Psychoinformatics & Neuroinformatics

Week 13-3

Sprint/Module Review

by Tsung-Ren (Tren) Huang 黃從仁

Lessons Learned

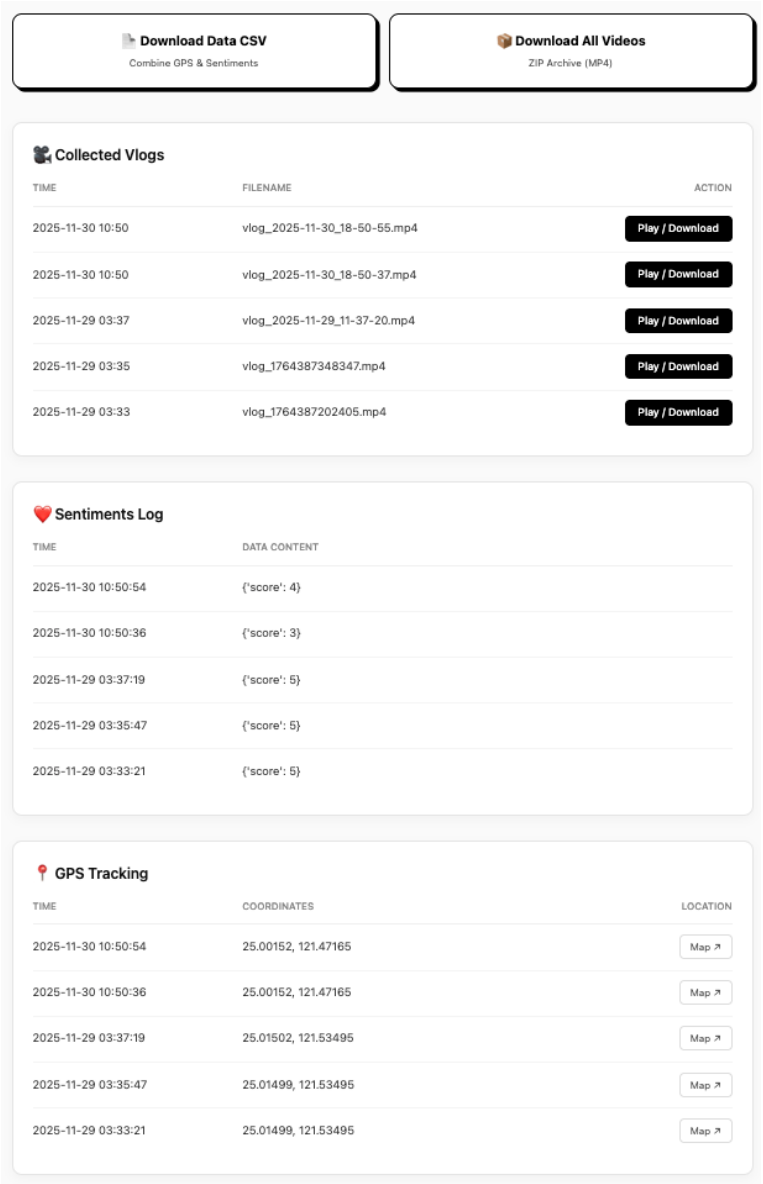
beyond scalability

Unstructured data are harder to deal with

Same backend can serve different types of devices

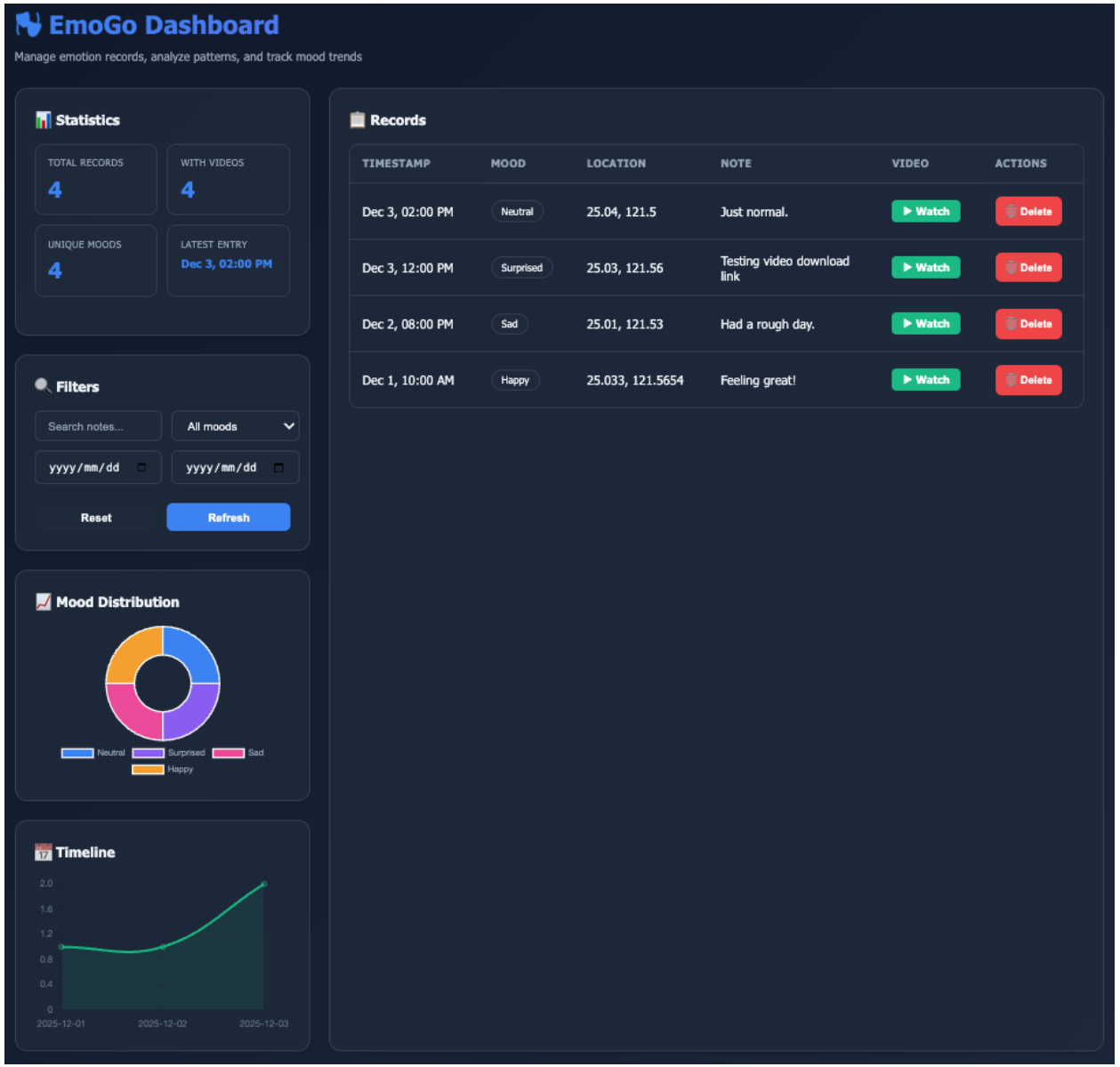
Dashboards are important inner products

Outstanding Dashboard (1/3)



龍妤如

Outstanding Dashboard (2/3)

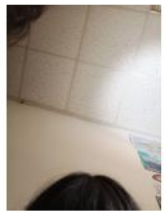
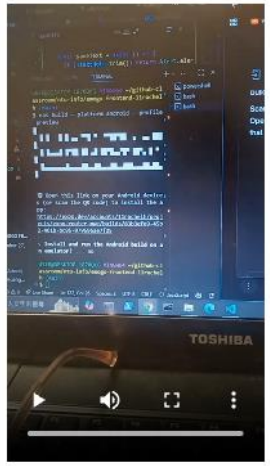
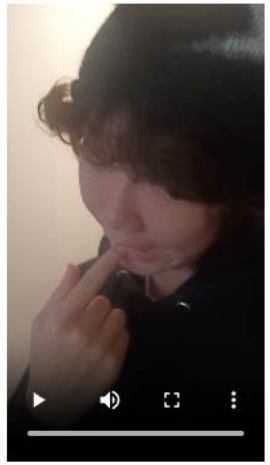


Inder Chaudhary

Outstanding Dashboard (3/3)

EmoGo Data Dashboard

Download CSV

Timestamp	Sentiment	GPS	Snapshot	Vlog	Text	Download
2025-11-23T20:55:37.357Z	1	25.0092179, 121.4527921			Really tired	Snapshot Vlog
2025-11-23T20:58:13.813Z	5	25.0092179, 121.4527921			睡飽了	Snapshot Vlog

黃莉棋

Outstanding Product (1/3)

張宸華

EmoGo 使用者紀錄總表

匯出所有資料 (JSON)

這裡整合顯示了每一次紀錄的完整資訊 (時間、心情、GPS、影片)。

時間 (Time)	時段 (Slot)	心情 (Mood)	位置 (GPS)	影片 (Vlog)
2025-12-04T15:43:32.270Z	t3	3	25.0151, 121.5358	下載 vlog_1764863012239.mp4
2025-12-04T12:49:58.207Z	t3	1	25.0152, 121.5358	下載 vlog_1764852598172.mp4
2025-12-04T12:48:12.228Z	t3	1	25.0151, 121.5358	下載 vlog_1764852492196.mp4
2025-12-04T08:58:16.937Z	t2	5	25.0151, 121.5358	無影片
2025-12-04T08:33:54.240Z	t2	1	25.0151, 121.5358	無影片
2025-12-04T07:28:25.350Z	t2	3	25.0151, 121.5358	下載 vlog_1764833306204.mp4
2025-12-04T07:09:25.910Z	t2	3	25.0151, 121.5358	下載 vlog_1764832166707.mp4
2025-12-04T06:58:45.995Z	t2	2	25.0151, 121.5358	下載 vlog_1764831526820.mp4
2025-12-04T06:16:33.562Z	t2	2	25.0151, 121.5358	下載 vlog_1764828994050.mp4
2025-12-04T05:03:50.086Z	t2	4	25.0148, 121.5358	下載 vlog_1764824654598.mp4
2025-12-03T05:02:06.225Z	t2	2	25.0153, 121.5358	下載 vlog_1764738141268.mp4
2025-12-02T11:03:12.710Z	t3	3	25.0152, 121.5358	下載 vlog_1764673420243.mp4

Outstanding Product (2/3)

Emogo Dashboard

Export CSV | Download All Videos

Summary Statistics

Total Sessions: 2 | **Total Devices:** 2

王敏行

Sessions

Session ID	Device ID	Timestamp	Emotion Score	Latitude	Longitude	Video
692f03a228b43e244852a6f9	test-device-12345	2024-12-02T15:00:00Z	4	25.033	121.5654	Download Video
6931321faa5cb941eea832d2	e21efcc1-7f90-4c6f-8b09-9e5df02e2f30	2025-12-04T15:02:56.037+08:00	5	24.9999947	121.5150867	Download Video

Outstanding Product (3/3)

