



深度學習在金融服務之應用

JD Chiou

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講者介紹

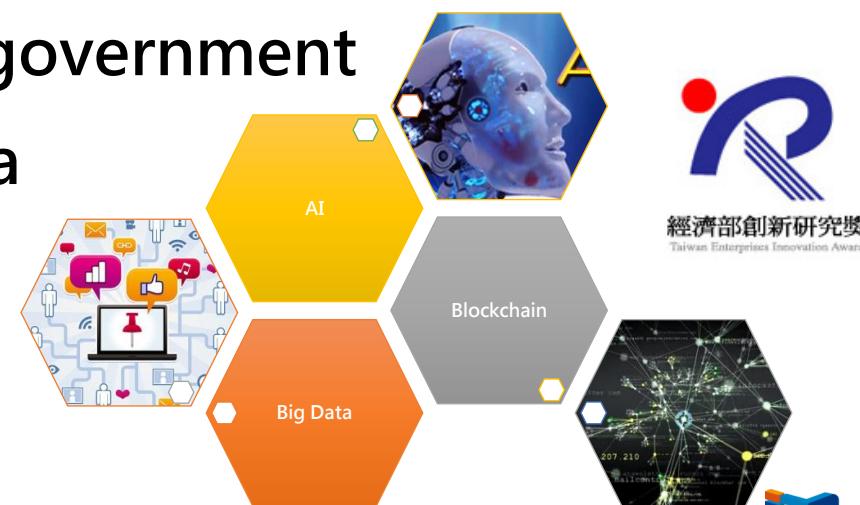


邱仁錤 JD

- 專業**：人工智能與機器人、文字探勘與大數據分析、區塊鏈與Fintech
- 學歷**：美國麻省理工學院碩士 / 博士
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- 經歷**：第16屆經濟部產業科技發展獎 -
個人成就獎之傑出青年創新獎
- 碩網團隊榮耀**：資訊月百大產品創新金賞
中小企業創新研究獎
Gartner Cool Vendors in Analytics
Microsoft Top Valuable ISV Partner

About Intumit

- Founded in 1999, a leading A.I. and big data technology company
- Gartner Cool Vendors in Analytics, Greater China, 2017
- Microsoft Top Valuable ISV Partner, 2017
- No.1 enterprise VCA brand in Taiwan
- Microsoft Teams global 150 partner
- NVIDIA Deep Learning ISV partner
- Numerous honors and awards from government
- 500+ customers in greater China area
- Over 20 patents worldwide
- CMU SEI CMMI maturity level 3



Gartner Cool Vendors in Analytics



Named by Gartner as Cool Vendors in Analytics, Greater China, 2017

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Cool Vendors in Analytics, Greater China, 2017 Published: 31 May 2017 ID: G00332902 [f](#) [t](#) [in](#) [G+](#) [e](#)

Analyst(s): Melody Chien | CK Lu | Peter Liu

Summary
With a rapidly growing digital economy and the big data this entails, analytics technologies will be at the core of China's future innovation. For CIOs in China, we highlight four vendors with disruptive technologies and solutions that are enabling organizations' digital transformation.

Table of Contents

Analysis

- What You Need to Know
- Hydata
- Intumit**
- MeritData
- Ptmind

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Being competitive requires enterprises to adapt more quickly to the...

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Source: <https://www.gartner.com/doc/3733917/cool-vendors-analytics-greater-china>

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Microsoft Top Valuable ISV Partner

Microsoft Top Valuable ISV, FY17



Microsoft Teams Global 150+ Partner



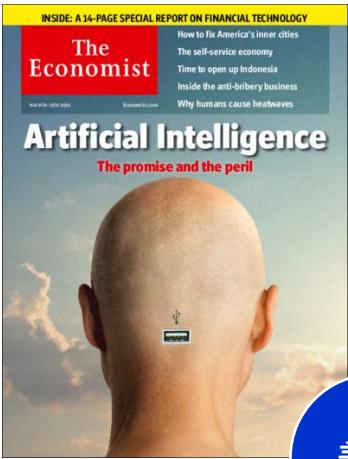
150+



Agenda

- 人工智慧的最新發展
- 人工智慧與智能機器人的技術
- 智能機器人的應用與展示
 - 智慧文字客服
 - 智慧語音客服 + 智慧迎賓
 - Amazon Echo & Google Car
- 結論

The whole world is watching AI (I)

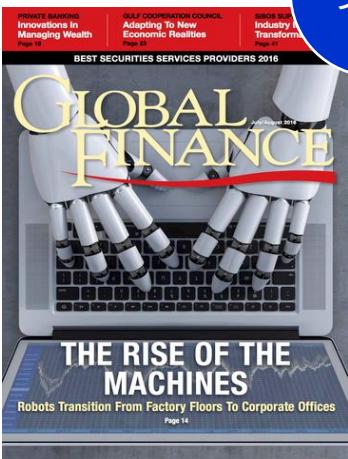
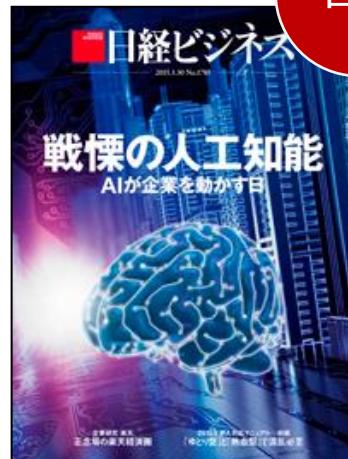


日本

美國

德國

法國



Sources: <http://dw.diamond.ne.jp/list/magazine?isd=2016-08-27>, <http://www.dhbr.net/ud/backnumber/561385bcb31ac9590d000001>,
http://www.vnetj.com/35lecturer/post_110.html, <http://www.weekly-economist.com/バックナンバー/>,
<http://www.economist.com/printedition/2015-05-09>, <https://hbr.org/2015/06/beyond-automation>,
<https://www.gfmag.com/magazine/julyaugust-2016/rise-machines>, <http://europe.newsweek.com/could-artificial-intelligence-kill-us-off-329208> ,
<http://www.tichyseinkblick.de/kolumnen/der-sonntagsleser/der-spiegel-nr-36-sie-sind-entlassen/>,
<http://www.spiegel.de/spiegel/print/d-125300634.html>, <http://www.harvardbusinessmanager.de/heft/index-2015-9.html>,
<http://www.geld-magazin.at/?n=2%7C13>, <https://www.relay.com/covers/ficheproduit/205807.jpg>, <http://www.larecherche.fr/parution/dossiers-18>

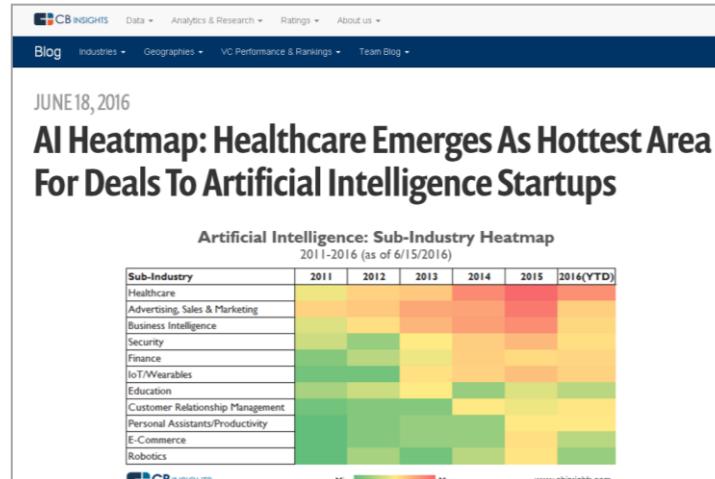
The whole world is watching AI (II)

The screenshot shows a news feature from the journal Nature. The article title is "Can we open the black box of AI?". It discusses the challenges of understanding how machines learn. The author is Davide Castelvecchi, and the date is 05 October 2016. The page includes a sidebar with a small image of a brain and some social sharing options.



The cover of a report titled "Tomorrow's AI-Enabled Banking" by IP SOFT. It features a blue-toned circular graphic with arrows and the IP SOFT logo at the bottom. The report is described as a study on how cognitive technology can breathe new life into relationships between retail banks and their customers. It includes quotes from Edouard van Beurden and Marianne Hirschfeld.

The cover of a report titled "ARTIFICIAL INTELLIGENCE AND LIFE IN 2030" from the One Hundred Year Study on Artificial Intelligence. It features a complex diagram of interconnected systems and components. The text on the cover discusses the overarching purpose of the study and its periodic expert review. It also mentions the One Hundred Year Study's previous report on cognitive systems.

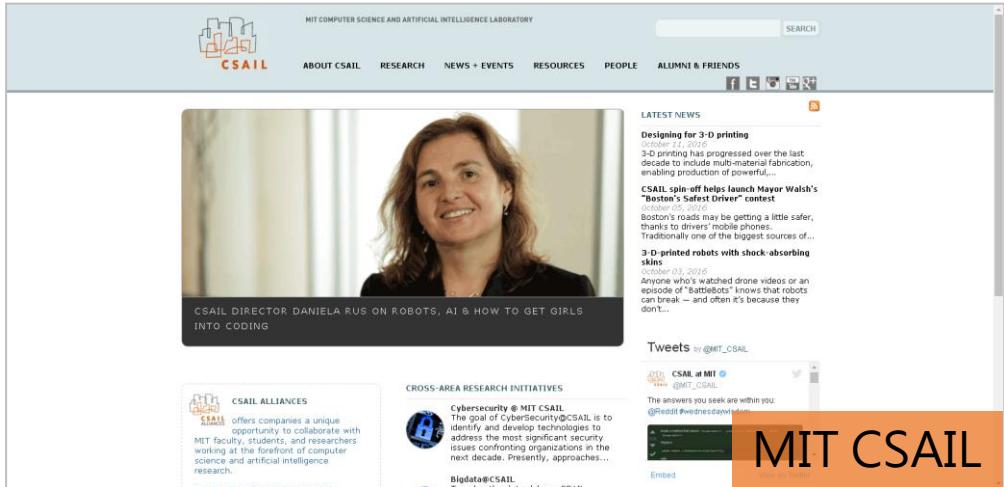


A screenshot from Scientific American. The article is titled "Springtime for AI: The Rise of Deep Learning" by Yoshua Bengio. It discusses the resurgence of AI after decades of disappointment, thanks to deep learning. The text highlights the development of deep learning techniques and their applications in various fields. There is also an advertisement for "THE NEUROPSYCHOLOGY OF BRAIN INJURY".

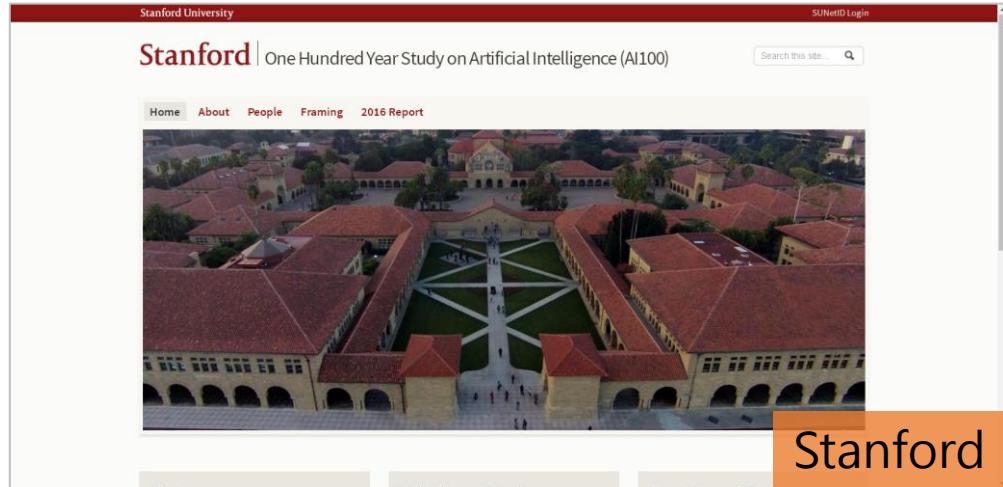
A screenshot from Scientific American. The article is titled "Special Report on the Rise of AI" by Mark Fischetti. It discusses the resurgence of AI and its impact on society. The text highlights the development of AI algorithms and technologies, and their impact on daily life. There is also an advertisement for "AI IN VEHICLE REPORT".

Sources: <http://www.nature.com/news/can-we-open-the-black-box-of-ai-1.20731>, http://www3.weforum.org/docs/WEF_The_future_of_financial_services.pdf,
http://www.ipsoft.com/wp-content/themes/ipsoft_v2/images/v2/pdf/IPsoft_Tomorrow_AI_enabled_banking.pdf, https://ai100.stanford.edu/sites/default/files/ai_100_report_0906fnlc_single.pdf
<https://www.cbinsights.com/blog/artificial-intelligence-investment-heatmap/>, <https://www.scientificamerican.com/article/special-report-on-the-rise-of-ai/>,
<https://www.scientificamerican.com/article/springtime-for-ai-the-rise-of-deep-learning/>, <https://hbr.org/2016/07/how-companies-are-benefiting-from-lite-artificial-intelligence>

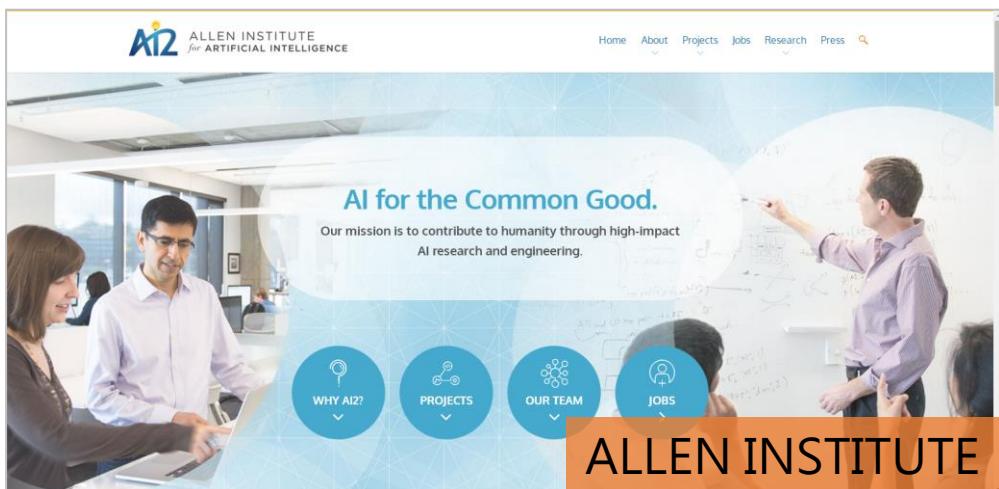
The whole world is watching AI (III)



The screenshot shows the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) website. At the top, there's a navigation bar with links for About CSAIL, Research, News + Events, Resources, People, and Alumni & Friends. Below the navigation is a large photo of Daniela Rus, the Director. To the right of the photo is a news section titled "LATEST NEWS" with several articles. Below the news is a "Tweets by @MIT_CSAIL" feed. Further down are sections for "CSAIL ALLIANCES" and "CROSS-AREA RESEARCH INITIATIVES". A prominent orange banner at the bottom right reads "MIT CSAIL".



The screenshot shows the Stanford University One Hundred Year Study on Artificial Intelligence (AI100) website. The header includes the Stanford logo and a search bar. Below the header is a navigation menu with links for Home, About, People, Framing, and 2016 Report. The main content area features a large aerial photograph of the Stanford campus. An orange banner at the bottom right reads "Stanford".



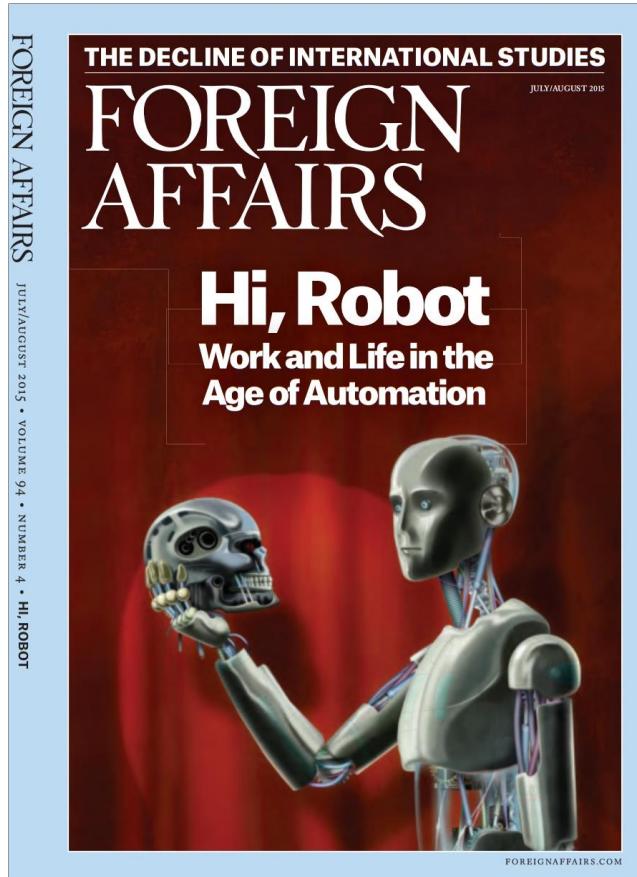
The screenshot shows the Allen Institute for Artificial Intelligence website. The header features the AI2 logo and a navigation bar with links for Home, About, Projects, Jobs, Research, and Press. The main content area has a large image of people working in an office. Overlaid on the image is the text "AI for the Common Good." and "Our mission is to contribute to humanity through high-impact AI research and engineering." Below the image are four circular buttons labeled "WHY AI?", "PROJECTS", "OUR TEAM", and "JOBS". A large orange banner at the bottom right reads "ALLEN INSTITUTE".



The screenshot shows the Facebook Research website. The header includes the Facebook logo and a search bar. Below the header is a navigation menu with links for Home, Research, Academic Programs, Publications, Blog, and People. The main content area features a banner for the European Conference on Computer Vision (ECCV '16). To the right is a "Highlights" sidebar with links to various research publications. An orange banner at the bottom right reads "Facebook".

Sources: <http://www.csail.mit.edu/>, <https://ai100.stanford.edu/>, <http://allenai.org/>, <https://research.facebook.com/ai/>

The whole world is watching AI (IV)



Sources: <http://blog.irvingwb.com/blog/2016/03/the-coming-robotics-revolution.html>
<https://funkensprungnus.wordpress.com/2013/04/23/the-rise-of-big-data/>

How will AI transform the Wall Street?

The collage consists of six screenshots arranged in two rows of three. The top row includes a screenshot of SALON.com, THE WALL STREET JOURNAL, and another THE WALL STREET JOURNAL page featuring a blue robotic head. The bottom row includes a screenshot of VENTURE SCANNER, THE WALL STREET JOURNAL, and a French magazine cover for '4 REVOLUTION'.

- SALON.com Screenshot:** Headline: "No bull – AI investing is coming to Wall Street". Subtext: "Artificial intelligence is emerging as a powerful investment tool, capable of finding trading patterns humans can't".
- THE WALL STREET JOURNAL Screenshot (Left):** Headline: "It's Time to Take Artificial Intelligence Seriously". Subtext: "No Longer an Academic Curiosity, It Now Has Measurable Impact on Our Lives".
- THE WALL STREET JOURNAL Screenshot (Right):** Headline: "What's Next for Artificial Intelligence". Subtext: "The best minds in the business—Yann LeCun of Facebook, Luke Nosek of the Founders Fund, Nick Bostrom of Oxford University and Andrew Ng of Baidu—on what life will look like in the age of the machines".
- VENTURE SCANNER Screenshot:** Headline: "Artificial Intelligence Q1 Update in 15 Visuals". Subtext: "NOTE: Our blog has moved! Please visit our new blog at <https://www.venturescanner.com/blog> to read up on our latest content."
- THE WALL STREET JOURNAL Screenshot (Bottom Left):** Headline: "Intel, Apple Add to Artificial-Intelligence Deal Wave". Subtext: "Chip giant to buy Nervana Systems on heels of iPhone maker's Turi acquisition".
- 4 REVOLUTION Magazine Cover (Bottom Right):** Headline: "Robotics and AI, a \$33 trillion ‘disruption’". Subtext: "In a rich report, Bank of America Merrill Lynch sought to understand the impact that will have Robotics and artificial intelligence in the world economy over the coming 10 years. Their impact in the economy could go from \$14 trillion to \$33 trillion, evolve a range of 14,000 to 33,000 billion dollars".

Sources: <http://www.salon.com/2016/08/24/no-bull-a-i-investing-is-coming-to-wall-street/>, <http://www.wsj.com/articles/its-time-to-take-artificial-intelligence-seriously-1408922644>,
<http://www.wsj.com/articles/whats-next-for-artificial-intelligence-1465827619>, <https://venturescannerinsights.wordpress.com/category/artificial-intelligence-2/>,
<http://www.wsj.com/articles/intel-apple-add-to-artificial-intelligence-deal-wave-1470772801?mod=e2tw>, <http://www.4erevolution.com/en/robotique-ia-disruption/>.

