

Introduction to Artificial Intelligence

L.-Y. Wei

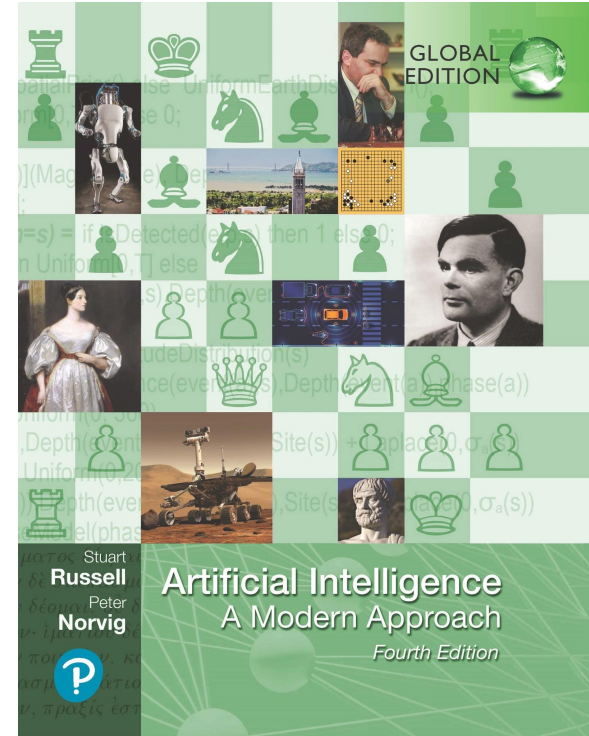
Spring 2024

Course

- Instructor: 魏綾音
- Tuesday 9:10-12:00 (Room 3102)
- email: lywei@nccu.edu.tw
 - Email subject: [AI24]...
- Office hours
 - Email first for scheduling

Textbook and References

- **Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Fourth Edition, Pearson FT Press, 2020**
- Ian H. Witten, Eibe Frank, Mark A. Hall, and Christopher J. Pal, *Data Mining: Practical Machine Learning Tools and Techniques*, Fourth Edition, Morgan Kaufmann, 2017
- Aurélien Géron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems*, Second Edition, O'Reilly Media, 2019 (3rd, 2022)



Prerequisites

- Linear algebra
- Probability
- Discrete mathematics
- Data structure
- Algorithm
- Python

Grading Policy

- Homework [20%]
 - Bonus points for early submissions
 - e.g., $\text{Score} \times [1+0.1]$ for the first 5 submissions
 - **Hard deadline**, unless you have an extension

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- Programming assignments [40%]
 - 3-4 tasks
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- Programming assignments [40%]
 - 3-4 tasks
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- Midterm exam [30%]

Grading Policy

- Final report [10%] (2-3 members)
 - Submit your team member list **by April 7** (or assigned randomly)
 - Announce the paper list on **April 16**
 - International conference papers published in 2023-2024
 - Submit your top 3 papers **by April 23** (or assigned randomly)
 - Announce the assigned paper before **April 30**
 - Presentation on **June 4/June 11**



By DALL·E 3

Add Course (加簽)

- 2/27(Tue.) - 3/5(Tue.)
 - 若加簽的同學不是在候補名單中(即選課身份不符無法透過系統登記者), 請到系辦索取「資料系加簽單」

課程加簽暨退課

加簽單、退課單列印: 2/27 上午 9:00 至 3/5 晚間 12:00 止

加簽單、退課單收件: 2/27 上午 9:00 至 3/6 中午 12:00 止

Add-drop course with the approval of the course instructor

Add-drop course request forms can be printed from 9am on Feb.27 to Mar.5

Add-drop course request forms can be submitted for processing from 9am on Feb.27 to 12pm on Mar.6

What is Artificial Intelligence?