📊 共計 6 筆紀錄

📥 下載 CSV 檔案

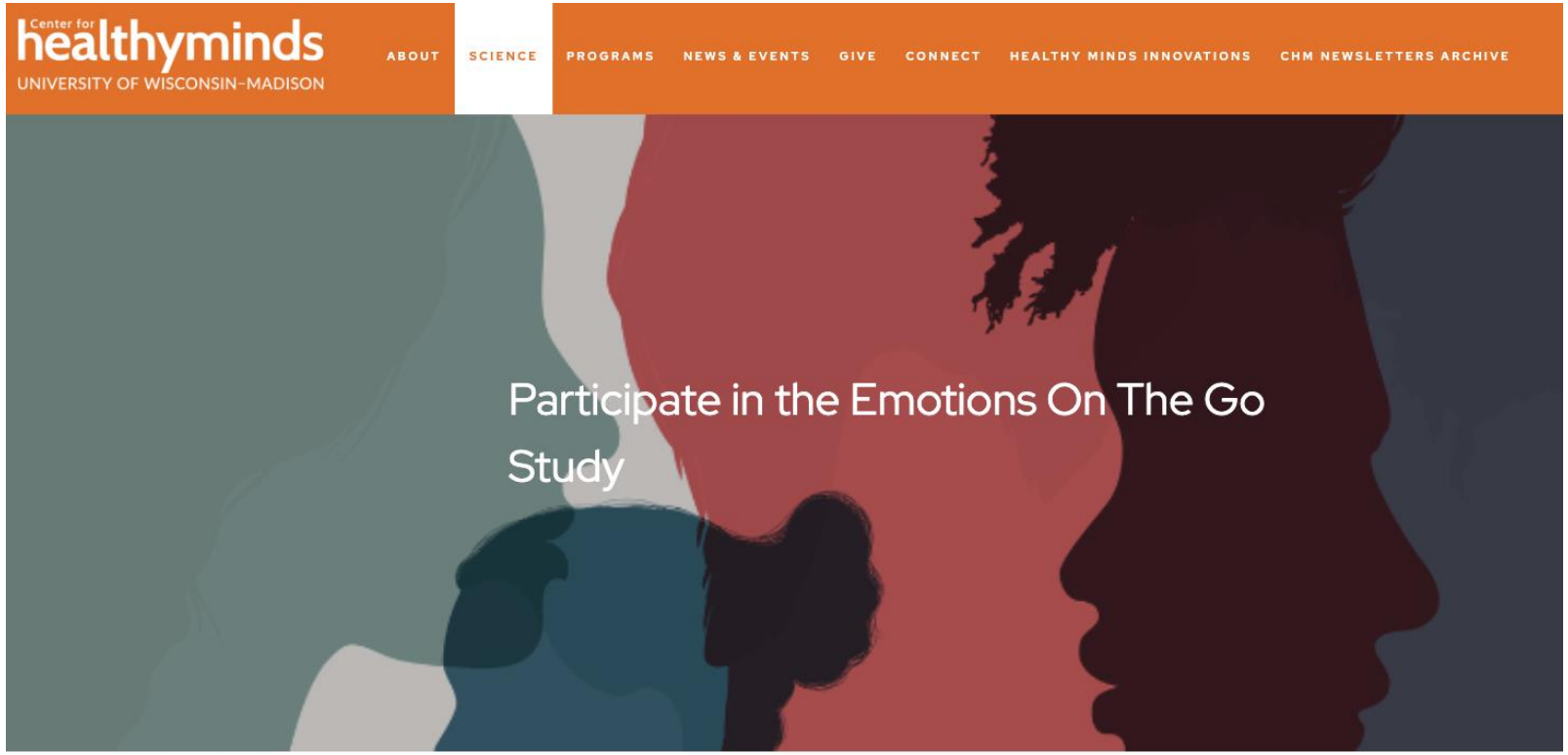
ID	心情	心情值	緯度	經度	記錄時間	上傳時間	影片路徑	影片下載
14	非常好	5/5	25.018973	121.536365	2025-11-29 19:18:49	2025-11-29 19:18:49	file:///var/mobile/Containers/Data/Application/F4664ED9-9654-476B-A5FE-E9A113BF7F9E/Documents/ExponentExperienceData/@kylelai/emogo-frontend/data/video_1764415119373.mp4	下載影片
15	非常好	5/5	25.018973	121.536365	2025-11-29 23:20:34	2025-11-29 23:20:34	file:///var/mobile/Containers/Data/Application/F4664ED9-9654-476B-A5FE-E9A113BF7F9E/Documents/ExponentExperienceData/@kylelai/emogo-frontend/data/video_1764429624198.mp4	下載影片
2	非常好	5/5	24.988666	121.417759	2025-11-30 01:43:45	2025-11-30 01:43:45	file:///data/user/0/com.emogo.app/files/data/video_1764438223171.mp4	下載影片
1	較好	4/5	23.943700	120.692457	2025-12-03 20:58:59	2025-12-03 20:58:59	file:///data/user/0/com.emogo.app/files/data/video_1764766735782.mp4	下載影片
17	非常好	5/5	25.015590	121.529336	2025-12-03 21:41:42	2025-12-03 21:41:42	file:///var/mobile/Containers/Data/Application/F4664ED9-9654-476B-A5FE-E9A113BF7F9E/Documents/ExponentExperienceData/@kylelai/emogo-frontend/data/video_1764769292804.mp4	下載影片
2	較好	4/5	23.943697	120.692453	2025-12-03 23:07:02	2025-12-03 23:07:02	file:///data/user/0/com.emogo.app/files/data/video_1764774416252.mp4	下載影片

Emogo Backend API • 最後更新：2025-12-05 07:26:53

賴誌凱

Revisit Project Goal

Replicate or go beyond EmoGo: More Xs or Better Ys



We are recruiting participants for the "Emotions on the Go" smartphone study. The goal of this 2-week study is to understand how people feel as they go about their daily lives.

Psychoinformatics & Neuroinformatics

Week 14-1

Deep-Learning Models

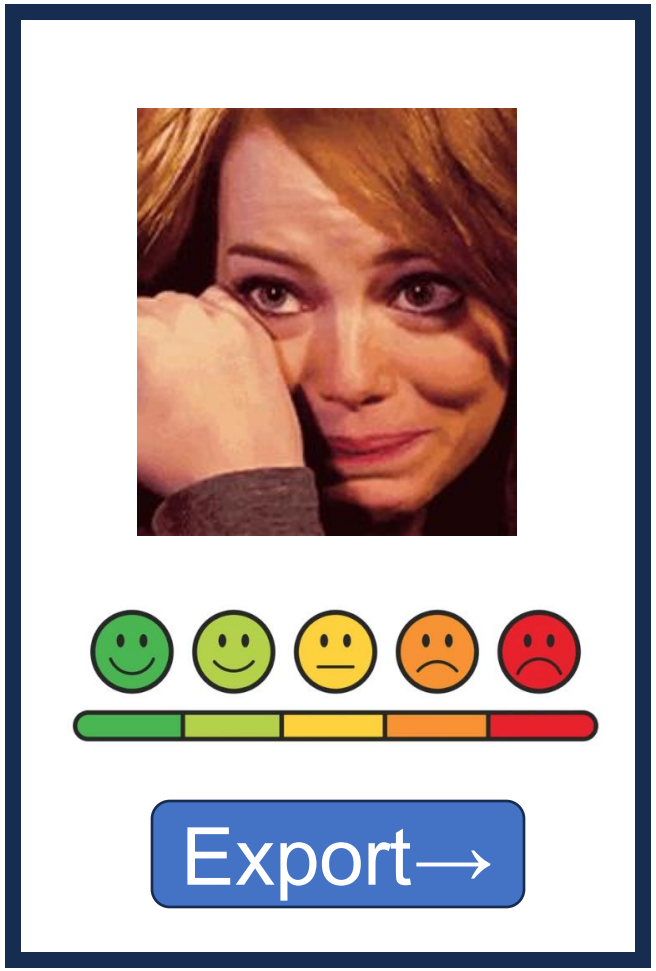
by Tsung-Ren (Tren) Huang 黃從仁

Where are we?

週次	日期	單元主題
第1週	9/5	[課程簡介] AI/LLM + 開發環境/工具介紹
第2週	9/12	[Neurosynth-資料搜集] 爬蟲與資料ETL
第3週	9/19	[Neurosynth-資料分析] 統合分析(Meta-analysis) & 機器學習(Machine Learning)導論
第4週	9/26	[Neurosynth-資料分析] 機器學習模型的評估與調教(scikit-learn)
第5週	10/3	[Neurosynth-後端服務] 伺服程式+資料庫(SQL)
第6週	10/10	國慶日(停課): 網站伺服器部署(課程參考資料)
第7週	10/17	[Neurosynth-前端介面] HTML+CSS+JavaScript
第8週	10/24	光復節連假(停課): 進階JavaScript: ES6+(課程參考資料)
第9週	10/31	[Neurosynth-前端介面] 網頁框架(React)
第10週	11/7	[EmoGo-前端介面] 手機應用程式框架(React Native)
第11週	11/14	[EmoGo-資料搜集] 多模態資料的搜集(問卷、錄影、感測器)
第12週	11/21	全校運動會(停課): 手機應用程式部署(課程參考資料)
第13週	11/28	[EmoGo-後端服務] API伺服器(FastAPI) + 資料庫(NoSQL)
第14週	12/5	[EmoGo-資料分析] 深度學習導論+預訓練深度學習模型(靜態與動態影像分析)
第15週	12/12	[EmoGo-資料分析] 預訓練深度學習模型(語音與文字資料分析)+課程總結
第16週	12/19	期末考週(停課)

Sprint Goal

Analyze the facial emotions in a vlog



You can output the dominant emotion category (using frame-based CNN, CNN-LSTM, or 3D-CNN)

You can also output the emotion dynamics as a time series

You can also use a regression rather than classification model

Sprint Backlog

Ensure your emotion recognizer's judgements are valid

- [ ] **A light validation of your chosen model on the Taiwanese face images on COOL**
- [ ] **A light validation of your chosen model on your chosen videos**
- [ ] **Output your results for the vlog provided by Tren**

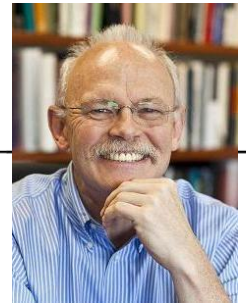
Psychoinformatics & Neuroinformatics

Week 14-2

Sprint

by Tsung-Ren (Tren) Huang 黃從仁

NeuroTree



- ?
  - Bruce R. Musicus (STSTree)
    - Cheng-Yuan Liou — National Taiwan University (STSTree)
  - Jacob T. Schwartz — NYU
    - Gian-Carlo Rota — MIT (MathTree)
      - Stephen Grossberg — Boston University
  - Nelson Dunford
    - Ting-Wai Chiu — National Taiwan University
- Wolfgang Köhler — Dartmouth
  - Richard M. Held — MIT
- Donald Benjamin Lindsley — UCLA
- Horace Barlow — Cambridge
  - Ken Nakayama — Smith Kettlewell
    - Shinsuke Shimojo — Caltech
      - Takeo Watanabe — Brown
- Frances Keesler Graham — University of Delaware
- Robert Calfee — UC Riverside
  - William Chase — Carnegie Mellon
    - Patrick Cavanagh — Glendon College
- Jean Mayer — Tufts
  - Paul Rozin — Penn
    - James L. McClelland — Stanford
- Hugh Christopher Longuet-Higgins — University of Sussex
- R. Michael Gaze — Edinburgh
  - David Willshaw — Edinburgh
- John Archibald Wheeler — UT Austin (Physics Tree)
- John J. Hopfield — Princeton
- Alan Gelperin — Monell Chemical Senses Center
- Stephen W. Kuffler — Harvard Medical School
  - Terrence J. Sejnowski — UCSD
    - Peter Dayan — UCL
      - Randall C. O'Reilly — CU Boulder
- Hugh Christopher Longuet-Higgins — University of Sussex
- Don Norman — UCSD
  - Geoffrey E. Hinton — University of Toronto

Tsung-Ren Huang — National Taiwan University

人工智慧的歷史

十年河東，十年河西

早期	晚近
符號派	聯結派
IF-THEN規則	類神經網路
演繹推理(理性)	歸納推理(直覺)
類似新手思維	類似專家思維
易有規則衝突	可有特殊例子
向人學習	自我學習

硬體層次(1/2)

機器在硬體上的過人之處

人類	機器
計算不精確	計算極精確
工作記憶容量小	記憶體容量大
長期記憶容量小	儲存碟容量大
重複會累	重複不會累

機器學習能從大數據中找出微細規律性

硬體層次(2/2)

硬體/計算能力的提升: 量變產生質變

以前機器做不到的現在做得到了

1. Ｘ今Ｘ要去Ｘ灣大ＸＸＸ講 (辨識率50%)
2. 我今Ｘ要去臺灣大Ｘ聽Ｘ講 (辨識率75%)

