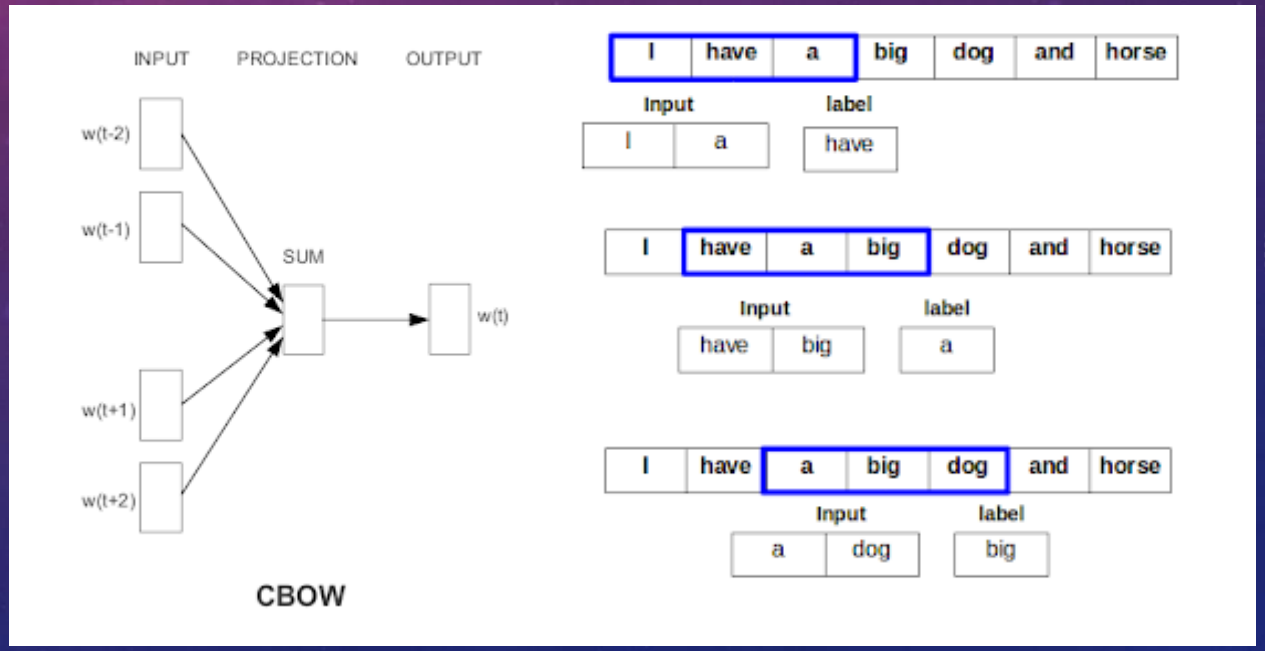
Index Words	Titles								
	T1	T2	T3	T4	T5	T6	T7	T8	T9
book			1	1					
dads						1			1
dummies		1						1	
estate							1		1
guide	1					1			
investing	1	1	1	1	1	1	1	1	1
market	1		1						
real							1		1
rich						2			1
stock	1		1					1	
value				1	1				

