

CC0002 Navigating the Digital World

Module 7: Latest Technology Trends

Introduction to Artificial Intelligence

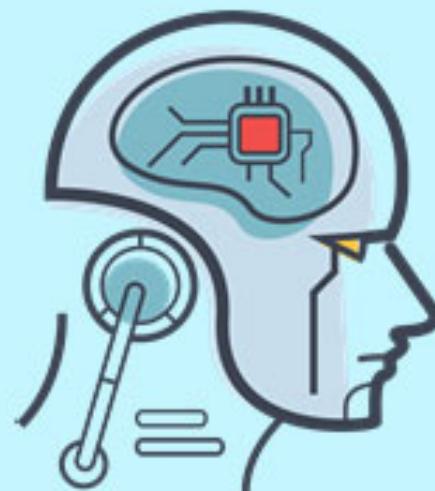
Presented by Assoc Prof Nicholas Vu WCH0



AI History and its Renaissance

SHT0

ARTIFICIAL INTELLIGENCE: Machines that are capable of performing tasks that typically require human intelligence



1950: 'Artificial Intelligence' was first coined
LISP programming language and computers

1973: The first AI Winter

1982: The second Spring
Japan's Fifth Generation Computer Project

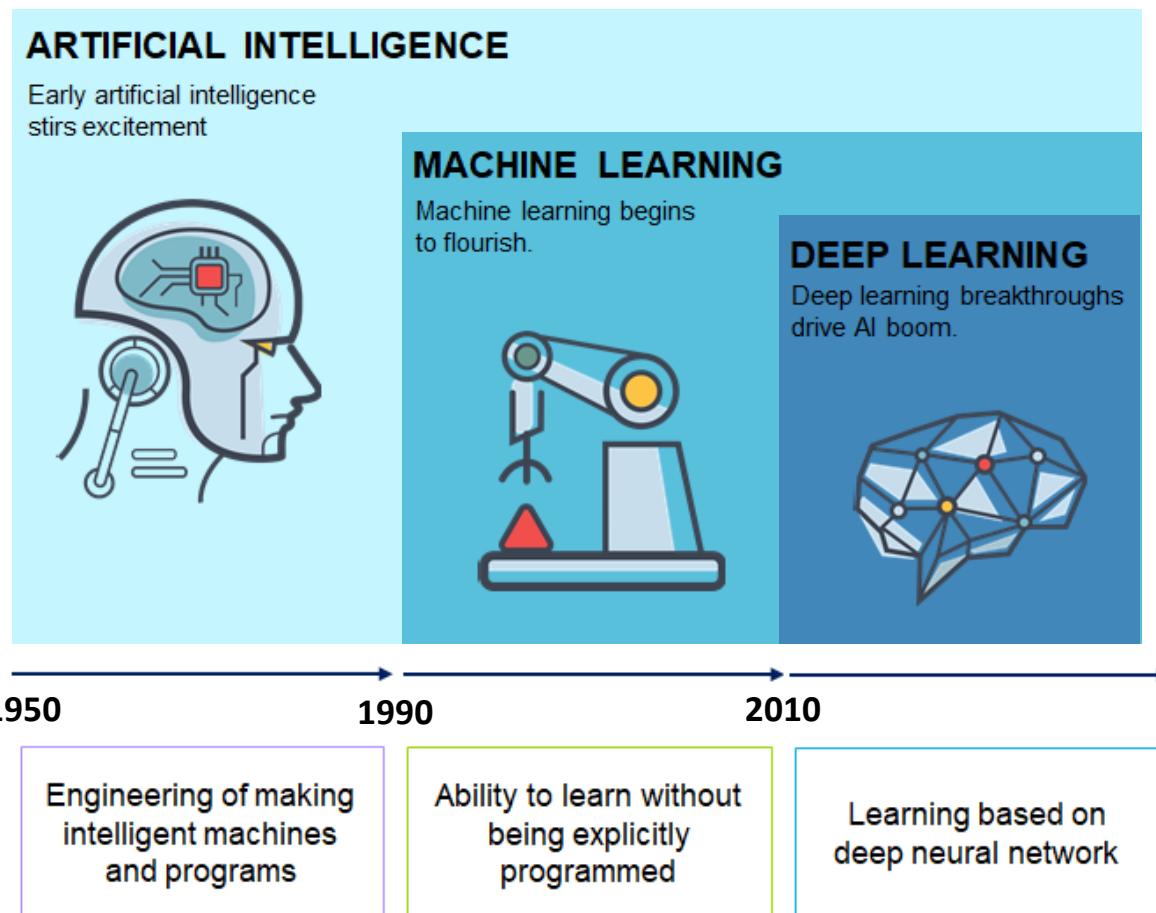
1985: The second Winter

2000: The Renaissance

Present: The Golden Age?