1997機器過人的智慧

IBM DeepBlue

2016機器過人的智慧

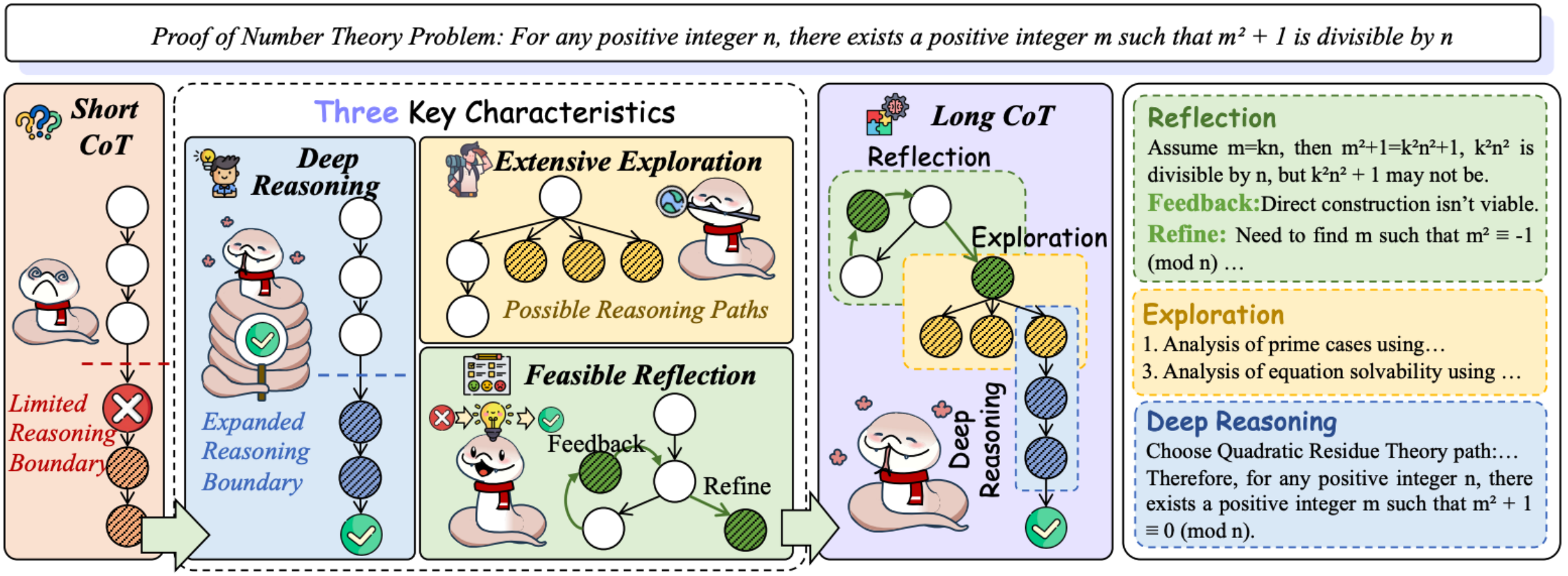
AlphaGo→AlphaGo Zero→AlphaZero

2025機器過人的智慧

[Submitted on 12 Mar 2025 (v1), last revised 9 Apr 2025 (this version, v3)]

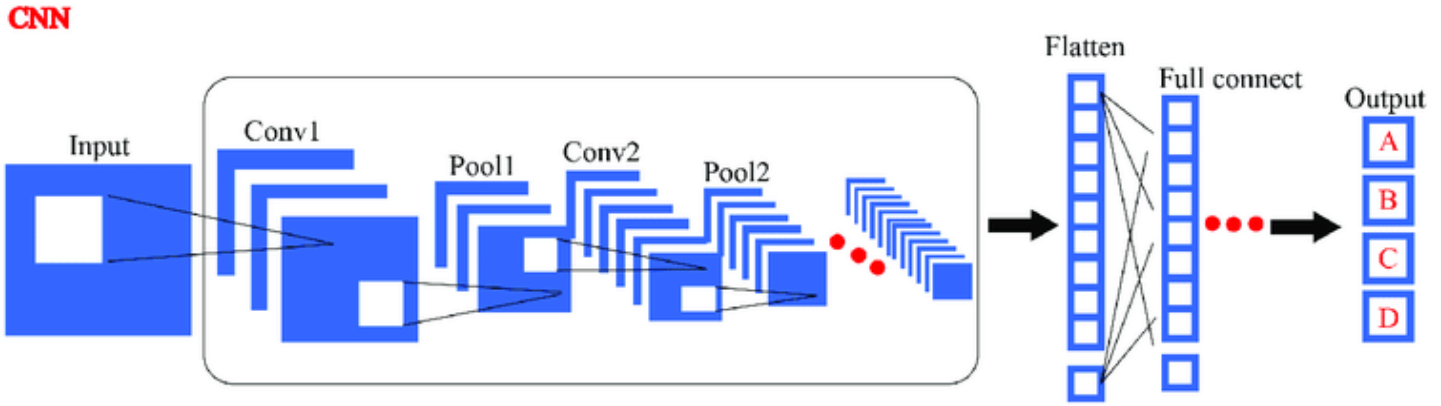
Towards Reasoning Era: A Survey of Long Chain-of-Thought for Reasoning Large Language Models

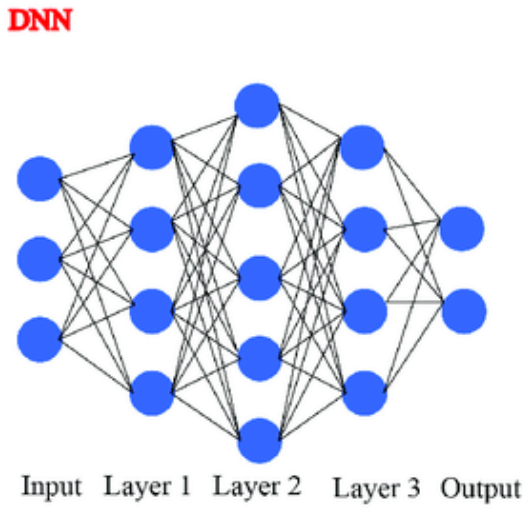
Qiguang Chen, Libo Qin, Jinhao Liu, Dengyun Peng, Jiannan Guan, Peng Wang, Mengkang Hu, Yuhang Zhou, Te Gao, Wanxiang Che

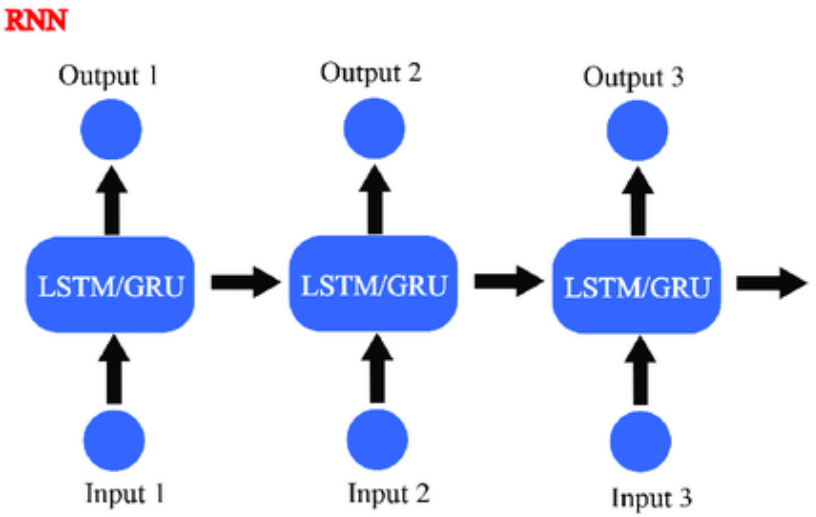


演算法層次(1/3)

只是用不同函數f(X)去逼近觀察到的Y

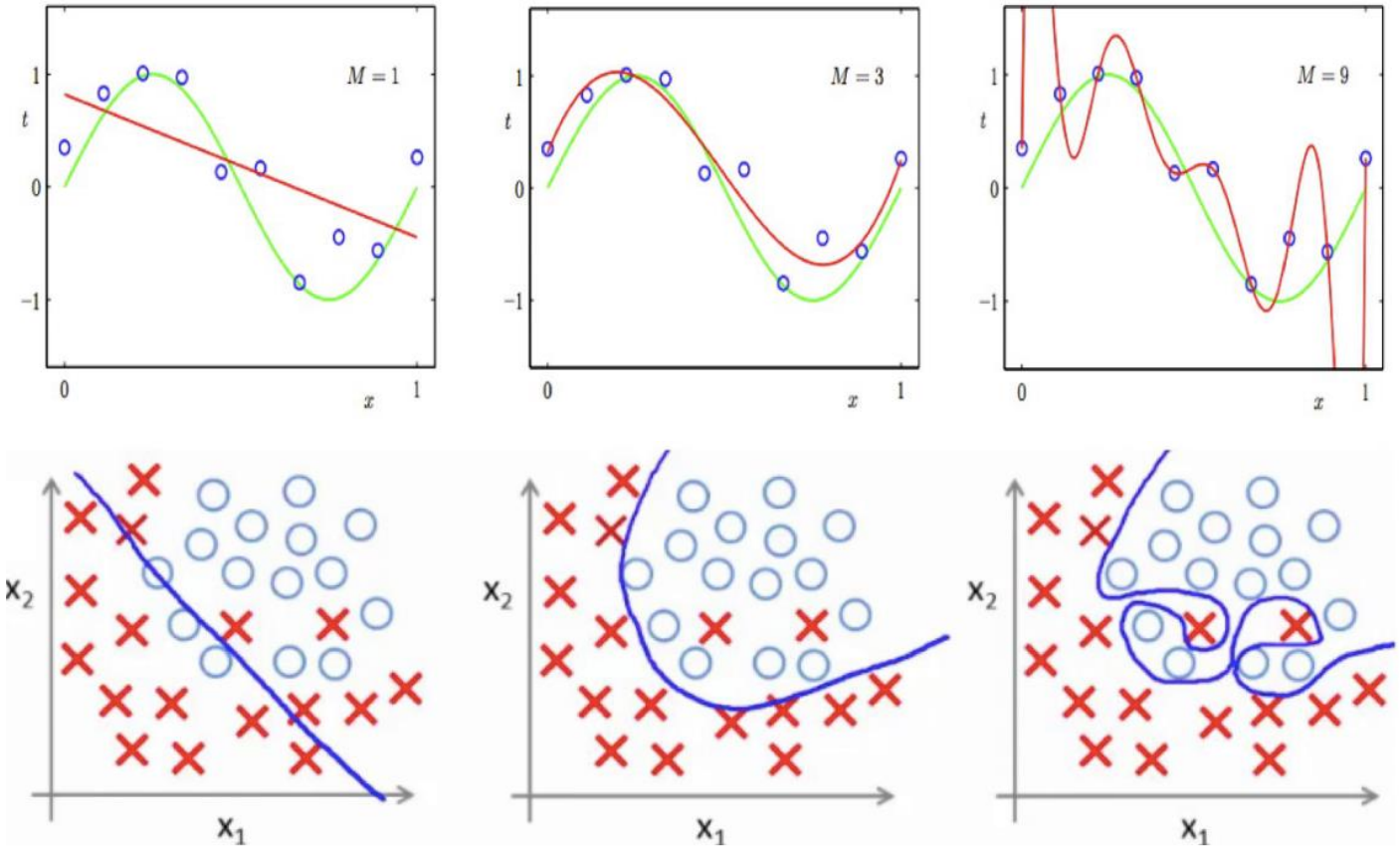






演算法層次(2/3)

只是用不同函數f(**X**)去逼近觀察到的**Y**



計算問題層次(1/5)

只要X與Y有相關便是一個可學習的問題

計算問題層次 (2/5)

影像➡文字：圖像描述

A young boy is playing basketball. 	Two dogs play in the grass. 	A dog swims in the water. 	A little girl in a pink shirt is swinging. 
A group of people walking down a street. 	A group of women dressed in formal attire. 	Two children play in the water. 	A dog jumps over a hurdle. 

