



# ML and FinTech

Huei-Wen Teng

Department of Information Management and Finance  
National Yang Ming Chiao Tung University  
<https://hackmd.io/@hwteng/HyKOPoA6d>

# Outline

1. About ME
2. Syllabus
3. FinTech
4. Stat, ML, and AI
5. More



# Financial Technology (FinTech)

- The convergence of financial services and modern technology
- Brussel effects
  - Data protection and privacy
- Basel III Accords
  - Financial Market Risk
  - Credit Risk
  - Innertal models
- ESG
  - Environmental
  - Social
  - Governance



Wiki: The Berlaymont building in Brussels, the headquarters of the European Commission



# Examples

- Digitalization
  - On-line banks, mobile payments, lending
- Investments & Trading
- Regulations: RegTech/LegalTech/SupTech
- Blockchain & Cryptocurrencies: Technology behind decentralized systems and digital currencies.
- Security 2.0: facial recognition, voice recognition, or other biometric data
- Customer Service: chat bots and conversational interfaces
- Quantum computers



# Portfolio management

- Markowitz modern portfolio theory
  - ▶ Time series modeling
  - ▶ Machine learning
  - ▶ Optimization

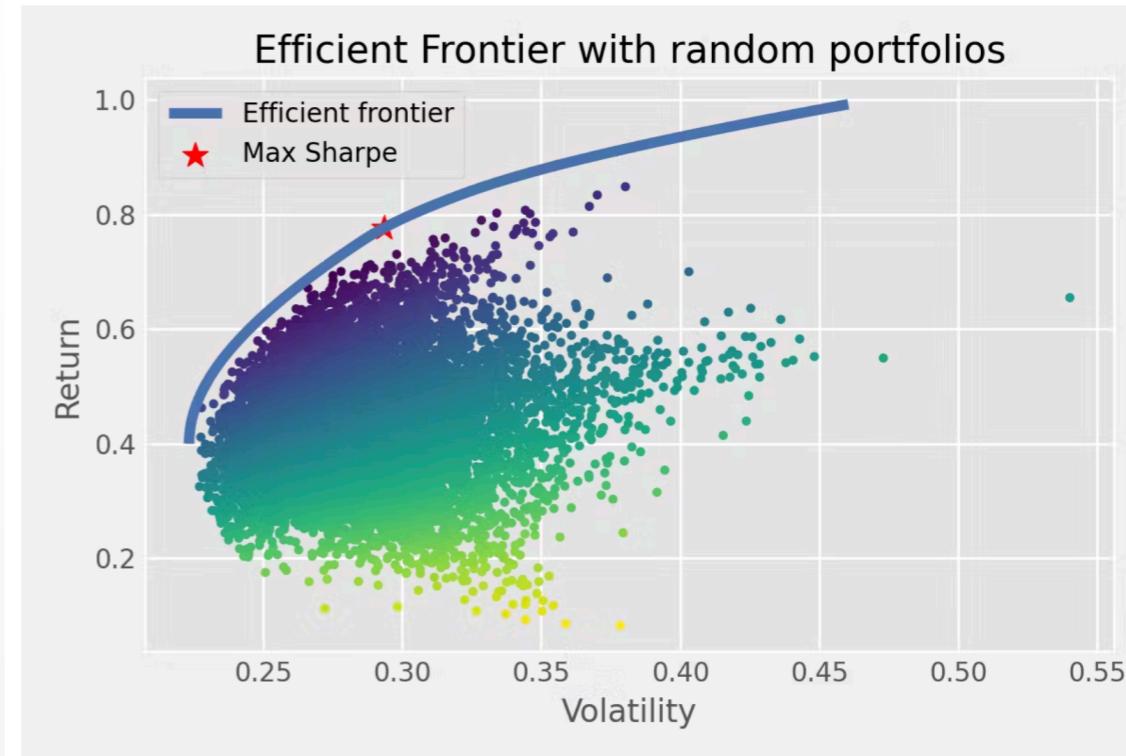
Harry Max Markowitz (born August 24, 1927) is an American economist, and a recipient of the 1989 John von Neumann Theory Prize and the 1990 Nobel Memorial Prize in Economic Sciences. Source: Wiki



A good portfolio is more than a long list of good stocks and bonds. It is a balanced whole, providing the investor with protections and opportunities with respect to a wide range of contingencies.

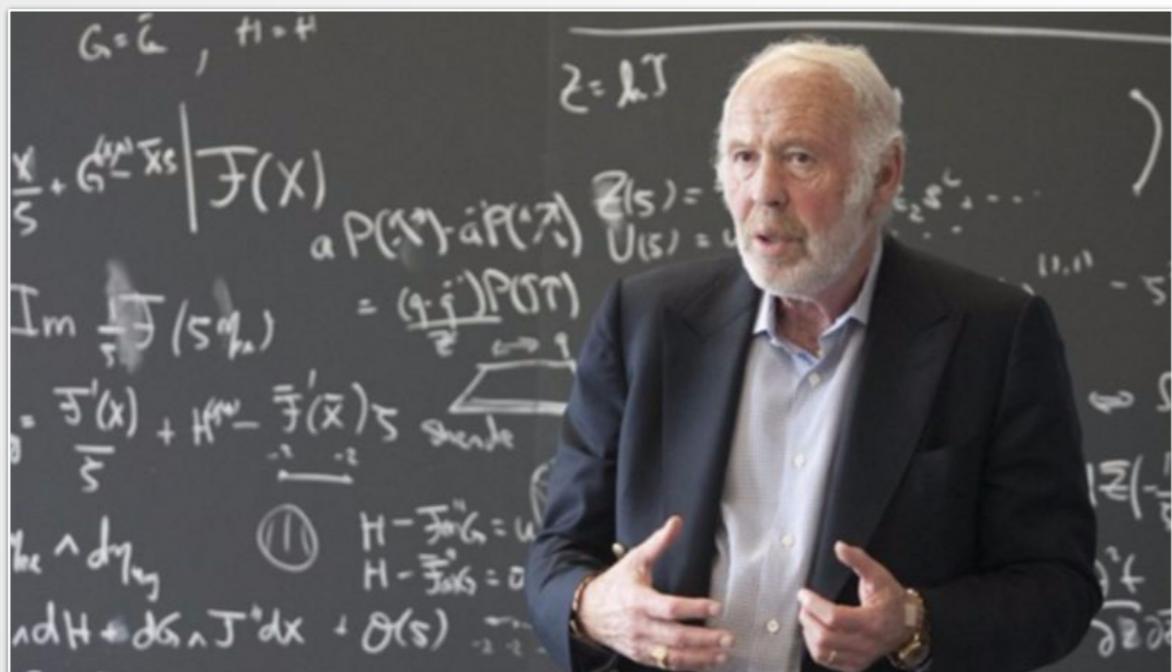
— Harry Markowitz —

AZ QUOTES

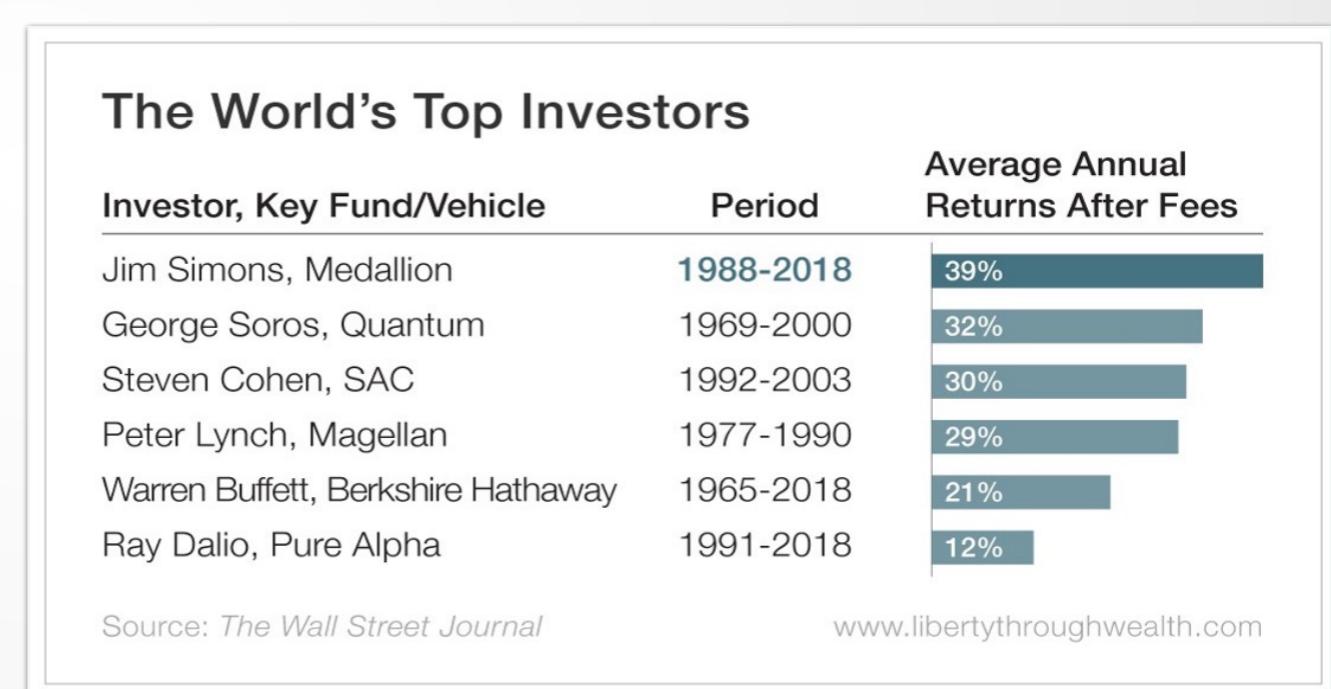


# Algorithmic trading

- Statistical arbitrage, high-frequency trading (Putra and Kosala, 2011), with convolutional neural network (Borovykh et al., 2018), reinforcement learning