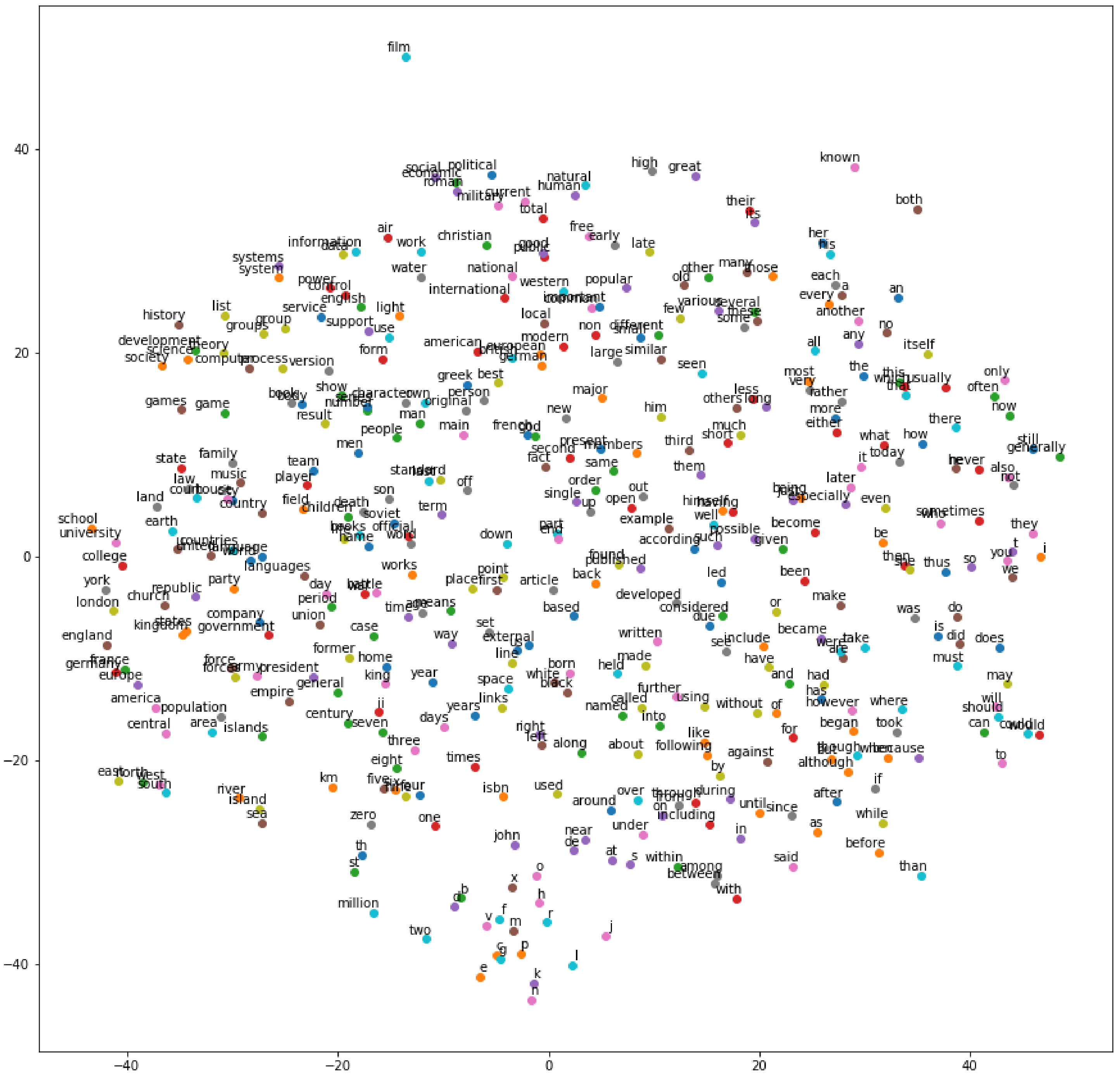
WORD2VEC

DEEP LEARNING FOR WORD EMBEDDING



http://zongsoftwarenote.blogspot.com/2017/04/word2vec-model-introduction-skip-gram.html





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科技部計畫-新進人員計畫分享

科技部新進人員研究計畫

- 計畫名稱：人工智慧音樂家─運用深度嵌入方法與生成對抗網路於和諧性為導向的詞曲生成器之設計
- 學門：工程處-自然語言與語音處理
- 執行期間：108年8月1日到111年7月31日，三年期。
- 申請金額：新臺幣 3,174,080 元
- 核定金額：新臺幣 2,727,000 元

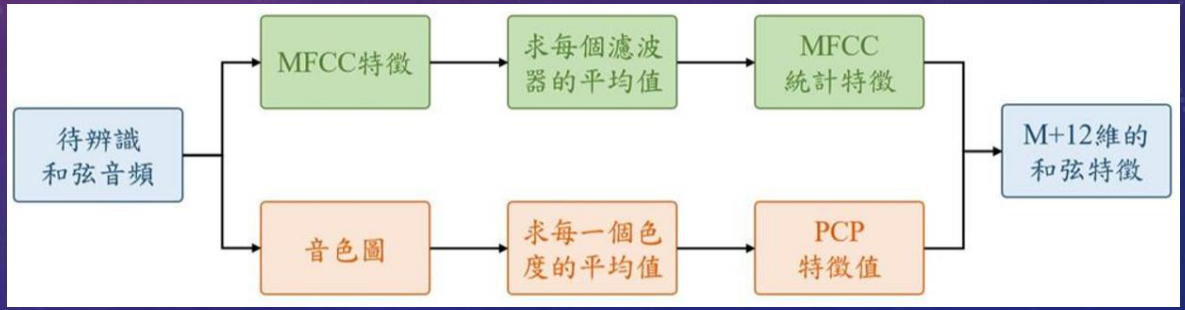
摘要

- 隨著深度學習的崛起，對抗式生成網路的相關研究近期獲得大量的關注。目前自動生成的詞曲尚無法與人類作詞和作曲人相媲美，很難產生出有如人類創造一般具有創意性的結果。如果機器能夠生成音樂並具有創意和美感的音樂，這將代表「人工智慧」達成了人類高階智慧行為的「創造」。作詞作曲都是表達的媒介，主要傳遞情感與思想。然而詞曲對於對機器來說僅是符號，難以理解其中的情感，因此生成的歌詞或歌曲難以跳脫既有框架，導致生成結果偏向模仿而缺乏創意。因此，目前的詞曲生成模型的主要瓶頸在於音樂旋律的上下文和諧度不足、歌詞的上下文涵義與情感的不一致性以及創意性的缺乏等。
- 本計畫以流行音樂的詞曲作為生成目標，第一年以流行音樂之要素設計各種音樂特徵的深度表徵學習方法，並且預期運用各種音樂特徵的深度表徵作為生成模型的有效輸入。第二年與第三年之主要目標則為整合變分自動編碼器與生成對抗式網路來設計考慮更為全面的詞曲生成模型。本計畫所設計之深度生成模型框架旨在於優化生成之音樂的和諧性以及生成之歌詞的上下文一致性，並允許使用者可以調整生成結果的創意度。預期本計畫之研究成果將有助於人工智慧音樂家實現人類的高階智慧能力─創造力。