AI and the Future of Financial Services



Genworth
Financial¹

Automates the underwriting of Long-Term Care (LTC) and life insurance applications by relying heavily on artificial intelligence techniques. A fuzzy logic rules engine encodes the underwriter guidelines and an evolutionary algorithm optimises the engine's performance. A natural language parser is also used to improve the coverage of the underwriting system.



Goldman
Sachs³

Has entered a strategic partnership to use Kensho's real-time statistical computing and analytics technology across the firm. Kensho's intelligent computer systems are capable of answering complex financial questions posed in plain English, and in real-time, achieving speed, scale, and automation of previously human-intensive knowledge work.



UBS
Group AG²

Uses artificial intelligence for help when delivering personalised advice to the bank's wealthy clients by modelling 85 million Singaporean individuals' behavioural patterns. Fine-tuned for financial services, the technology allows Sqreem (Sequential Quantum Reduction and Extraction Model) to build a profile of an individual showing potential match-ups with different types of wealth management products.

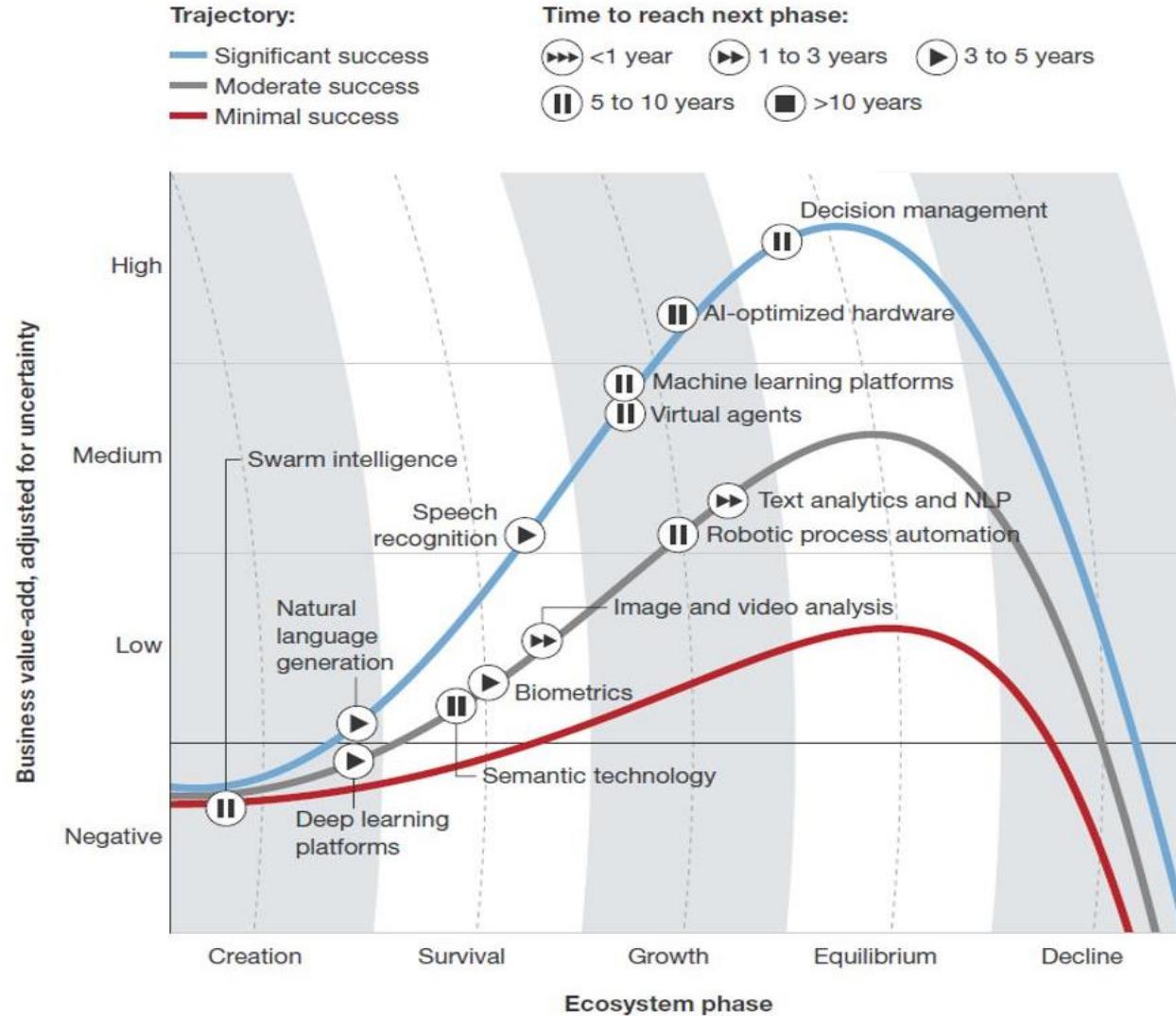


BBVA⁴

Selected Fonetiq to support their Trading Record Keeping Compliance solution. Other banks also use NLP software to monitor internal communication and identify potential misconduct. According to a report by the Financial Times, some banks have also begun monitoring traders' performance against the number of times they use internal communications systems in order to identify whether traders are covertly contacting clients and illegally profiting from doing so.

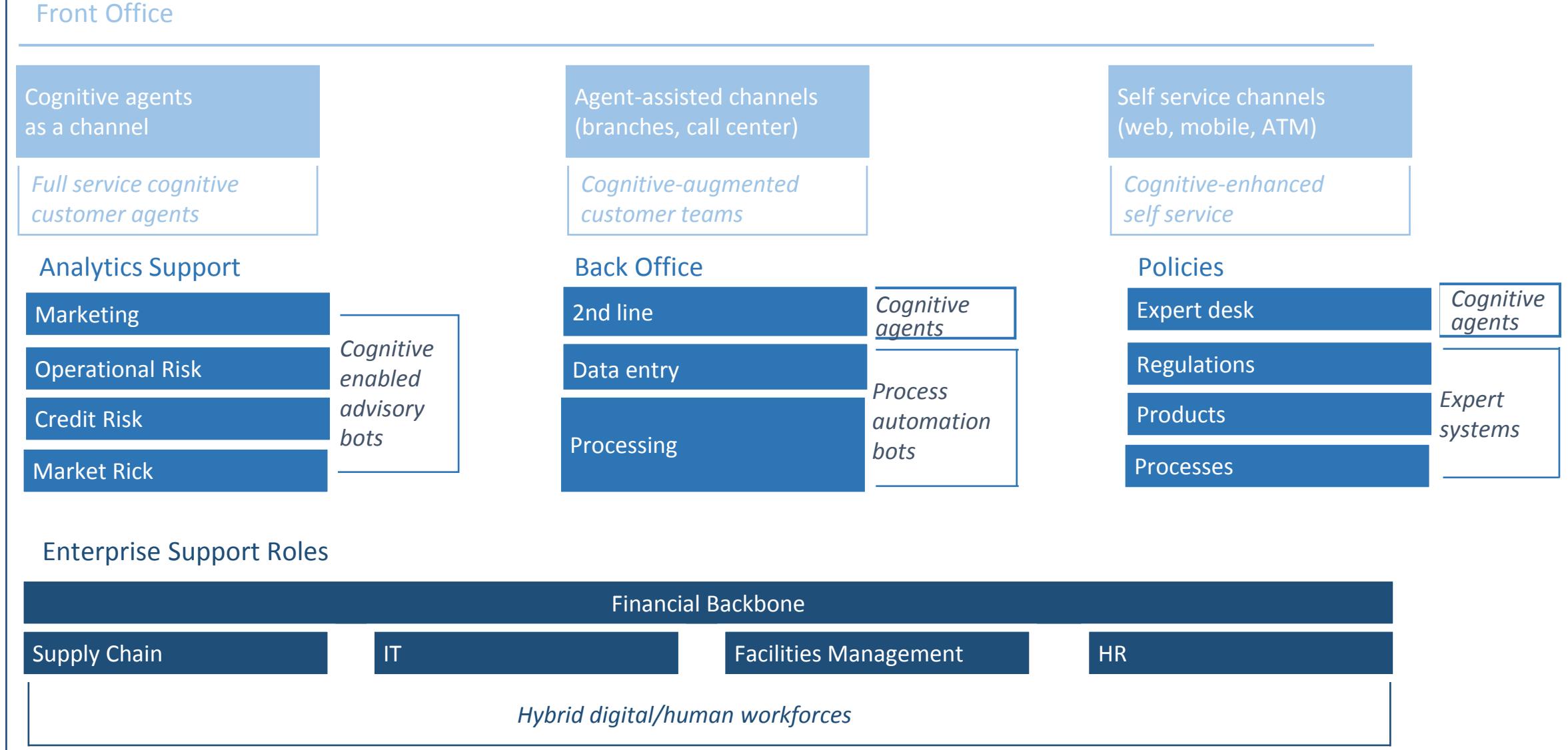


Top 10 Hot AI Technologies



- Natural Language Generation
- Speech Recognition
- Virtual Agents
- Machine Learning Platforms
- AI-optimized Hardware(GPU)
- Decision Management
- Deep Learning Platforms
- Biometrics
- Robotic Process Automation
- Text Analytics and NLP

The AI-enabled Bank



National AI R&D Strategy

THE NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH AND DEVELOPMENT STRATEGIC PLAN

National Science and Technology Council

Networking and Information Technology
Research and Development Subcommittee

October 2016

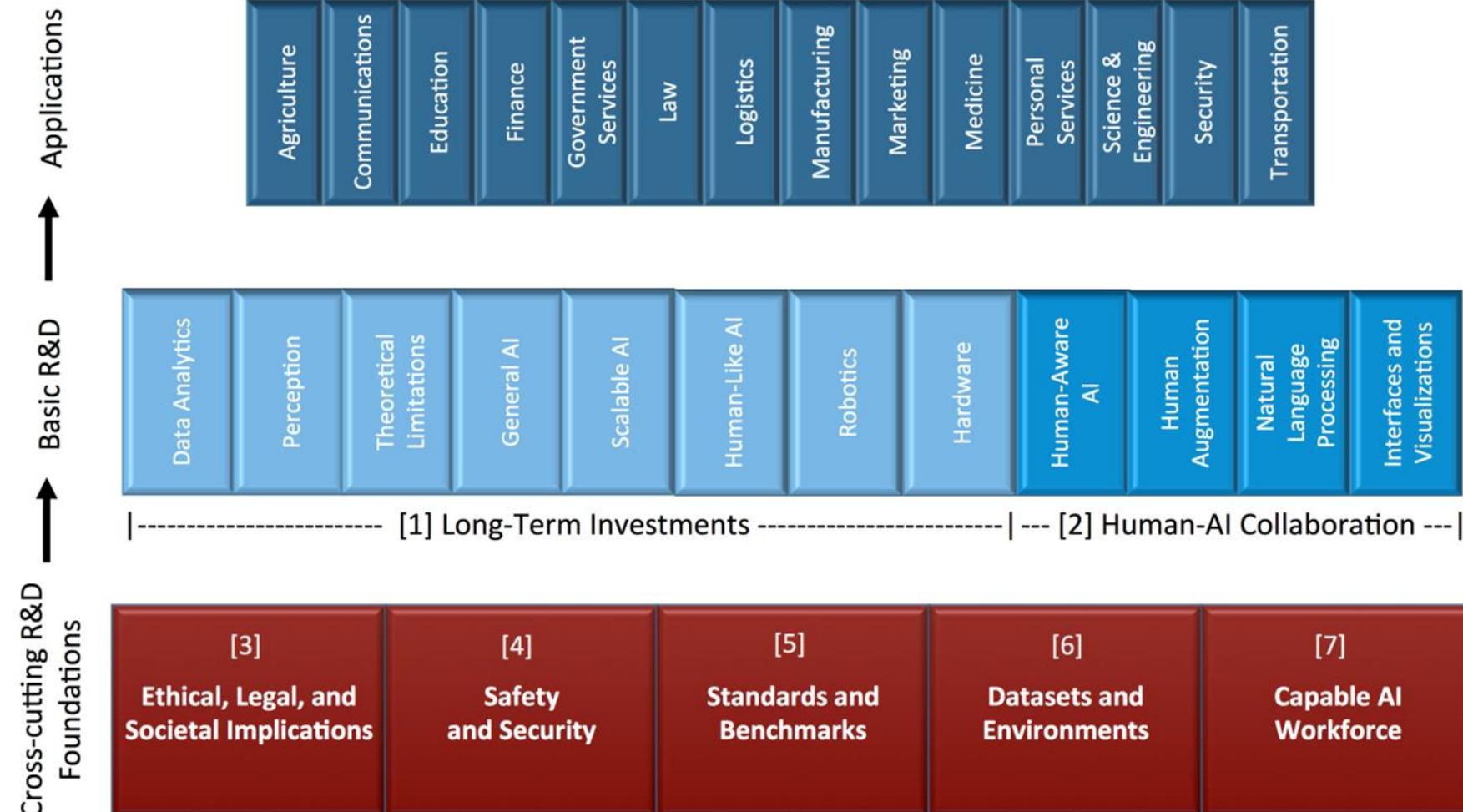
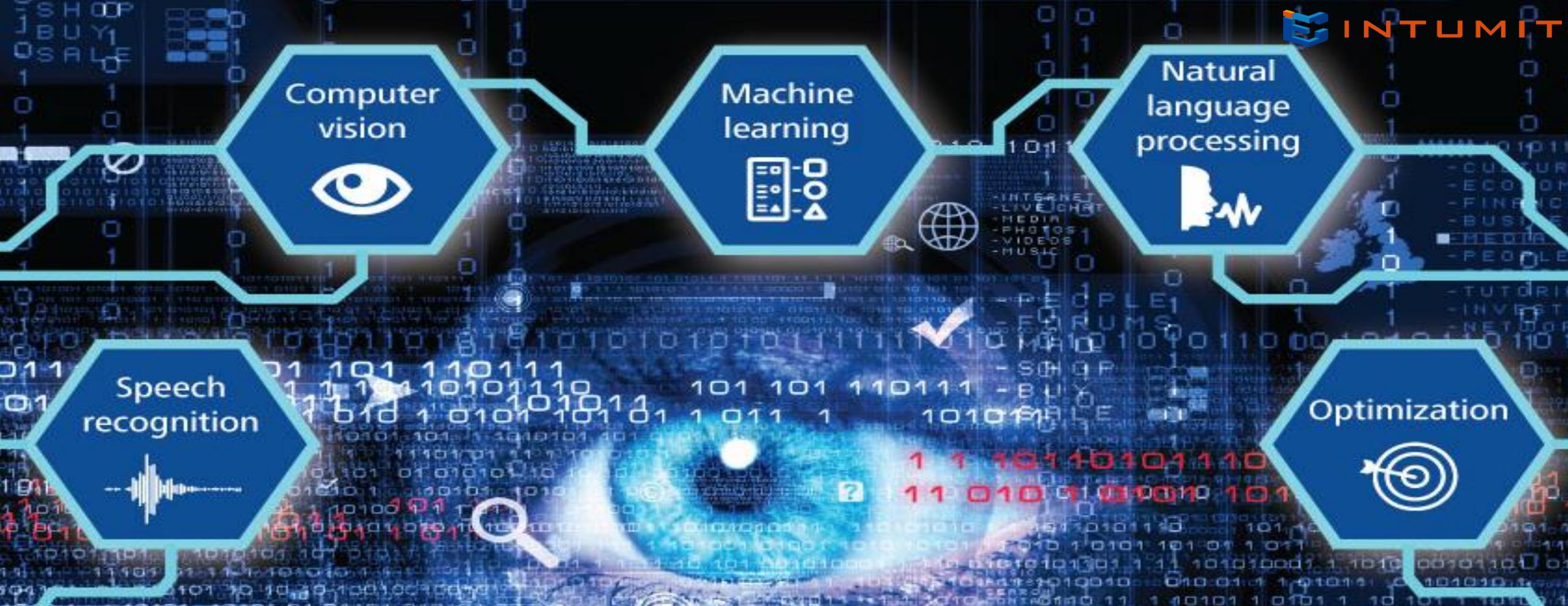


Figure: Organization of the AI R&D Strategic Plan

Source: https://www.nitrd.gov/PUBS/national_ai_rd_strategic_plan.pdf

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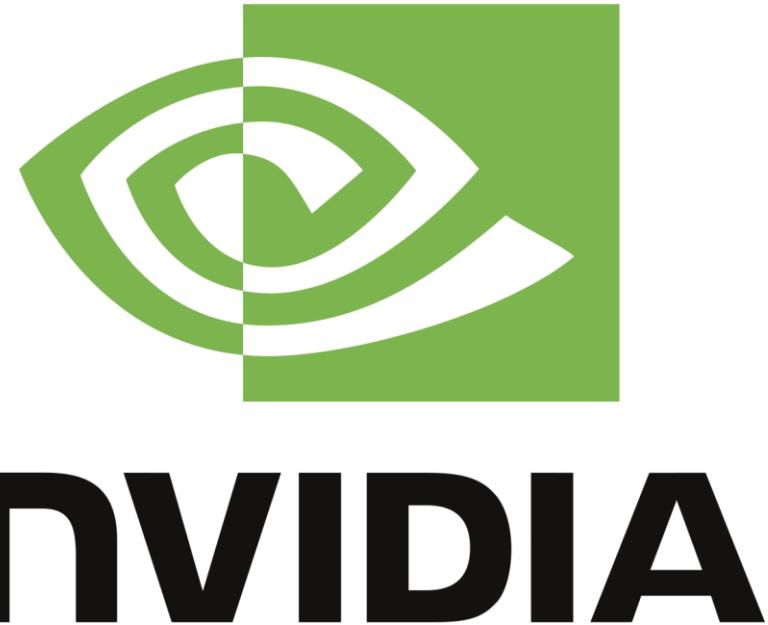


主流技術-NVIDIA DL SDK

Nvidia' s own SDK

<https://developer.nvidia.com/deep-learning-software>

- Builds on frameworks such as Caffe, CNTK, TensorFlow, Theano, and Torch
- Requires CUDA
- Tools and libraries:
 1. Deep Learning Primitives (cuDNN)
 2. Deep Learning Inference Engine (TensorRT)
 3. Deep Learning for Video Analytics (DeepStream SDK)
 4. Linear Algebra (cuBLAS)
 5. Sparse Matrix Operations (cuSPARSE)
 6. Multi-GPU Communication (NCCL)

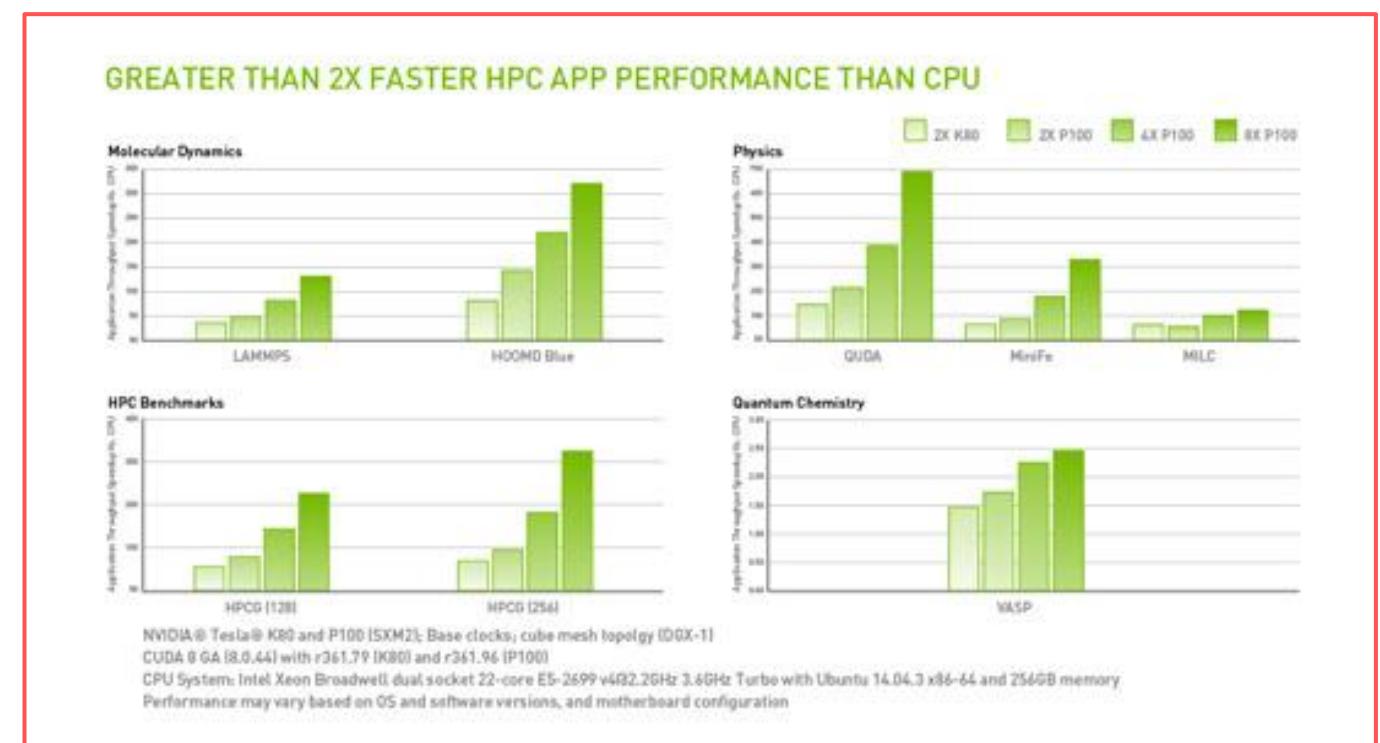


CUDA Toolkit

<https://developer.nvidia.com/cuda-toolkit>

Provides a development environment for creating high performance GPU-accelerated applications