James Simons (1938 - 2024, aged 86)



# FinTech in TW around 2020

- 根據《遠見雜誌》的市調顯示，企業端對於FinTech的最新動向如下所示：

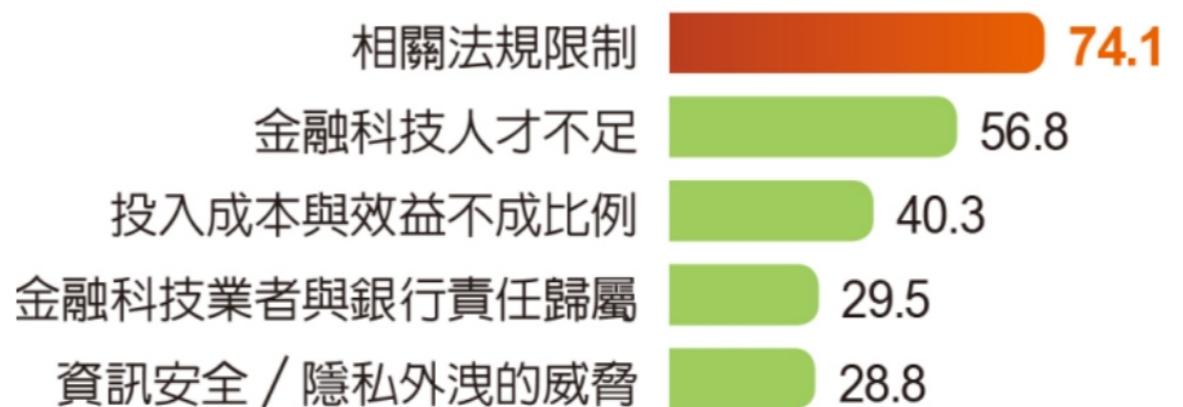
## 技術面：資安和洗錢防制、AI大數據投入最多資源

問：貴公司發展金融科技，在「技術面」目前投入最多資源的是？  
(複選，至多3項，%)



## 三大絆腳石：法規、人才、投資效益

問：因應金融科技發展，貴司目前面臨最大挑戰是哪些？  
(複選，至多5項，%)



# FinTech, RegTech, LegalTech, SupTech

Abb	Name	Chinese	Applications
FinTech	Financial Technology	金融科技	金融、金流相關: 最大統稱
RegTech	Regulation Technology	法遵科技	有合規需求的產業: 提供金融機構 監管合規技術支持
LegalTech	Legal Technology	法律科技	鑑定辨識需求的產業: 以科技輔助法律諮詢單位分析與 決策法規議題
SupTech	Supervisory Technology	監管科技	監理單位: 提供官方監管部門科技協助

監理科技與法遵科技

最新發展趨勢之探討

召集人：黃素惇  
研究人員：陳慧蓉、簡易賜、陳泰華  
周儒、吳宓穎、許佳雯  
林佳穎

 臺灣集中保管清算所  
TDCC Taiwan Depository & Clearing Corporation

中華民國 109 年 12 月

[https://m.tdcc.com.tw/TDCCWEB/upload/  
402897967d841dba017e3226bd08006c.pdf](https://m.tdcc.com.tw/TDCCWEB/upload/402897967d841dba017e3226bd08006c.pdf)



## 兆豐銀紐約分行裁罰案件2016

- 2016/08/19 遭紐約州金融服務署 (DFS, New York Department of financial service) 處以台灣金融史上最高罰款1.8億美元，並在10日內引入DFS指定的法律遵循顧問
- 內控不佳，兆豐紐約的首席法規遵循官不懂美國法律。在洗錢防治上，也沒有一套實地查核、加強查核的規則，甚至針對政治敏感人士的審查制度都沒有
- 與巴拿馬分行間有疑似洗錢的可疑匯款，卻未依洗錢防制申報
- 對客戶的實地查核，執行不切實
- 風控政策不明
- 稽核季報未依規定，送回總行
- 漠視金檢報告，不回應。
- 報告兩次寫到，兆豐甚至有些文件沒有翻成英文



## 遠雄人壽裁罰案件2018

- 2018金管會發現遠雄人壽違反保險法及洗錢防制法規定，於2010年合計裁罰350萬元
- 未通盤檢討法遵制度
- 假投保真理財:保單受益人均為法人、實屬理財行為，依違反保險法規定裁罰60萬元
- 辦理法人保戶的實質受益人辨識作業時，未採取合理驗證措施，依違反洗錢防制法規定裁罰50萬元



# 國泰世華銀行彈力貸：加深你的口袋

The banner features the bank's logo at the top left. The main headline reads "彈力貸 加深你的口袋" (Revolving Loan, Deepen Your Purse). Below it, a sub-headline says "CUBE App一鍵申辦 減輕負擔" (Apply via CUBE App, Reduce Burden). Two buttons are present: "口袋加深GO >" and "專人諮詢GO >". To the right is a smiling man holding a smartphone displaying the app interface. The bottom section contains a heading "你也遇到這些問題嗎？" (Have you encountered these problems too?) followed by a grid of eight small cards, each with a circular profile picture and a question. The cards are arranged in two columns of four. The questions are:

- [寶寶] 該從私托轉公托嗎？
- #討論 婚前買房？婚後買房？
- 第二胎要？不要？
- [猶豫] 業界磨練VS待業進修
- 繼續工作or進修選擇
- [請益] 28歲碩士還能出國進修嗎？
- 要繼續創業還是找工作？
- 小朋友上幼稚園的選擇？

At the bottom, a summary statement reads "這些問題都是資金問題 交由彈力貸為你解決" (These issues are all funding issues, handled by the Revolving Loan for you).

[https://www.cathaybk.com.tw/cathaybk/promo/event/loan/product/revolving/index.html?CUB\\_SRC=GOOGLE&CUB\\_CHL1=URL&CUB\\_CHL2=01&MA\\_TK=DB248&CUB\\_DT=20191201&utm\\_source=google&utm\\_medium=KW\\_extension3&utm\\_campaign=20Q1\\_revolving&utm\\_content=1&utm\\_term=1&gclid=Cj0KCQiA-eeMBhCpARIsAAZfxZDrg\\_HRMirKlp7594U4YHhtGBCybYXbYj2WWHzl60BG3HXt\\_1x660aApWCEALw\\_wcb](https://www.cathaybk.com.tw/cathaybk/promo/event/loan/product/revolving/index.html?CUB_SRC=GOOGLE&CUB_CHL1=URL&CUB_CHL2=01&MA_TK=DB248&CUB_DT=20191201&utm_source=google&utm_medium=KW_extension3&utm_campaign=20Q1_revolving&utm_content=1&utm_term=1&gclid=Cj0KCQiA-eeMBhCpARIsAAZfxZDrg_HRMirKlp7594U4YHhtGBCybYXbYj2WWHzl60BG3HXt_1x660aApWCEALw_wcb)



# 玉山人工智慧公開挑戰賽2019秋季賽

The screenshot shows the T-Brain AI Competition platform interface. At the top, there is a navigation bar with links to Home, Competitions, Discussion, Datasets, Success Story, and Sign In. A message box contains text about the competition period and score updates. The main title of the competition is displayed prominently. Below the title, there is a button labeled '已結束' (Completed). At the bottom of the main section, there are links for Overview, Leaderboard, and Download Dataset.