Jeopardy! IBM Watson, 2011



Two “Jeopardy!” champions, Ken Jennings, left, and Brad Rutter, competed against a computer named Watson, which proved adept at buzzing in quickly. Carol Kaelson/Jeopardy Productions Inc., via Associated Press

Go, DeepMind AlphaGo, 2016



Autopilot, Tesla 2016



國際汽車工程師學會-自動駕駛分級

自動駕駛分級	名稱	定義	駕駛操作	周邊監控	接管	應用場景
L0	人工駕駛	由人類駕駛員全權駕駛車輛	人類駕駛員	人類駕駛員	人類駕駛員	無
L1	輔助駕駛	車輛對方向盤和加減速中的一項操作提供駕駛，人類駕駛員負責其餘的駕駛動作	人類駕駛員和車輛			限定場景
L2	部分自動駕駛	車輛對方向盤和加減速中的多項操作提供駕駛，人類駕駛員負責其餘的駕駛動作	車輛			
L3	條件自動駕駛	由車輛完成絕大部分駕駛操作，人類駕駛員需保持注意力集中以備不時之需		車輛		
L4	高度自動駕駛	由車輛完成所有駕駛操作，人類駕駛員無需保持注意力集中，但限定道路和環境條件			車輛	
L5	完全自動駕駛	由車輛完成所有駕駛操作，人類駕駛員無需保持注意力集中				

Porker, CMU & FB, 2019



[News](#) > [Stories](#) > [Archives](#) > [2019](#) > [July](#) > Carnegie Mellon and Facebook AI Beats Professionals in Six-Player Poker

July 11, 2019

Carnegie Mellon and Facebook AI Beats Professionals in Six-Player Poker

Related Coverage

Wired: This New Poker Bot Can Beat Multiple Pros—At Once

Speech Translation, Meta, 2022



Meta AI built the first speech translator that works for languages that are primarily spoken rather than written. We're open sourcing this so people can use it for more languages.

Robots, BostonDynamics, 2009-2022



Robots, BostonDynamics, 2022



ChatGPT, OpenAI, 2022

ChatGPT: Optimizing Language Models for Dialogue

We've trained a model called ChatGPT which interacts in a conversational way. The dialogue format makes it possible for ChatGPT to answer followup questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests. ChatGPT is a sibling model to InstructGPT, which is trained to follow an instruction in a prompt and provide a detailed response.

ChatGPT: New AI chatbot has everyone talking to it

🕒 6 days ago



By Chris Vallance
Technology reporter

Source: <https://www.bbc.com/news/technology-63861322>

GPT-4, OpenAI, 2023

什麼是人工智慧

人工智慧，也稱為AI，源於一種科學領域，它的目標是設計和創建機能模擬、擴充和助益人體智能的系統或軟體。人工智慧系統可以以人類的思維方式來處理問題，包括學習、推理、解決問題、語義識別等等。特定的AI系統也被設計為在視覺、語音和其他感知領域具有增強能力。

這些在眾多領域中都有各種用途，同時也引發著一系列的科技倫理議題。

GPT-4, OpenAI, 2023

推薦的相關書籍

很高興你對人工智慧有興趣，下面是我精選的一些相關書籍推薦給你：

1. 《人工智慧簡史》（AI: A Modern Approach）：作者 Stuart Russell 和 Peter Norvig 兩位人工智慧領域的權威人物共同撰寫，是全球最暢銷的AI教科書之一。
2. 《超智能：對於一個機器智能時代的思考》（Superintelligence: Paths, Dangers, Strategies）：作者 Nick Bostrom 對未來機器智能可能帶來的影響進行了深度探討。