Includes GPU-accelerated libraries, debugging and optimization tools, a C/C++ compiler and a runtime library



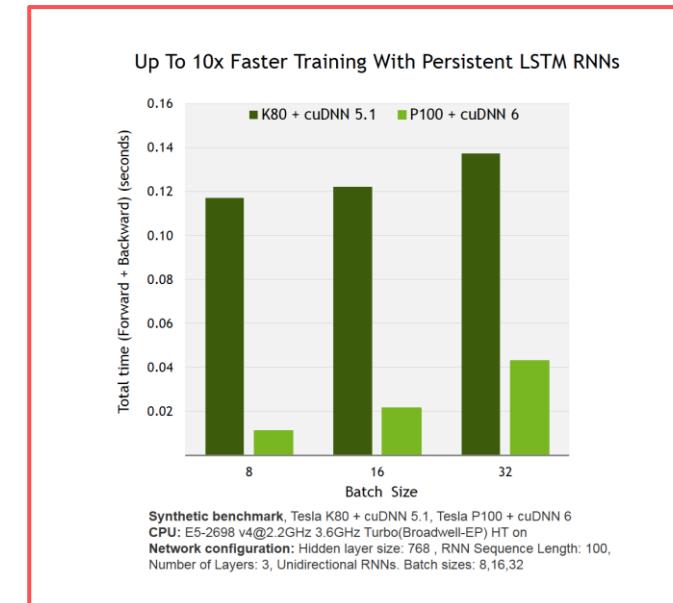
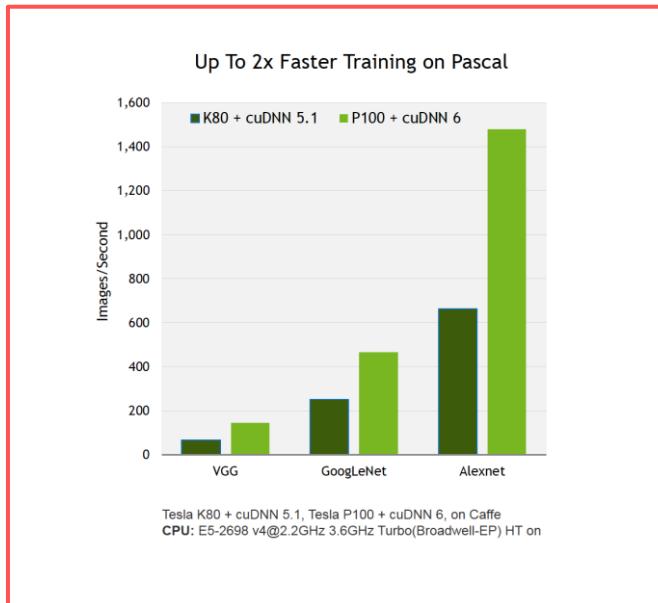
Deep Learning Primitives (cuDNN)

<https://developer.nvidia.com/cudnn>

High-performance building blocks for deep neural network applications including convolutions, activation functions, and tensor transformations

GPU-accelerated library of primitives for deep neural networks

Highly tuned implementations for standard routines such as forward and backward convolution, pooling, normalization, and activation layers



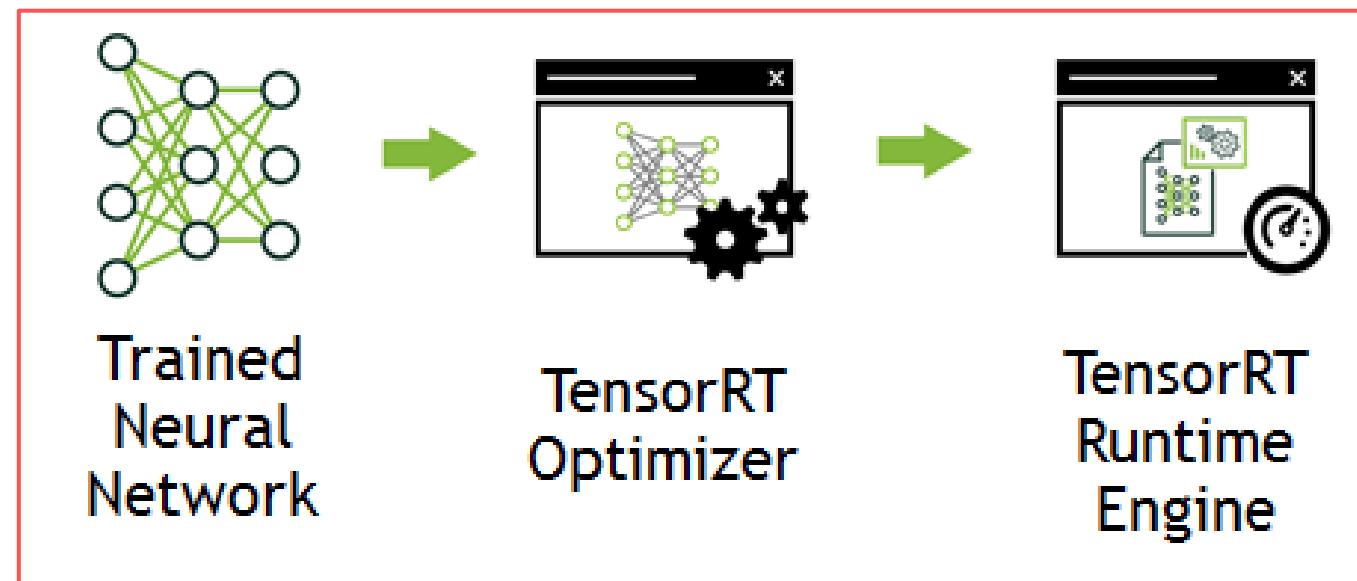
Deep Learning Inference Engine

(TensorRT) <https://developer.nvidia.com/tensorrt>

High-performance deep learning inference optimizer and runtime engine for production deployment

Deliver fast inference using INT8 or FP16 optimized precision that significantly reduces latency

Developers can focus on developing rather than performance tuning

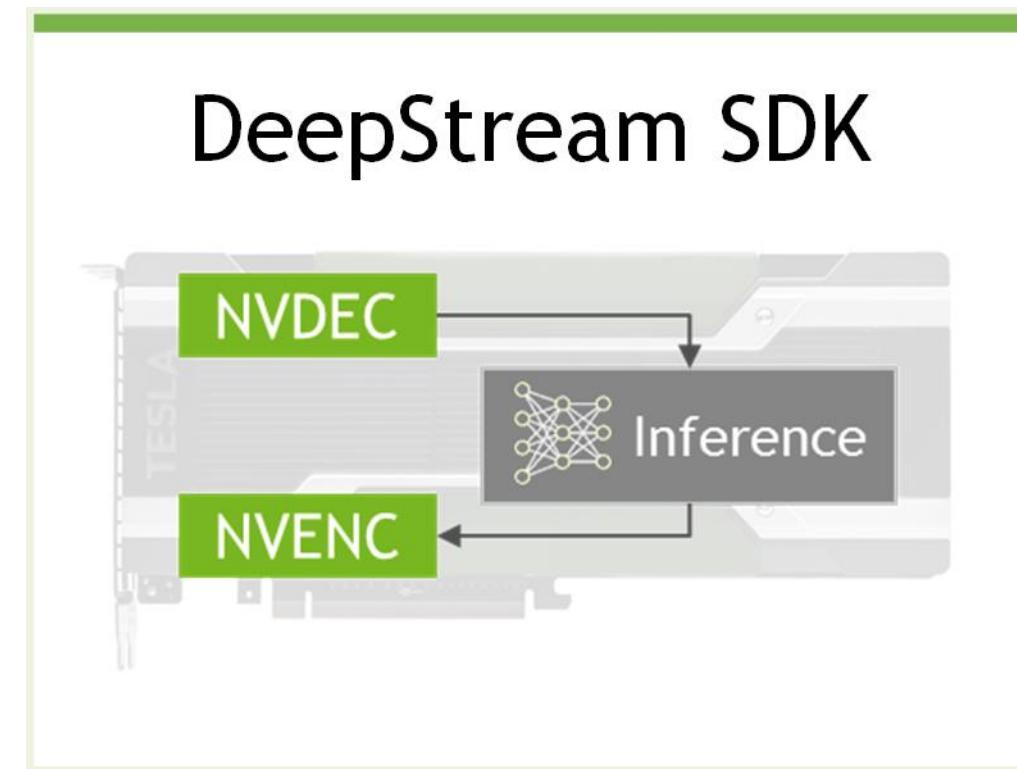


Deep Learning for Video Analytics

(DeepStream SDK) <https://developer.nvidia.com/deepstream-sdk>

High-level C++ API and runtime for GPU-accelerated transcoding and deep learning inference

Simplifies development of high performance video analytics applications



Linear Algebra (cuBLAS)

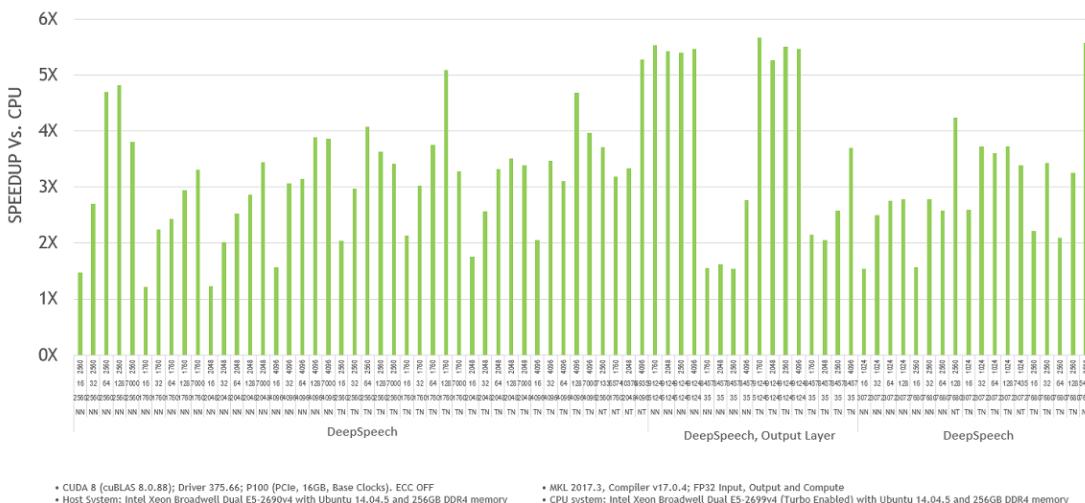
<https://developer.nvidia.com/cublas>

GPU-accelerated BLAS functionality, 6–17x faster than CPU-only BLAS libraries

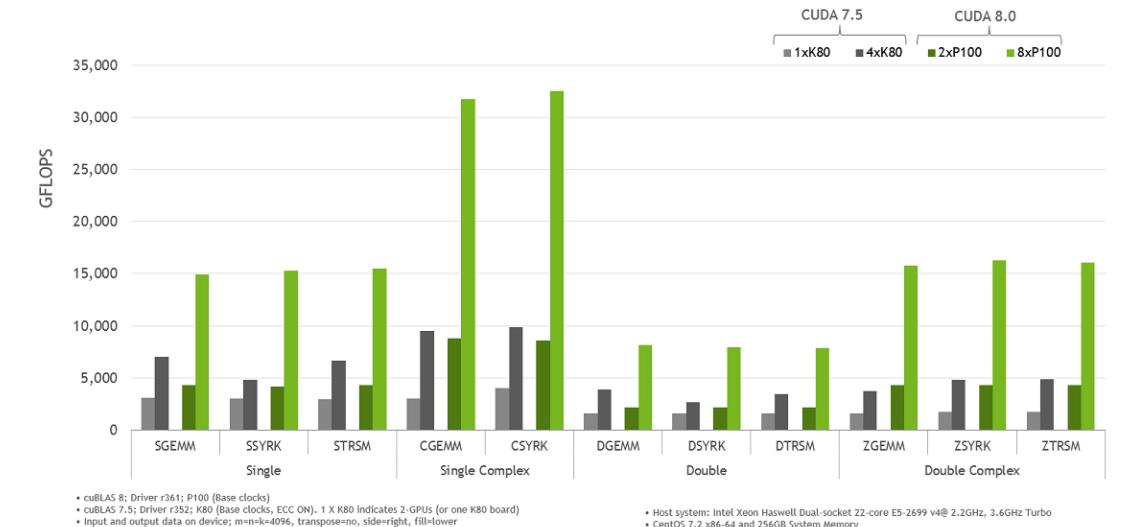
Speed up by deploying to single GPU or multi-GPU configurations efficiently

Used for developing GPU-accelerated algorithms in areas including high performance computing, image analysis and machine learning

UP TO 5X FASTER DEEPBENCH SGEMM OPERATIONS THAN CPU



cuBLAS-XT: GREATER THAN 30 TFLOPS ON A SINGLE NODE



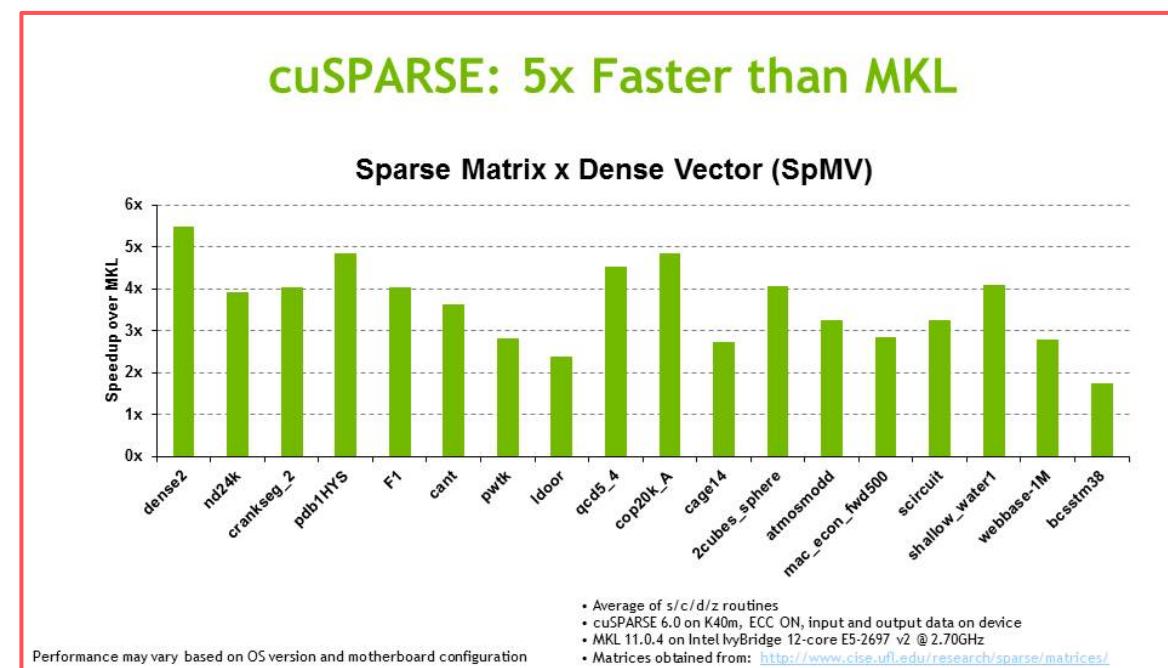
Sparse Matrix Operations (cuSPARSE)

<https://developer.nvidia.com/cusparse>

GPU-accelerated linear algebra subroutines for sparse matrices, up to 8x faster than CPU BLAS (MKL), ideal for applications such as NLP

Designed to be called from C or C++

Latest release includes a sparse triangular solver



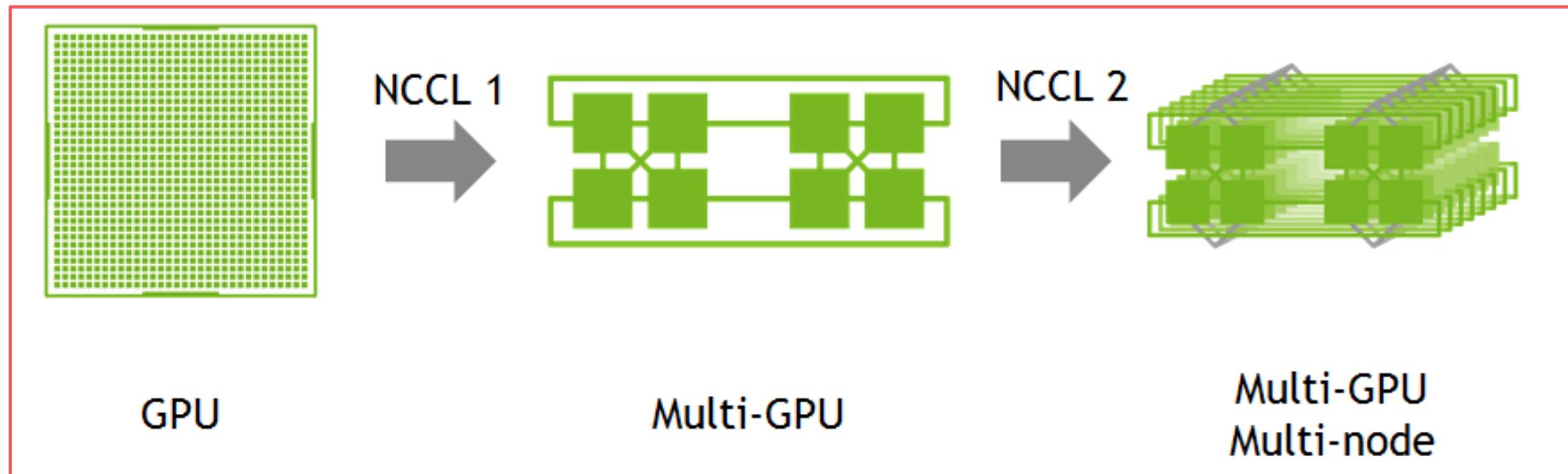
Multi-GPU Communication (NCCL)

<https://developer.nvidia.com/nccl>

Collective communication routines, such as all-gather, reduce, and broadcast that accelerate multi-GPU deep learning training on up to eight GPUs

MPI compatible and topology aware routines

Developers can focus on developing algorithms and software rather than performance tuning



Deep Learning GPU Training System

(DIGITS) <https://developer.nvidia.com/digits>

Solve complex image classification problems, quickly design best DNN

Simplifies tasks so data scientists can focus on designing/training networks

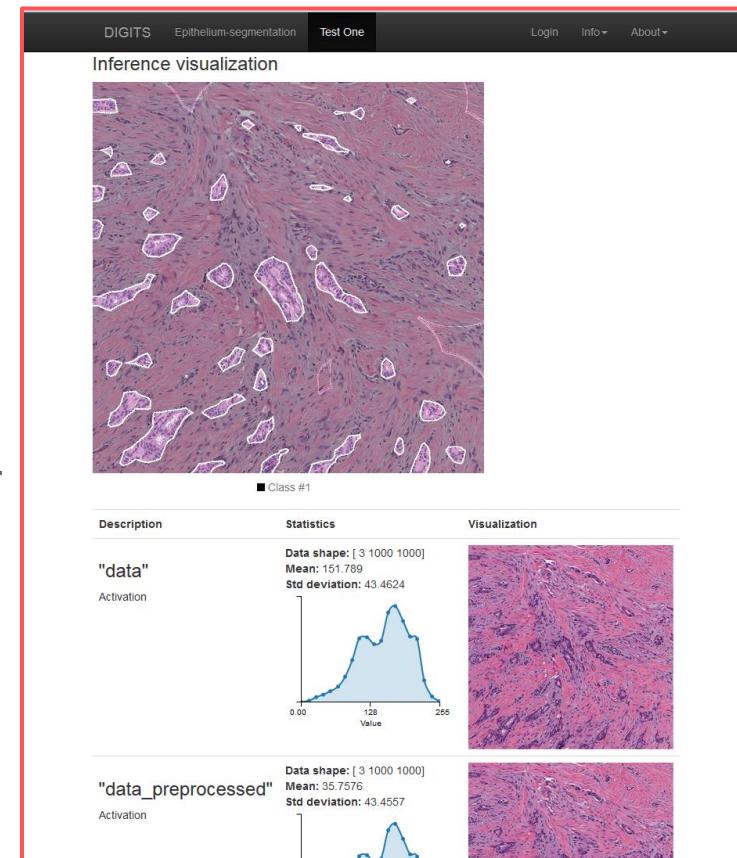
Managing data

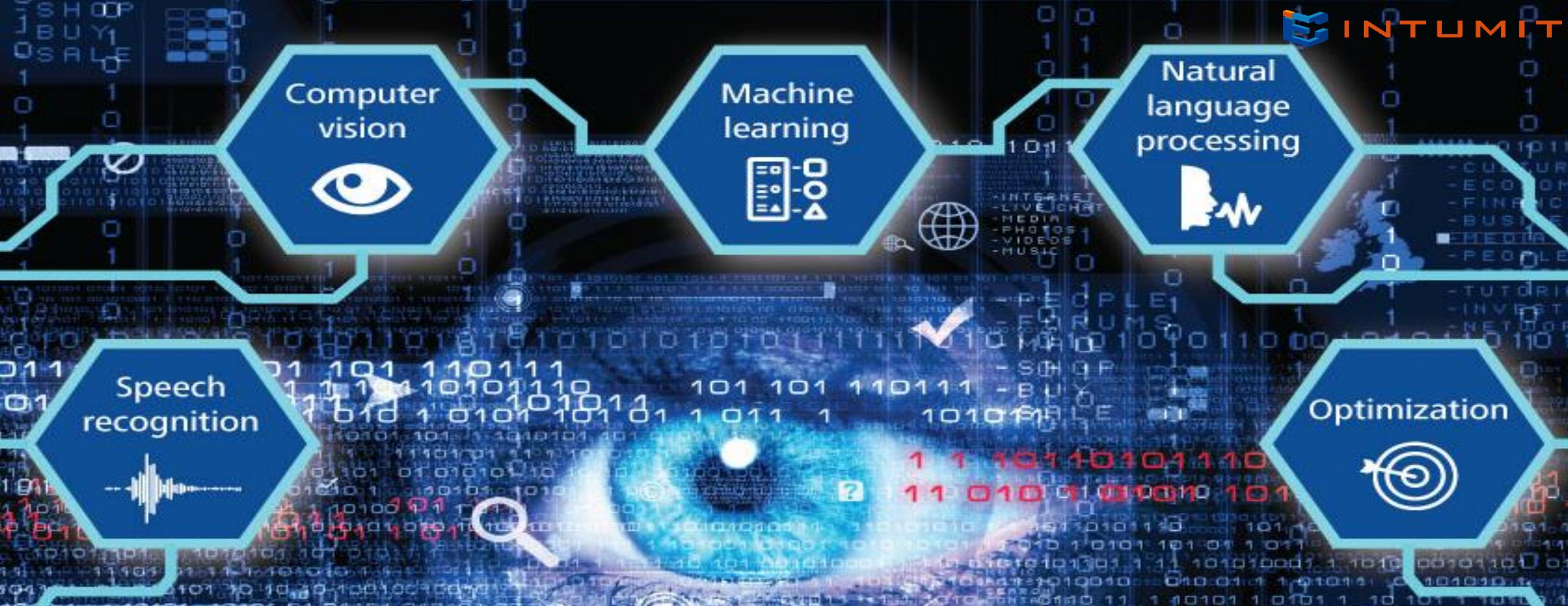
Designing/training on multi-GPU systems

Monitoring performance in real time with advanced visualizations

Selecting the best performing model from the results browser for deployment

Image segmentation neural network trained with DIGITS 5 to partition epithelium regions that contribute to identification of tumor