## 競賽說明

一卡在手，妙用無窮！

在台灣，20歲以上持有信用卡人數超過六成。因信用卡具備高回饋、延遲付款以及付款便利等特性，使得信用卡成為人們支付時不可或缺的工具。不過隨著科技的日新月異，不肖分子也針對此支付模式衍生出新的犯罪手法，即「信用卡盜刷」。

面對盜刷，一般民眾除了可以透過經常對帳、防止卡片資訊外洩等方式來避免外，國內外銀行及發卡組織近年也開始運用機器學習演算法找出潛在的盜刷交易，並及早因應。然而，盜刷的樣態千百種，到底什麼才是足以判斷為盜刷的關鍵因子呢？

本次競賽提供去識別信用卡交易授權資料，希望大家集思廣益，一同「反盜刷」！不僅捍衛自己的資產，守護身邊親友的財富，更有機會獲得高額獎金！

本次競賽共包含兩場獨立賽事，分別為「線上對決-模型準度爭霸戰」與「正面交鋒-創意做法擂台戰」。「線上對決-模型準度爭霸戰」為2019/09/06 – 2019/11/22於T-Brain平台上傳預測結果的競賽，將以預測準確度為排名依據，爭取最高12萬元的獎金；「正面交鋒-創意做法擂台戰」將於頒獎

## 優勝者



AlphaCard  
0.771

[Leaderboard](#)

<https://tbrain.trendmicro.com.tw/Competitions/Details/10>



# 玉山人工智慧公開挑戰賽2021冬季賽

The screenshot shows the TBrain AI Competition platform interface. At the top, there is a navigation bar with links to Home, Competitions, Discussion, Datasets, Success Story, and Sign In. A message box displays a note from 2021/11/01 stating: "調整訓練資料集壓縮方式，資料內容不變。" Below the navigation, the main title of the competition is "玉山人工智慧公開挑戰賽2021冬季賽 - 信用卡消費類別推薦". A red button indicates the competition has ended. At the bottom of the main content area, there are three navigation links: Overview, Leaderboard, and Download Dataset.

## 競賽說明

【聰明消費來預3－信用卡消費類別推薦】

你知道嗎，全台灣信用卡流通量竟然遠遠勝過全國總人口，高達5100多萬張！  
而將近每三個人就有一張玉山信用卡！

在台灣，多數人都有用信用卡消費的經驗，  
銀行也推出各式各樣的行銷活動，期望吸引消費者使用該銀行信用卡，  
但！這些行銷真的都是用戶想要的嗎？過多的行銷內容不會打擾顧客嗎？

玉山現正發出英雄帖！我們要找尋能夠預測未來的你！  
本次競賽我們將提供參賽者去識別化後的信用卡消費資料及基本屬性資料，  
只要你能透過機器學習，精準預測顧客最感興趣的三大消費類別排序，  
讓行銷活動更貼近顧客的心，就有機會獲得高額獎金！

你還在等什麼？別再觀望了！  
玉山人工智慧公開挑戰賽2021冬季賽，立刻手刀報名來挑戰！

競賽進行方式如下：



<https://tbrain.trendmicro.com.tw/Competitions/Details/18>



# Kaggle: G-Research Crypto Forecasting

The screenshot shows the main landing page of the competition. At the top left is a 'Featured Code Competition' badge with a trophy icon. The title 'G-Research Crypto Forecasting' is prominently displayed in large white text. Below it is a subtitle: 'Use your ML expertise to predict real crypto market data'. A small logo for 'G-RESEARCH' is followed by the text 'G-Research · 1,946 teams · a year ago'. The navigation bar below includes links for Overview (which is underlined), Data, Code, Models, Discussion, Leaderboard, and Rules.

## Overview

**Start**  
Nov 3, 2021

**Close**  
May 4, 2022

Merger & Entry

## Description

<https://www.kaggle.com/competitions/g-research-crypto-forecasting>



# Kaggle: Credit card fraud detection



## Credit Card Fraud Detection

Machine Learning Group - ULB · Updated 6 years ago  
Usability 8.5 · 1 File (CSV) · 69 MB



## Credit Card Fraud Detection

Mishra5001 · Updated 4 years ago  
Usability 8.8 · 3 Files (CSV) · 118 MB



## Credit Card Transactions Fraud Detection Dataset

Kartik Shenoy · Updated 3 years ago  
Usability 8.5 · 2 Files (CSV) · 212 MB



## Credit Card Fraud Detection Dataset 2023

Nidula Elgiriwyethana · Updated 25 days ago  
Usability 10.0 · 1 File (CSV) · 150 MB



## Fraud Detection - Credit Card

Yashpal · Updated a year ago  
Usability 8.8 · 1 File (CSV) · 46 MB



## Credit Card Fraud Detection

shayan naveed · Updated 4 years ago  
Usability 8.8 · 1 File (CSV) · 69 MB

<https://www.kaggle.com/datasets/mlg-ulb/creditcardfraud>



# 永豐金AI GO 競賽 2023

PJ! 「永豐AI GO競賽」於即日起至10月31日開放報名，大專院校以上及碩博士生 與業界人士皆可報名參加。本次競賽主題「攻房戰-不動產估價現值預測」，期望藉由人工智慧技術的應用，透過影響房價高低的關鍵因素，包括坪數大小、屋齡屋況、地段環境及居住條件等，為每一筆房產找出最適的價值。競賽冠軍隊伍可獲得新臺幣20萬元獎金，佳獎以上之參賽隊伍另提供永豐金控與子公司銀行的實習機會，參賽者可透過競賽過程累積寶貴的學習經歷，並為履歷加分。

## 永豐金「永豐AI GO競賽」即日起開放報名

競賽主題「攻房戰-不動產估價現值預測」 冠軍可獲新臺幣20萬元獎金

文/ 廠商新聞稿 | 2023-09-22 發表

讚 0

分享



<https://www.ithome.com.tw/pr/158877>



# 台灣企銀放膽做夢想像可能 2023



<https://tbb-fintech.bhuntr.com/tw/er7vc7fm9n5pk5v2jk/home/>



# 大專院校資訊應用服務創新競賽 2023



**AI 金融科技協會**  
8月17日 ·

《總獎金高達10萬元，輕鬆參賽，容易得獎》！！！

還可晉級參賽12月【2023AI金融科技創新創意競賽】第三屆總獎金超過前兩屆，快快報名，晉搭上最夯「AI金融科技行業」列車！

【AI金融科技協會】參與協辦「ADI數位產業署」《第28屆大專院校資訊應用服務創新競賽\_AI金融科技應用》。

【2023 資訊應用服務創新競賽 | 10/5 (四)  
17 : 00 截止報名！】

第28屆大專院校資訊應用服務創新競賽在8月1日開放線上報名！

➡ 資訊應用服務創新競賽\_\_AI金融科技應用組  
(AI FinTech)

金融科技如火如荼發展，金融結合科技應用蔚為

[https://www.facebook.com/photo.php?fbid=679419294206896&set=a.456685016480326&type=3&eid=ARBoUIQX7sm1VE6eUMAUplBx5\\_KQ\\_oaugdo8CM1O9O0bx2Nfro2F2ytJ2kQcwpqNFkehnQsT8Zspk6m&paipv=0&eav=AfYGMpLdMUYcXhJrEpUajKsHfH6sqhBeM\\_BwxnCuiTfDfBuylT9sT5G1ODdR9l86ZGk&rdr](https://www.facebook.com/photo.php?fbid=679419294206896&set=a.456685016480326&type=3&eid=ARBoUIQX7sm1VE6eUMAUplBx5_KQ_oaugdo8CM1O9O0bx2Nfro2F2ytJ2kQcwpqNFkehnQsT8Zspk6m&paipv=0&eav=AfYGMpLdMUYcXhJrEpUajKsHfH6sqhBeM_BwxnCuiTfDfBuylT9sT5G1ODdR9l86ZGk&rdr)



# 第二屆法國巴黎人壽校園黑客松2024



BNP PARIBAS CARDIF  
法國巴黎人壽

Cardif InsurHack

## 第二屆 法國巴黎人壽 校園黑客松 商業競賽

# 生成式AI於保險銷售及服務流程的運用  
# 創新型態的保險商品或服務

2024 徵件時間 08.15 → 10.31

隨著科技的迅猛發展，生成式人工智慧(AI)技術逐漸成為各行各業創新與變革的核心推動力，保險業也不例外，在這樣的時代背景下，如何運用AI技術來提升保險服務的效率和品質，並設計出更加符合市場需求的創新型態保險商品，成為業界的重要課題。

法國巴黎人壽深知創新是推動行業前進的關鍵，特此舉辦「Cardif InsurHack 第二屆法國巴黎人壽校園黑客松商業競賽」，旨在激發大專院校學生的創意潛力，探討AI技術在保險規劃、銷售及服務流程中的應用，並發掘出最具創意的保險創新方案。

本競賽不僅是對學生創意與專業知識的一次考驗，更是一次推動產學合作、促進保險業務模式革新的契機。我們期待通過此次競賽，能夠挖掘出更多新穎的保險產品和服務方案，提升保險行業的競爭力和服務水平，並成為最貼近新世代保險需求的人壽保險服務。