GPT-4, OpenAI, 2023

請給我一張圖，大學生在課堂舉手問問題

Using DALL·E 3



Robots, BostonDynamics, 2023



Medical Imaging, NTUH, 2023

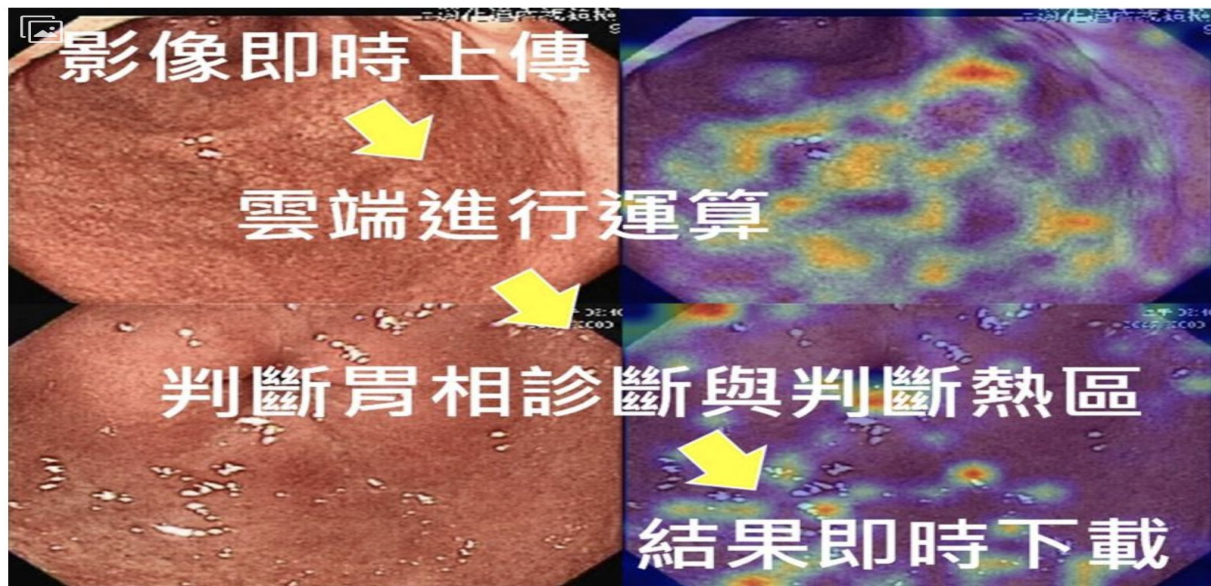
只要9秒！看你的「胃相」揪幽門桿菌、胃癌 台大醫院AI技術準確率破9成

2023/01/16 16:24:00

追蹤三立：



記者黃仲丘 / 台北報導



▲臺大醫院研發AI影像系統，可看「胃相」揪出幽門桿菌胃癌高風險者（圖 / 台大醫院提供）

Sora, OpenAI, 2024

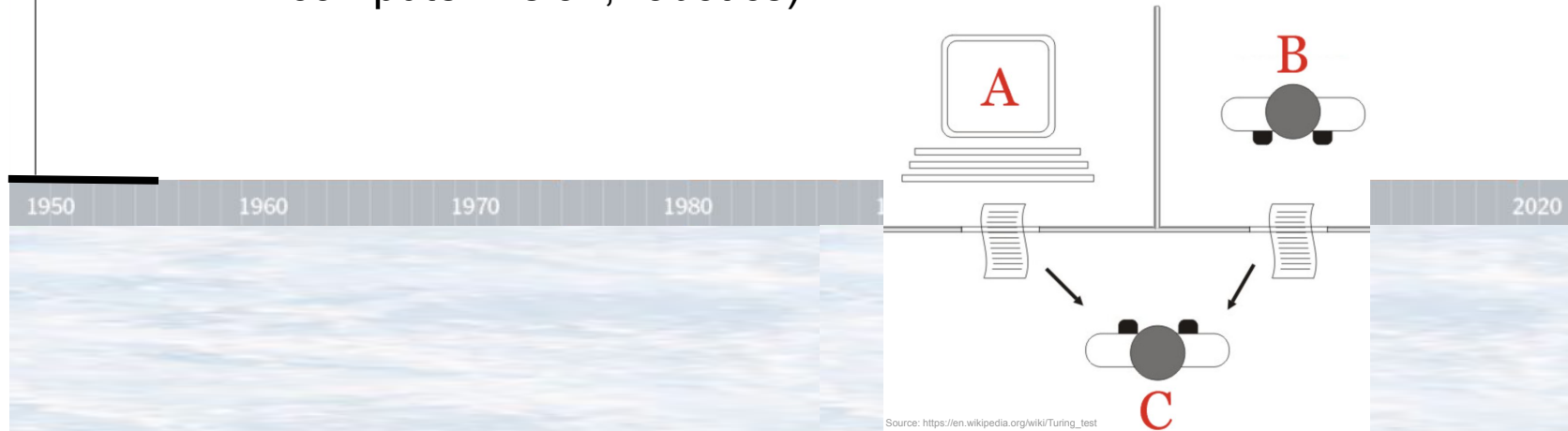
Prompt: “Beautiful, snowy Tokyo city is bustling. The camera moves through the bustling city street, following several people enjoying the beautiful snowy weather and shopping at nearby stalls. Gorgeous sakura petals are flying through the wind along with snowflakes.”