人工智慧與智能機器人

機器人能做什麼

- 世界上有80%的數據資料是非結構化的
- 認知運算能夠提升並簡化學習過程



電腦運算

- 結構化資料
- 傳統專家系統
- 輸入 / 輸出公式固定
- 運算能力有限



大數據運算

- 結構化資料及部分非結構化資料
- 可處理巨量資料
- 機器學習



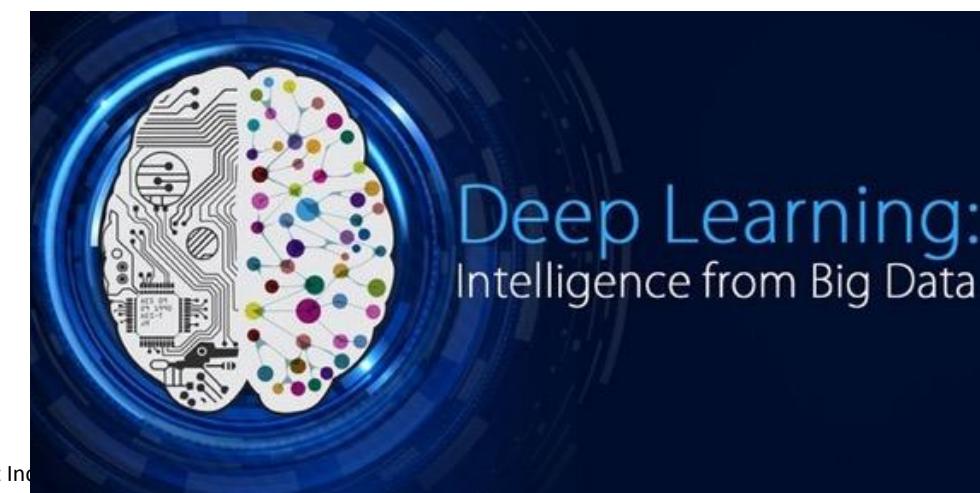
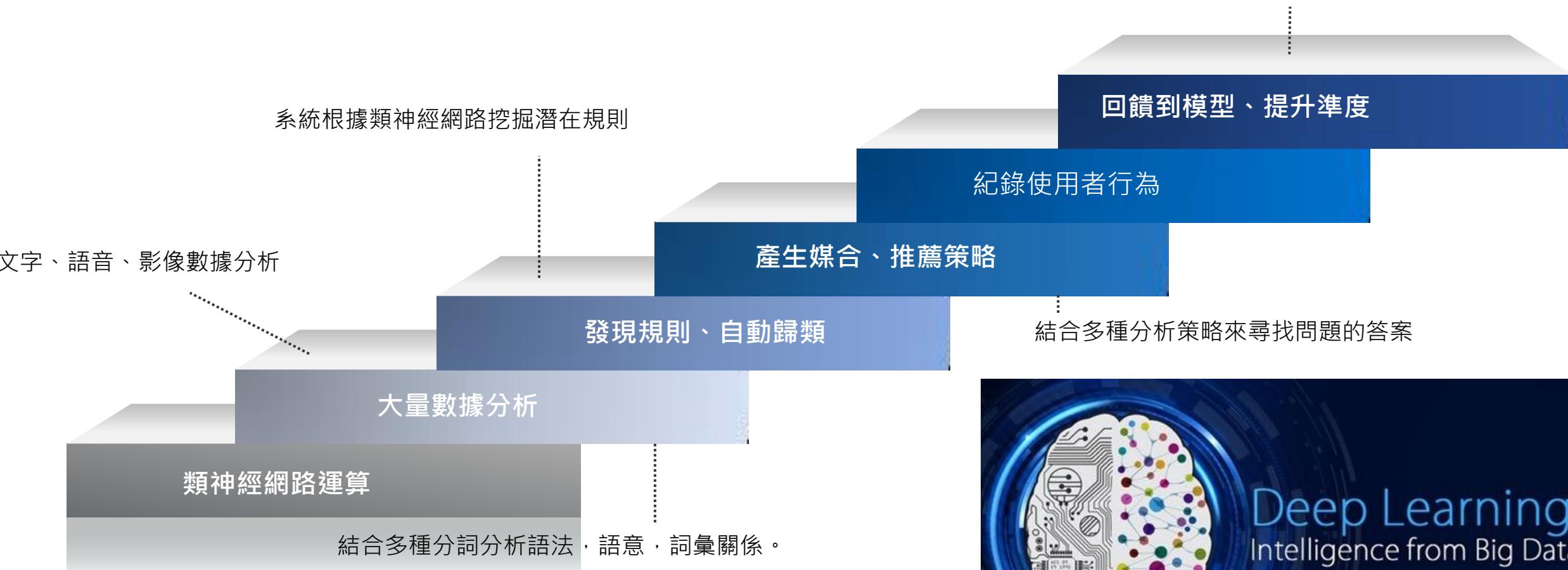
認知運算

- 可處理大量非結構化資料
- 語言、圖像、聲音的認知能力
- 深度學習

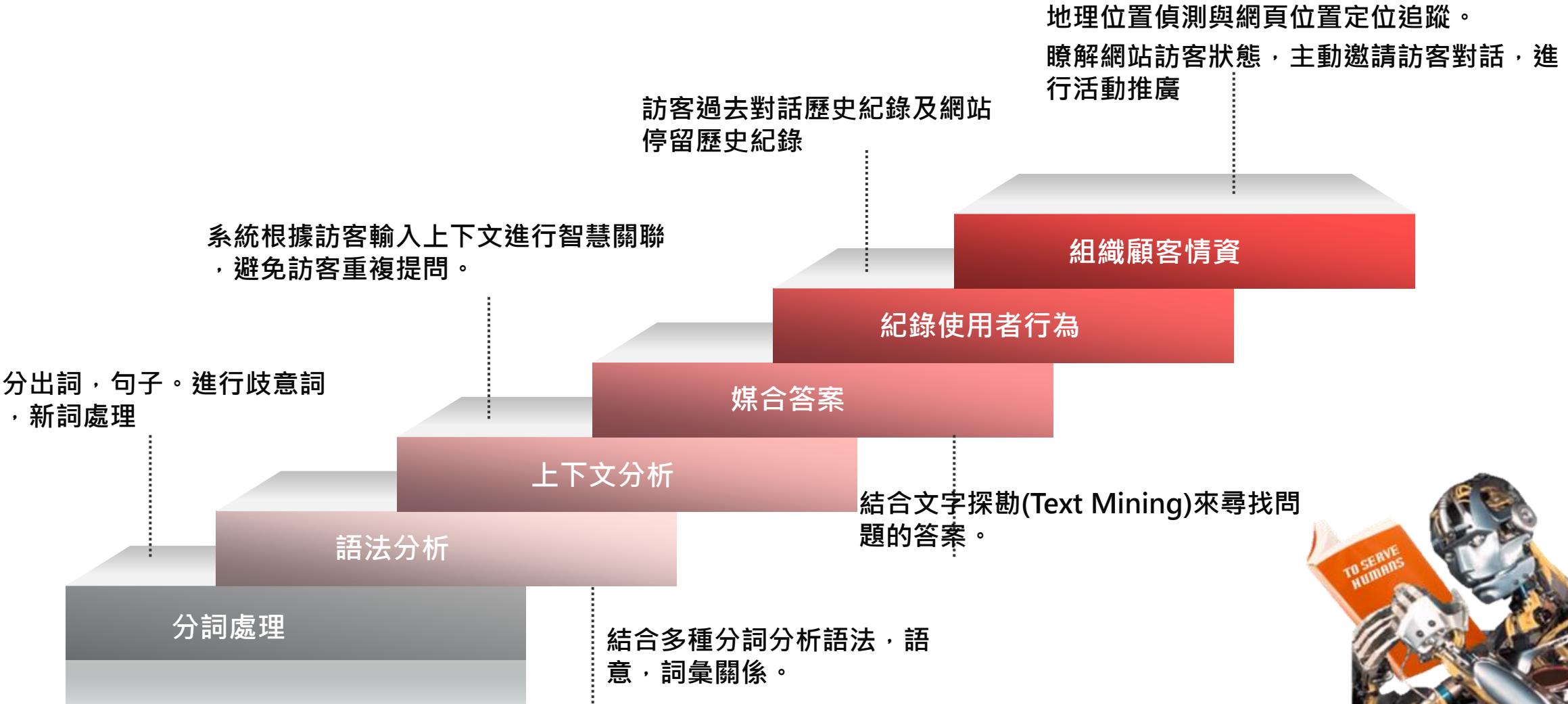
深度學習技術

-自然語言文字、聲音辨識、視覺影像

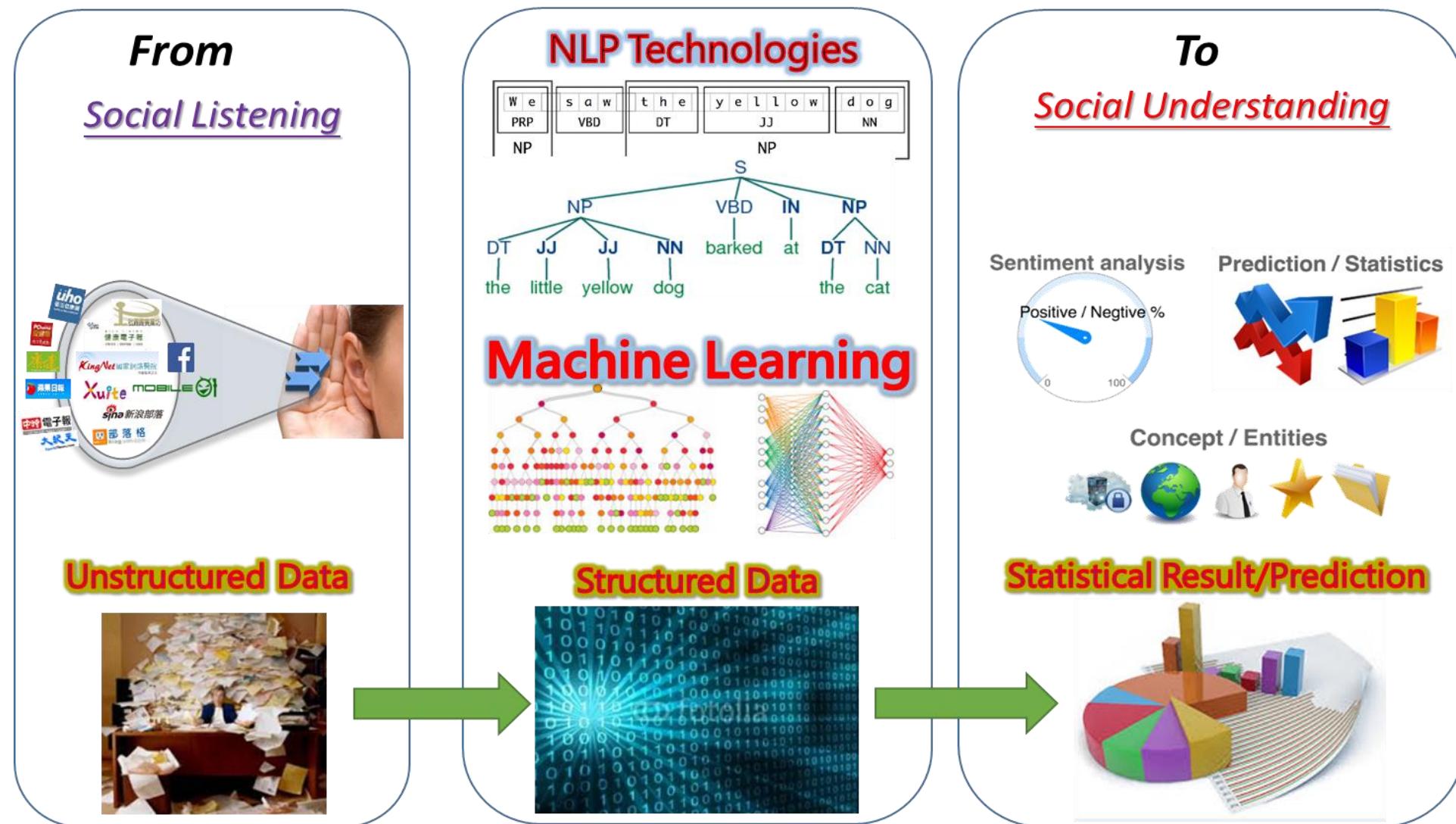
提升數據品質、自我學習修正



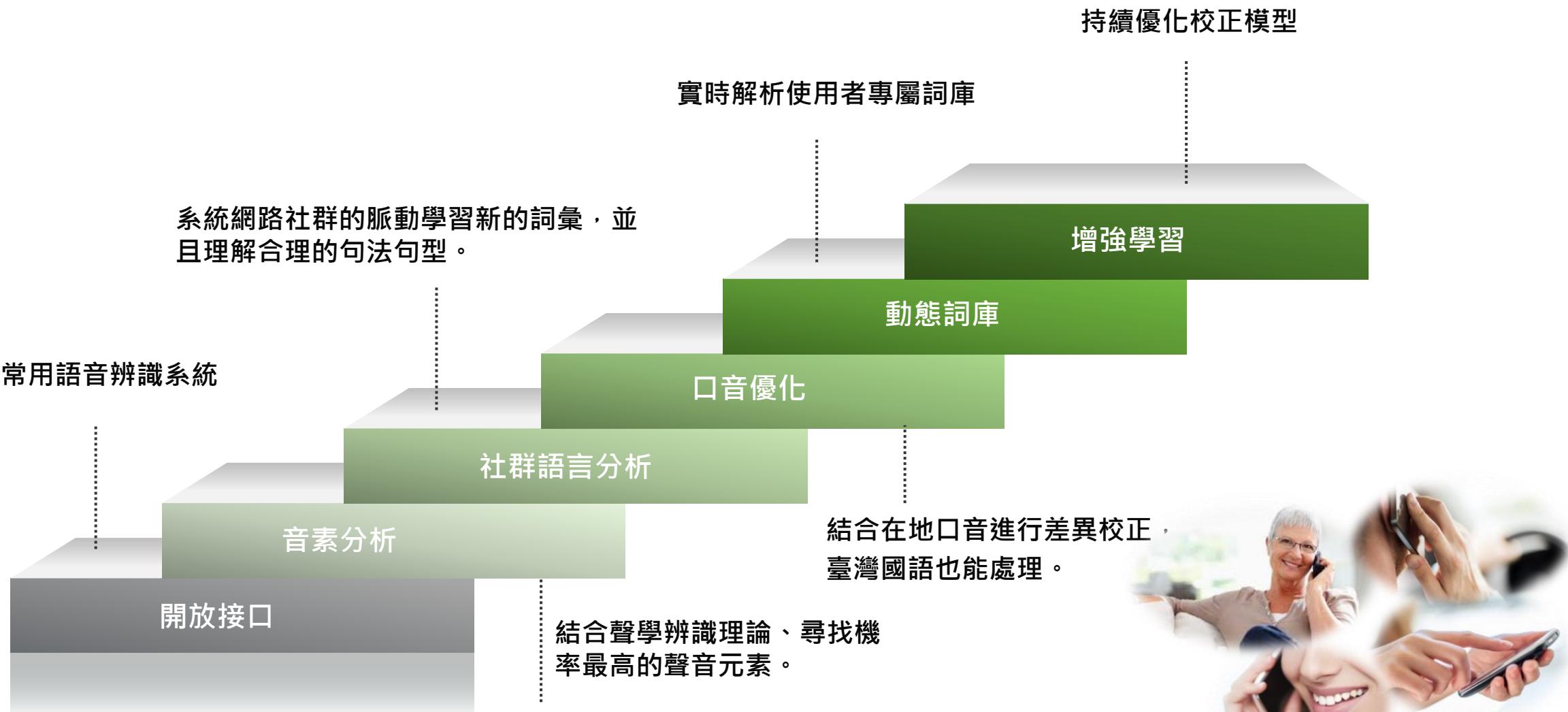
自然語言分析技術(1/2)



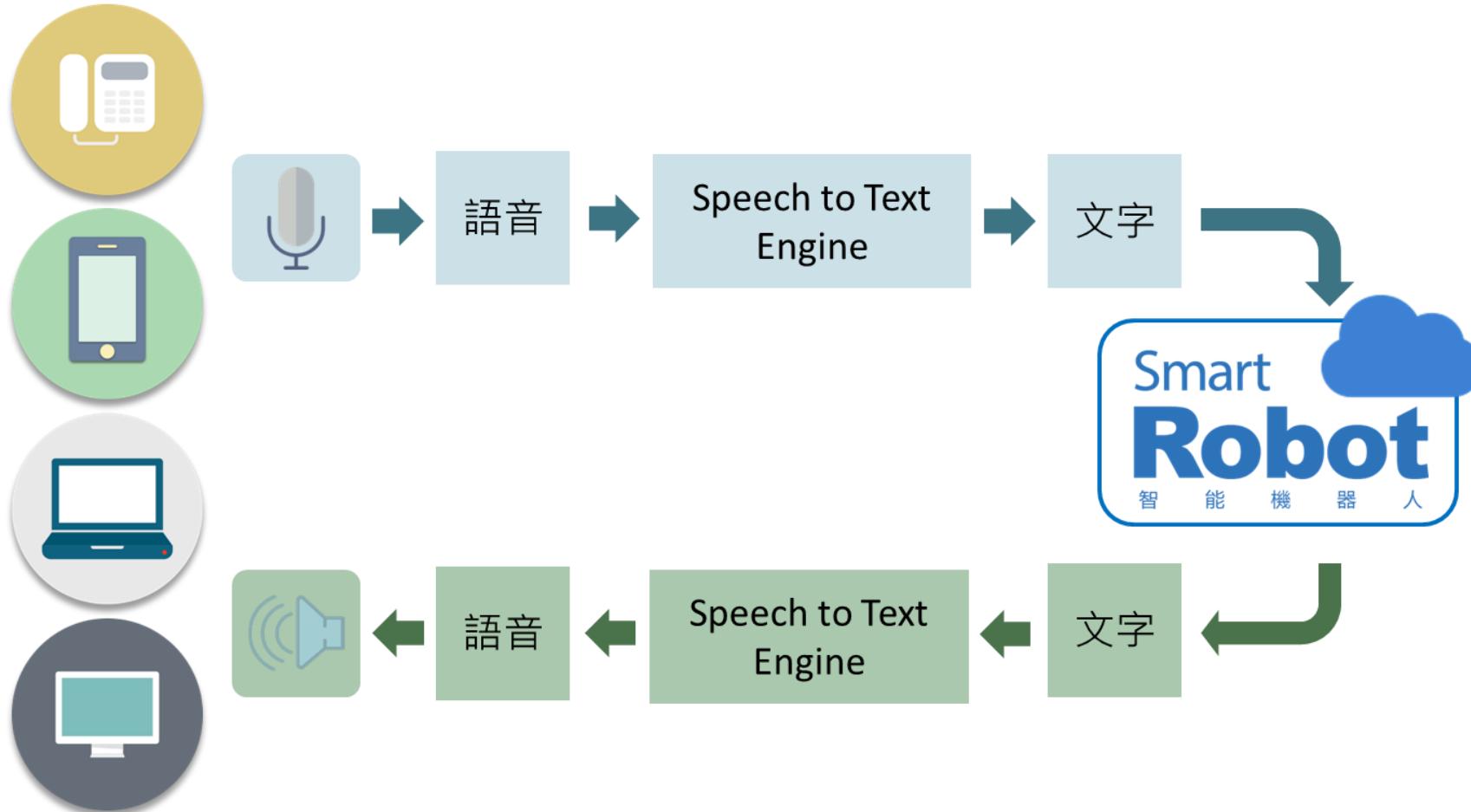
自然語言分析技術(2/2)