競賽簡介：

- 報名時間2024年8月15日(四)12:00起至2024年10月31日(四)17:00止。
- 本競賽限全台大專院校大一至碩二學生可參加。

### 活動獎項：

金獎1組	新台幣:60,000元
銀獎1組	新台幣:40,000元
銅獎1組	新台幣:30,000元
佳作2組	新台幣:10,000元



# Is AI just glorified statistics? Is AI just statistics with coding?

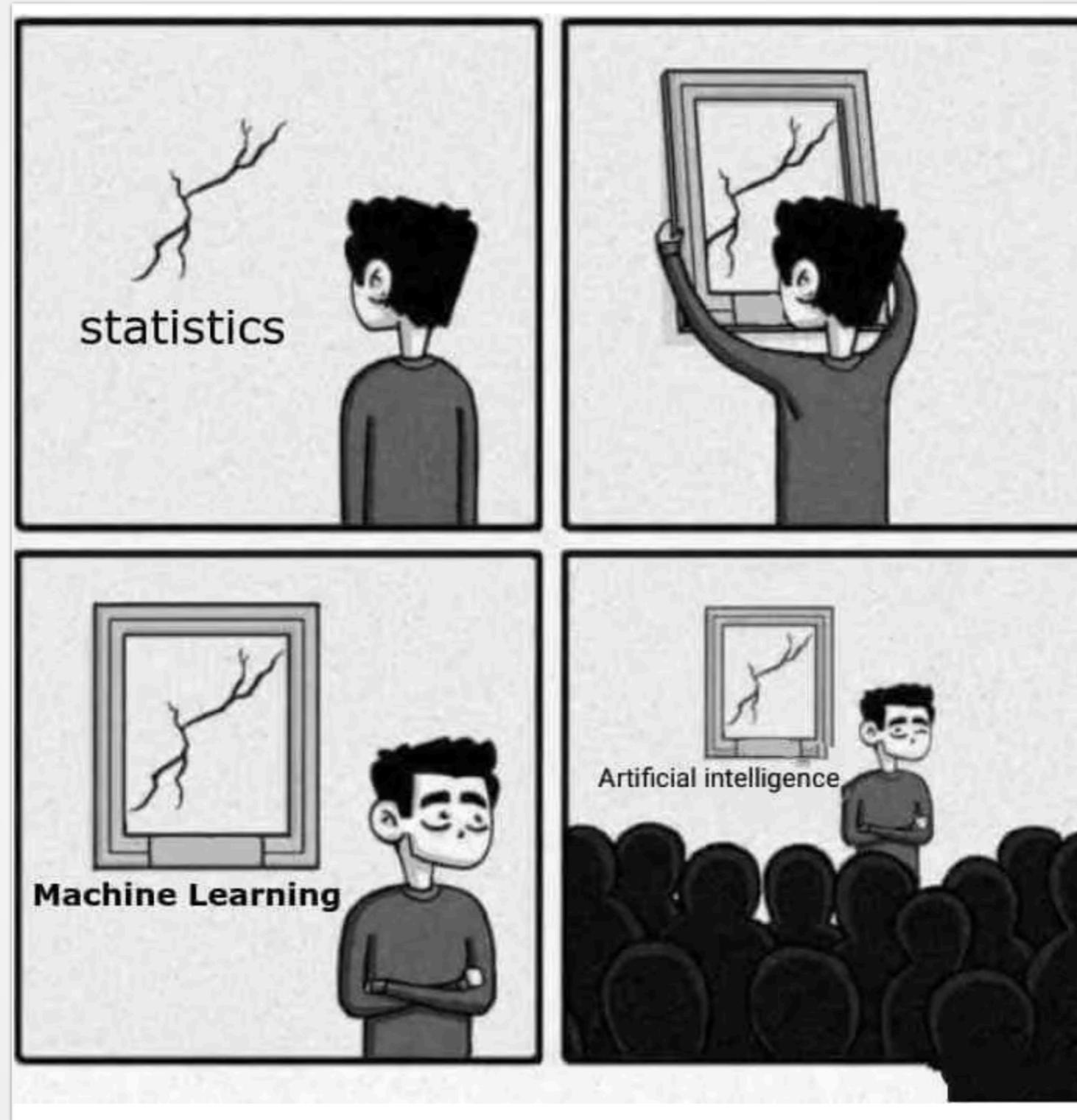


Aug 10-12, 2018, the World Science and Technology Innovation Forum

【手機中國新聞】近日，2011年諾貝爾經濟學獎獲得者Thomas J. Sargent在世界科技創新論壇表示：「人工智慧首先是一些很華麗的辭藻。人工智慧其實就是統計學，只不過用了一個很華麗的辭藻。」



**"When you're fundraising, it's AI. When you're hiring, it's ML. When you're implementing, it's logistic regression."**



<https://towardsdatascience.com/no-machine-learning-is-not-just-glorified-statistics-26d3952234e3>



# Andrew Ng: Opportunities in AI (2023)



DeepLearning.AI Stanford ONLINE

Opportunities in AI

by Andrew Ng

[MUSIC PLAYING]

0:01 / 36:54 • Introduction >

Andrew Ng: Opportunities in AI - 2023

Stanford Online

44.6 萬位訂閱者

觀看次數：65萬次 2 週前

This discussion took place on July 26, 2023, at Cemex Auditorium, Stanford University, and was hosted by the Stanford Graduate School of Business.

This talk covers: ...更多內容

AI is a collection of tools

AI

Supervised learning

Generative AI

Unsupervised learning

If you're familiar with AI, you may have heard of other tools.

Stanford

Stanford University logo

2:03 / 36:54 • Technology landscape >

[https://youtu.be/5p248yoa3oE?si=sa54b4NTwd\\_CGvfk](https://youtu.be/5p248yoa3oE?si=sa54b4NTwd_CGvfk)



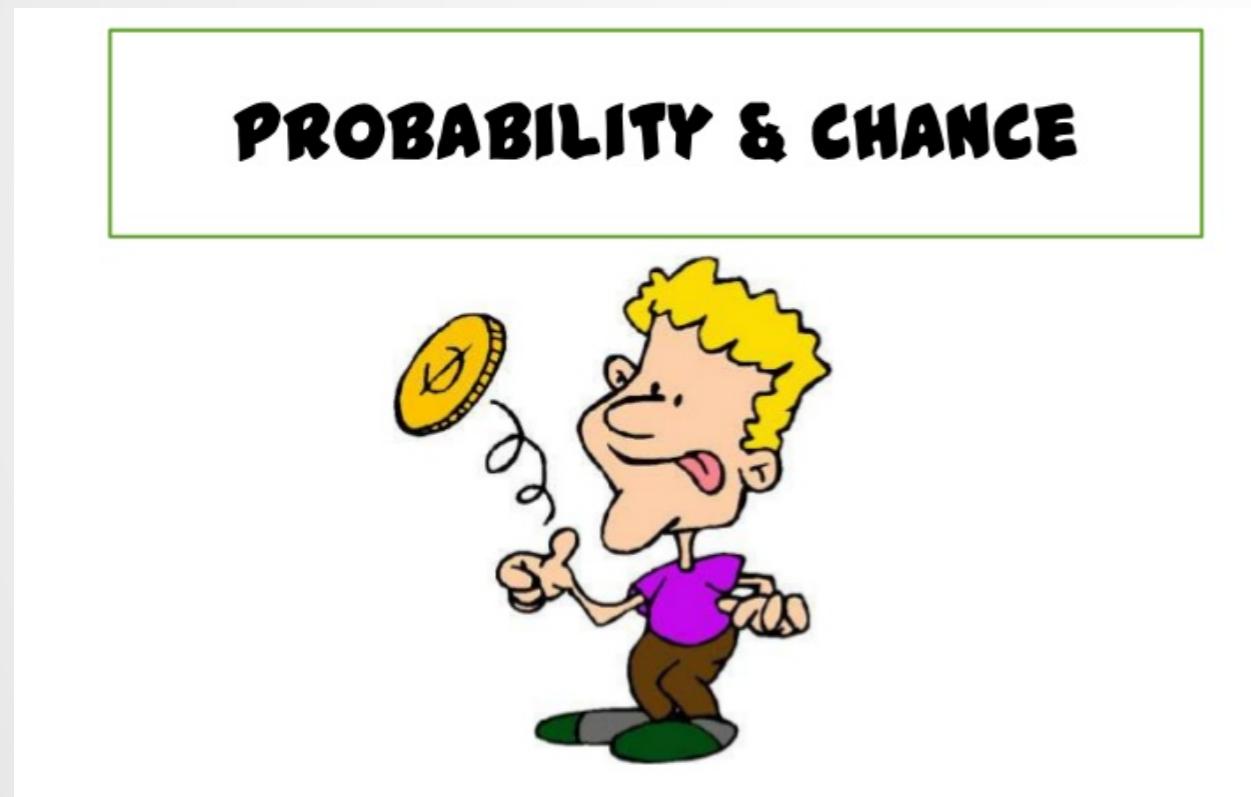
# Machine Learning versus Statistics

	Machine Learning	Statistical methods
Field	Computer Science	Mathematics
Method	General methodology	Probability models
Focus	Prediction accuracy	Model interpretability (including prediction accuracy)