美麗的白雪皚皚的東京城熙熙攘攘。鏡頭穿過熙熙攘攘的城市街道，跟著幾個人享受美麗的雪天並在附近的攤位購物。絢麗的櫻花花瓣隨著雪花在風中飛舞。(Google Translate)

<https://twitter.com/i/status/1758192957386342435>

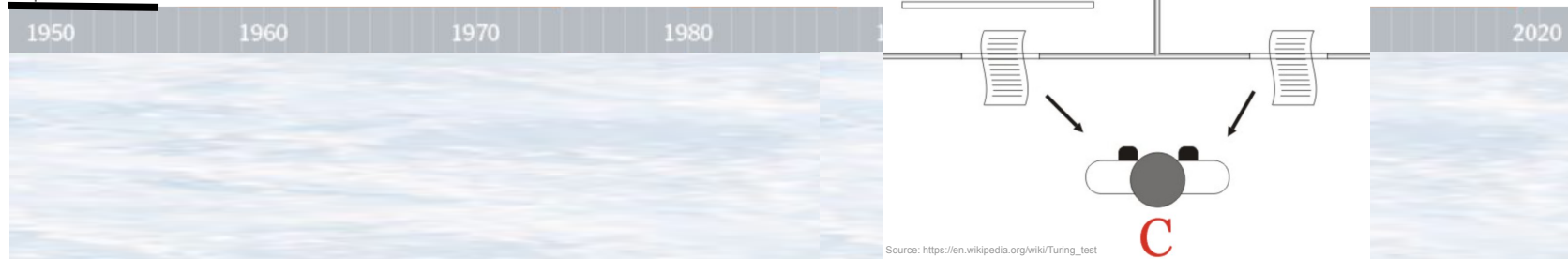
AI History

- 1940-1955: Early days
 - 1943: McCulloch and Pitts - Boolean circuit model of brain (artificial neurons)
 - 1950: Turing - “Computing Machinery and Intelligence”
 - Turing test (NLP, knowledge representation, automated reasoning, computer vision, robotics)



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 - Machine learning
 - Genetic algorithms
 - Reinforcement learning



AI History

1956-1974

First wave of excitement

First neural networks and perceptrons written, first attempts at machine translation.

- 1956: McCarthy, Dartmouth meeting – “Artificial Intelligence”

1950 1960 1970 1980 1990 2000 2010 2020

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1974-1980

First AI winter

Limited applicability of AI leads to funding pullback in the U.S. and abroad.

Source:
<https://www.techtarget.com/searchenterpriseai/feature/3-tips-for-getting-AI-system-integration-right>

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- 2006: Hinton - Deep Belief Networks

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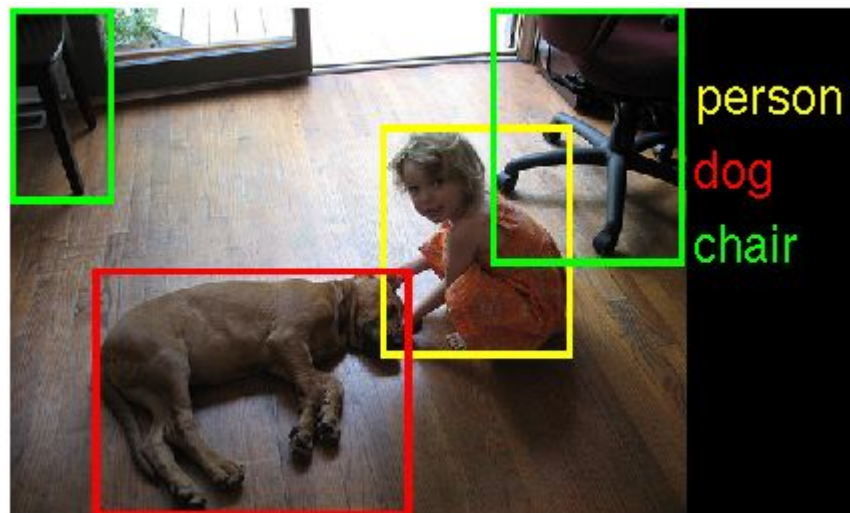
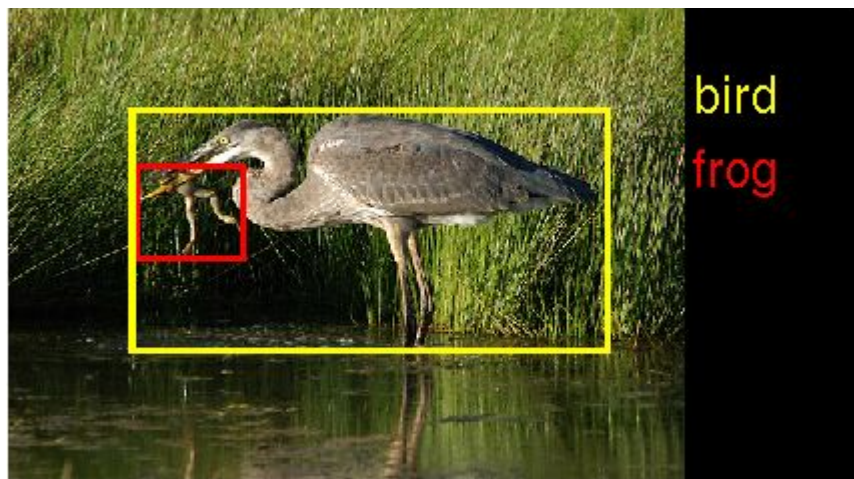
Second AI winter