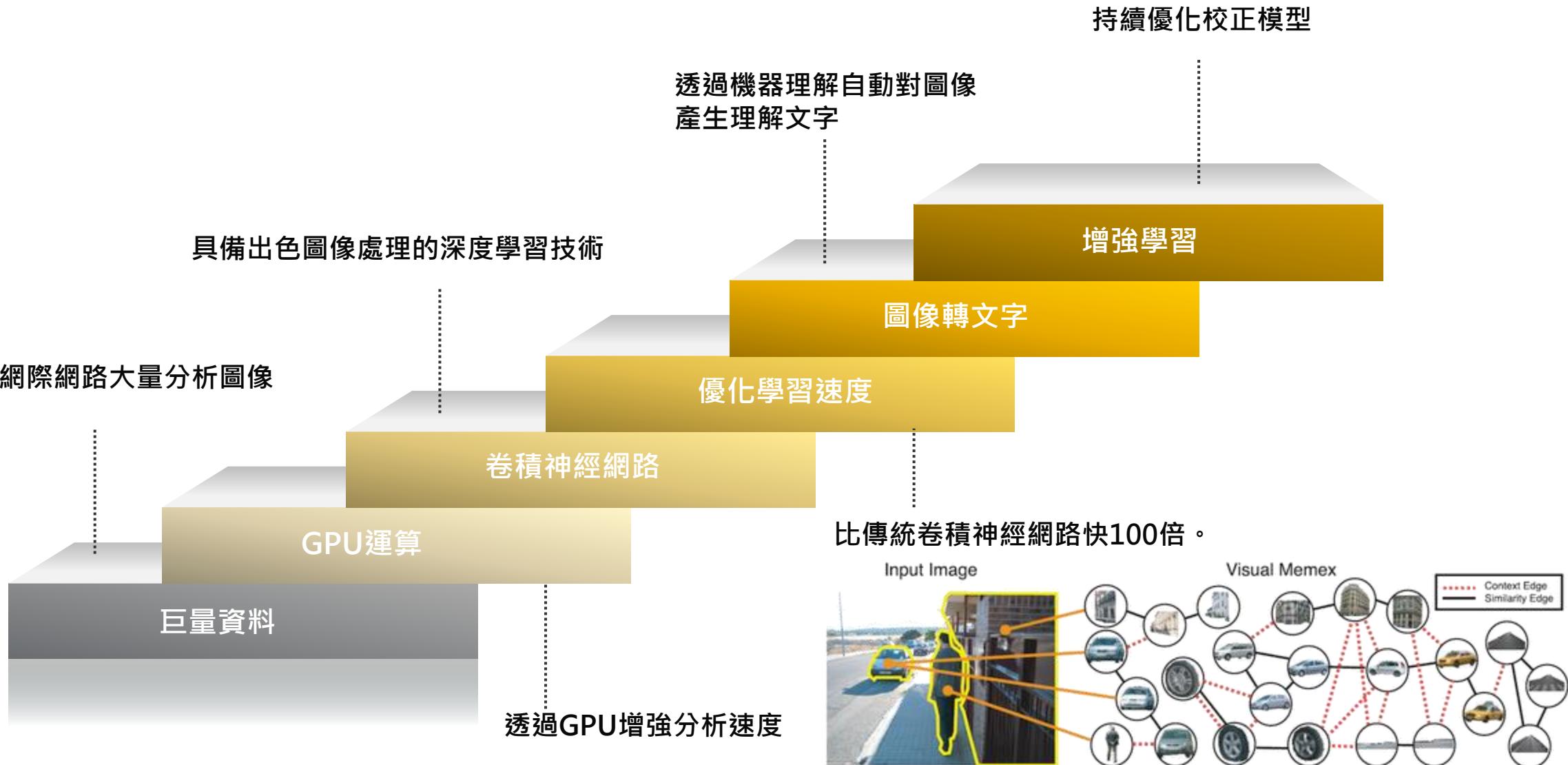
語音辨識優化技術(1/2)



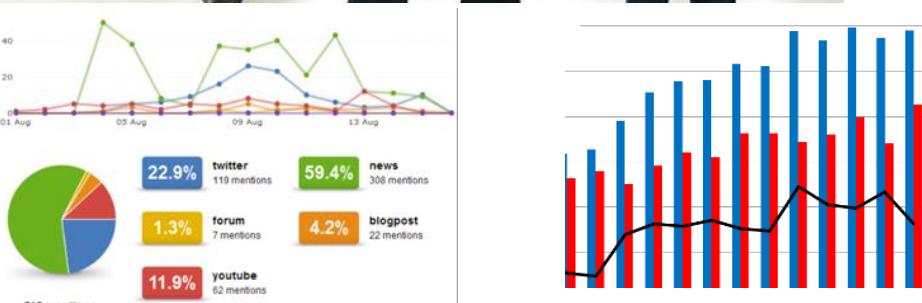
語音辨識優化技術(2/2)



視覺辨識及理解技術(1/2)



視覺辨識及理解技術(2/2)

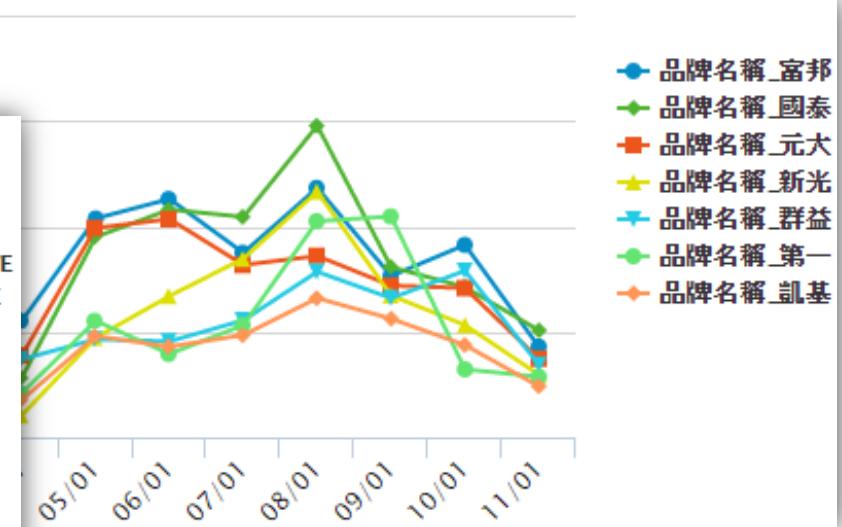


Automatic real-time analytics and report

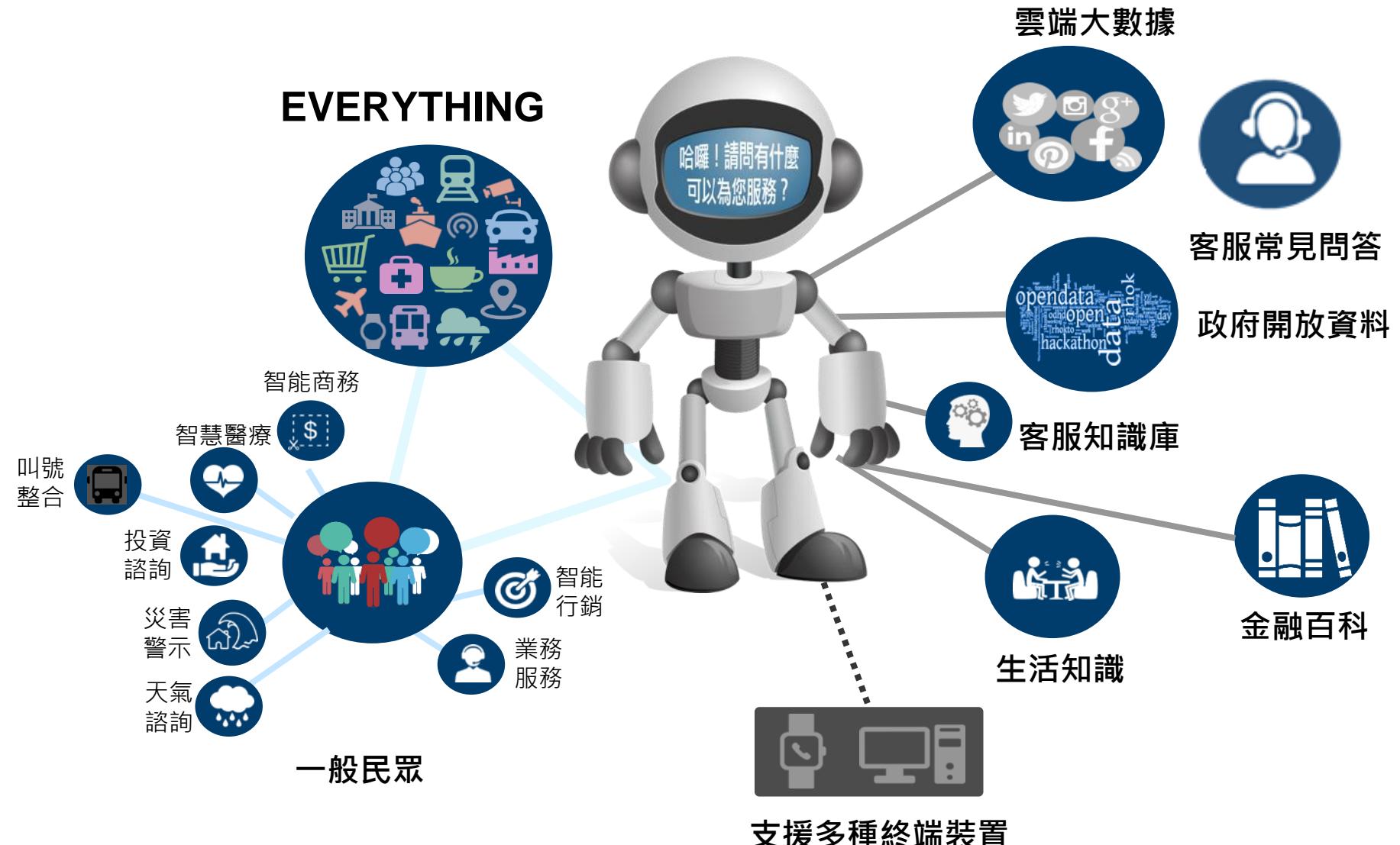
- Female 10~20
2.5 sec. Interested
- Male 40~50
1.2 sec. Neutral
- Female 30~40
1.5 sec. Neutral
- Male 1~10
2.8 sec. Interested
- Male 30~40
3.5 sec. Interested



AI結合大數據分析



多元資料來源，跨平台系統資源整合



以線上智能客服為例

生活資訊和專業詞彙的問答設計

顧客即時獲得權威且專業的回覆



降低成本



不受地域限制



全年無休



智能機器人展示介面

智能機器人展示介面 - 線上客服

首頁 > 客戶服務 > 線上客服

常見問題

- 信用卡
- \$ ATM
- 分行
- 基金
- 其他

卡片毀損了，怎麼辦？

信用卡將到期是否須重新申請換卡？若到期即不再續用，怎麼辦？

卡片遺失（被竊）了，怎麼辦？

額度不夠用，怎麼辦？

您們的信用卡如何預借現金？

預借現金手續費多少？

在國外消費的現金如何退還？

根據自然語言分析
回饋最精確的回答

機器人提供最相關的
標準問題供客戶快速
選擇

顯示常見及熱門問題

客戶以自然語言進
行詢問

阿明 你好

小智 Hi! 阿明 您好，歡迎來到線上客服系統，請問你需要什麼樣的協助？

阿明 我在國外要如何預借現金？

小智 出國前請先開啟信用卡預借現金功能並設定信用卡ATM預借現金密碼，在國外需至貼有「Cirrus」標誌之自動櫃員機操作，即可在國外提領現金。提醒您國外預借現金將會產生相關手續費用：預借現金手續費：每筆 3% + NT\$150、

或是您可以從下面選擇同類型的其他常見問題：

按1.怎樣預借現金(編號95)
按2.預借現金為何失敗?(編號101)
按3.如何申請預借現金密碼(編號100)
按4.怎樣取消預借現金功能(編號98)

我在國外要如何預借現金？



服務情境(1) -情境式特定業務(匯率諮詢)

- 換匯業務

- 幣別
- 買賣
- 換匯類型
- 金額

我想買美金

- 幣別：美金
- 買賣：買進
- 換匯類型
- 金額

請問您預計用即期還是現金的方式購買？

請問您預計買進的金額？

服務情境(2) -情境式特定業務(房屋估價)(I)

對話式商務概念 → 房貸篇

當客戶有房貸需求，不要再讓客戶轉到其他地方進行處理，直接線上自動化進行房屋估價，並且後續轉接真人服務。

不知道買房子可以貸多少錢？



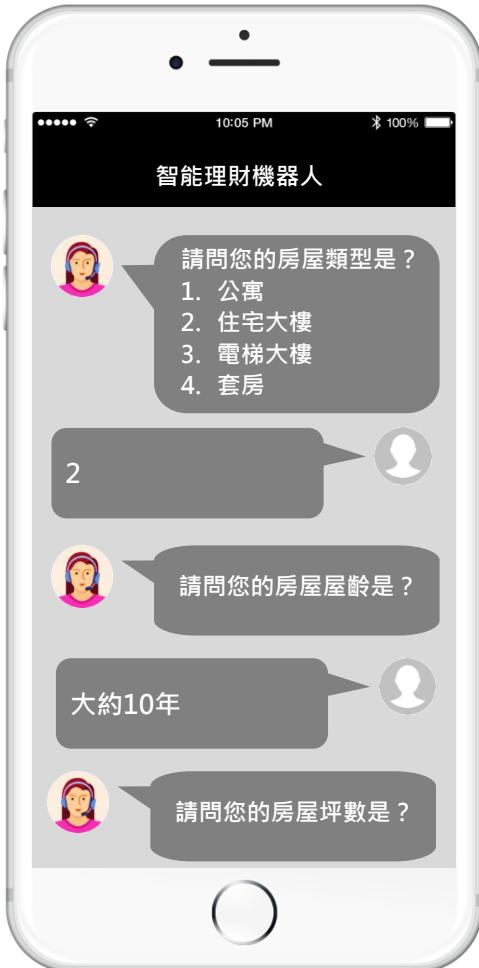
開始進行房貸估價資訊
蒐集

服務情境(2) -情境式特定業務(房屋估價)(II)

對話式商務概念 → 房貸篇

當客戶有房貸需求，不要再讓客戶轉到其他地方進行處理，直接線上自動化進行房屋估價，並且後續轉接真人服務。

不知道買房子可以貸多少錢？



服務情境(2) -情境式特定業務(房屋估價)(III)

對話式商務概念 → 房貸篇

當客戶有房貸需求，不要再讓客戶轉到其他地方進行處理，直接線上自動化進行房屋估價，並且後續轉接真人服務。

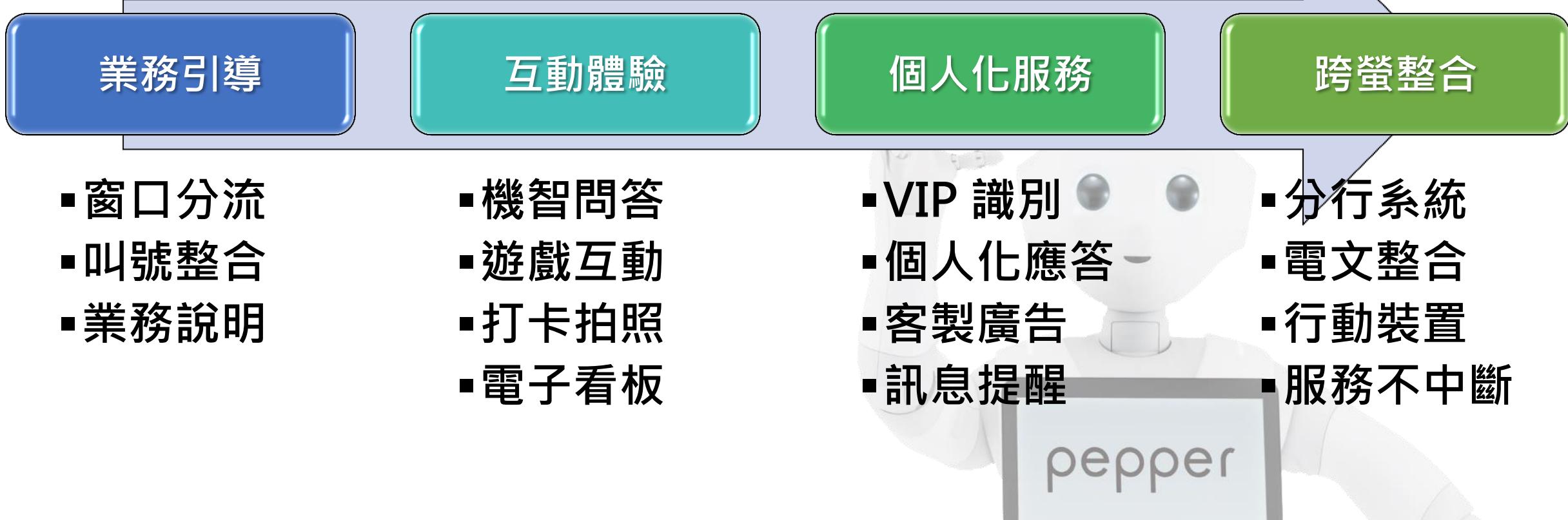
不知道買房子可以貸多少錢？



連結放款估價系統，試算貸款成數及金額，並且直接引導客戶與客服聯繫。



以智慧迎賓為例(I)



以智慧迎賓為例(II)