# Statistics & probability

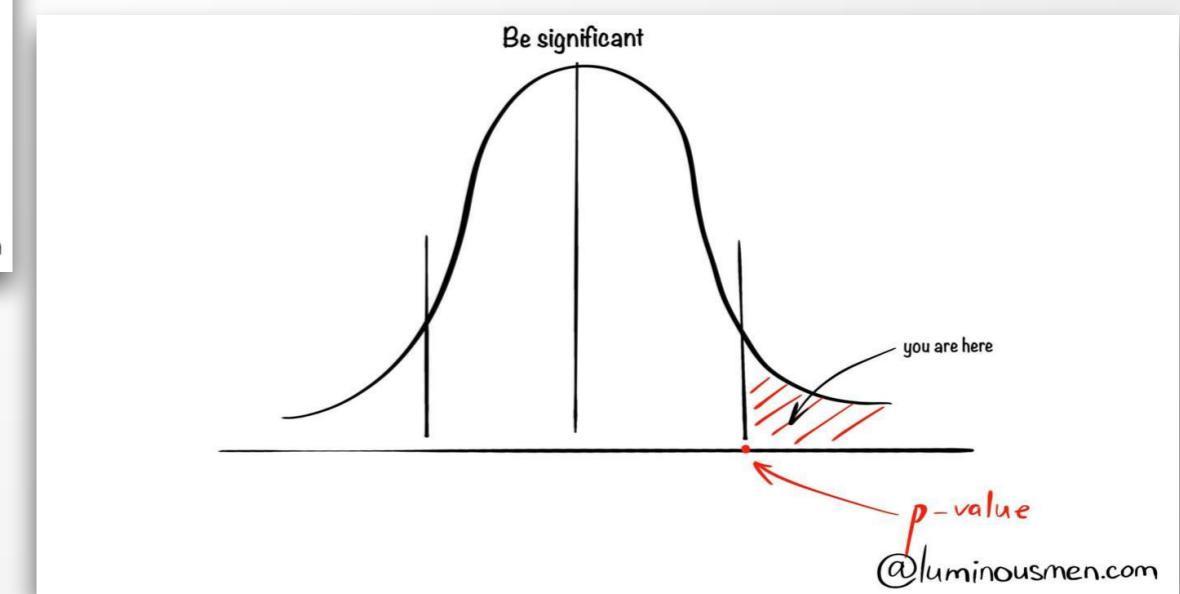
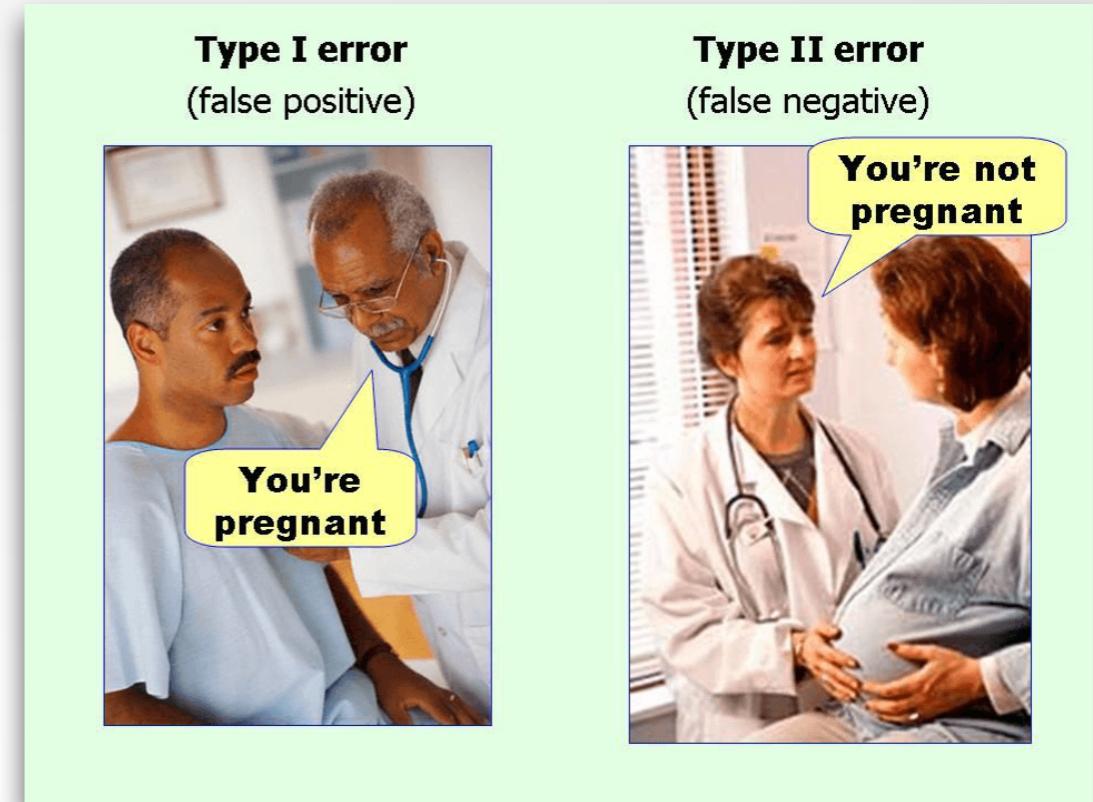
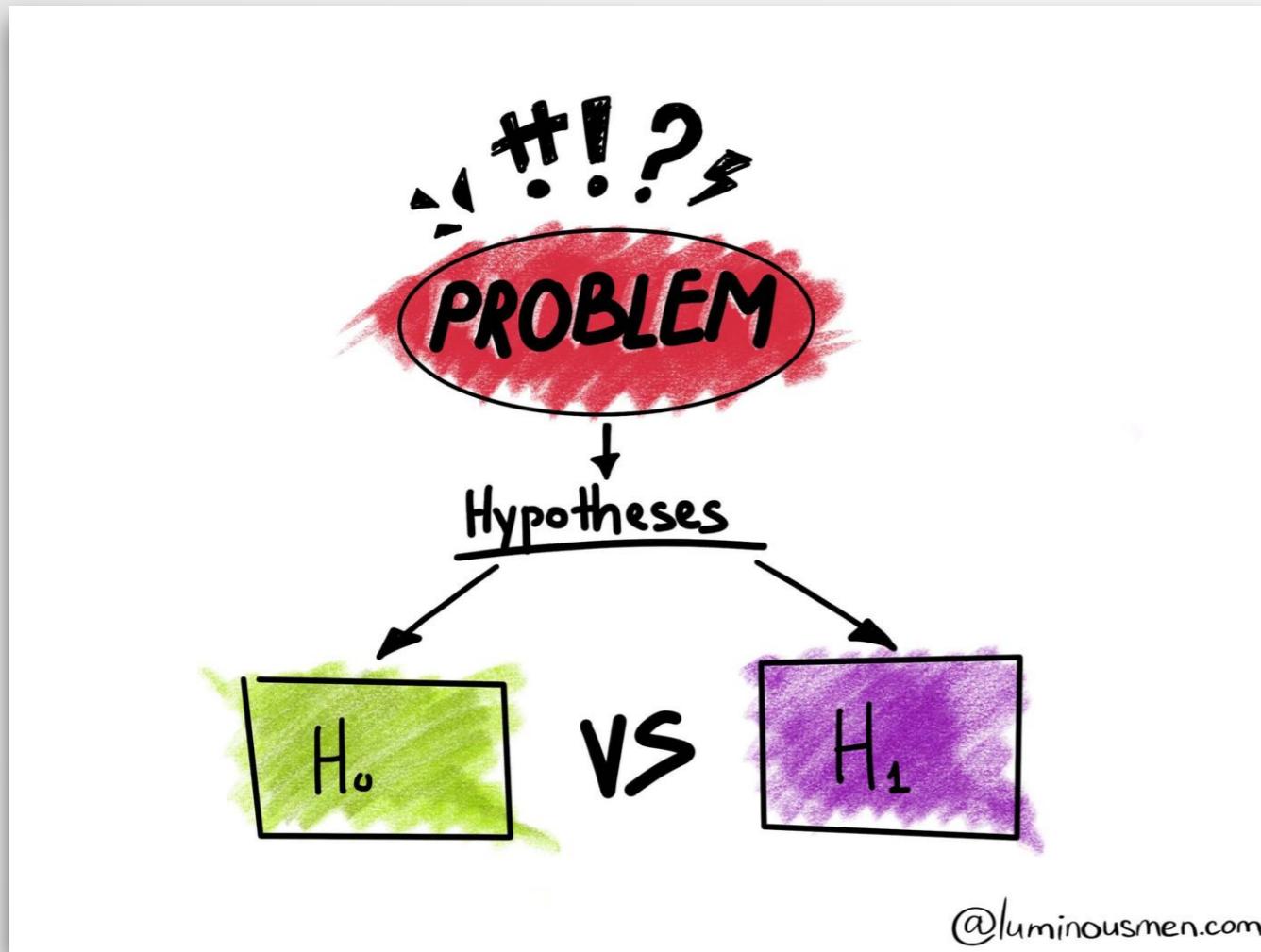
- Statistics originates from probability:
  - ▶ Probabiltiy = Proportion of event + Repeated Sampling