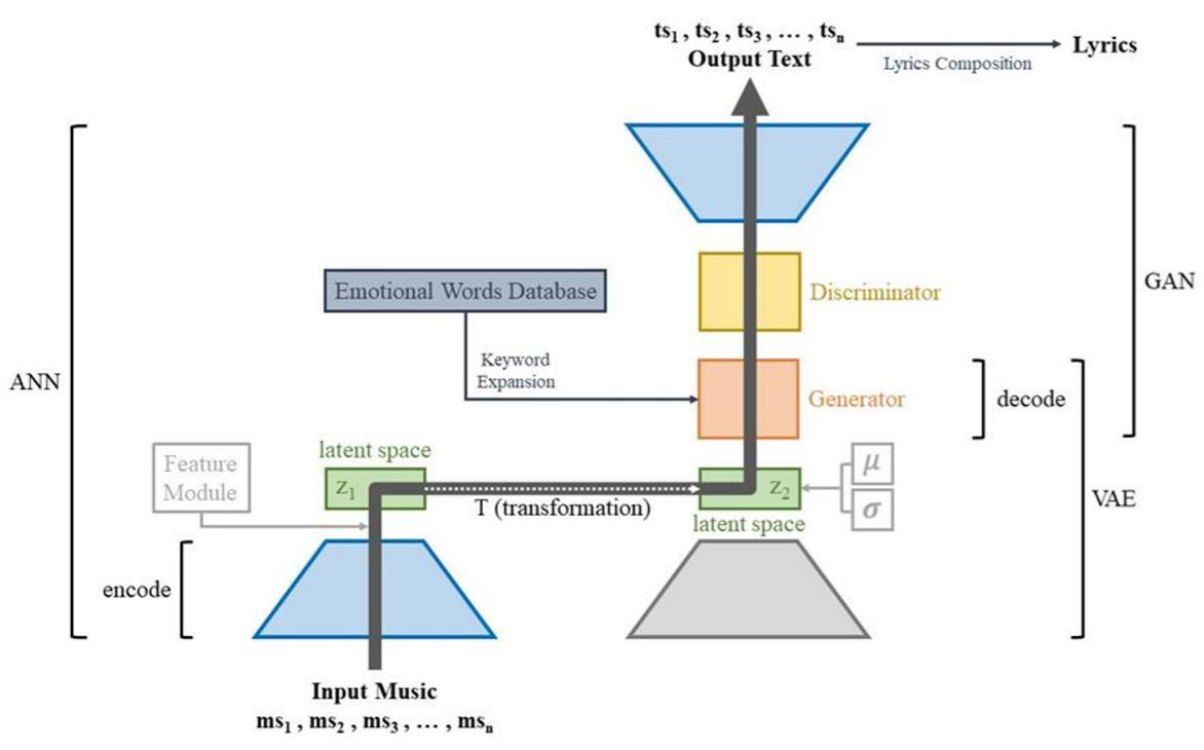
第一年 特徵萃取

音色特徵	定義	公式
頻譜滑動率 （Spectral Rolloff）	用來描述頻譜圖形狀。	$\sum_{m=1}^{Rn} M_n[m] = TH \times \sum_{m=1}^{N} \mathrm{M_n[m]}$
過零率 （Zero-Crossing Rate）	計算經過振幅為零的水平線的次數，可用來表示時間域上的頻率程度。	$Z_t = \frac{1}{2}\sum_{n=1}^{N} \lvert sign(x[n]) - sign(x[n-1]) \rvert$
頻譜質心 （Spectral Centroid）	頻譜能量的集中點，主要用來表示聲音訊號組成頻率的平均值，可用來表示聲音的明亮程度，此值越小，說明越多的能量集中在低頻範圍內。	$C_n = \frac{\sum_{m=1}^{\frac{N}{2}} M_n[m] \times m}{\sum_{m=1}^{\frac{N}{2}} M_n[m]}$
梅爾頻率倒譜係數 （Mel-frequency cepstral coefficients，MFCC）	用一組模擬人類聽覺系統之梅爾濾波器來過濾每一臨界頻帶之聲音訊號，並對每一頻帶之對數能量頻譜值做離散餘弦轉換（discrete cosine transform，DCT），即可求得每一音框梅爾頻率倒譜係數。	$MFCC_m = \sqrt{\frac{2}{N}} \sum_{k=1}^{N} M_m(k) \cos\left(\frac{\pi m}{M}(k-0.5)\right)$ $1 \le m \le M$

調	小調	大調
C	天真無邪、率真樂天	相思、苦戀、尋覓、渴求
C#/Db	燦爛、浪漫	傷心失意、壓抑、啜泣
D	排除萬難、凱旋而歸	消極、迷思、嚴肅、憂傷
D#/Eb	堅忍、熱忱、誠懇、真摯	恐懼、猶豫、焦慮、憂鬱
E	爭執不斷、吵吵鬧鬧	溫婉柔弱
F	狂躁、瀕臨爆發邊緣	哭號
F#/Gb	旗開得勝、寬心恬靜	矛盾、不滿
G	莊嚴華麗	咬牙切齒、掙扎不安
G#/Ab	難以忘懷、死亡、終結	怨恨、哀痛、缺氧、窒息
A	積極樂觀、愛的宣告	溫文爾雅、欣慰
A#/Bb	無愧於心、熱愛和平	陰森恐怖、嘲諷、唾棄
B	失控、憤恨、嚴苛、應戰	沉著、鎮靜、從容不迫