Q1:有位抽菸的先生走進銀行。



Q2:謝謝提醒，我想要辦理房屋
貸款



A1:不好意思，麻煩請您先將菸熄了，請問
有甚麼可以為您服務的

A2:好的，我立刻請專人為您服務。

Q1:有位媽媽帶小孩走進銀行。



Q2:我要辦理存款及轉帳服務。



Q1:有兩位戴著安全帽進入銀行。

Q2:喔，我只是要補登存摺



A1:不好意思，麻煩您取下安全帽

A2:您好，門口有自動補摺機可以
快速補登，不用抽號碼牌



A1:您好，這裡有座位，請問您想辦理甚麼
業務？

A2:請填寫存款單及匯款單，您的辦理序號
是5，叫到號時請您到指定櫃台辦理。



Q1:有位人士持柺杖來到銀行門口。

Q2:謝謝關心，我要開戶及辦信用卡。



A1:您好，這邊有座位，請問您要
辦理甚麼業務

A2:請先稍坐，我請專人為你辦
理。

AI-Deep Learning Platform

Credit
Rating/Scoring

Wealth
Management

KYC/AML/Fraud
Detection

Keras

Python

BrainScript

NVIDIA TensorRT

TensorFlow 1.2

CNTK 2.0

NVIDIA DIGITS 5

CUDA 8.0

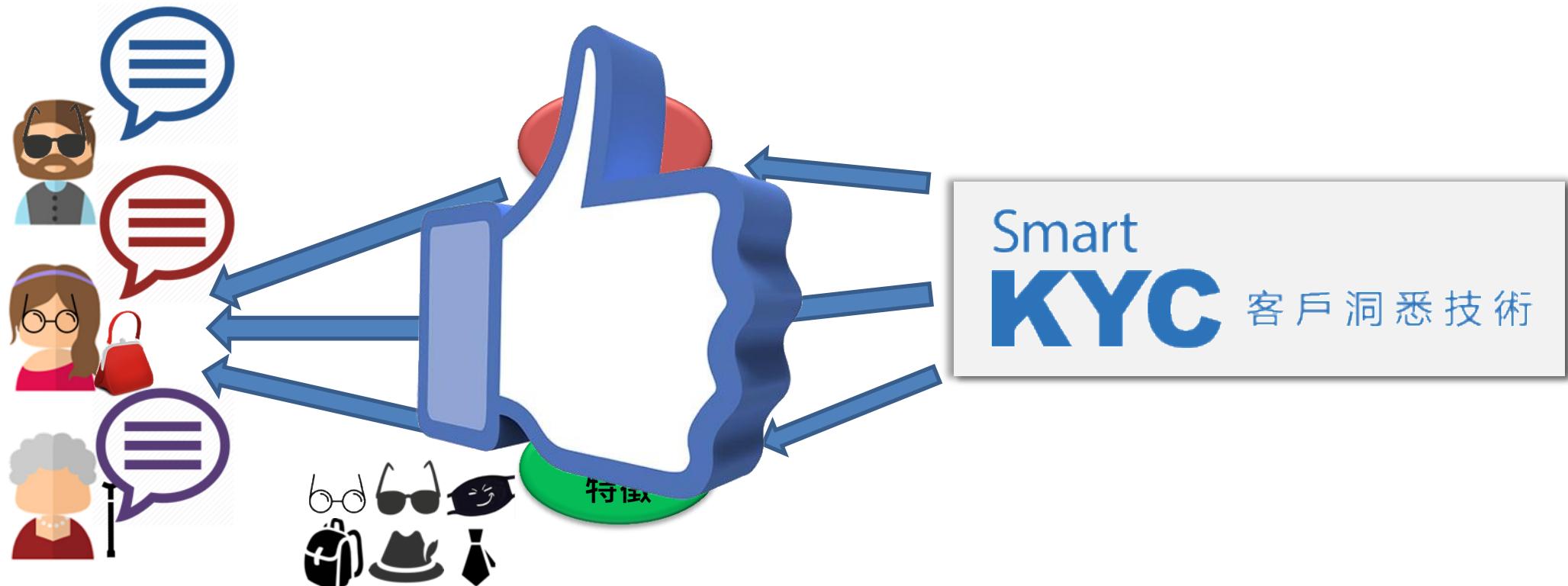
cuDNN

NVIDIA Docker

NVIDIA Based GPU Cloud

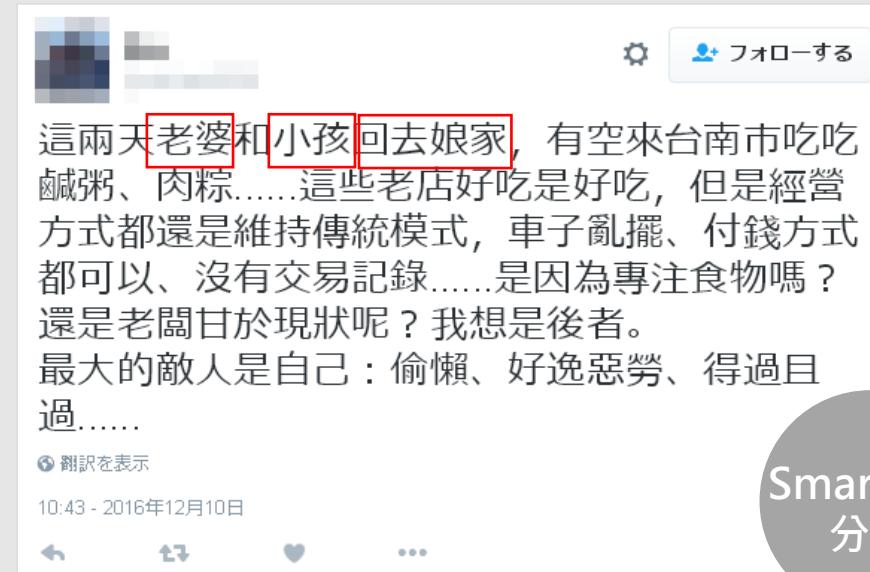
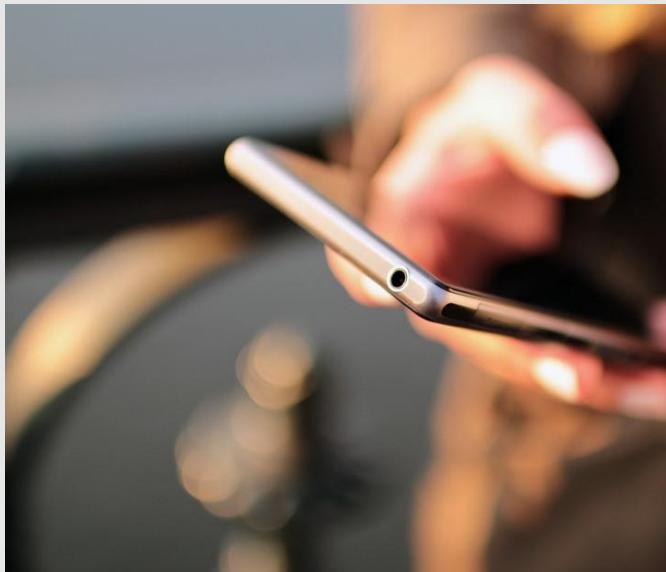
SmartKYC深度學習顧客屬性平台

機器主動提問，掌握客戶潛在投資屬性
結合robo-advisory，提供個人化投資建議



從文章推測發文者性別、年齡等屬性的服務 SmartKYC

發文者性別？年齡？屬性？



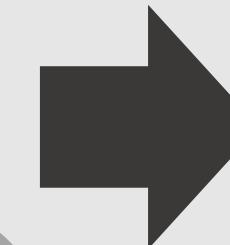
這兩天老婆和小孩回去娘家，有空來臺南市吃吃鹹粥、肉粽.....這些老店好吃是好吃，但是經營方式都還是維持傳統模式，車子亂擺、付錢方式都可以、沒有交易記錄.....是因為專注食物嗎？還是老闆甘於現狀呢？我想是後者。最大的敵人是自己：偷懶、好逸惡勞、得過且過.....

④ 翻訳を表示

10:43 - 2016年12月10日

結果

這位發文者是男性，已婚有小孩。



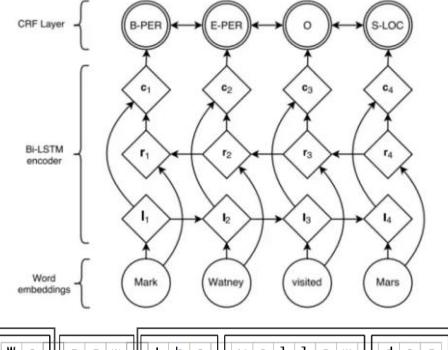
Big Data 分析



AI-Based Investment Management



NLP /Text Mining



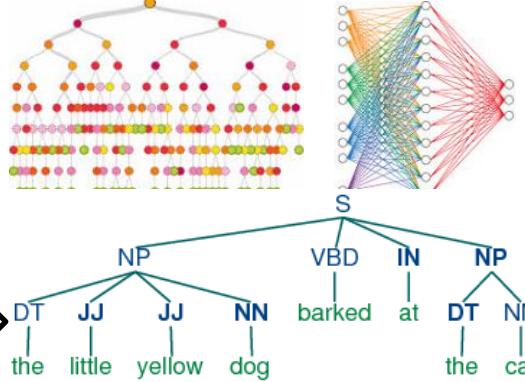
Risk Preference

Experience of Investment

Income/Expenditure Model

Current Asset Portfolio

Machine Learning



Recommendation Engine

Predictive/Prescriptive Analysis

Advanced Algorithmic Trading

Dynamic Portfolio Rebalancing

Unstructured Data

Structured Data

Trends & Correlations

Investment Tools

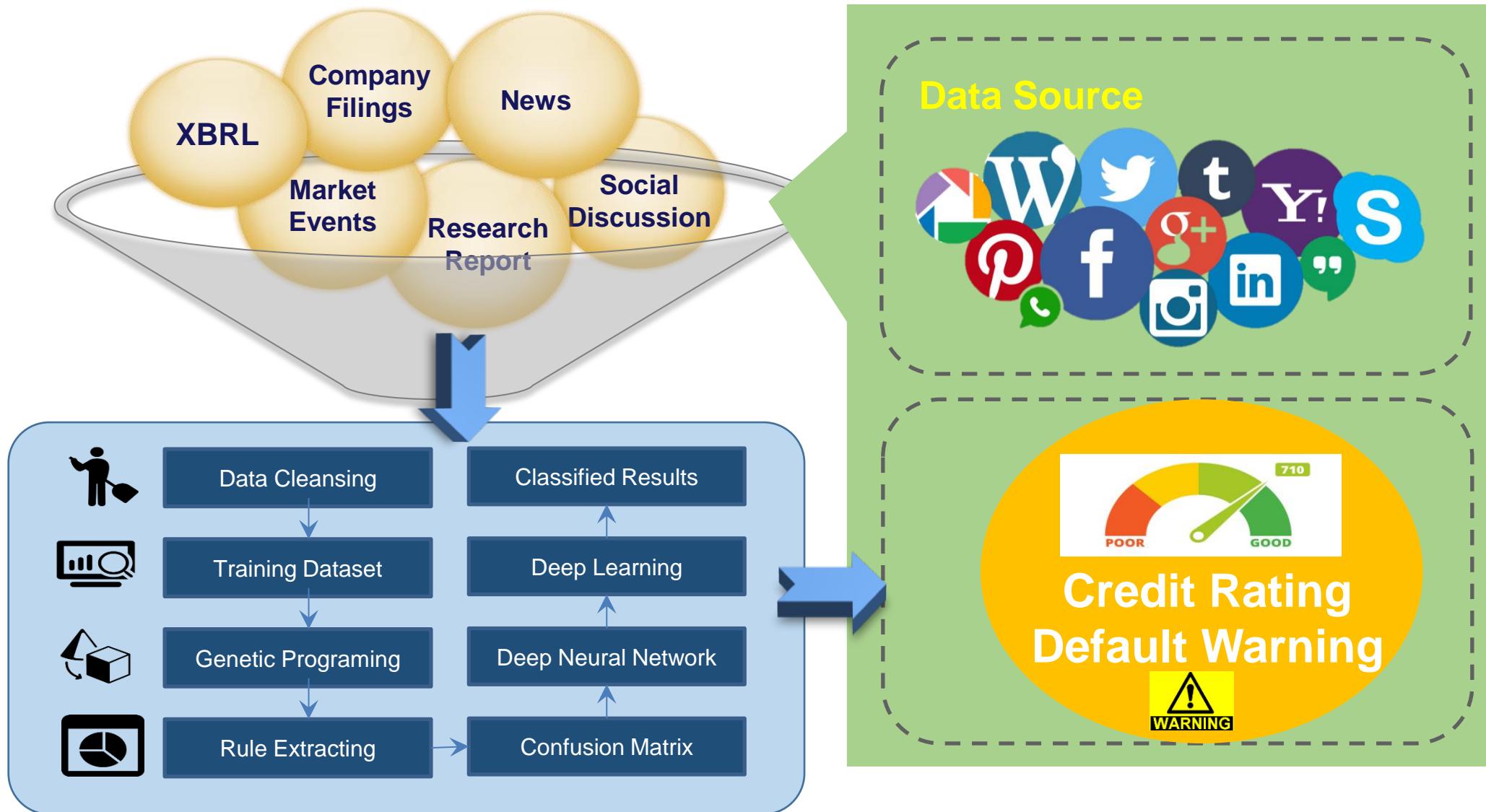


Market Info



Transaction Data

AI-Based Credit Scoring/Rating



SmartStory

AI-based NLG engine that turn data into various reports

- Smarter, faster machines that turning data into personalized portfolio summaries by NLG technology

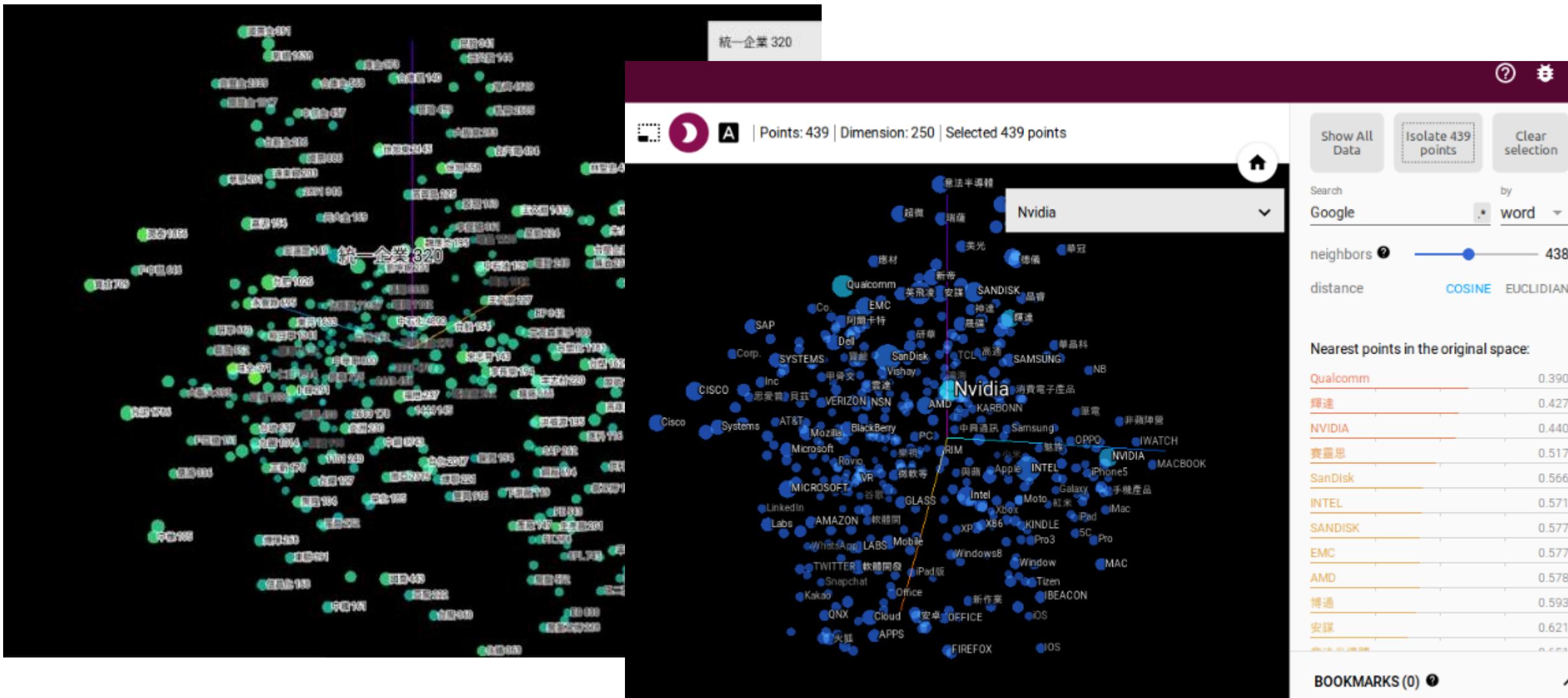
SmartStory 管理介面 > 客戶持股週報 > 範本編輯

線上客戶 同答管理 同義詞 辭典 制式文案

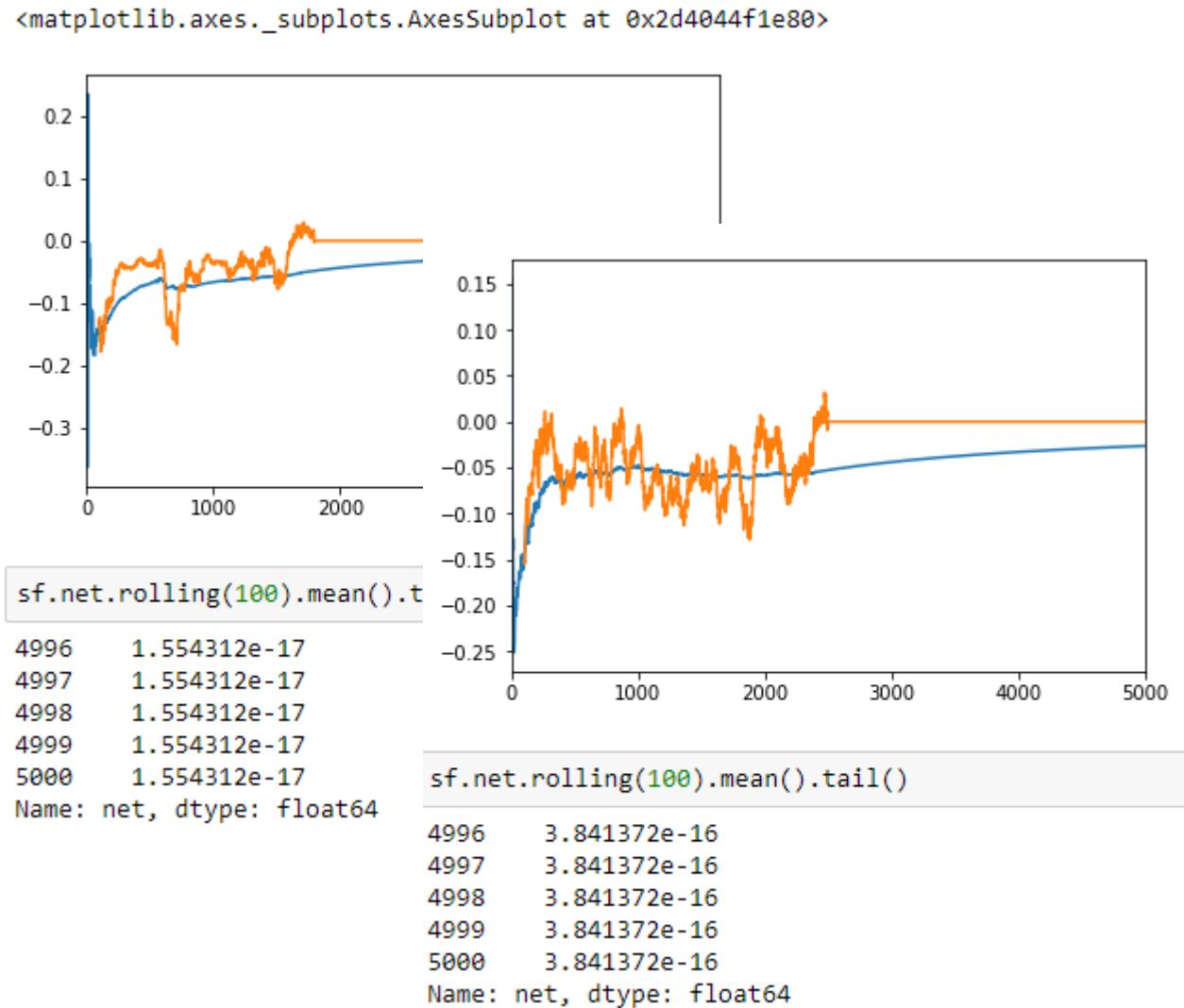
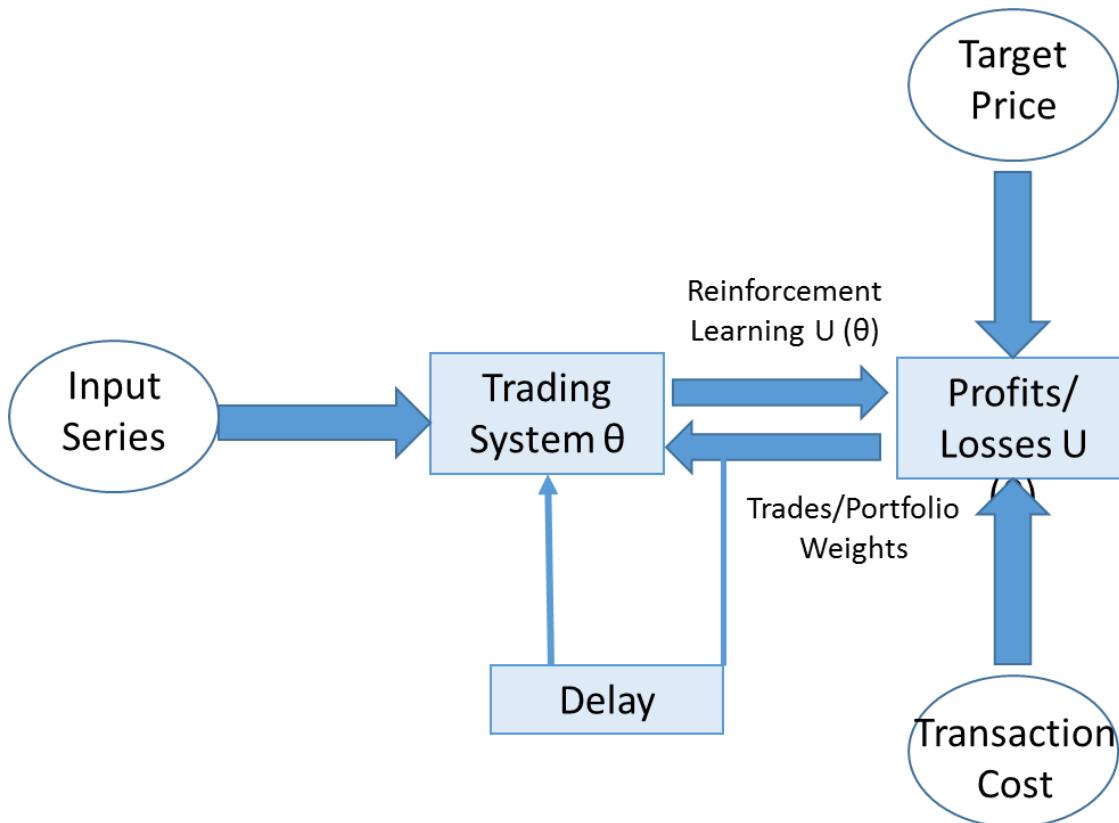
Your current portfolio is up 16.8% for the last month. The best performer is NVIDIA, which rose by 32% for the past 30 days...
The worst performer is IBM, down by 5% for the past month...
It should be noted that Warren Buffett sold a third of stake in IBM...