<https://www.slideshare.net/cbsroscommon/probability-chance>



# Hypothesis Testing



<https://luminousmen.com/post/demystifying-hypothesis-testing>



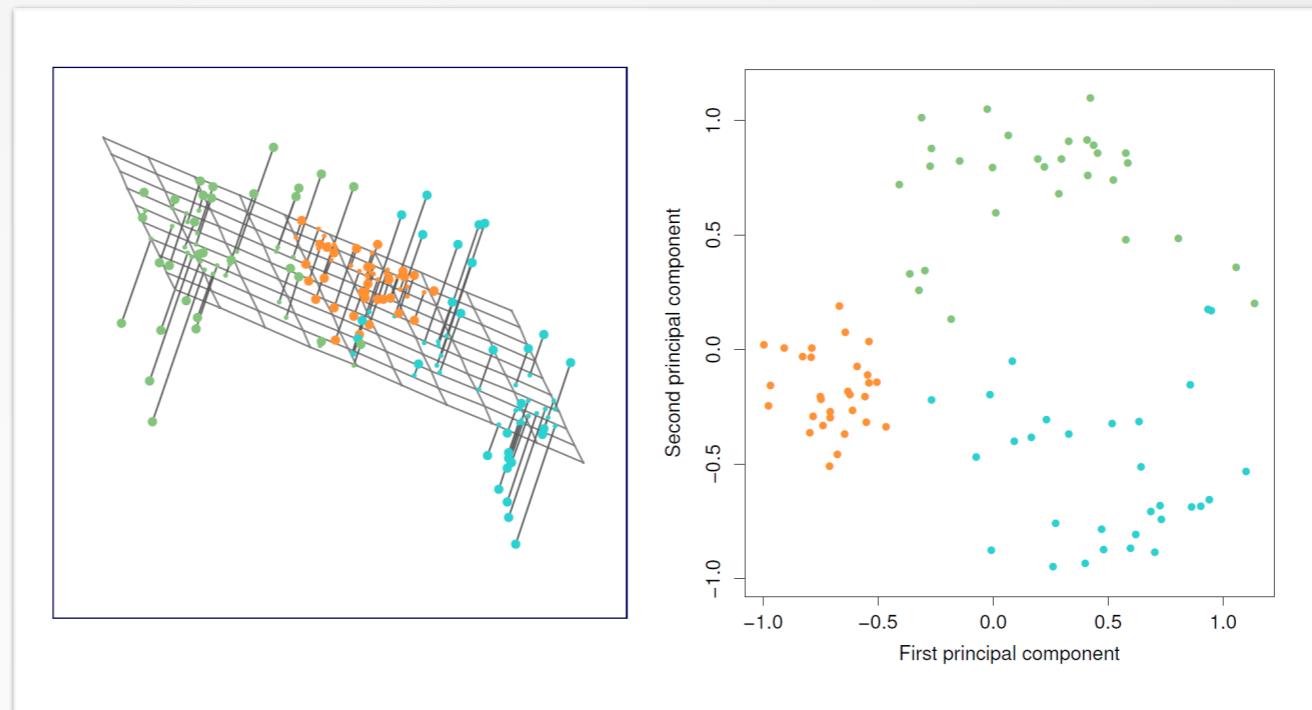
# Machine learning: Constrained optimization problems!

- Supervised learning
  - ▶ Regression
  - ▶ Classification
- Unsupervised learning
  - ▶ Clustering: K-means clustering, hierarchical tree clustering
  - ▶ Dimension reduction: principle component analysis, tSNet, UMap
- Others
  - ▶ Reinforcement learning
  - ▶ Generative learning
  - ▶ Semi-supervised, active learning, Natural language processing