AI Present Day Renaissance



Powerful computers:

Become widely available, such as Cloud computing and GPU

Big Data:

Availability of large amount of data due to internet and smart mobile phones

Software Algorithms:

Machine Learning, Deep Learning



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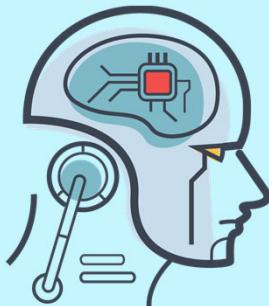
Overviews of AI Technologies

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AI Implementations

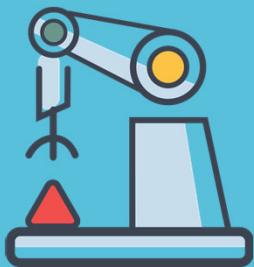
ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement



MACHINE LEARNING

Machine learning begins to flourish.



DEEP LEARNING

Deep learning breakthroughs drive AI boom.



1950

1990

2010

Engineering of making intelligent machines and programs

Ability to learn without being explicitly programmed

Learning based on deep neural network

Rule-based expert systems
Fuzzy logic

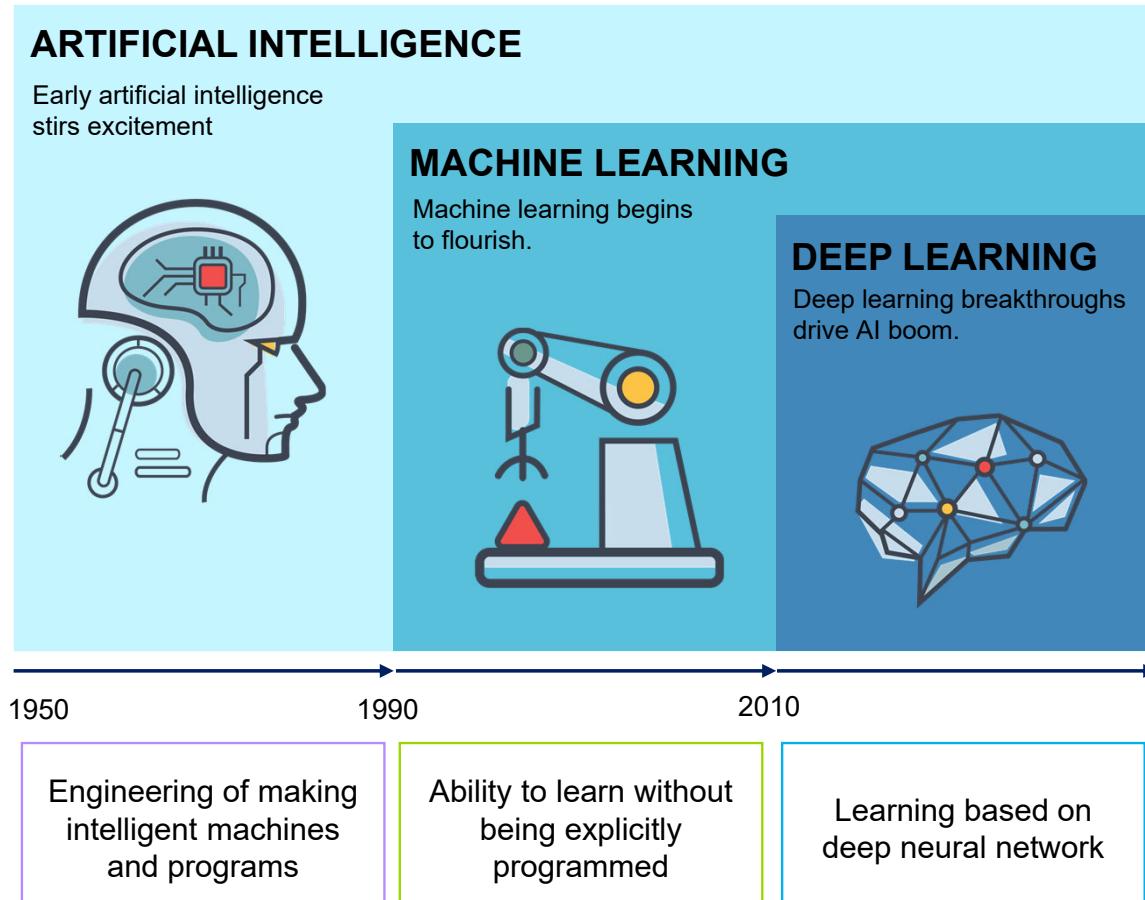
Need data

Supervised Learning with labelled data (e.g., regression and classification)

Unsupervised Learning without labelled data (e.g., clustering)

Reinforcement Learning with the use of 'agent' that learns to maximise 'reward' in an environment

AI Implementations – Deep Learning



Implementation of ML based on **Deep Neural Network** that mimics the human brains

Artificial Neural Network (ANN)
Classifying numbers-based data

Convolution Neural Network (CNN)
Classifying images

Recurrent Neural Network (RNN)
Time series data (e.g., audio)