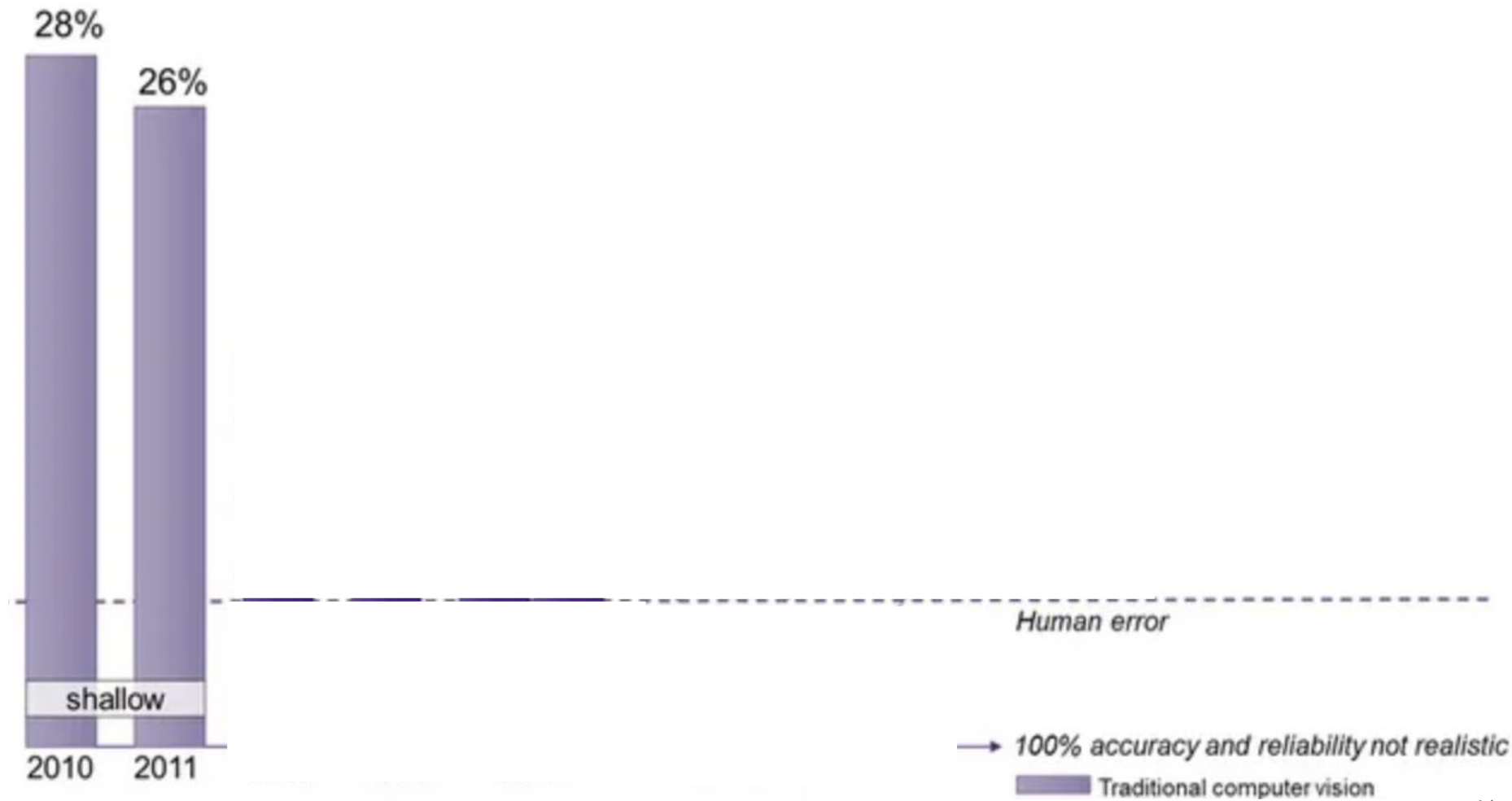
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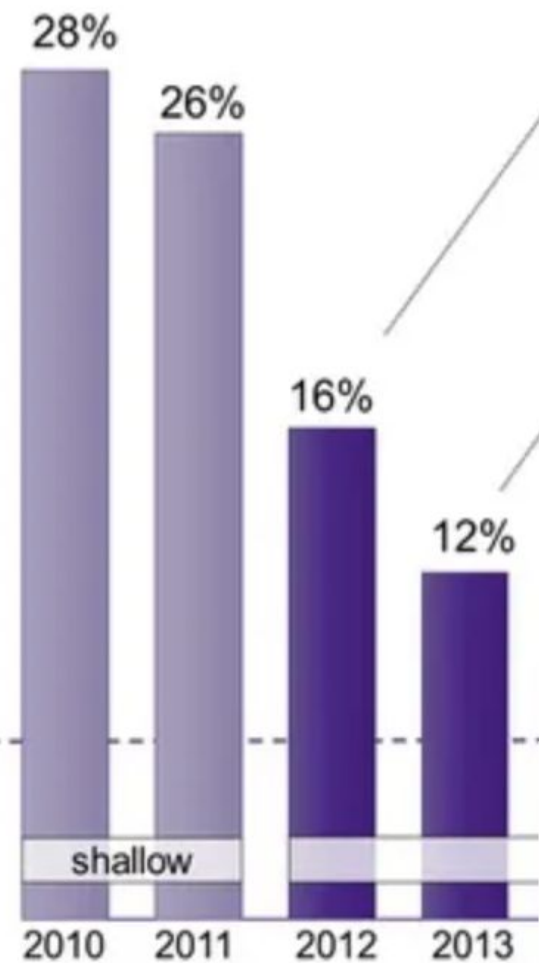
source:
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The ImageNet Large Scale Visual Recognition Challenge (ILSVRC)