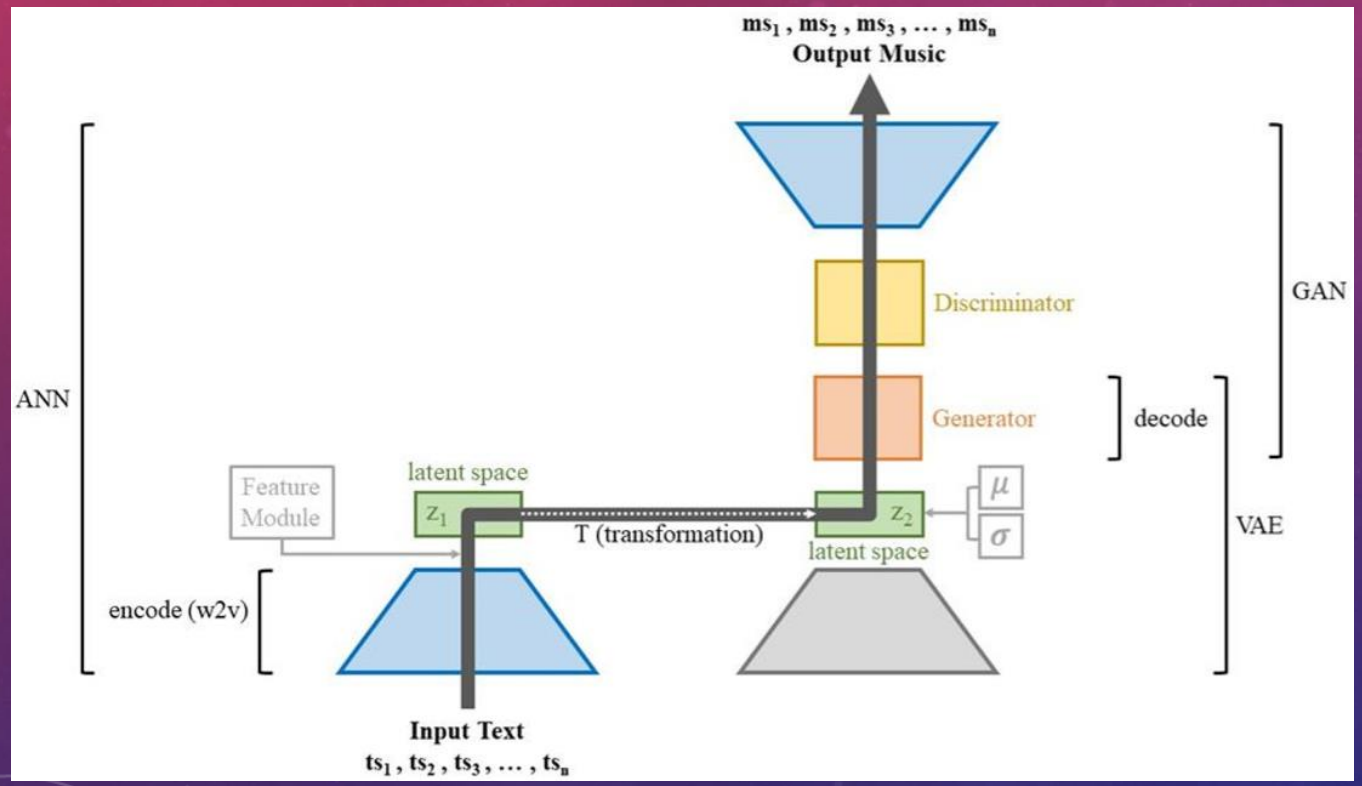


第二年 自動作詞



(1) 如何從歌曲音頻中抓取歌曲的意境或情緒？
(2) 生成的歌詞是否達到一個基本句子的結構？
(3) 生成的歌詞是否有達到上下文語義一致性？
(4) 生成的歌詞是否能對上歌曲的拍點或時間點？

第三年 自動作曲



(1) 如何從歌詞中抓取歌詞的意境或情緒？
(2) 生成的旋律是否考慮到音樂和諧性的問題？
(3) 生成的旋律是否具有創新性？
(4) 生成的旋律是否考慮到歌曲結構的問題？

OTHER APPLICATIONS

AIR QUALITY PREDICTION

Journals & Magazines > IEEE Access > Volume: 6

Adaptive Deep Learning-Based Air Quality Prediction Model Using the Most Relevant Spatial-Temporal Relations

3 Author(s) Ping-Wei Soh ; Jia-Wei Chang ; Jen-Wei Huang View All Authors

556 Full Text Views

Open Access Comment(s)