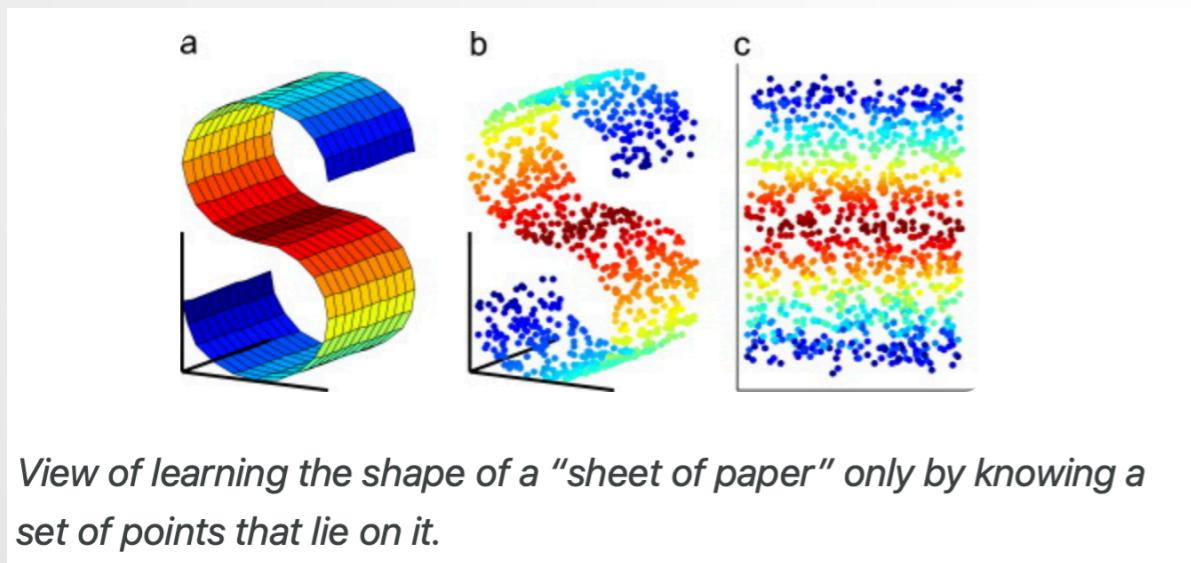


# Dimension Reduction

PCA



Umap



<https://www.jkobject.com/blog/umap-explanation/>

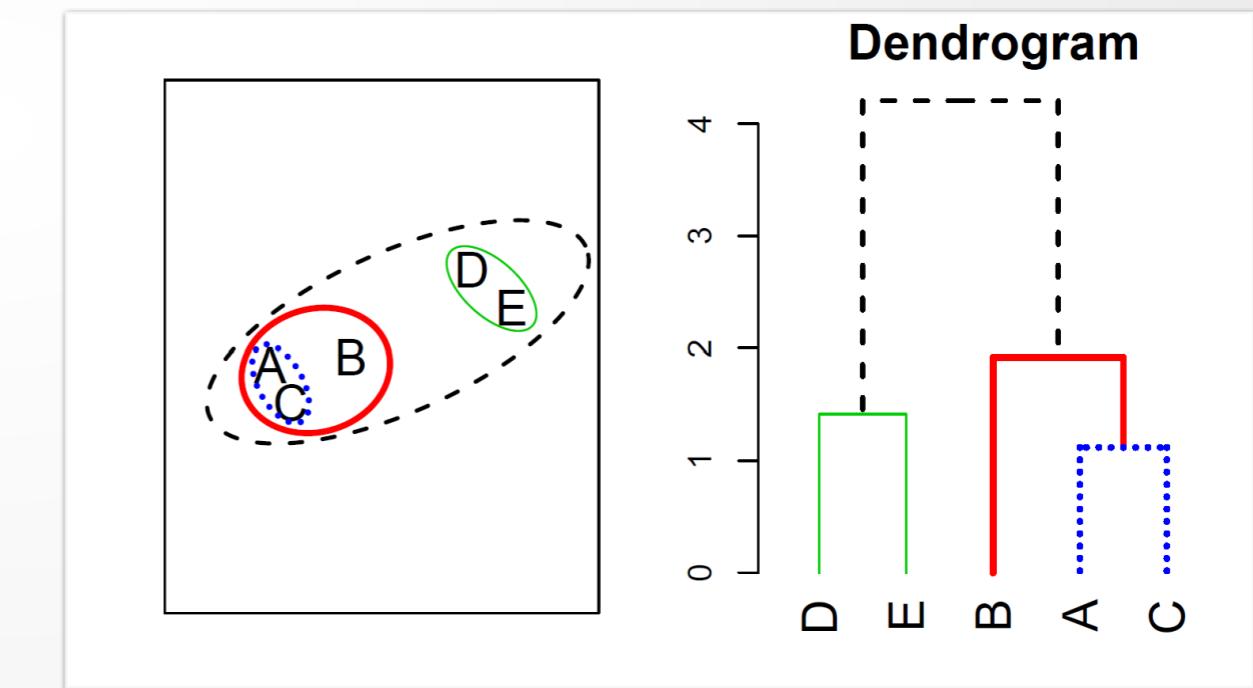


# Clustering

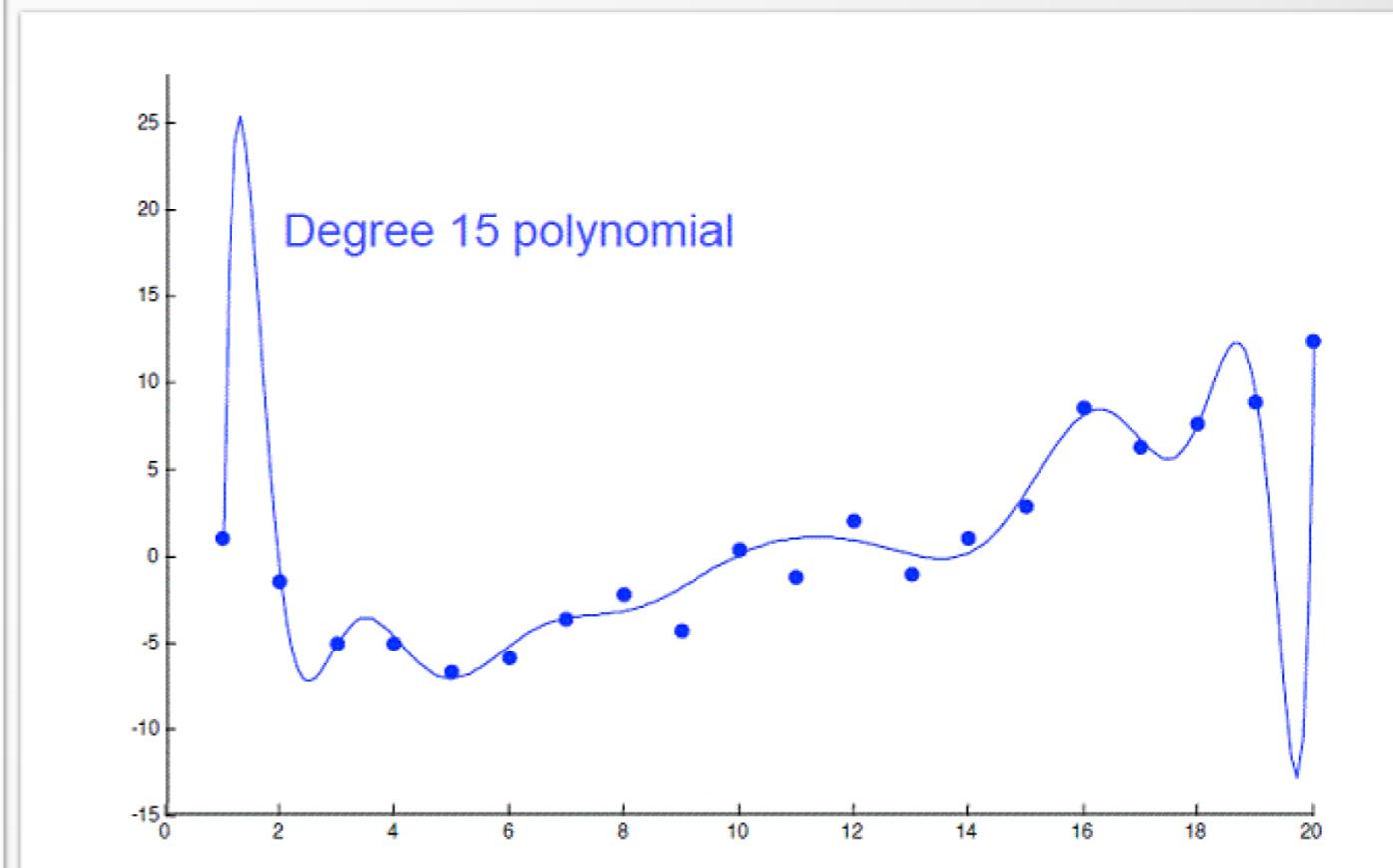
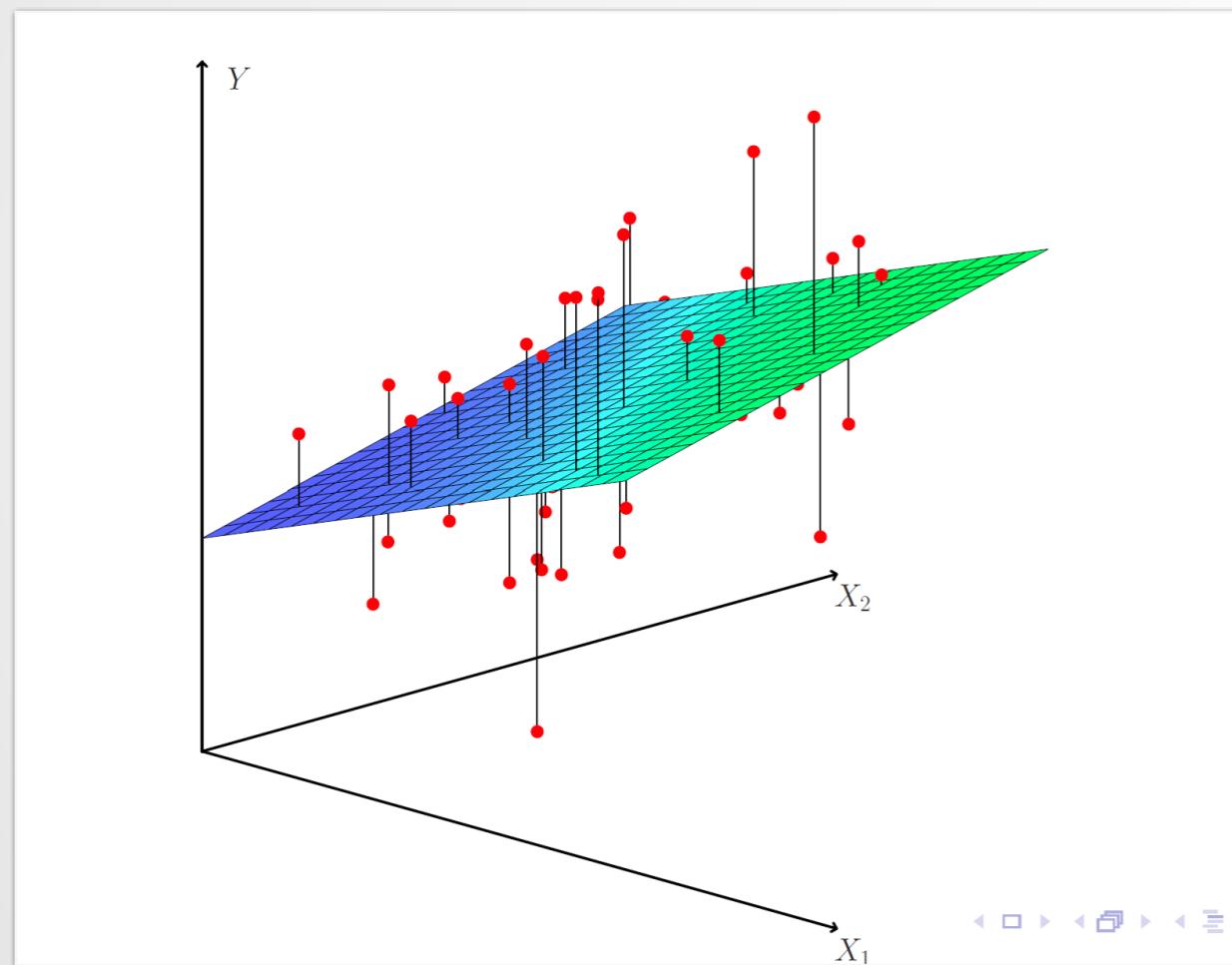
## K-Means clustering