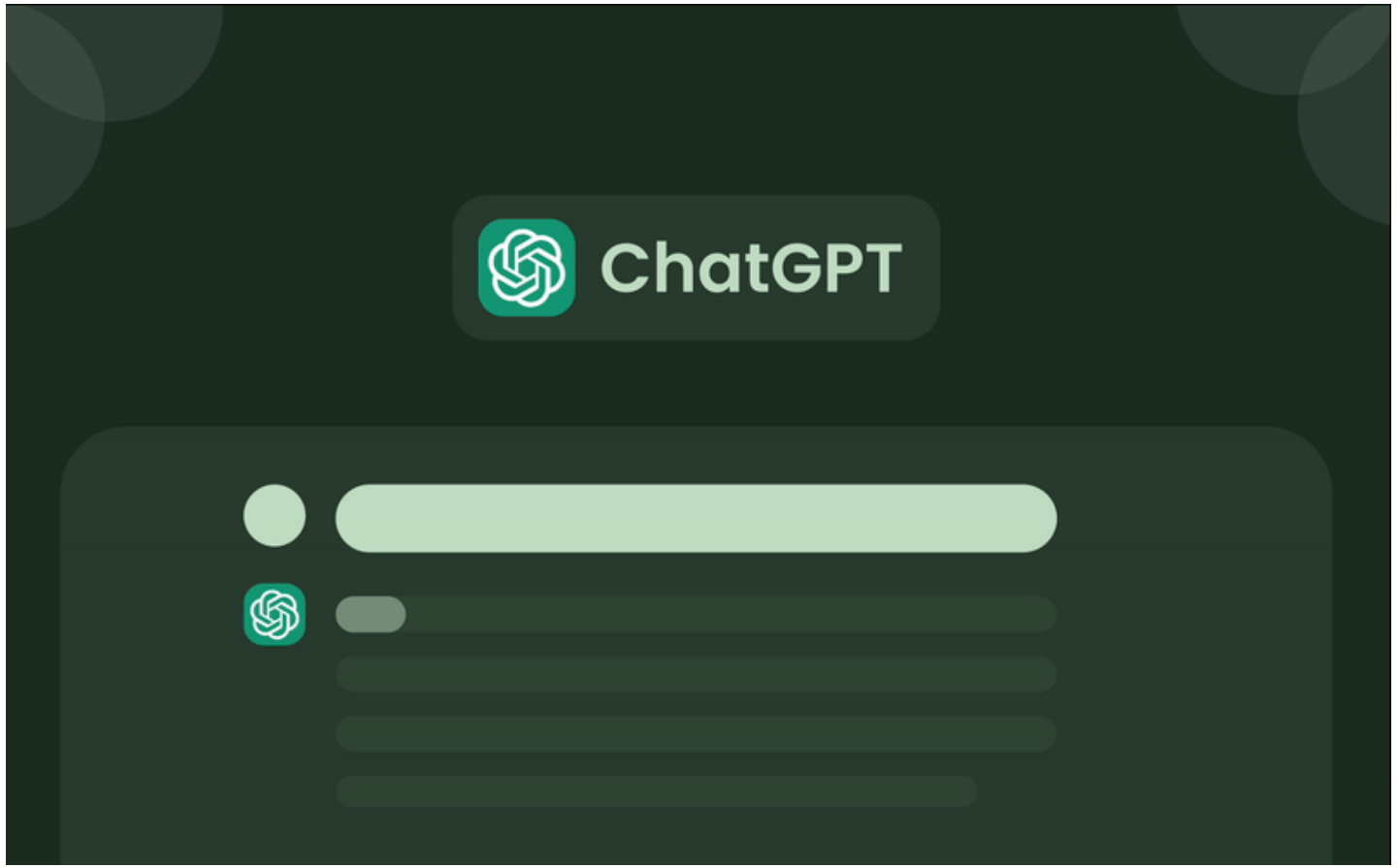
Özlü, 2020

計算問題層次(3/5)

文字➡影像:影像描述

計算問題層次(4/5)

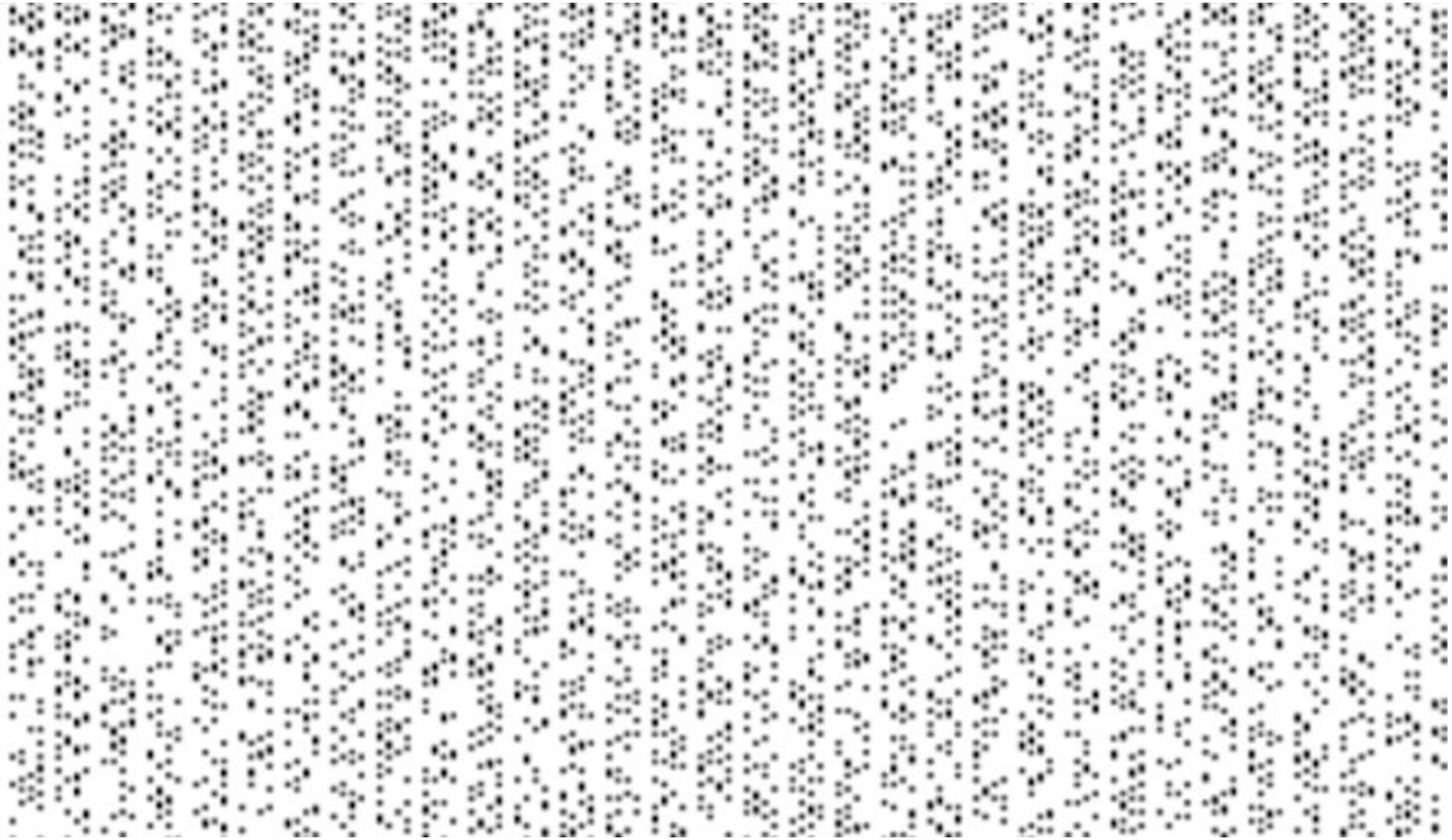
文字➡文字:聊天機器人



Kaushik, 2023

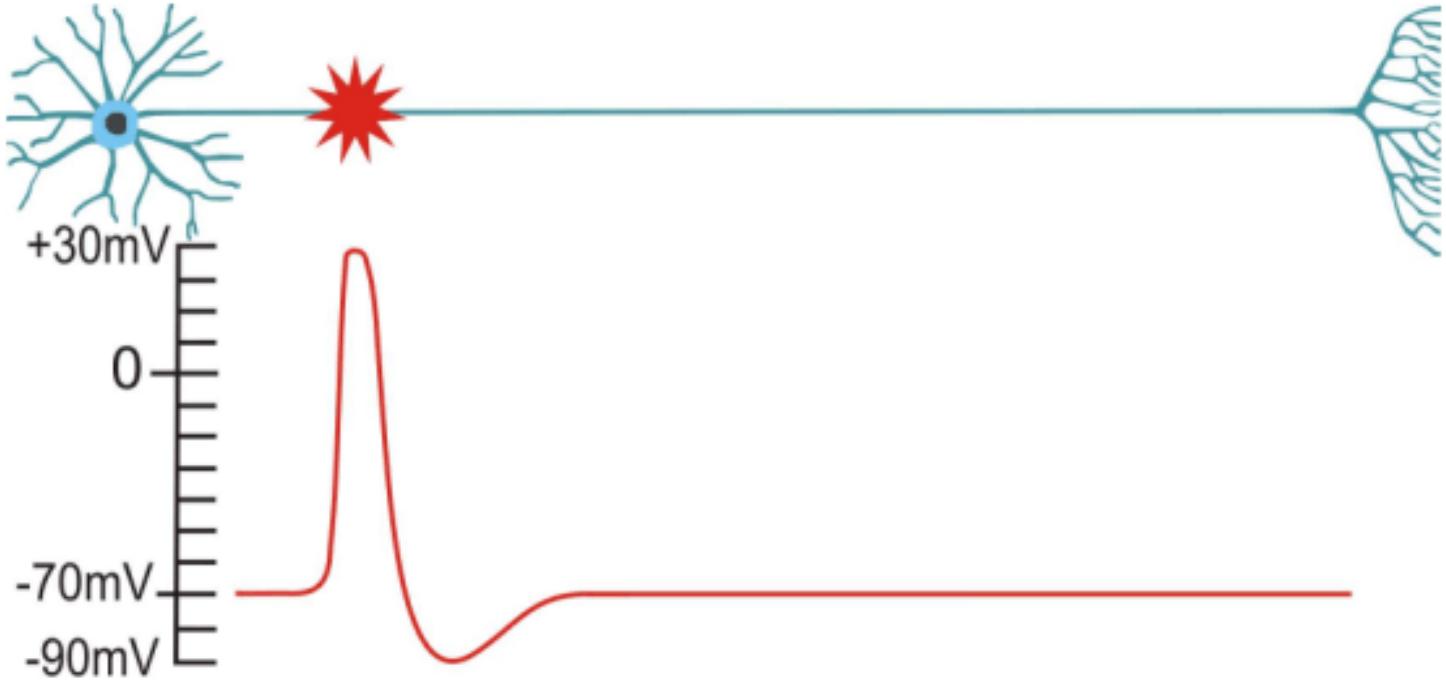
計算問題層次(5/5)

機器/深度學習無法準確預測一個數是否為質數



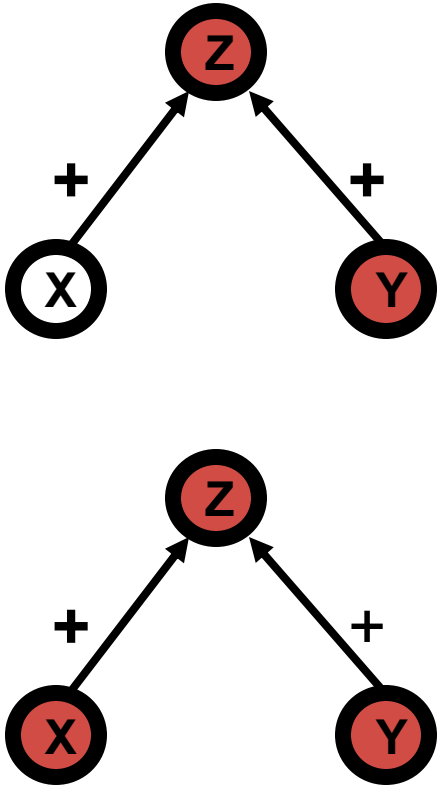
硬體實作:一個神經元

一個神經元的狀態:0 vs. 1



硬體實作:三個神經元(1/4)

神經元z若有個低閾值

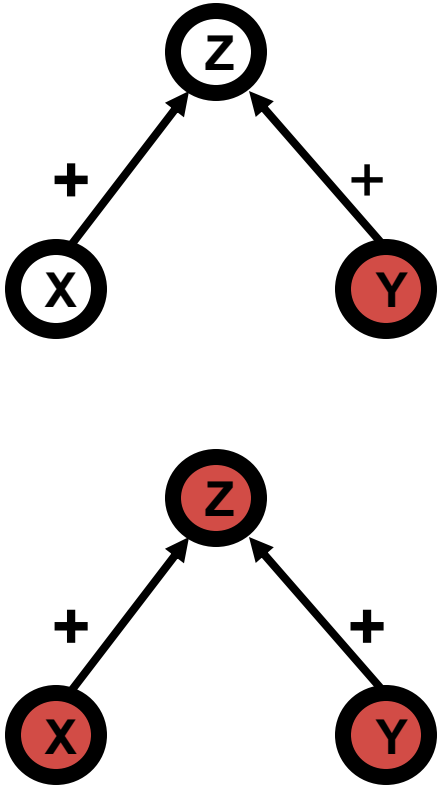


X	Y	Z
0	0	0
0	1	1
1	0	1
1	1	1

Z=X+Y (OR)

硬體實作:三個神經元(2/4)