Abstract

Document Sections

I. Introduction

II. Related Works

III. Problem Definition

IV. Prediction Model Framework

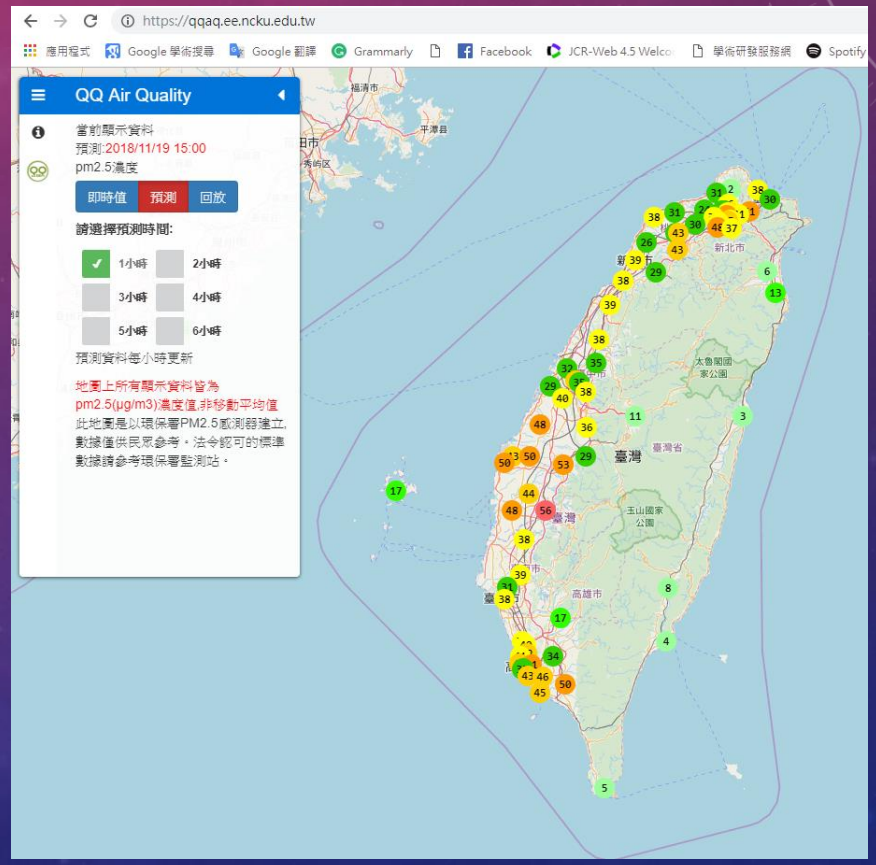
V. Experiments

Show Full Outline

Authors

Abstract:
Air pollution has become an extremely serious problem, with particulate matter having a significantly greater impact on human health than other contaminants. The small diameter of fine particulate matter (PM2.5) allows it to penetrate deep into the alveoli as far as the bronchioles, interfering with a gas exchange within the lungs. Long-term exposure to particulate matter has been shown to cause the cardiovascular disease, respiratory disease, and increase the risk of lung cancers. Therefore, forecasting air quality has also become important to help guide individual actions. This paper aims to forecast air quality for up to 48 h using a combination of multiple neural networks, including an artificial neural network, a convolutional neural network, and a long-short-term memory to extract spatial-temporal relations. The proposed predictive model considers various meteorology data from the previous few hours as well as information related to the elevation space to extract terrain impact on air quality. The model includes trends from multiple locations, extracted from correlations between adjacent locations, and among similar locations in the temporal domain. Experiments employing Taiwan and Beijing data sets show that the proposed model achieves excellent performance and outperforms current state-of-the-art methods.

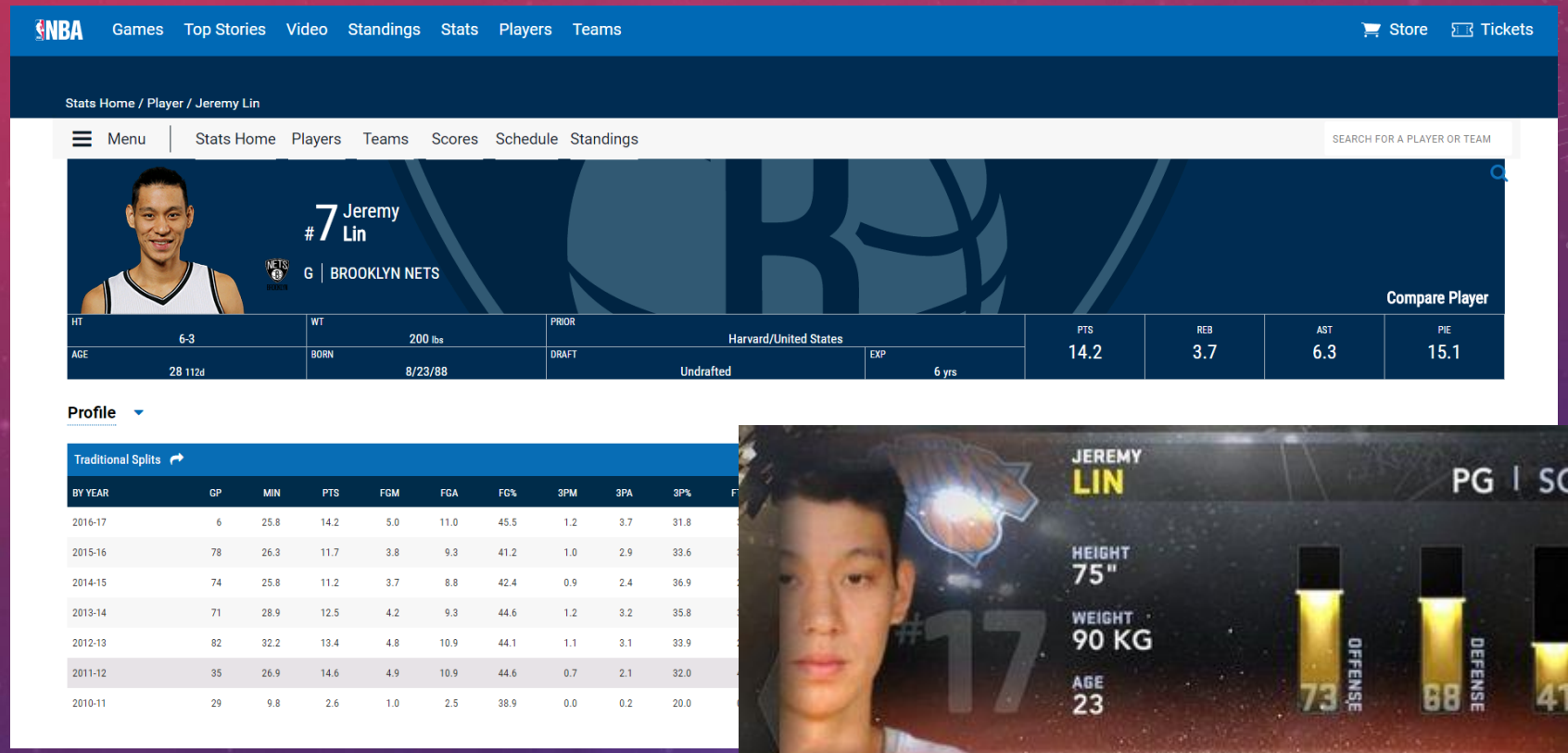
Published in: IEEE Access (Volume: 6)