- Prof. Fei-Fei Li, Stanford University
- Dataset: 1000 categories and 1.2 million images

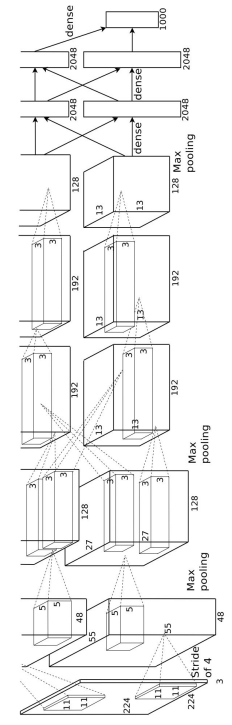






AlexNet, 8 layers

ZF, 8 layers



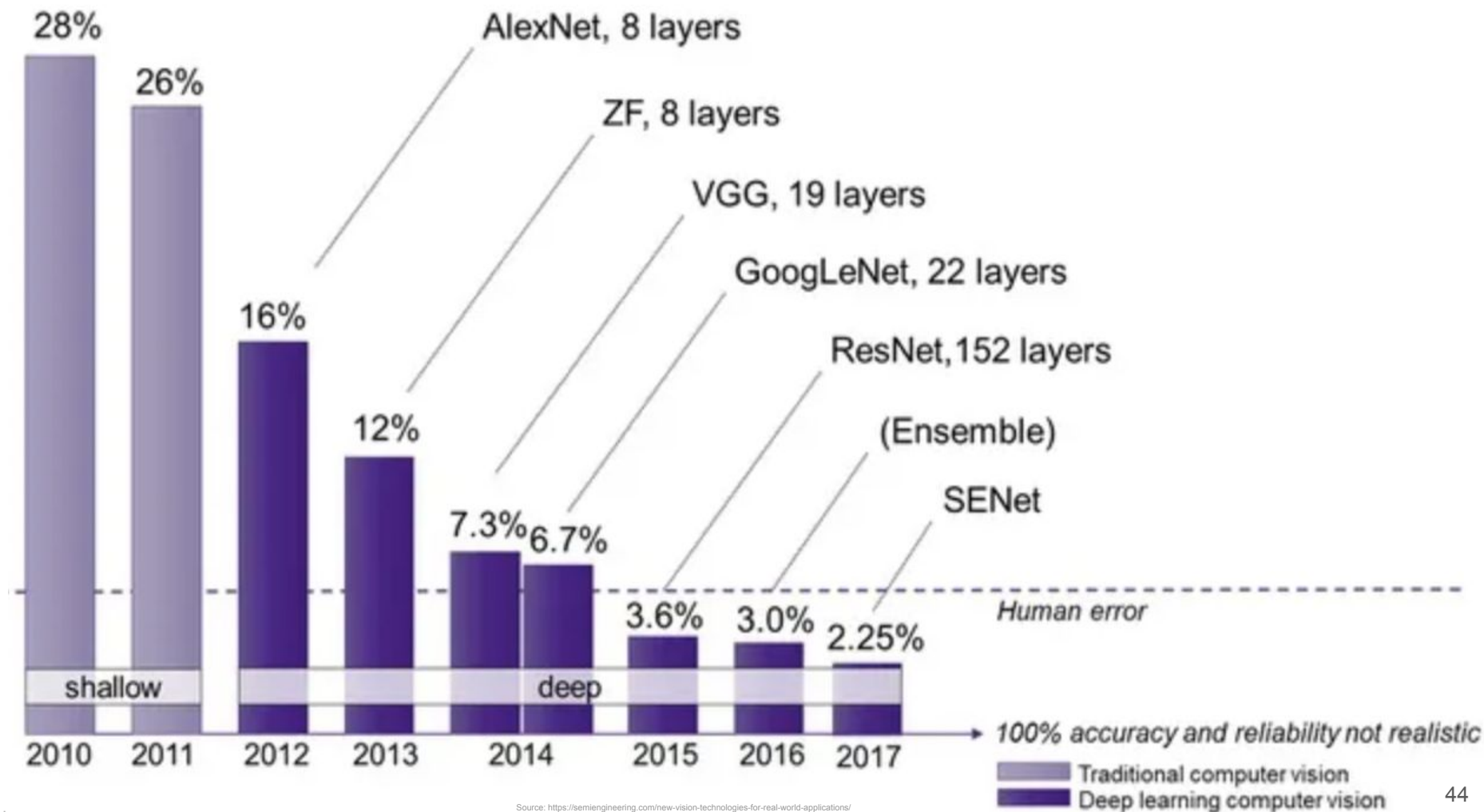
NIPS 2012

Human error

→ 100% accuracy and reliability not realistic

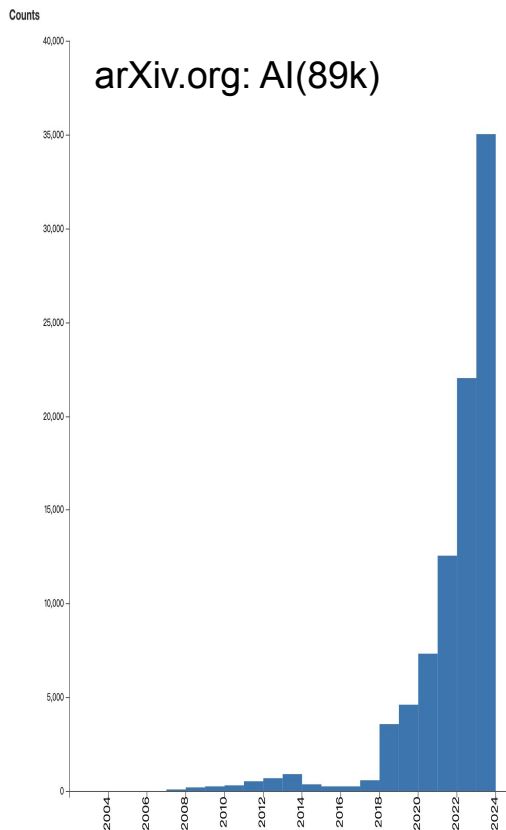
Traditional computer vision

Deep learning computer vision

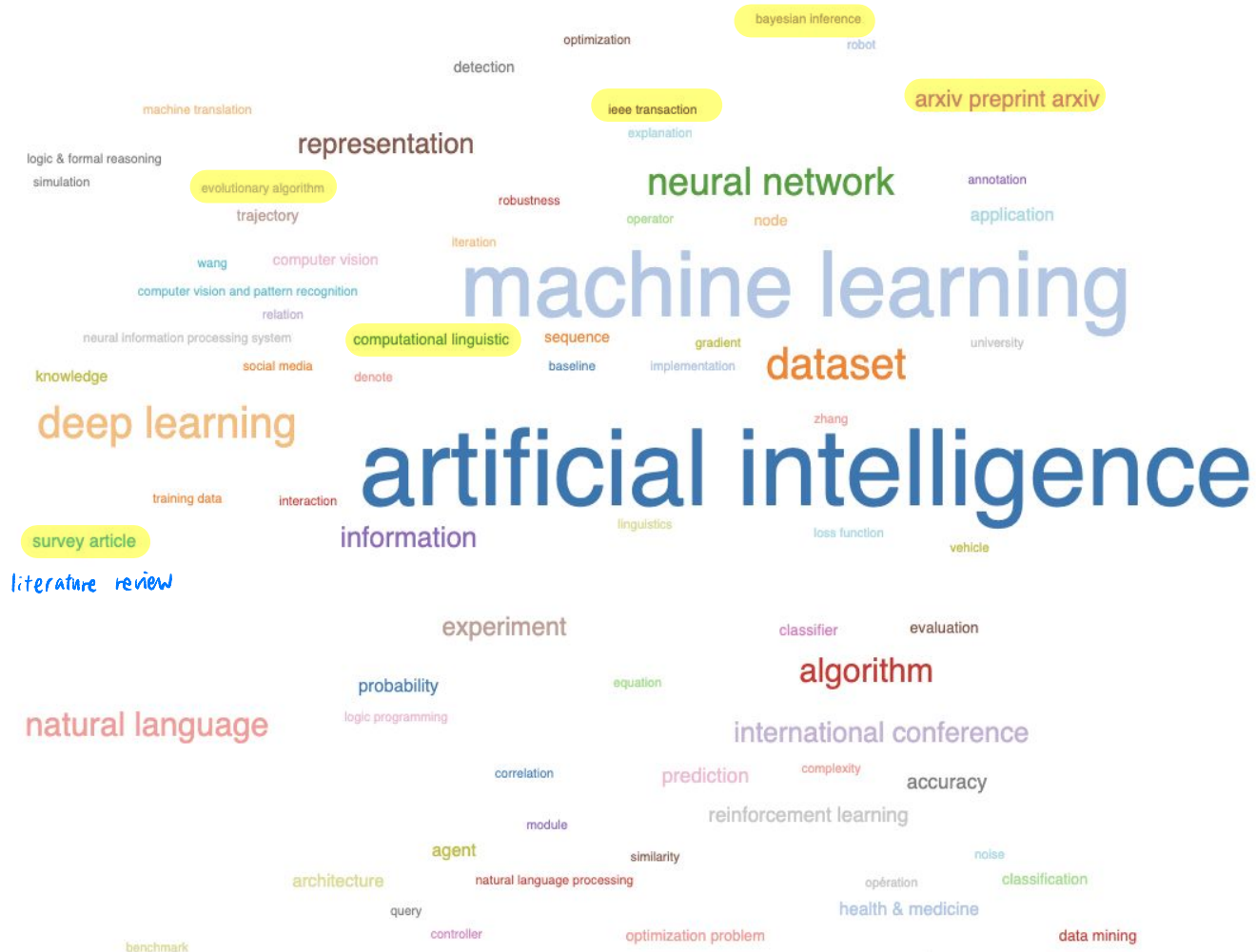


AI Topics

arXiv.org: AI(89k)



AI / Spring 2024 / Wei



AI Topics (cont.)

Artificial Intelligence



Any technique that enables computers to mimic human intelligence. It includes *machine learning*

AI Topics (cont.)

Artificial Intelligence



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Machine Learning



A subset of AI that includes techniques that enable machines to improve at tasks with experience. It includes *deep learning*

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Deep Learning



A subset of machine learning based on **neural networks** that permit a machine to train itself to perform a task.

Course Topics

- Intelligent agents (AIMA Ch. 2)
- Search (AIMA Ch. 3, 4, 6, 5)
- Reasoning (AIMA Ch. 7-9, 12-15)
- Machine learning (AIMA Ch. 19-20)
- Deep learning (AIMA Ch. 22)
- Natural language processing (AIMA Ch. 24)
- Generative AI (Optional)

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