神經元z若有個高閾值

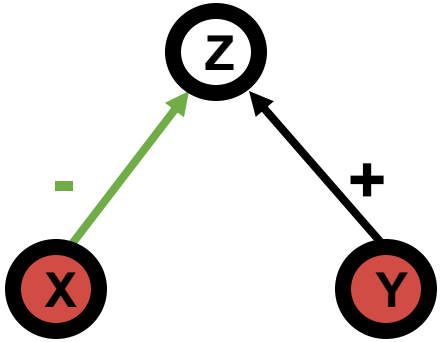


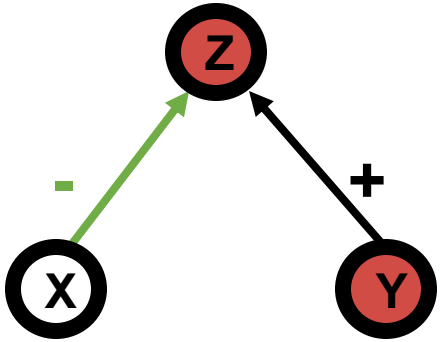
X	Y	Z
0	0	0
0	1	0
1	0	0
1	1	1

Z=X*Y (AND)

硬體實作:三個神經元(3/4)

若開始考慮神經元彼此的抑制關係



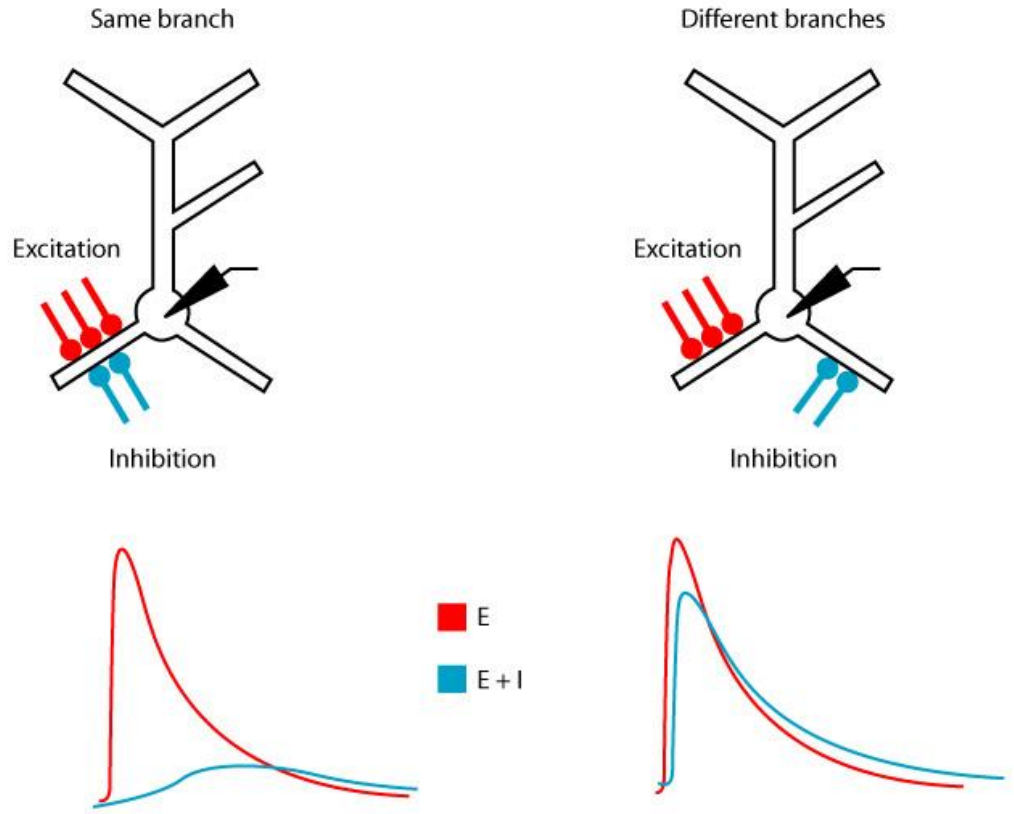


X	Z
0	1
1	0

Z=1-X (NOT)

硬體實作:三個神經元(4/4)

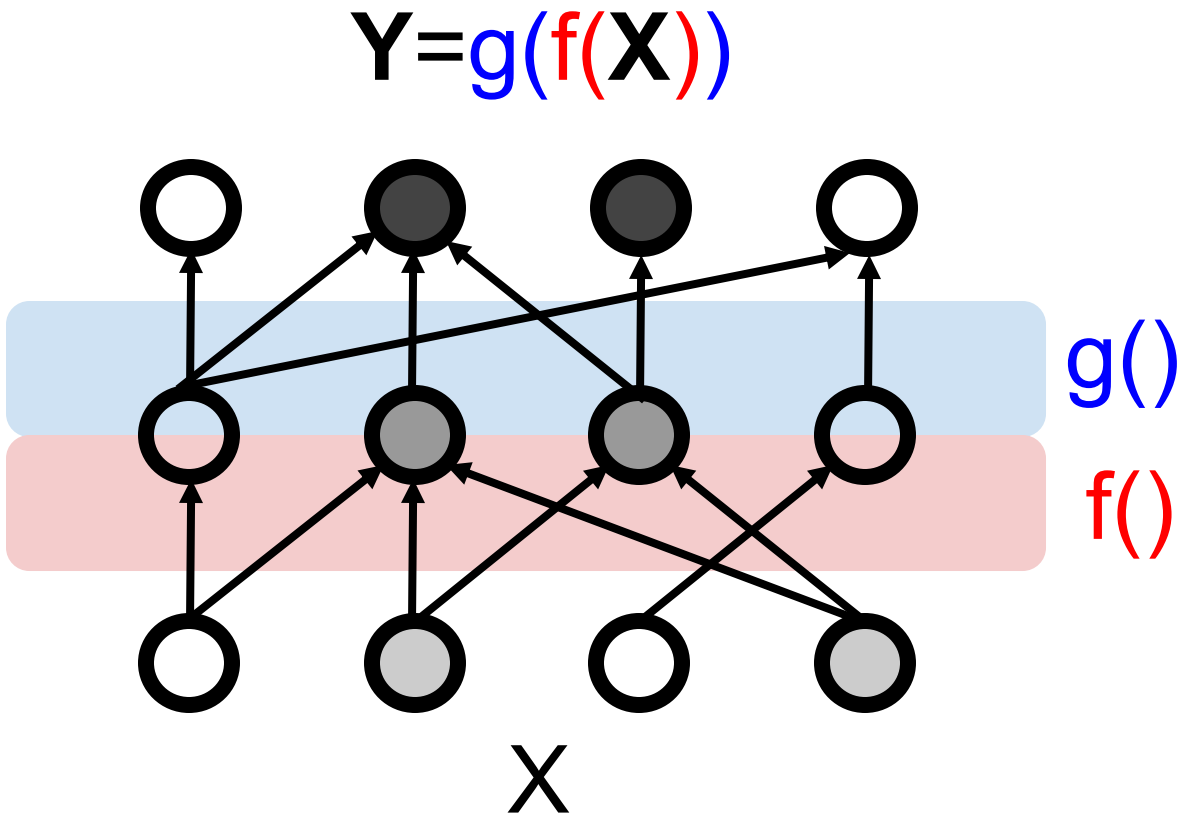
神經元間的抑制可以導致除法(左)做減法(右)