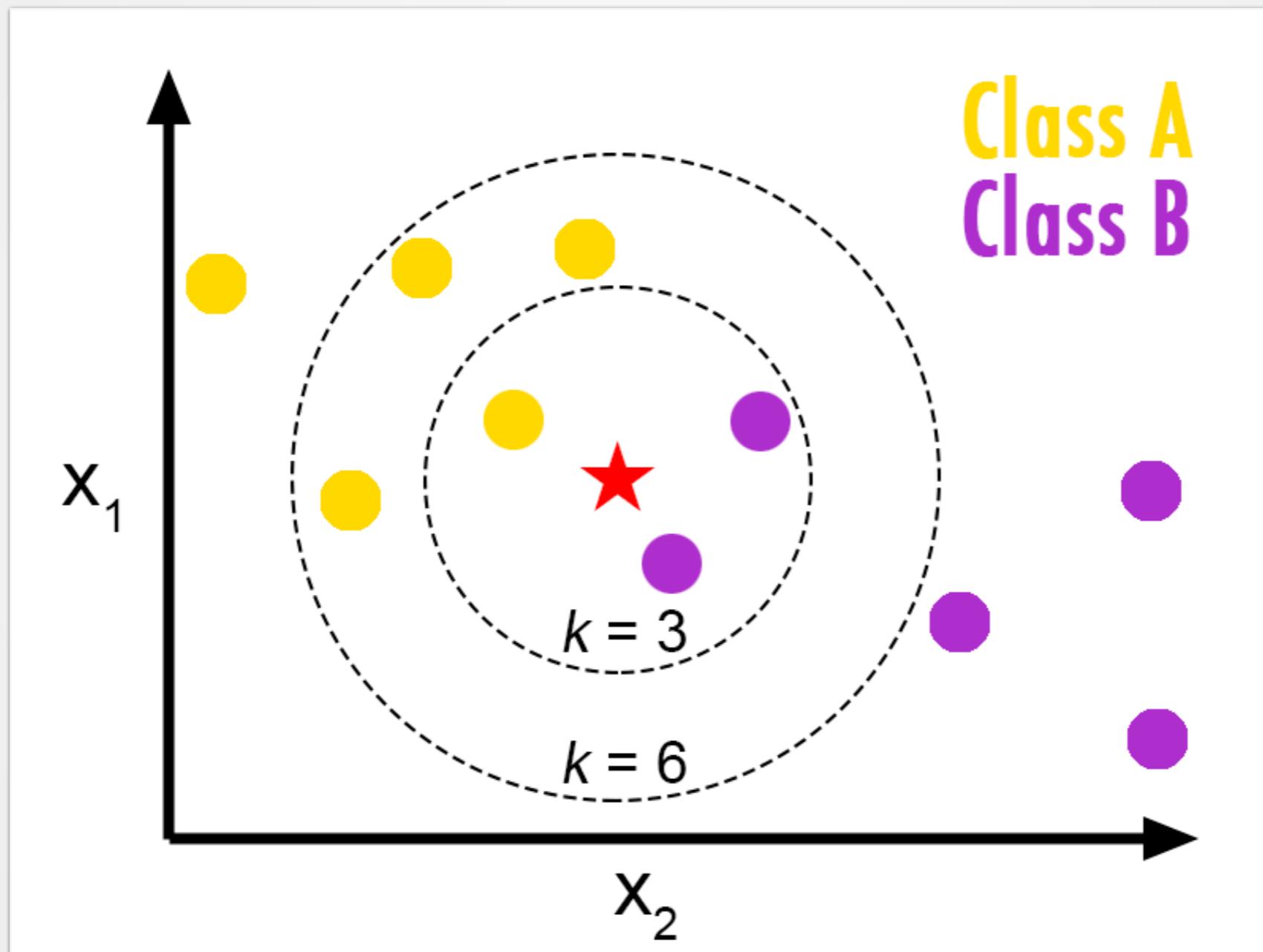
## Hierarchical Clustering



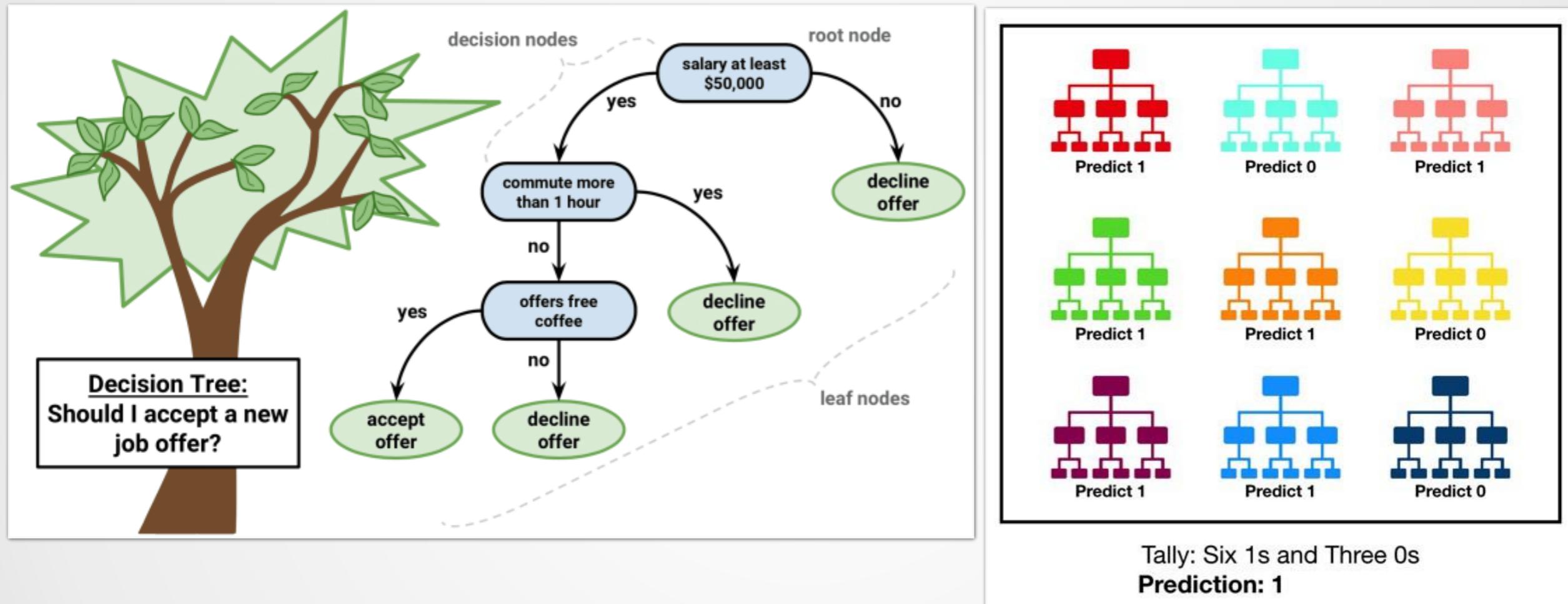
# Regression



# KNN

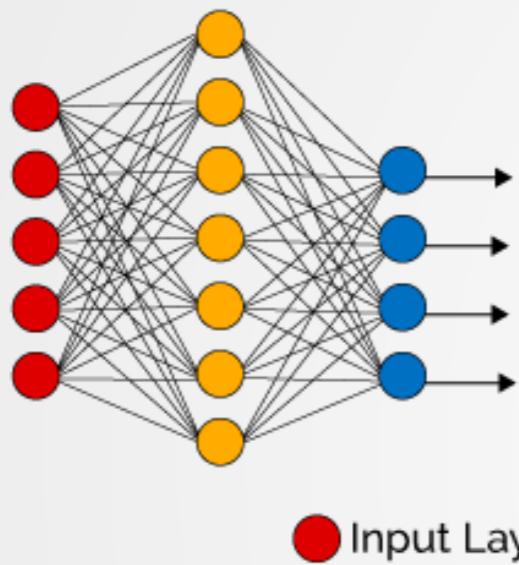


# Decision trees

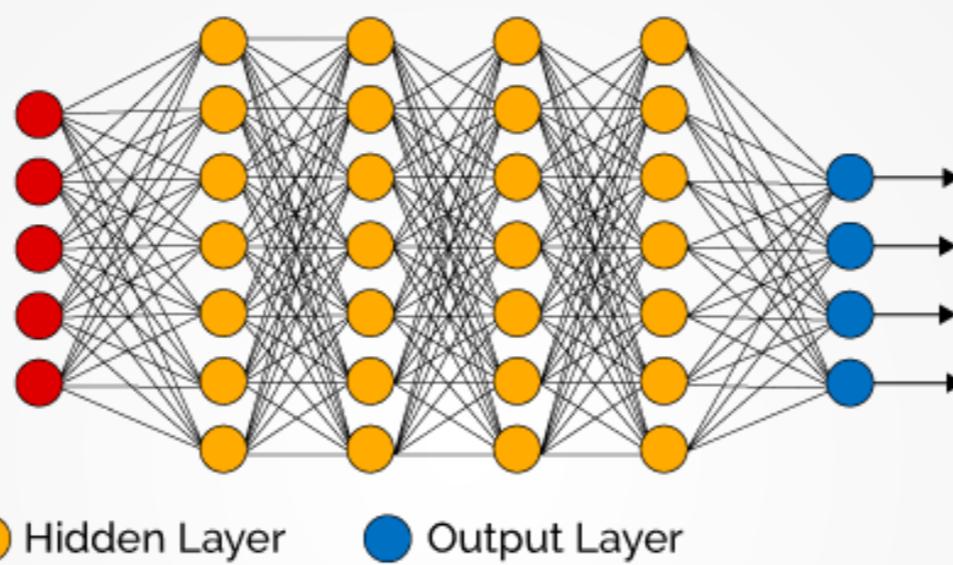


# Neural network

**Simple Neural Network**



**Deep Learning Neural Network**



● Input Layer

● Hidden Layer

● Output Layer

$$\begin{aligned}
 Z^{(1)} &= f^{(0)} \left( W^{(0)} X + b^{(0)} \right) \\
 Z^{(2)} &= f^{(1)} \left( W^{(1)} Z^{(1)} + b^{(1)} \right) \\
 Z^{(3)} &= f^{(2)} \left( W^{(2)} Z^{(2)} + b^{(2)} \right) \\
 &\vdots \\
 Z^{(l)} &= f^{(l-1)} \left( W^{(l-1)} Z^{(l-1)} + b^{(l-1)} \right) \\
 &\vdots \\
 Z^{(L)} &= f^{(L-1)} \left( W^{(L-1)} Z^{(L-1)} + b^{(L-1)} \right) \\
 \hat{Y} &= f^{(L)} \left( W^{(L)} Z^{(L)} + b^{(L)} \right).
 \end{aligned}$$

Generative neural networks  
Generative AI  
chatGPT, etc



# What's next?



<https://www.bnnext.com.tw/article/79613/pegatron-ai-2024>

還原童子賢在國鼎論壇專講中是這樣說的：「很幸運的，台灣是AI整個進步群的一員，我對於把台灣捧太高的說法，會覺得說，不要飄飄然就上了雲端，我們是重要的參與者之一，但是我們絕對不是一切的制定者跟決定者。」

「我只期待AI，不要最後淪為只有像代工這樣，我們是AI的中心，最後少了代工兩個字這樣子。我也希望台灣除了能夠做代工外，也能夠運用、也能夠用AI創造附加價值。」





# ML and FinTech

Huei-Wen Teng

Department of Information Management and Finance  
National Yang Ming Chiao Tung University  
<https://hackmd.io/@hwteng/HyKOPoA6d>