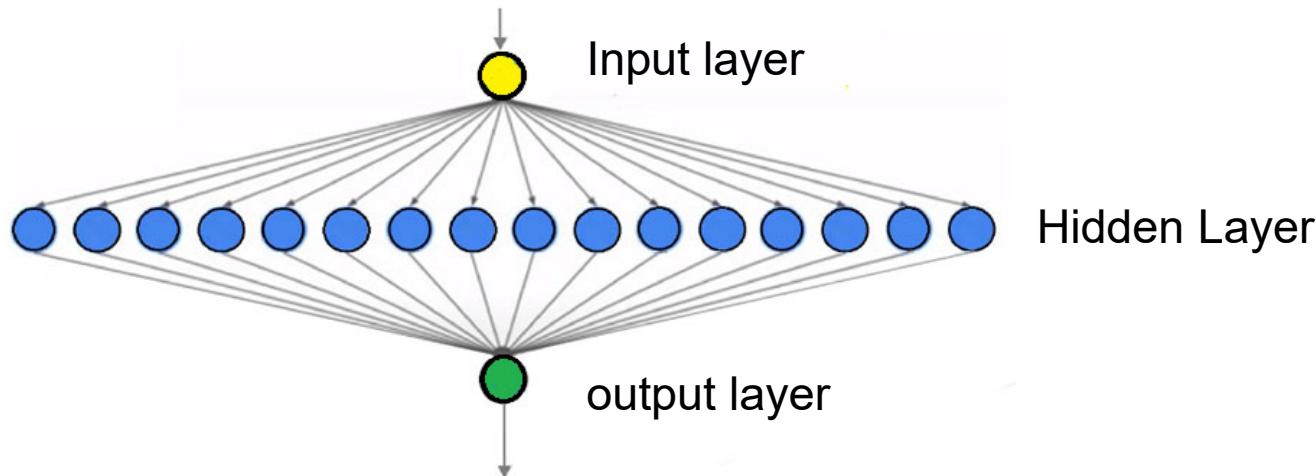
Deep Reinforcement Learning

Transfer Learning

Basics of Deep Learning

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Neurons and Neural Network



Mimics the human brain to recognize pattern

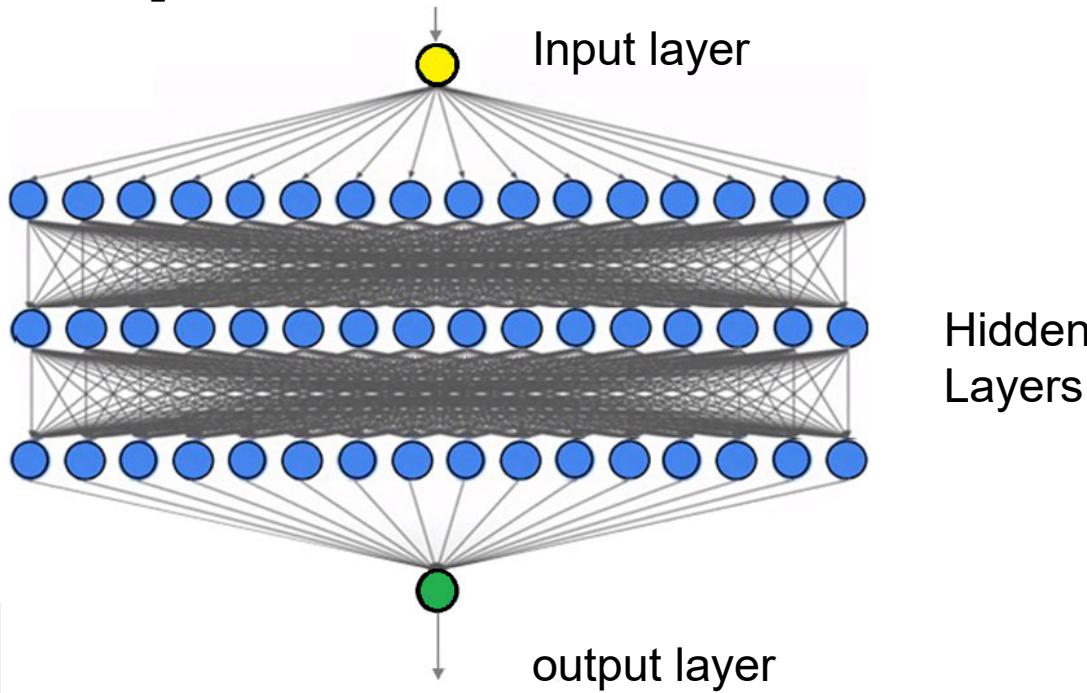
- ability to learn

Hidden Layer