Mel & Schiller, 2004

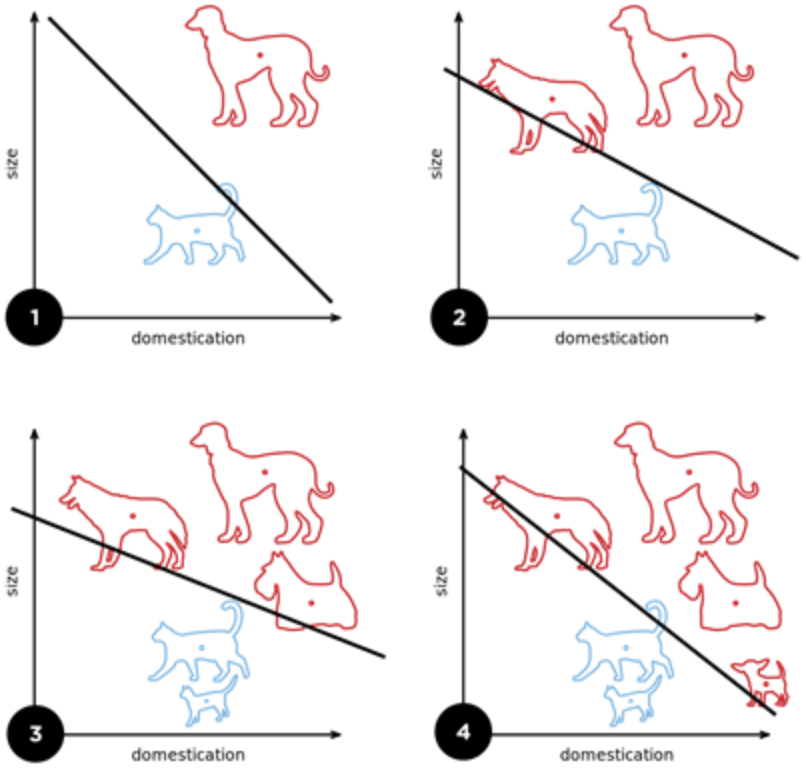
演算法

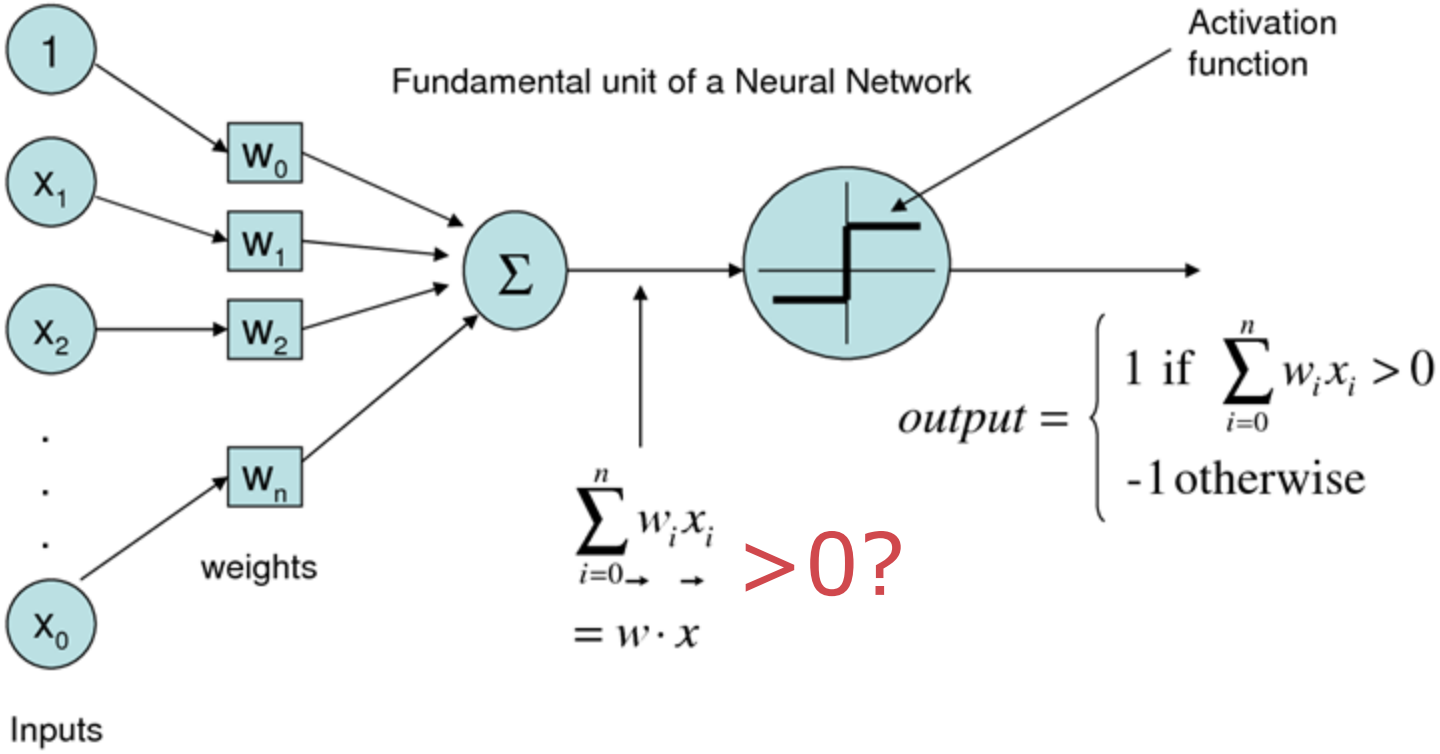
一個神經網路透過組合基本的計算來實現演算法



計算問題(1/3)：區分貓狗

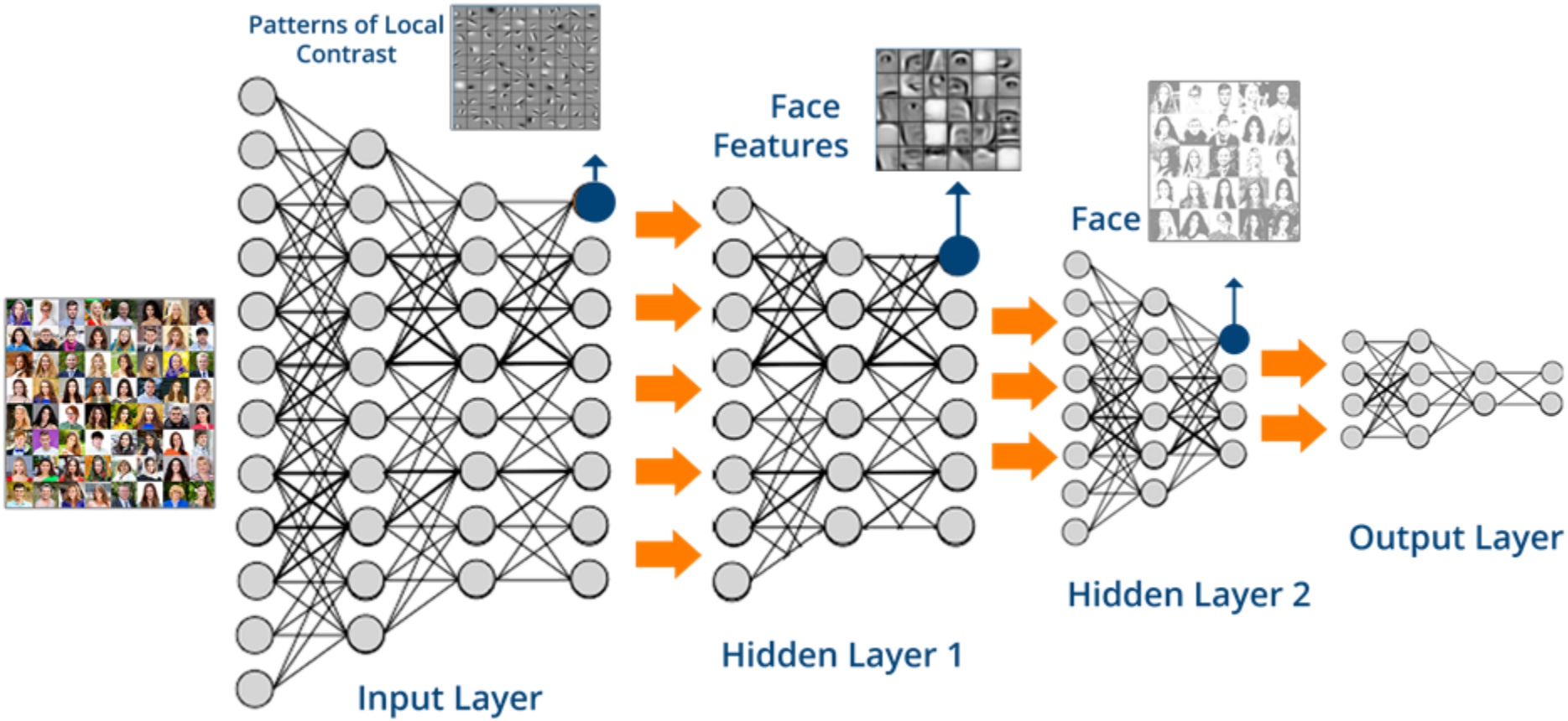
在特徵空間中找一個決策平面





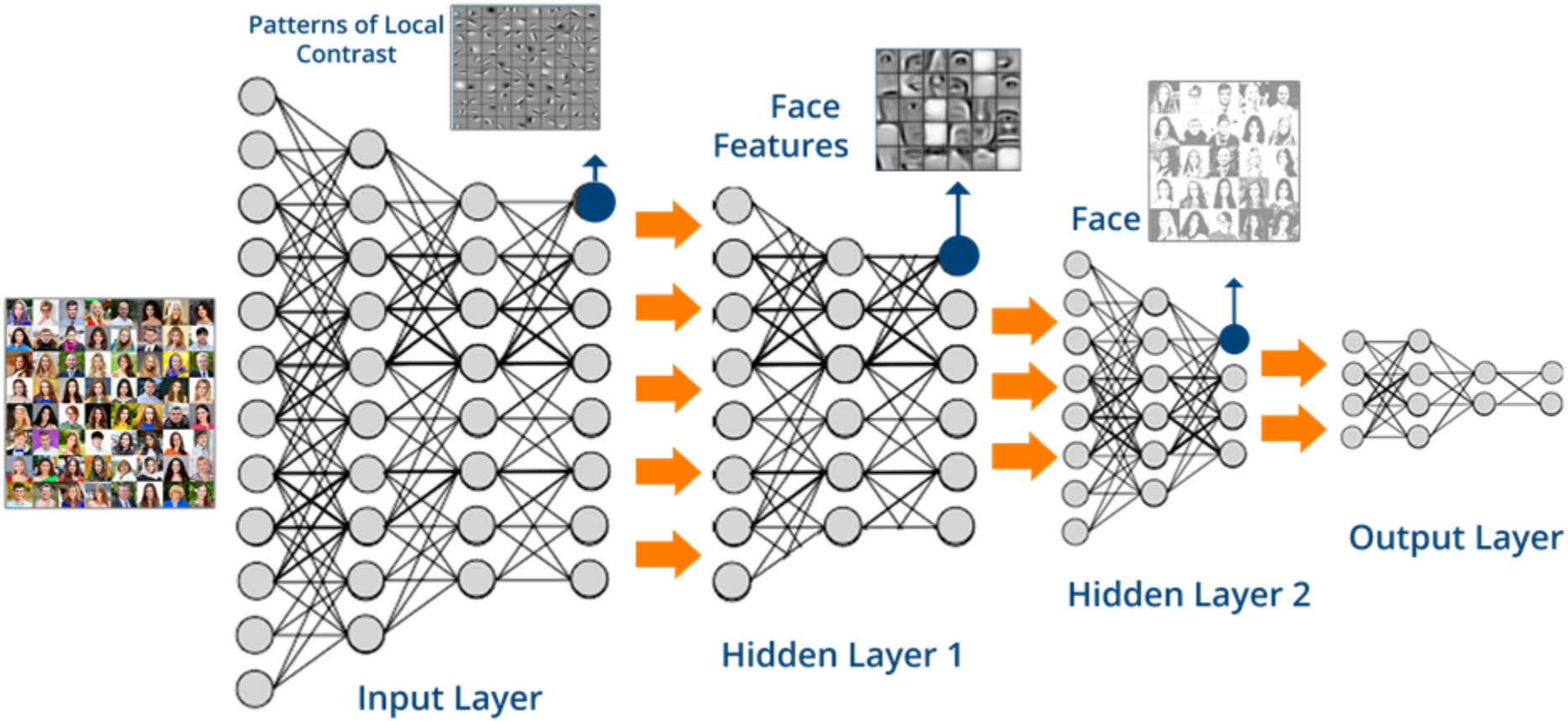
計算問題(2/3)：區分男女

深度學習網路=比較多層的類神經網路

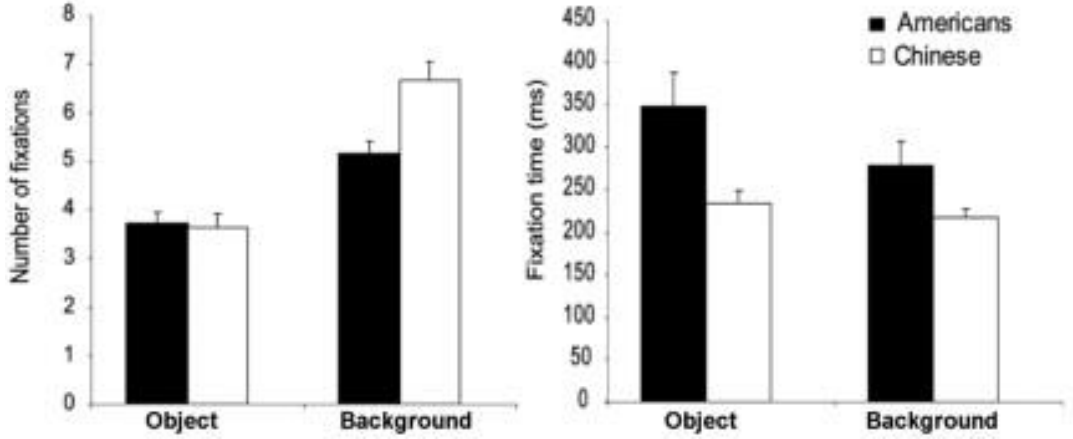


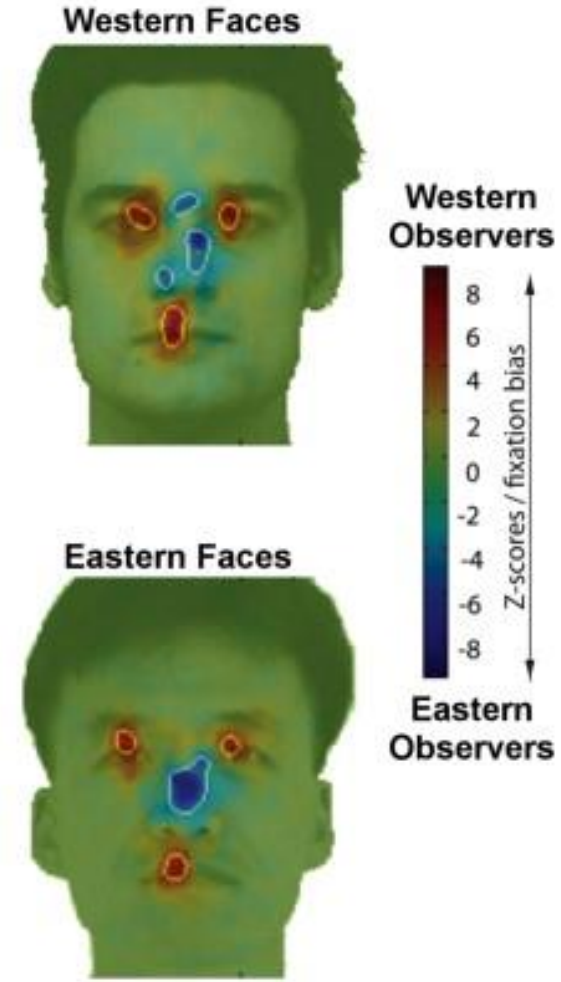
計算問題(3/3)：區分本國/外國人

神經網路會學習去萃取能解決問題的特徵



Cross-cultural Differences





Goh & Park, 2009

Machine's Cross-race Effect (1/2)

Machines are poor at judging Asian faces

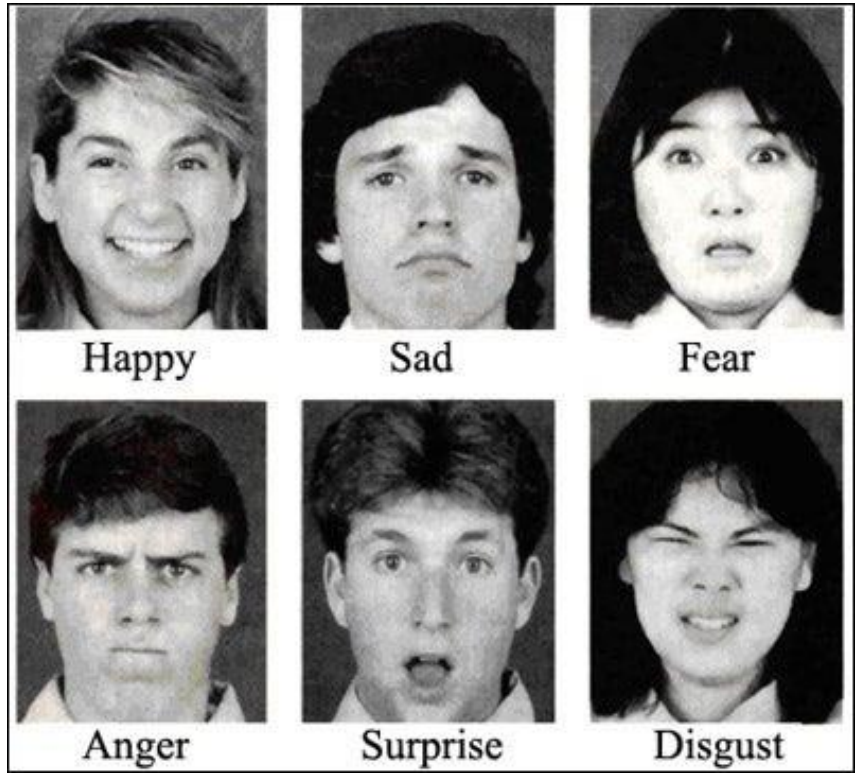
	Angry	Disgusted	Fearful	Happy	Neutral	Sad	Surprised
Chen's							
Tu's							
KDEF							
RaFD							