以NBA的應用為例

- DevDays Asia 2016
- 入圍前五
  - 24小時黑客松
  - 3人臨時組團
  - 臨時命題
  - 純好玩

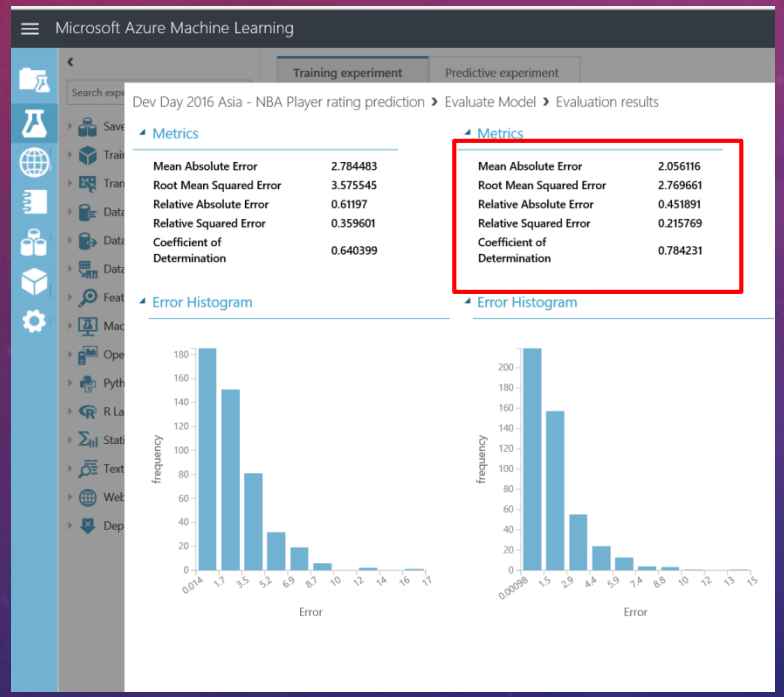
NBA公開資料 & GAME NBA 2K 能力值

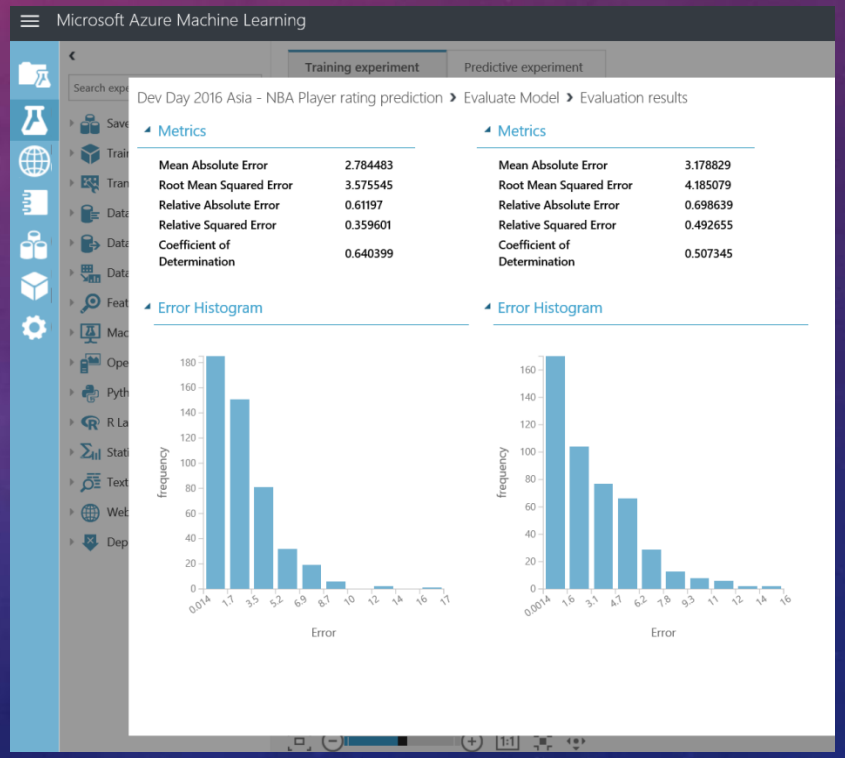


- 資料來源
  1. 2K Games
  2. NBA

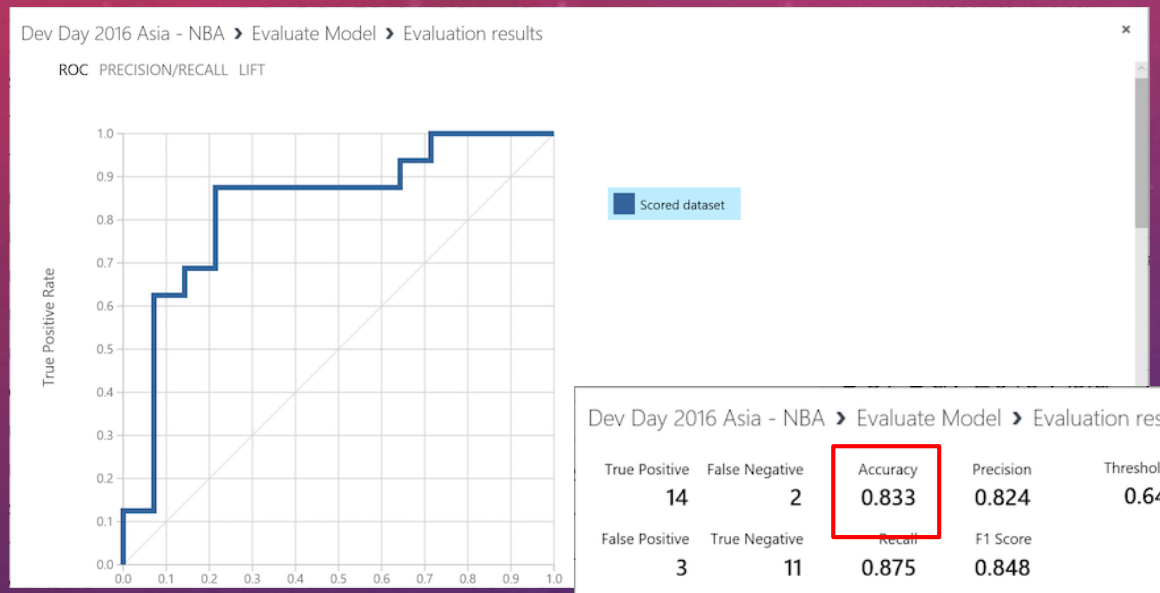
以NBA的應用為例

- NBA 2K17能力預測





NBA季後賽預測



Dev Day 2016 Asia - NBA › Evaluate Model › Evaluation results

True Positive	False Negative	Accuracy	Precision	Threshold	AUC
14	2	0.833	0.824	0.64	0.830

False Positive	True Negative	Recall	F1 Score
3	11	0.875	0.848

Positive Label	Negative Label
1	0

Score Bin	Positive Examples	Negative Examples	Fraction Above Threshold	Accuracy	F1 Score	Precision	Recall	Negative Precision	Negative Recall	Cumulative AUC
(0.900,1.000]	1	0	0.033	0.500	0.118	1.000	0.063	0.483	1.000	0.000
(0.800,0.900]	6	1	0.267	0.667	0.583	0.875	0.438	0.591	0.929	0.009
(0.700,0.800]	3	1	0.400	0.733	0.714	0.833	0.625	0.667	0.857	0.054