Visualization Model Using TensorFlow



Reinforce Learning on Trading



Remarks

- 1.** Comprehend what AI can do for us
- 2.** Harness the power of AI to help us lead in the market
- 3.** Raise awareness among team members
- 4.** Explore cross-industry opportunities
- 5.** Invest in deep learning and relevant technologies
- 6.** Embrace AI and the future of financial services

CFA vs. AI

≡ Search

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Institute is reshaping its course to meet employer demand for fintech skills



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MAY 11, 2017 by: Cat Rutter Pooley

Candidates for the finance industry's toughest exams will now have an extra challenge: becoming fintech experts.

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Sukuk surge masks problems for asset class Premium

AN HOUR AGO



Source: <https://www.ft.com/content/28d94422-3588-11e7-99bd-13beb0903fa3>

AI Fintech Map

THE AI IN FINTECH MARKET MAP

CREDIT SCORING / DIRECT LENDING



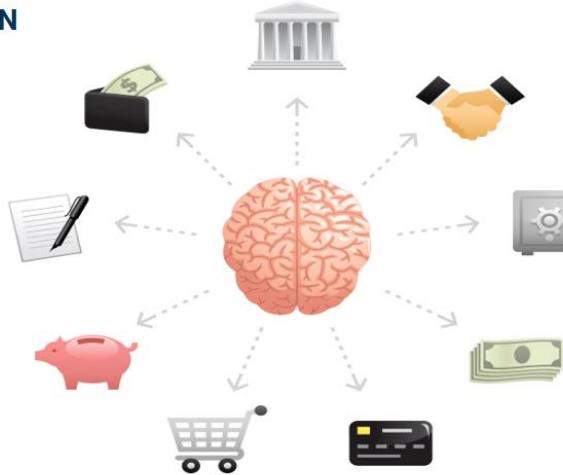
ASSISTANTS / PERSONAL FINANCE



REGULATORY, COMPLIANCE, & FRAUD DETECTION



GENERAL PURPOSE / PREDICTIVE ANALYTICS



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QUANTITATIVE & ASSET MANAGEMENT



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DEBT COLLECTION



CB INSIGHTS

Source: <https://cbi-blog.s3.amazonaws.com/blog/wp-content/uploads/2017/03/AI-in-FinTech-Market-Map-Image3.png>

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 INTUMIT

OpenAI Gym

[Environments](#) [Documentation](#) [Forum](#)



A toolkit for developing and comparing reinforcement learning algorithms. It supports teaching agents everything from walking to playing games like Pong or Go.

[Read the launch blog post >](#)

[View documentation >](#)

[View on GitHub >](#)



ceobillionaire's algorithm on LunarLander-v0



ceobillionaire's algorithm on MsPacman-ram-v0



Source: <https://gym.openai.com/>

Alphago on Nature

nature International weekly journal of science

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NATURE | LETTER
日本語要約

Human-level control through deep reinforcement learning

Volodymyr Mnih, Koray Kavukcuoglu, David Silver, Andrei A. Rusu, Joel Veness, Marc G. Bellemare, Alex Graves, Martin Riedmiller, Andreas K. Fidjeland, Georg Ostrovski, Stig Petersen, Charles Beattie, Amir Sadik, Ioannis Antonoglou, Helen King, Dharshan Kumaran, Daan Wierstra, Shane Legg & Demis Hassabis

Affiliations | Contributions | Corresponding authors

Nature 518, 529–533 (26 February 2015) | doi:10.1038/nature14236
Received 10 July 2014 | Accepted 16 January 2015 | Published online 25 February 2015

Citation Rights & permissions Article metrics

The theory of reinforcement learning provides a normative account¹, deeply rooted in psychological² and neuroscientific³ perspectives on animal behaviour, of how agents may optimize their control of an environment. To use reinforcement learning successfully in situations approaching real-world complexity, however, agents are confronted with a difficult task: they must derive efficient representations of the environment from high-dimensional sensory inputs, and use these to generalize past experience to new situations. Remarkably, humans and other animals seem to solve this problem through a harmonious combination of reinforcement learning and

Editor's summary العربية
For an artificial agent to be considered truly intelligent it needs to excel at a variety of tasks considered challenging for humans. To date, it has only been possible to create individual algorithms...

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Artificial intelligence: Learning to see and act by Schölkopf

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如何兼顧生產彈性與高效率?

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<http://www.nature.com/nature/journal/v529/n7587/full/nature16961.html?foxtrotcallback=true>

nature International weekly journal of science

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NATURE | ARTICLE
日本語要約

Mastering the game of Go with deep neural networks and tree search

David Silver, Aja Huang, Chris J. Maddison, Arthur Guez, Laurent Sifre, George van den Driessche, Julian Schrittwieser, Ioannis Antonoglou, Veda Panneershelvam, Marc Lanctot, Sander Dieleman, Dominik Grewe, John Nham, Nal Kalchbrenner, Ilya Sutskever, Timothy Lillicrap, Madeleine Leach, Koray Kavukcuoglu, Thore Graepel & Demis Hassabis

Affiliations | Contributions | Corresponding authors

Nature 529, 484–489 (28 January 2016) | doi:10.1038/nature16961
Received 11 November 2015 | Accepted 05 January 2016 | Published online 27 January 2016

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Abstract
Abstract • References • Author information • Extended data figures and tables • Supplementary information • Comments

The game of Go has long been viewed as the most challenging of classic games for artificial intelligence owing to its enormous search space and the difficulty of evaluating board positions and moves. Here we introduce a new approach to computer Go that uses ‘value networks’ to

Editor's summary العربية
The victory in 1997 of the chess-playing computer Deep Blue in a six-game series against the then world champion Gary Kasparov was seen as a significant milestone in the development of artificial intelligence...

Related audio
Hear from the makers of the AI that mastered Go - and the professional player it beat.
 00:00

如何兼顧生產彈性與高效率?
SAP 為數位轉型企業首選，下戰工業 4.0 白皮書，瞭解製造創新的挑戰與機會。
 SAP

Editors' pick

PwC AI report(I)

Artificial intelligence (AI) is a source of both huge excitement and apprehension. What are the real opportunities and threats for your business? Drawing on a detailed analysis of the business impact of AI, we at PwC identify the most valuable commercial opening in your market and how to take advantage of them.

Sizing the prize

What's the real value of AI for your business and how can you capitalise?

+14%

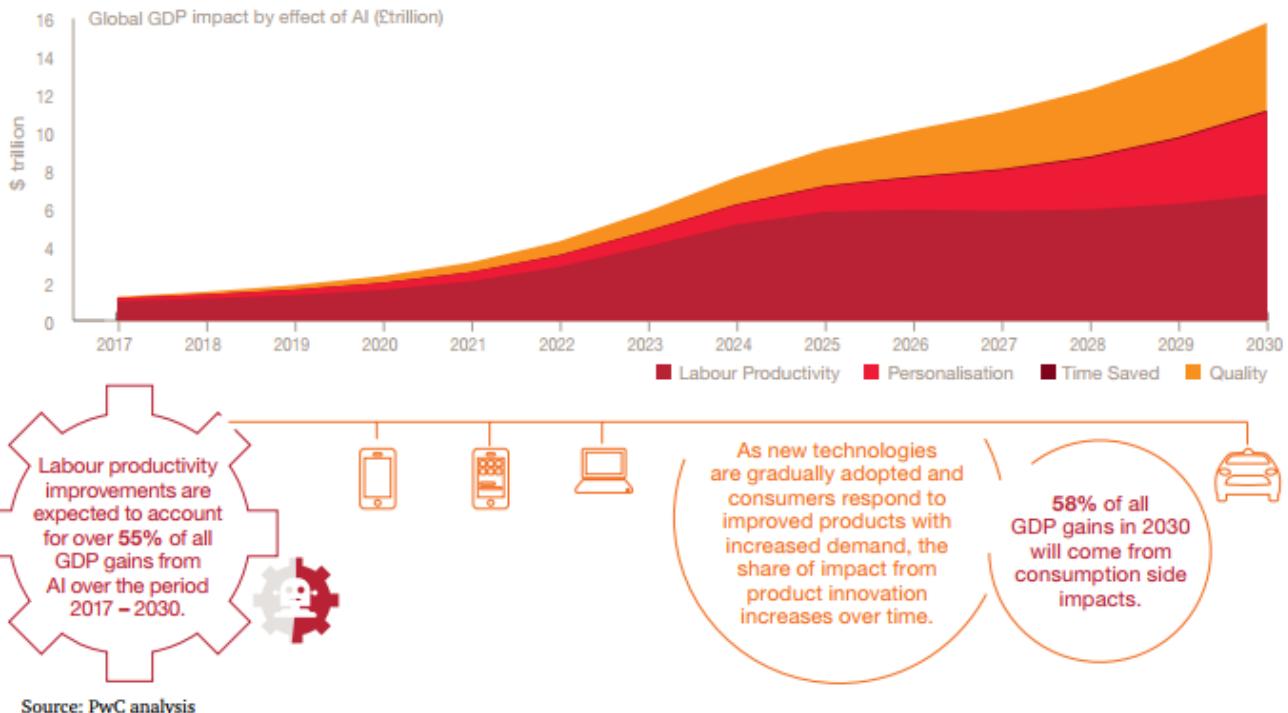
According to PwC research carried out for this report, global GDP could be up to 14% higher in 2030 as a result of AI – equivalent of an additional \$15.7 trillion – making it the biggest commercial opportunity in today's fast changing economy

+26%

The greatest gains from AI are likely to be in China (boost of up to 26% by 2030) and North America (potential 14% boost). The biggest sector gains will be in retail, financial services and logistics, as AI increases productivity, product quality and consumption.



Figure 1: Where will the value gains come from with AI?



www.pwc.com/AI

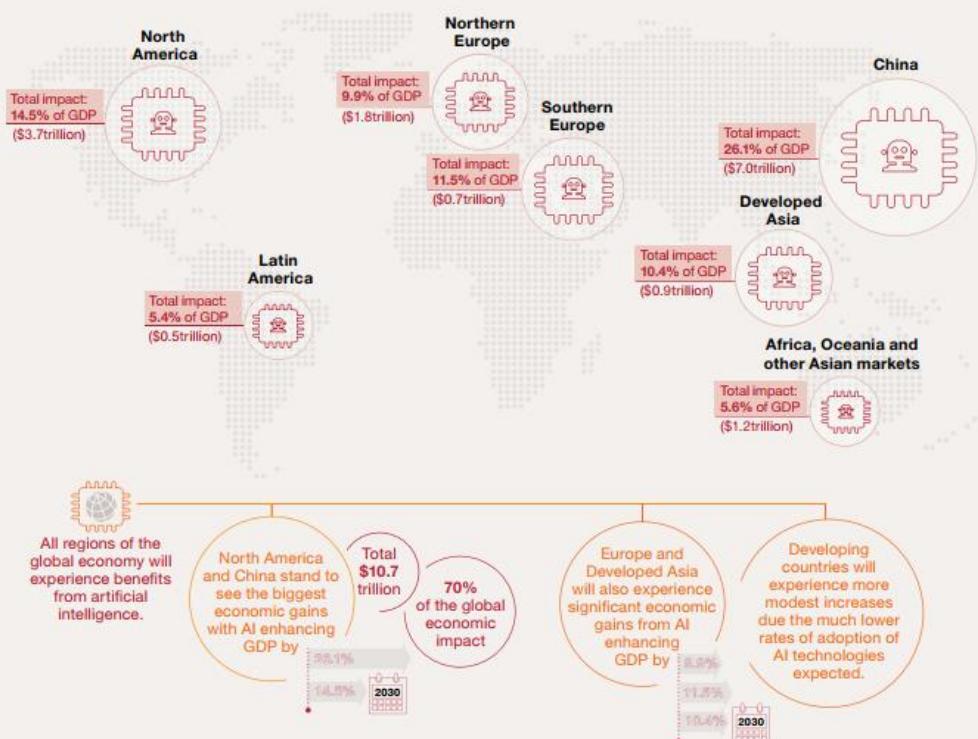
Source: <https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html>
<https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>

PwC AI Report (II)

Figure 4: What's the potential value for your sector?

Sector	Subsector	Potential AI Consumption Impact	Personalisation	Time Saved	Utility	Data Availability
Healthcare	Providers/Health Services	3.9	4.1	3.0	3.9	4.7
	Pharma/Life Sciences	3.8	3.9	2.8	4.2	4.1
	Insurance	3.6	3.6	2.6	3.8	4.2
	Consumer Health	3.5	3.4	2.3	3.4	4.8
Automotive	Aftermarket & Repair	3.9	4.2	2.8	3.6	4.6
	Component suppliers	3.9	4.0	2.0	3.5	5.0
	Personal Mobility as a Service	3.8	4.0	3.7	4.0	3.7
	OEM	3.6	4.0	3.0	4.0	3.5
	Financing	3.3	3.3	3.0	3.7	3.0
Financial Services	Asset Wealth Management	3.4	2.9	2.2	3.7	4.3
	Banking and Capital	3.3	2.5	2.9	3.0	5.0
	Insurance	3.2	3.1	2.4	3.1	4.4
	Transportation and Logistics	3.2	3.5	2.6	3.3	3.7
Transportation and Logistics	Transportation	3.5	3.0	2.8	3.5	5.0
	Logistics	3.1	3.9	2.5	3.1	3.0
Technology, Communications and Entertainment	Technology	3.3	2.7	2.4	3.6	4.1
	Entertainment, Media and Communication	3.0	2.5	2.0	3.3	4.4
	Retail	3.0	2.8	2.1	3.3	3.8
Retail	Consumer Products	3.1	3.0	2.3	3.3	3.8
	Retail	3.0	2.6	2.0	3.3	3.7
Energy	Oil & Gas	2.3	4.0	2.1	2.9	3.0
	Power & Utilities	2.1	2.0	2.1	3.3	3.2
Manufacturing	Industrial manufacturing	2.2	2.0	1.4	3.7	3.9
	Industrial Products/Raw Materials	2.1	NA	1.0	3.6	3.7
	Grand Total	3.1	3.1	2.3	3.5	4.1

Figure 2: Which regions will gain the most from AI?



Source: PwC analysis

Figure 3: How quickly will AI impact productivity?

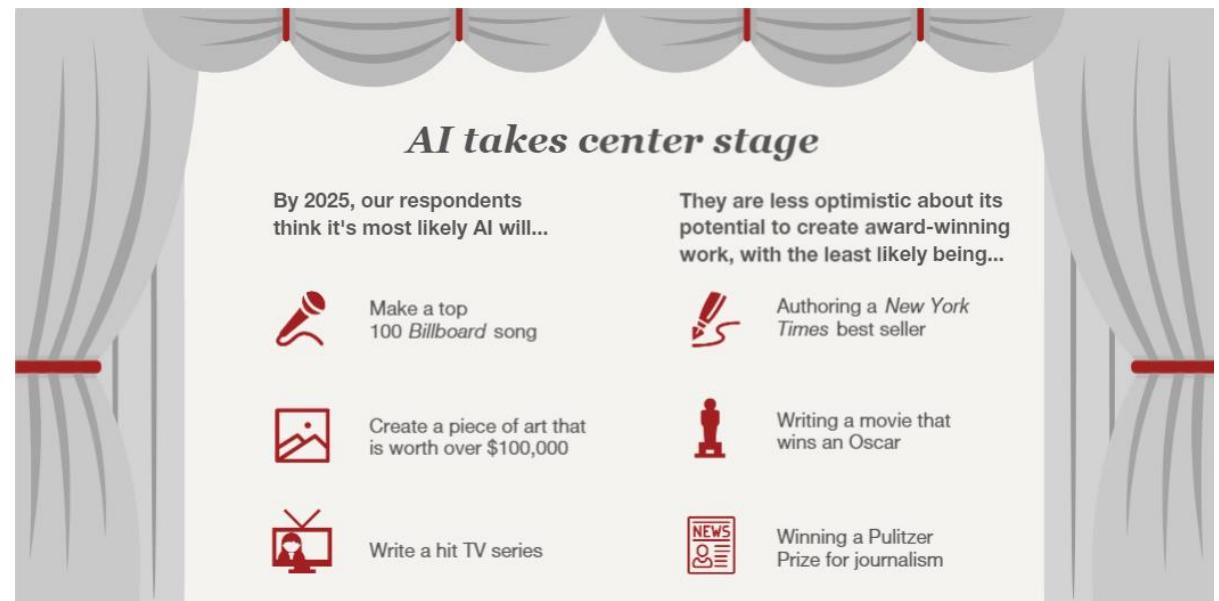
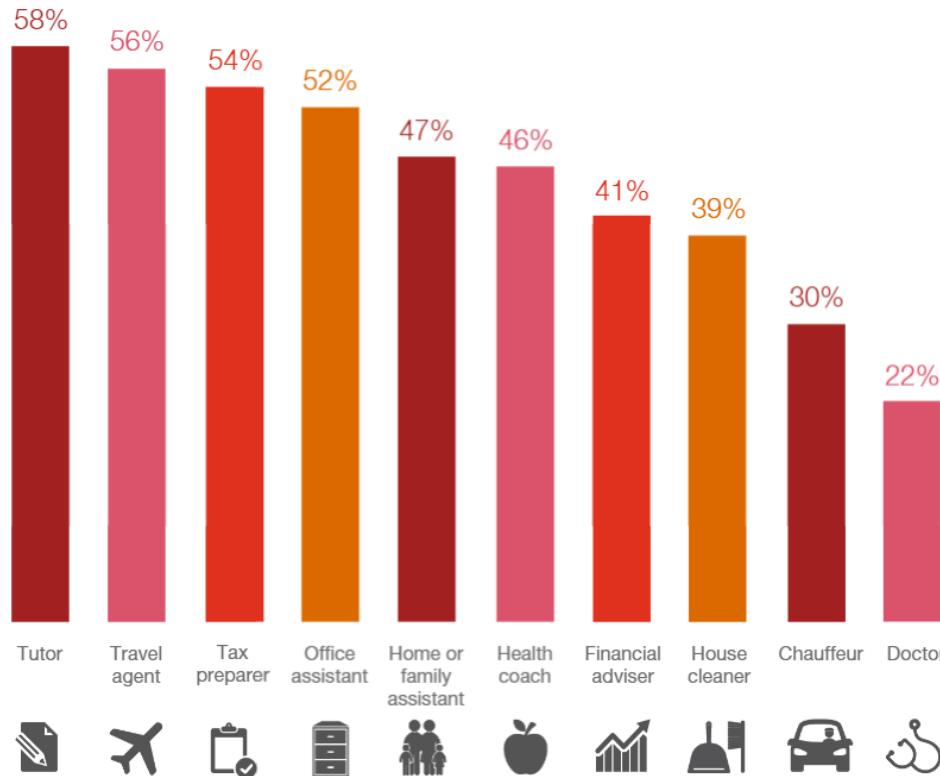
North America and China are expected to witness the greatest GDP gains from AI increasing productivity, but the trajectory over impact for the two countries differs.



Source: <https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html>
<https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>

PwC AI Report (III)

"In the next five years, I can see AI replacing humans as a..."



Digital assistants are fueling the first wave of adoption:

Digital assistants are AI computer programs that help individuals perform tasks or services, combining user input, location awareness and the ability to aggregate data from many online sources.

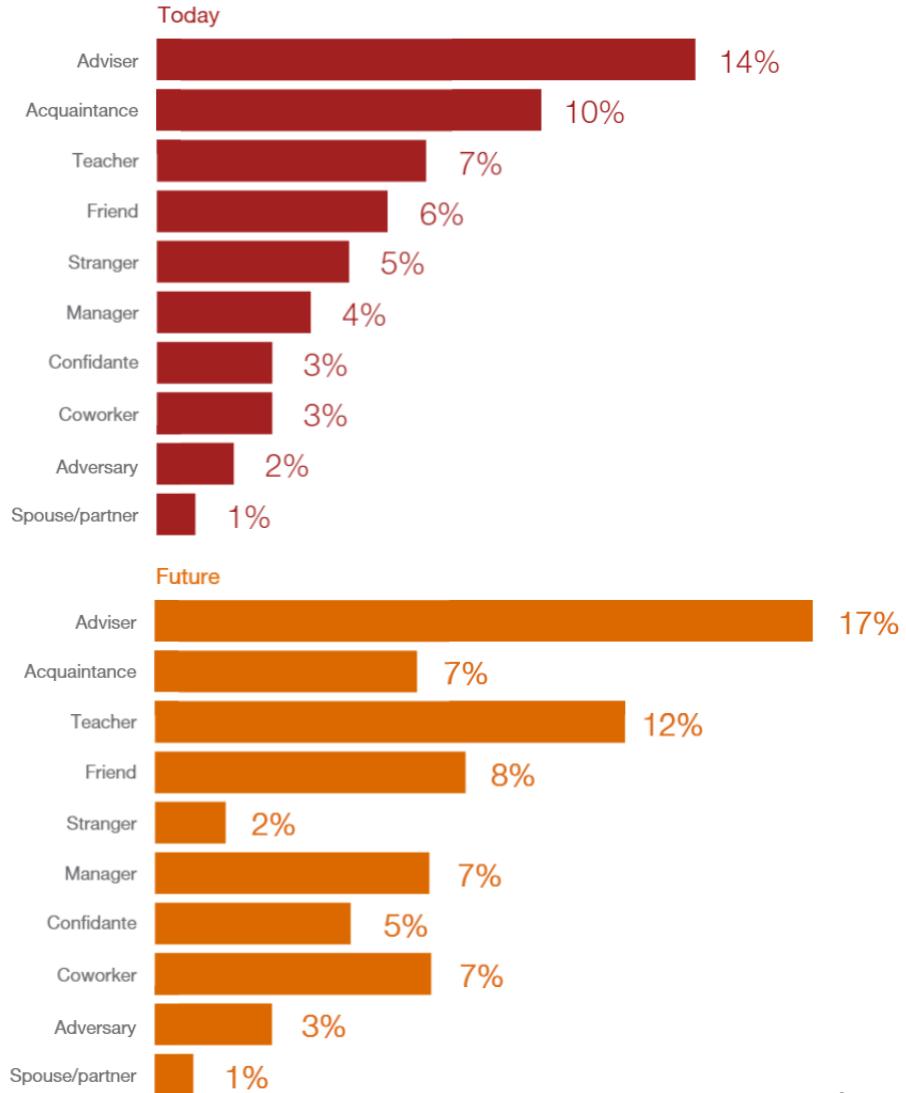
Percentage already using digital assistants:

- 42% of consumers
- 53% of millennials
- 72% of business decision makers
- 34% of business decision makers say that the time freed up from using digital assistants allows them to focus on deep thinking and creating.