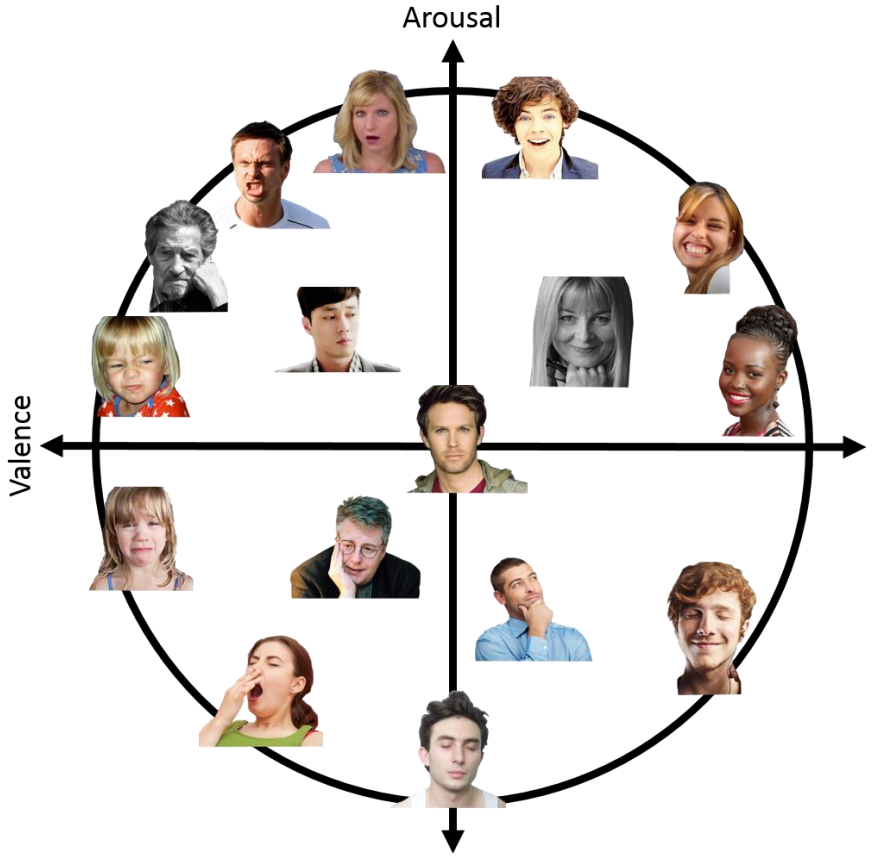
Machine's Cross-race Effect (2/2)

Expression	Dataset	FaceReader			DeepFace		
		N_{images}	Accuracy		N_{images}	Accuracy	
Angry	Chen's	19	0.895	0.647	19	0.737	0.618
	Tu's	15	0.333		15	0.467	
	KDEF	31	0.968	0.982	31	0.903	0.857
	RaFD	25	1.000		25	0.800	
Happy	Chen's	214	0.967	0.955	207	0.923	0.885
	Tu's	54	0.907		54	0.741	
	KDEF	59	1.000	1.000	59	1.000	1.000
	RaFD	39	1.000		39	1.000	
Sad	Chen's	34	0.706	0.587	34	0.441	0.478
	Tu's	12	0.250		12	0.583	
	KDEF	20	1.000	1.000	20	0.800	0.791
	RaFD	23	1.000		23	0.783	
Surprised	Chen's	78	0.923	0.932	76	0.724	0.652
	Tu's	39	0.949		39	0.513	
	KDEF	17	1.000	1.000	17	0.882	0.682
	RaFD	27	1.000		27	0.556	
Total	Chen	345	0.928	0.890	336	0.818	0.765
	Tu	120	0.783		120	0.617	
	KDEF	127	0.992	0.996	127	0.929	0.871
	RaFD	114	1.000		114	0.807	

Discrete vs. Dimensional Emotions

An unresolved debate as of 2012





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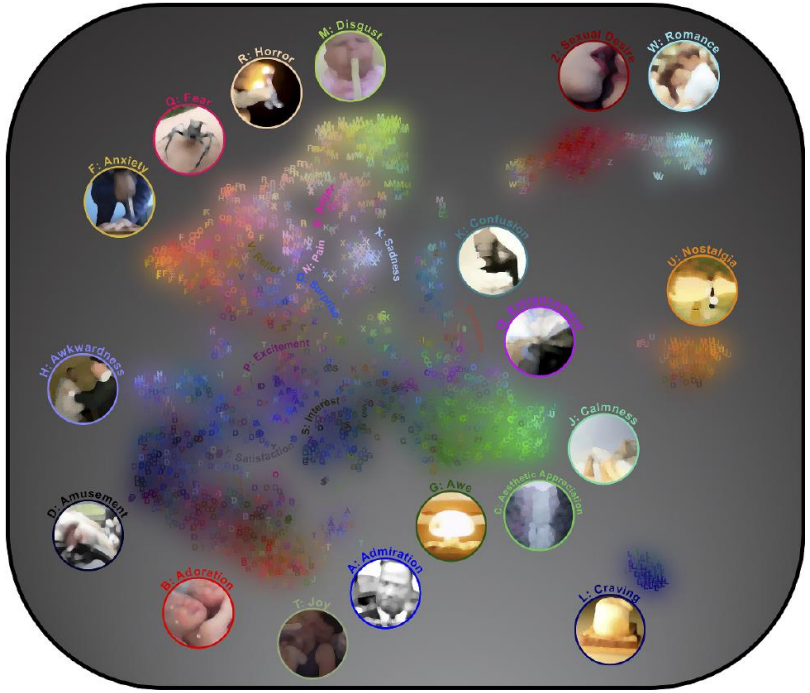
Discrete vs. Dimensional Emotions

Both theories are correct



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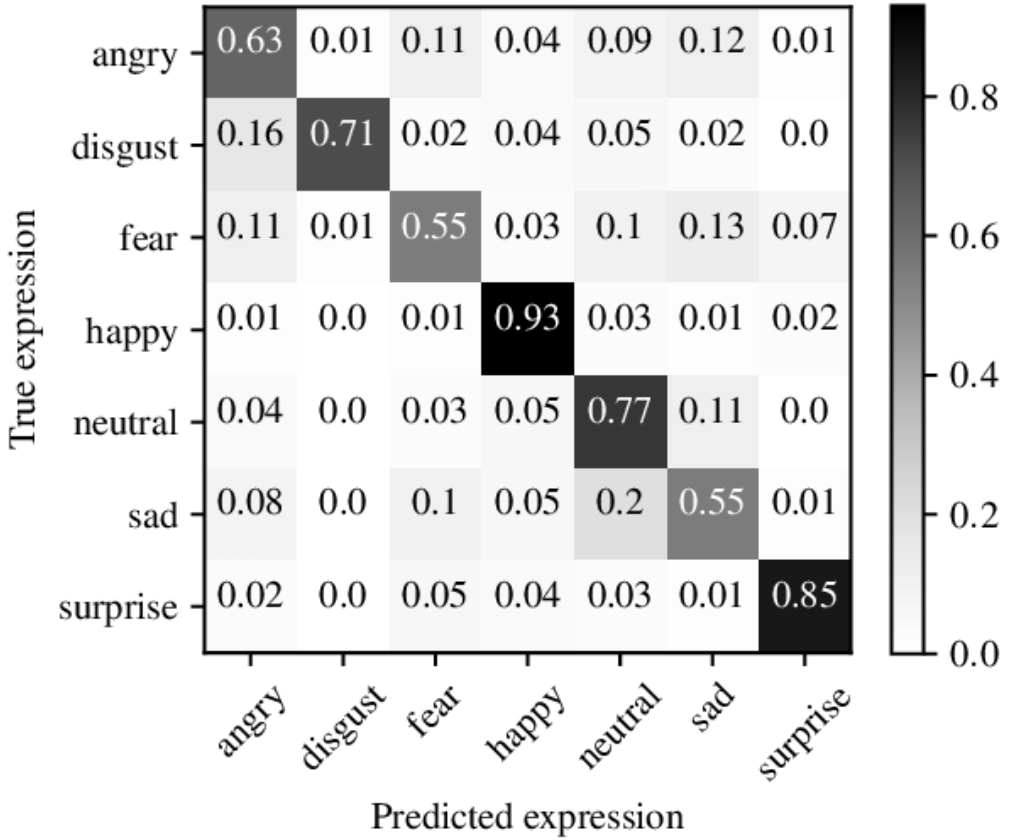
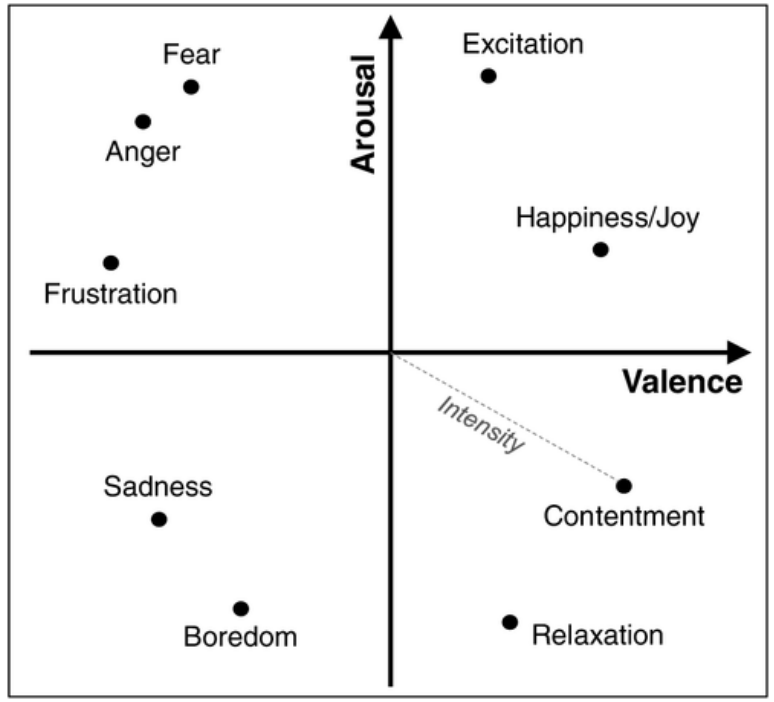
Discrete vs. Dimensional Emotions