(0.600,0.700]	4	1	0.567	0.833	0.848	0.824	0.875	0.846	0.786	0.103
(0.500,0.600]	0	4	0.700	0.700	0.757	0.667	0.875	0.778	0.500	0.353
(0.400,0.500]	0	2	0.767	0.633	0.718	0.609	0.875	0.714	0.357	0.478
(0.300,0.400]	2	2	0.900	0.633	0.744	0.593	1.000	1.000	0.214	0.616
(0.200,0.300]	0	1	0.933	0.600	0.727	0.571	1.000	1.000	0.143	0.688
(0.100,0.200]	0	1	0.967	0.567	0.711	0.552	1.000	1.000	0.071	0.759

中文OCR辨識為例

- Lee, M. C., Chiu S. Y., & Chang, J. W. (2017) A Deep Convolutional Neural Network based Chinese Menu Recognition App. Information Processing Letters, 128, 14-20. https://doi.org/10.1016/j.ipl.2017.07.010 (SCI, COMPUTER SCIENCE, INFORMATION SYSTEMS)

CNN應用於情緒感知辨識的照護機器人

link

- Lee, M. C., Yeh, S. C., Chiu, S. Y. & Chang, J. W. (2017, June). A Deep Convolutional Neural Network Based Virtual Elderly Companion Agent. ACM Multimedia Systems 2017 (MMSYS2017), Taipei, Taiwan. (Accept Rate: 28%) http://dl.acm.org/citation.cfm?id=3083220