Source: <http://pwcartificialintelligence.com/>

PwC AI Report (IV)

"I see my digital assistant as a..."



Less repetitive tasks = more big thinking

In their own roles, business execs see huge potential for AI to alleviate repetitive tasks such as:



82%

Paperwork



79%

Scheduling



78%

Timesheets



69%

Accounting



65%

Personal expenses



60%

HR functions, like benefits



60%

Email management



49%

Proposal writing



37%

HR management

Source: <http://pwcartificialintelligence.com/>

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PwC AI Report (V)



Importance of AI being used to help solve:



68%

Cybersecurity and privacy



66%

Cancer and diseases



62%

Clean energy



61%

Personal financial security and fraud



58%

Global education



56%

Global health and well-being



56%

Economic growth



50%

Climate change



38%

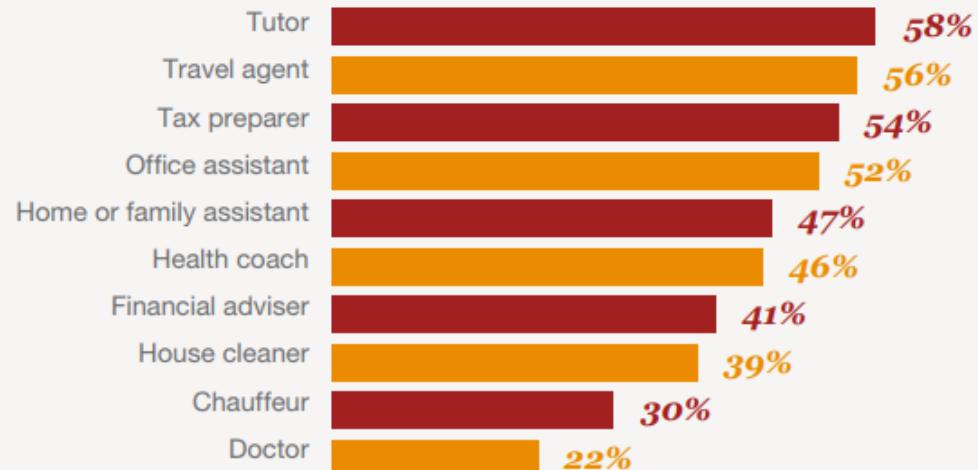
Income inequality



31%

Gender inequality

In the next five years, how likely is it that people will turn to AI assistants versus real humans within the following roles?



Base: Gen pop – Q4. In the next 5 years, how likely is it that people will turn to AI assistants versus real humans within the following categories? Top 2 box.

Source: http://www.pwc.com/us/en/industry/entertainment-media/publications/consumer-intelligence-series/artificial-intelligence.html?WT.mc_id=CT10-PL102-DM2-TR1-LS4-ND6-BPA1-CN_CIS-AI-PressAnnouncement
<http://www.pwc.com/us/en/industry/entertainment-media/publications/consumer-intelligence-series/assets/pwc-botme-booklet.pdf>

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PwC AI Report (VI)

Life upgraded with artificial intelligence



Consumers are buying into AI

They are more optimistic about the solutions it could provide than the disruption it could create:

63% agree AI will help solve complex problems that plague modern societies

59% agree AI will help people live more fulfilling lives

On the other hand:

46% believe AI will harm people by taking away jobs

23% believe AI will have serious, negative implications

AI, the great equalizer?

AI has the potential to expand opportunities and access:

71% believe AI will provide educational help to disadvantaged school children

40% believe AI will expand access to financial, medical, legal, and transportation services to those with lower incomes

This access is even more important to them than preserving jobs of employees in certain industries:

80% say it's more important to have access to more affordable legal advice than preserve the jobs of lawyers

69% would rather have more affordable, convenient and reliable transportation than preserve the jobs of taxi drivers

64% would rather have instant access to quality customer service than preserve the jobs of customer service reps



Make a top 100 Billboard song



Authoring a New York Times best seller



Create a piece of art that is worth over \$100,000



Writing a movie that wins an Oscar



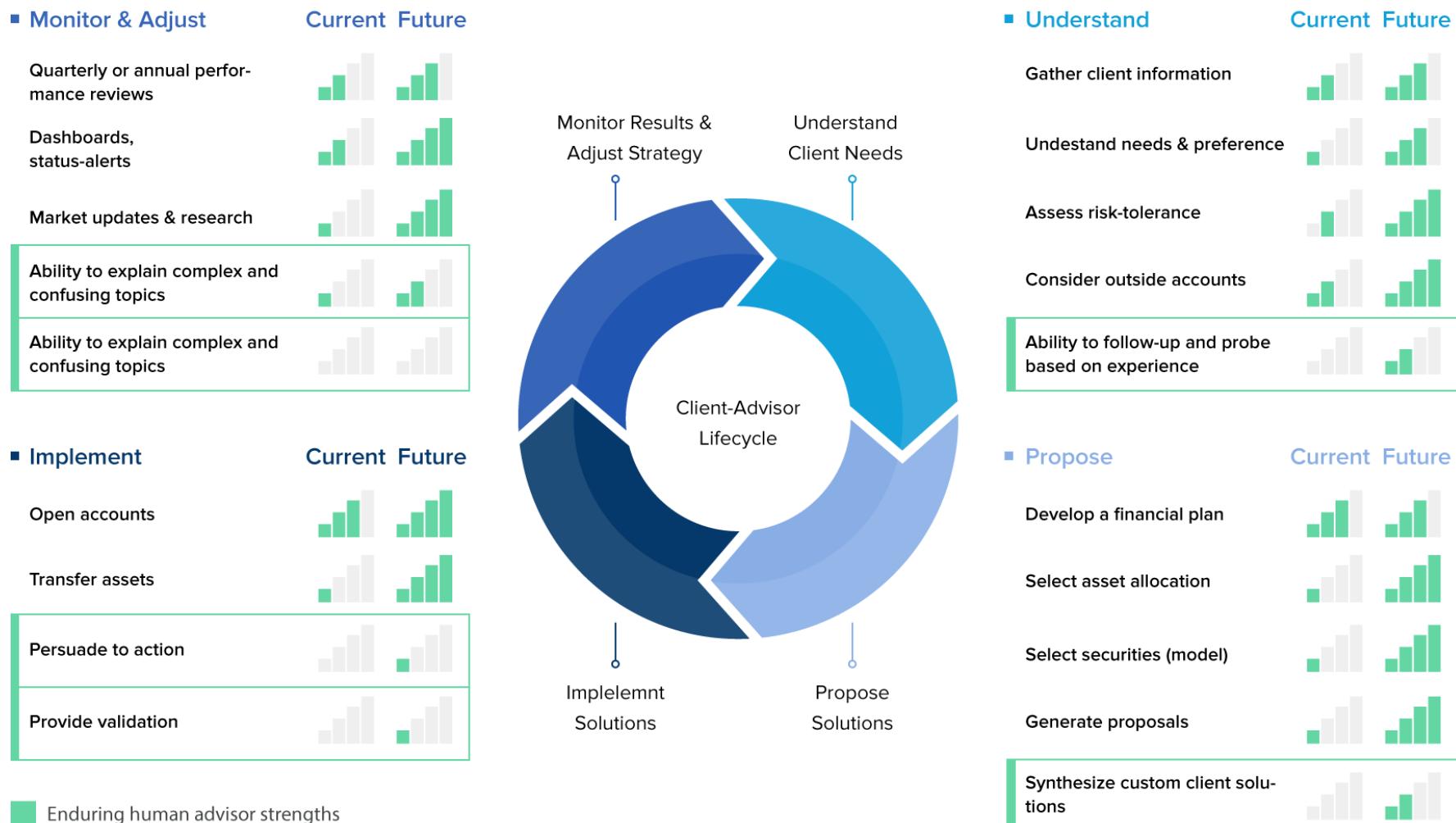
Write a hit TV series



Winning a Pulitzer Prize for journalism

Robo-Advice (I)

Chart 3: Current and Future Robo-Advice Capabilities



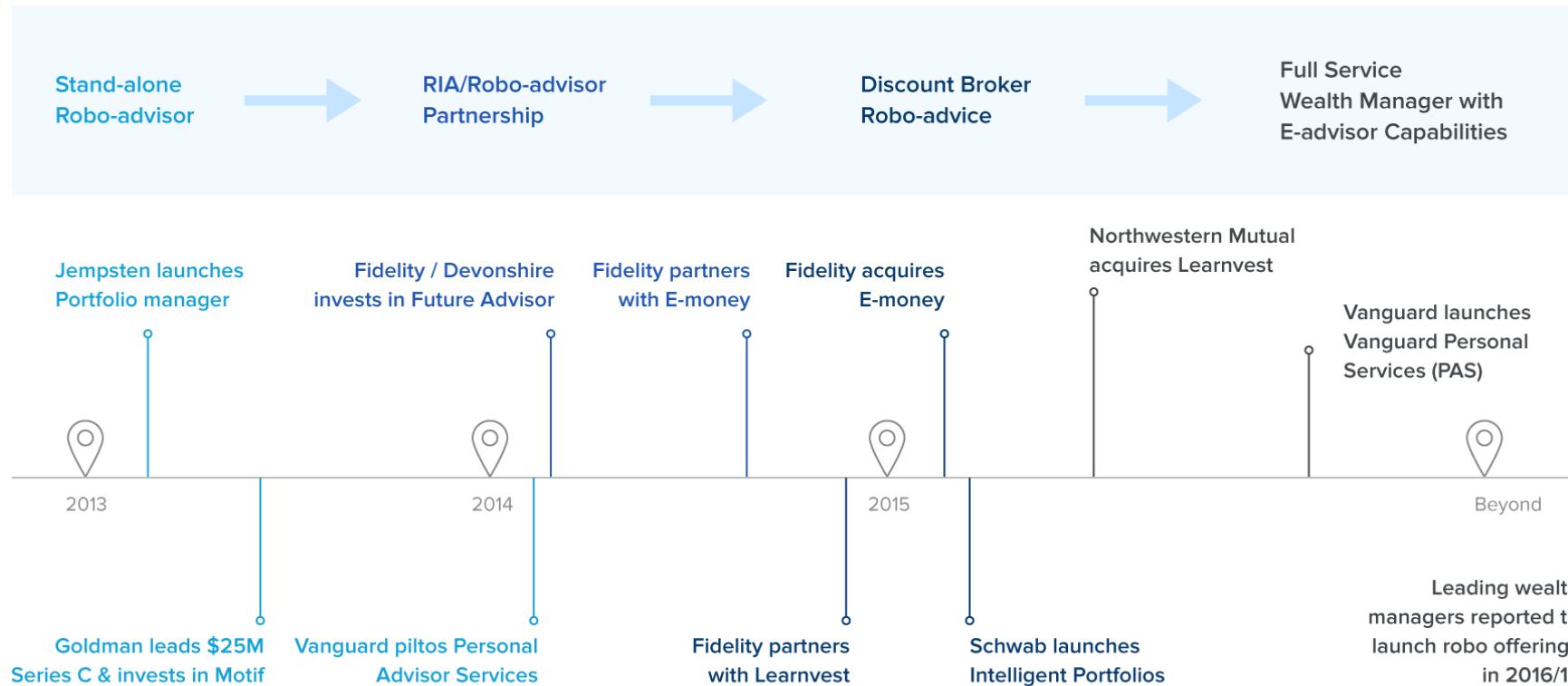
Source: Accenture Research

Source: <https://www.toptal.com/finance/market-research-analysts/artificial-intelligence-in-finance>

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Robo-Advice (II)

Figure 3: Approaches to Robo-Advice Capabilities



Source: Accenture Research



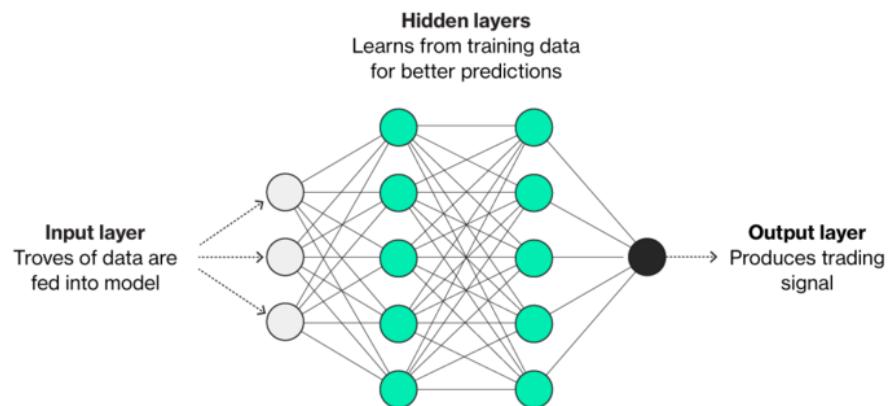
Source: <https://www.toptal.com/finance/market-research-analysts/artificial-intelligence-in-finance>

AI for Financial Service



How Artificial Neural Networks Work

Hedge funds experiment with deep learning technology for trading

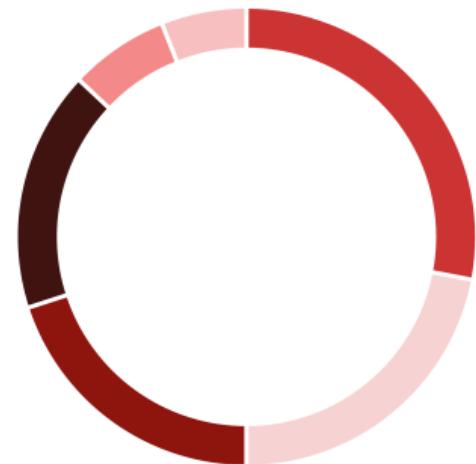


Bloomberg

Where AI will have the biggest impact

Insurance business functions with most to gain from investments

- Customer service, 28%
- IT, 20%
- Sales, 17%
- Marketing, 7%
- R&D, 6%
- Other, 22%



Source: Tata Consultancy Services

Source: <https://www.slideshare.net/NVIDIA/artificial-intelligence-ai-for-financial-services>

Yann LeCun

Deep Learning's Killer App for Finance?

Posted on March 25, 2017 by aldousbirchall

Yann LeCun, arguably the father of modern machine learning, has described **Generative Adversarial Networks (GANs)** as the most interesting idea in deep learning in the last 10 years (and there have been a lot of interesting ideas in Machine Learning over the past 10 years).

From a trading perspective, or any game theoretic activity in which the *game itself constantly evolves*, GANs are big news. There is a school of thought in quantitative asset management, risk management, systematic trading etc that goes something like this:

"If I can just get enough data into my machine learning algo, then I win!"

This is wrong, because it doesn't address the evolution of the game and the other players. It also comes up with all kinds of nonsense based on spurious correlations. Bigger data set = more false positives. Yet this approach is the basis for many startup hedge funds who get a lot of air time from the press. I'm not saying this approach doesn't work, but it's not the holy grail, and the results are often underwhelming, even if done correctly.



Market Data (Source: Investopedia)

Source: <https://aldousbirchall.com/2017/03/25/deep-learning-s-killer-app/>

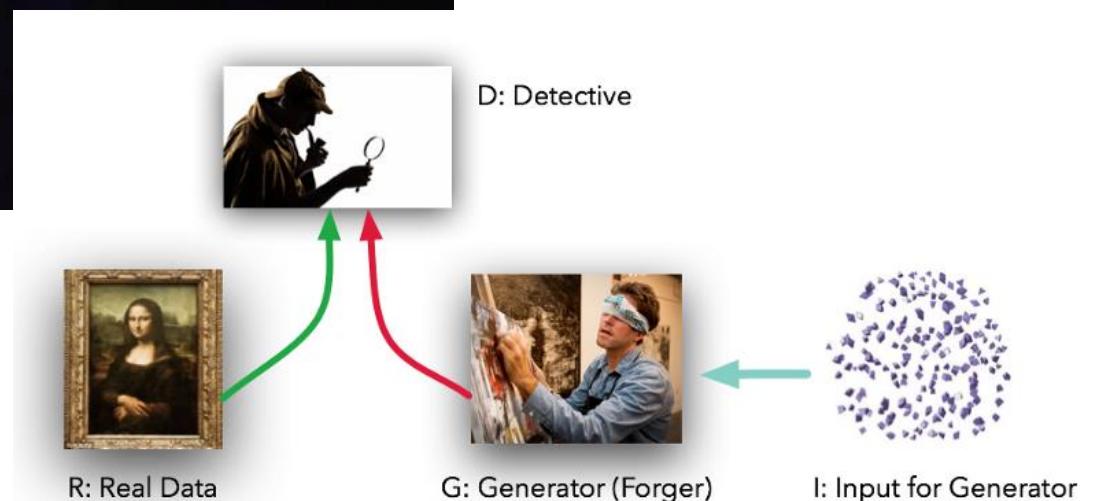
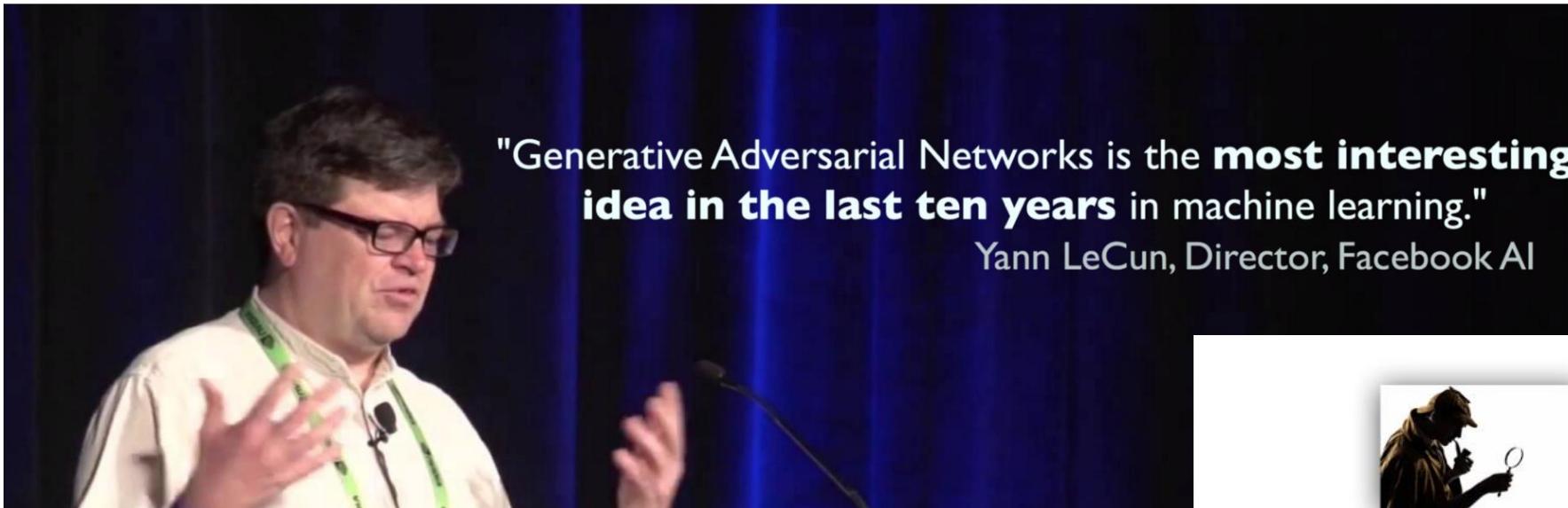
Yann LeCun(II)

Generative Adversarial Networks (GANs)
in 50 lines of code (PyTorch)

tl;dr: GANs are simpler to set up than you think

"Generative Adversarial Networks is the **most interesting idea in the last ten years** in machine learning."

Yann LeCun, Director, Facebook AI



Source: <https://medium.com/@devnag/generative-adversarial-networks-gans-in-50-lines-of-code-pytorch-e81b79659e3f>



感謝您的聆聽

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