Both theories are wrong because of mixed emotions





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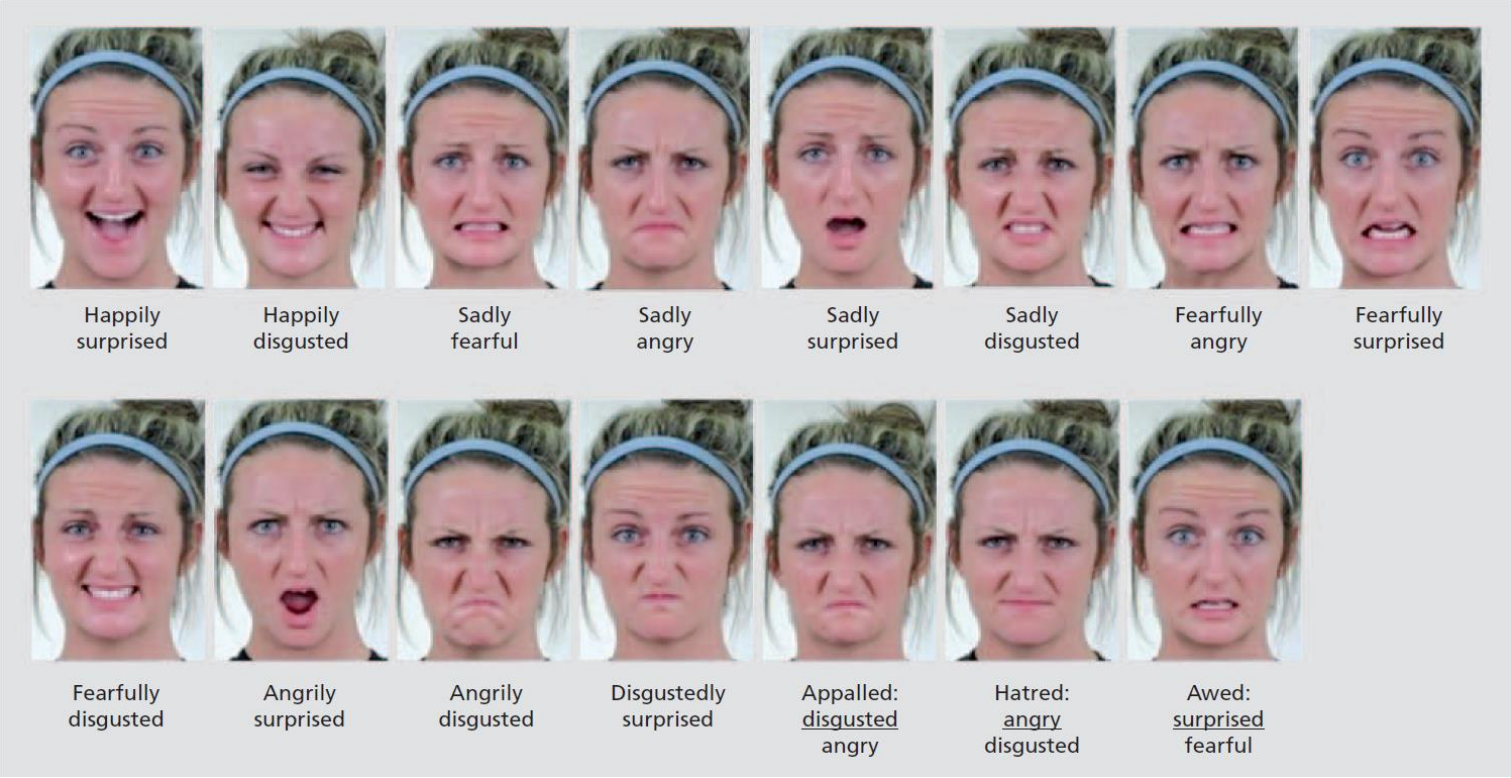
TOKYO 2020
Sad?
Happy?
Happy
Sad
Happy
Sad
Happy
Sad
Happy
Sad
Happy
Sad

Mixed Emotions

have corresponding facial expressions



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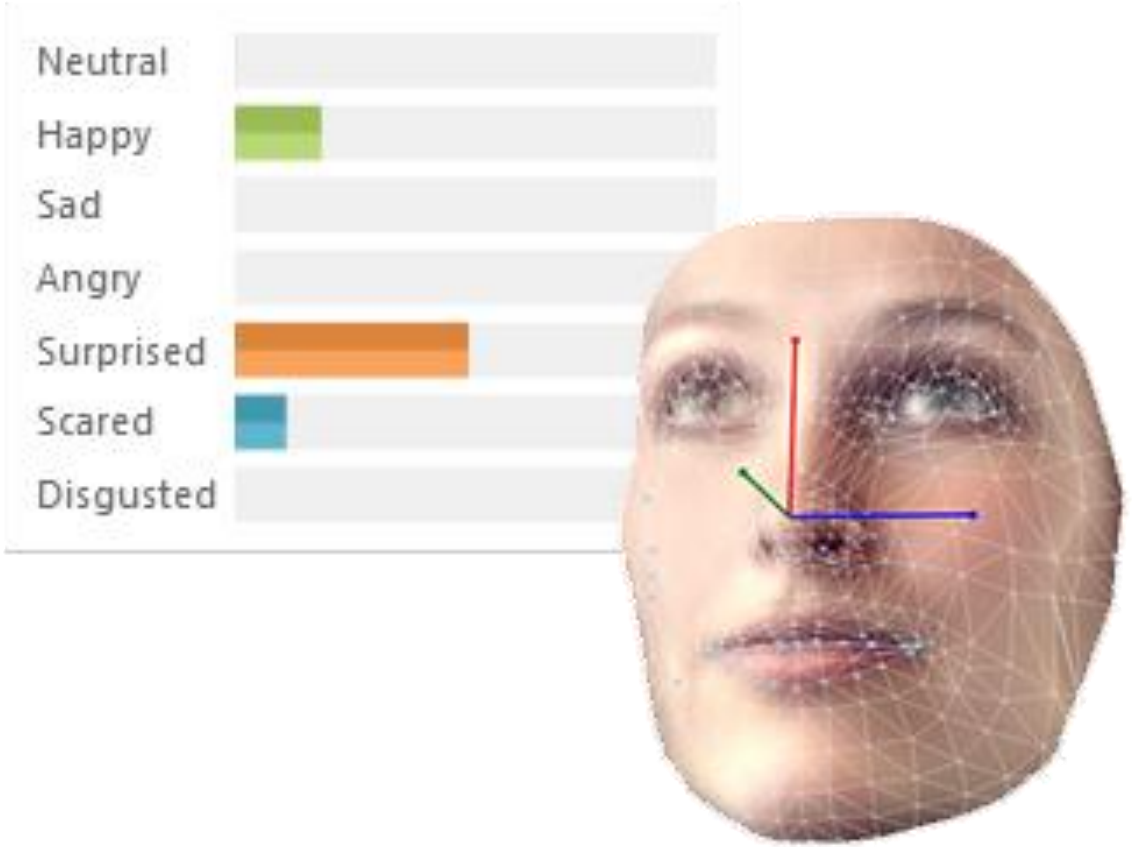
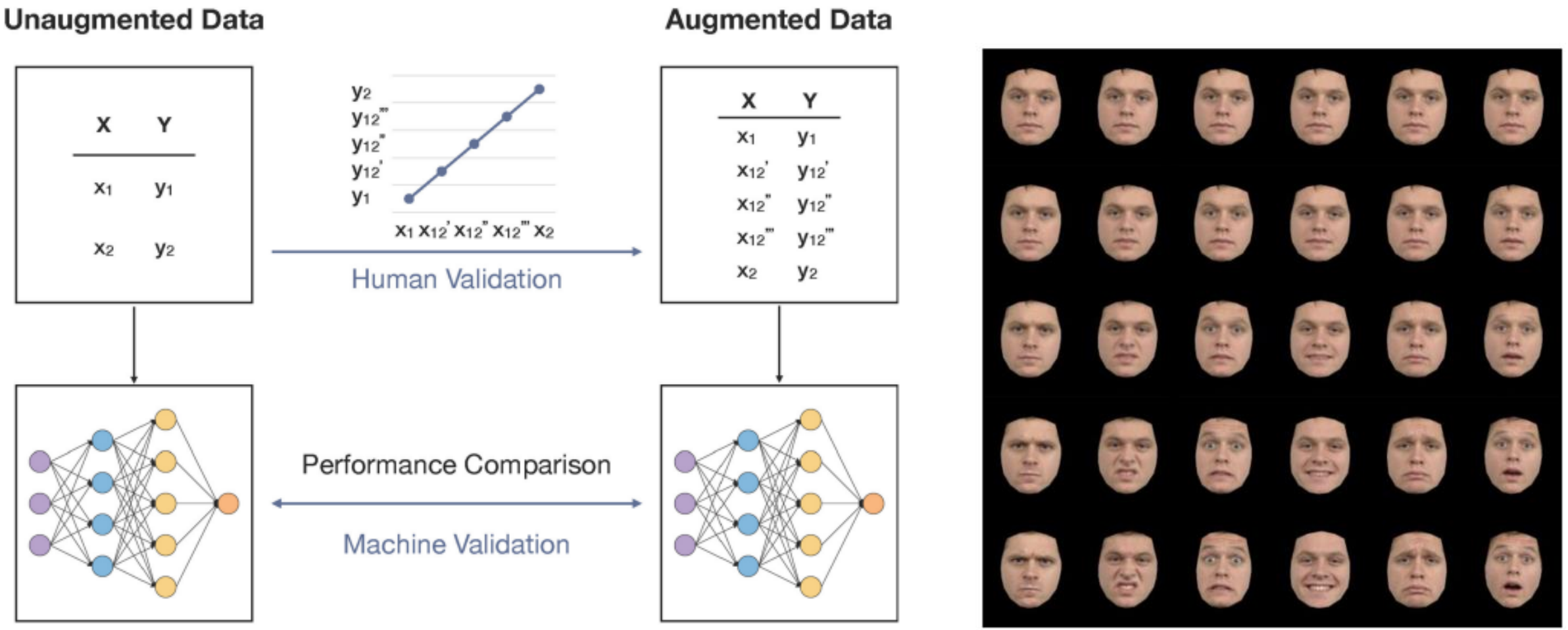
Recognizing Mixed Emotions

if we have training data of emotion intensities



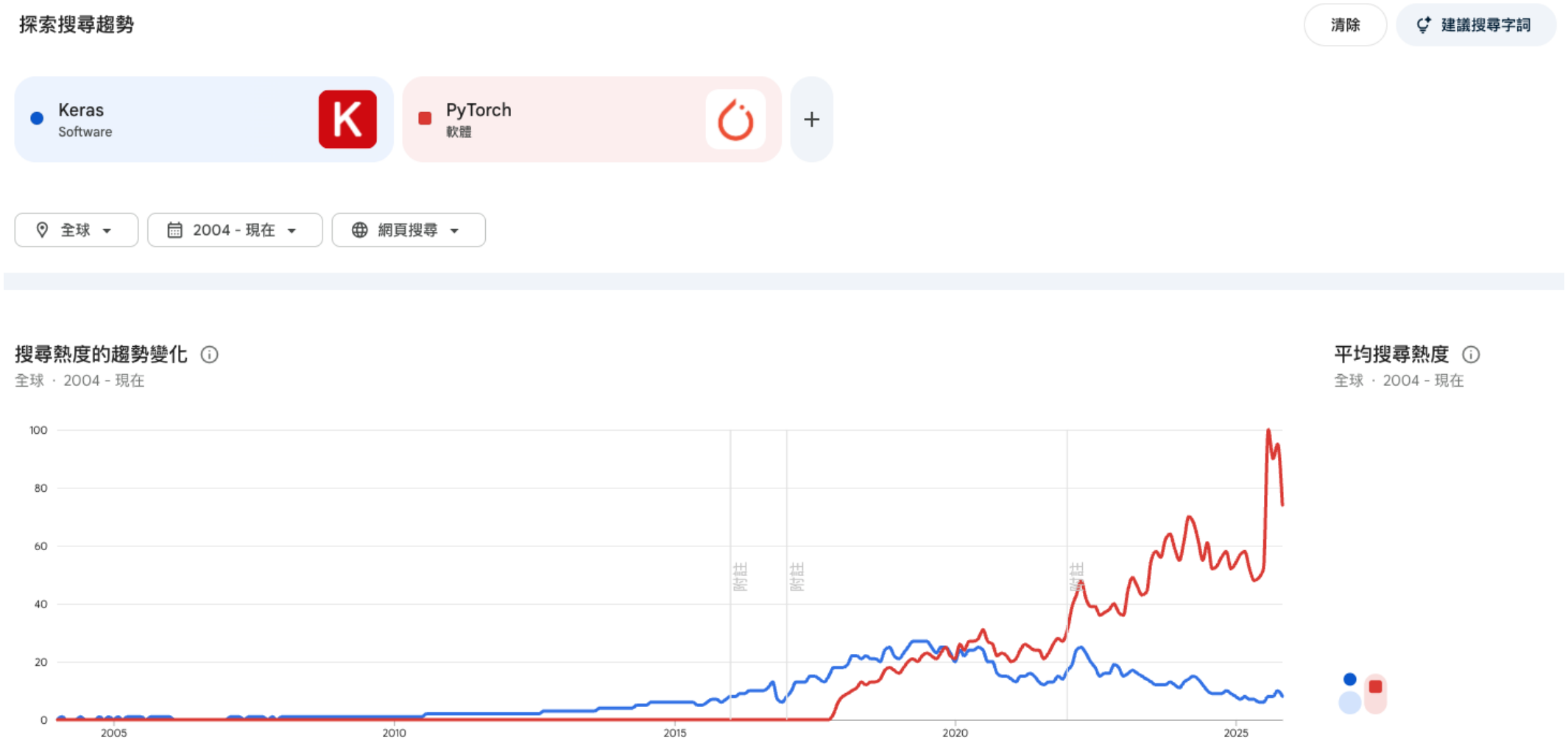
Data Augmentation

for training regression models



Implementation

Keras is easier for beginners



Game Over