資料驅動創新應用

- 文字、聲音、影像、時序性
  - 自然語言處理
  - 語音辨識
  - 影像辨識
  - 物聯網應用
- 數值與非數值
  - 連續性
  - 離散性、類別

OPEN DATASETS

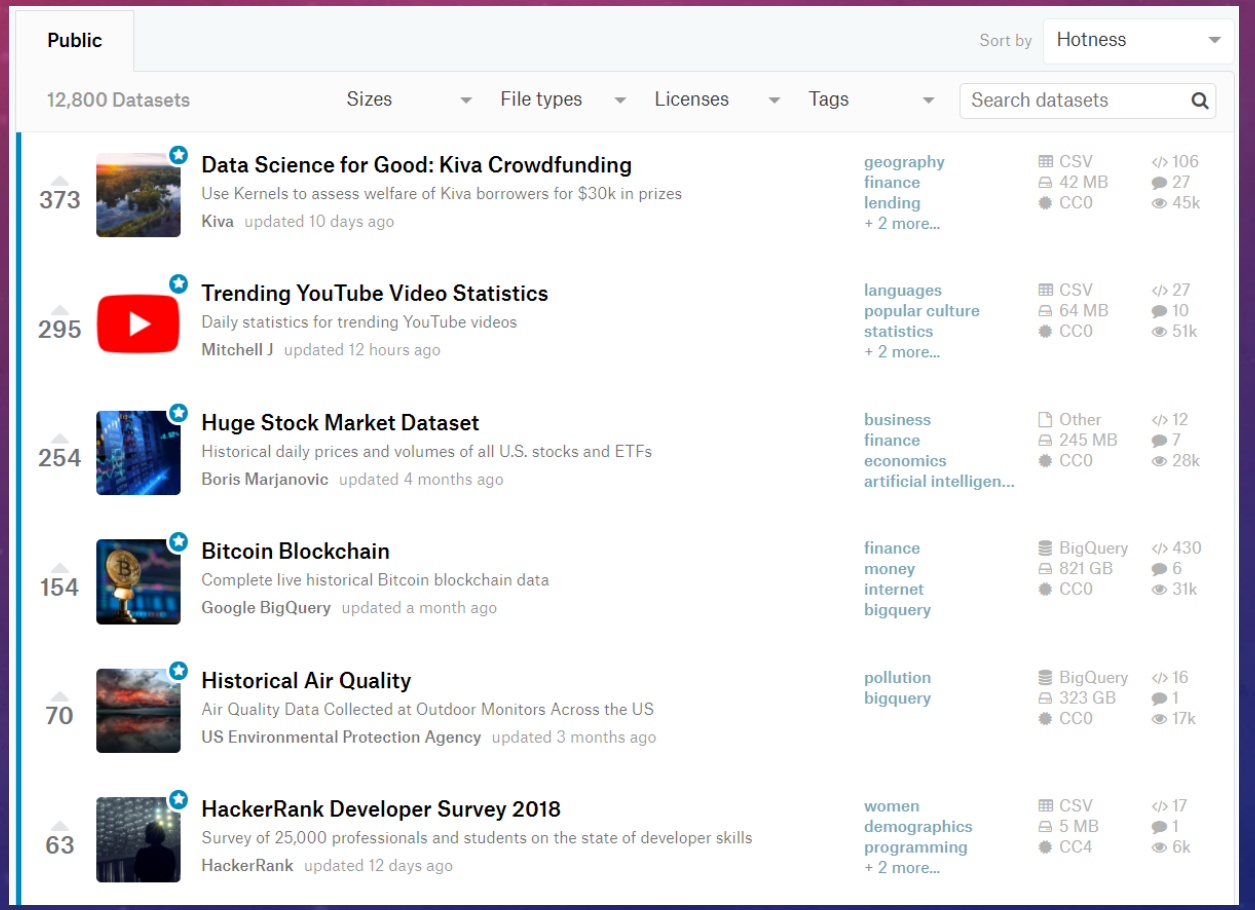
UC IRVINE MACHINE LEARNING REPOSITORY

- http://archive.ics.uci.edu/ml/datasets.html

Name	Data Types	Default Task	Attribute Types	# Instances	# Attributes	Year
Abalone	Multivariate	Classification	Categorical, Integer, Real	4177	8	1995
Adult	Multivariate	Classification	Categorical, Integer	48842	14	1996
Annealing	Multivariate	Classification	Categorical, Integer, Real	798	38	
Anonymous Microsoft Web Data		Recommender-Systems	Categorical	37711	294	1998
Arrhythmia	Multivariate	Classification	Categorical, Integer, Real	452	279	1998
Artificial Characters	Multivariate	Classification	Categorical, Integer, Real	6000	7	1992
Audiology (Original)	Multivariate	Classification	Categorical	226		1987
Audiology (Standardized)	Multivariate	Classification	Categorical	226	69	1992
Auto MPG	Multivariate	Regression	Categorical, Real	398	8	1993
Automobile	Multivariate	Regression	Categorical, Integer, Real	205	26	1987
Badges	Univariate, Text	Classification		294	1	1994

KAGGLE DATASETS

- https://www.kaggle.com/datasets



臺南市開放資料

- http://data.tainan.gov.tw/dataset

THANK YOU