- consists of learnable parameters
- the ‘algorithm’ that can learn and improve by itself

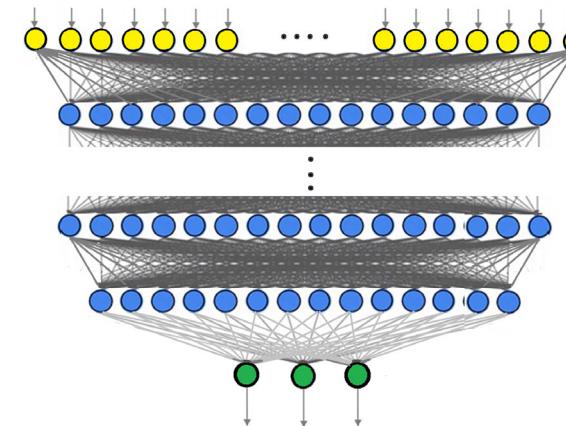


Deep Neural Network for Deep Learning



Deep Neural Network

- multiple layers of hidden layers
- much more sophisticated algorithms can be learnt

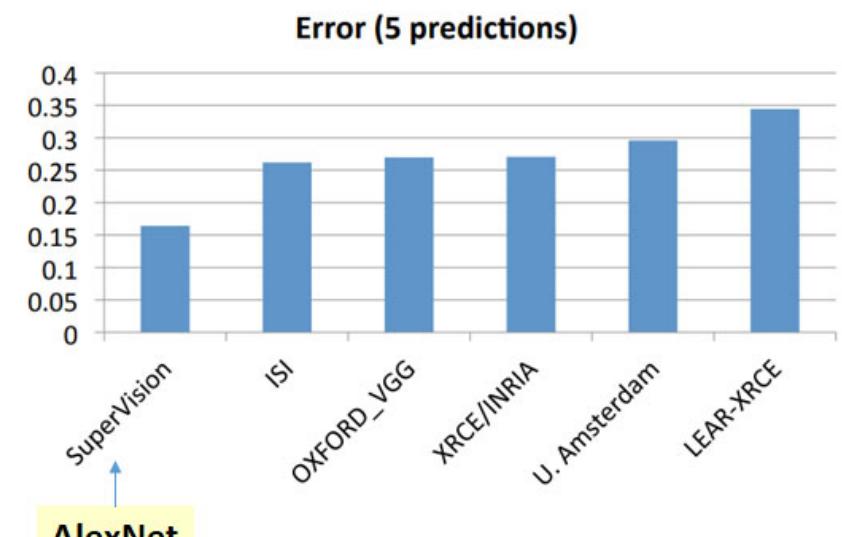


AlexNet

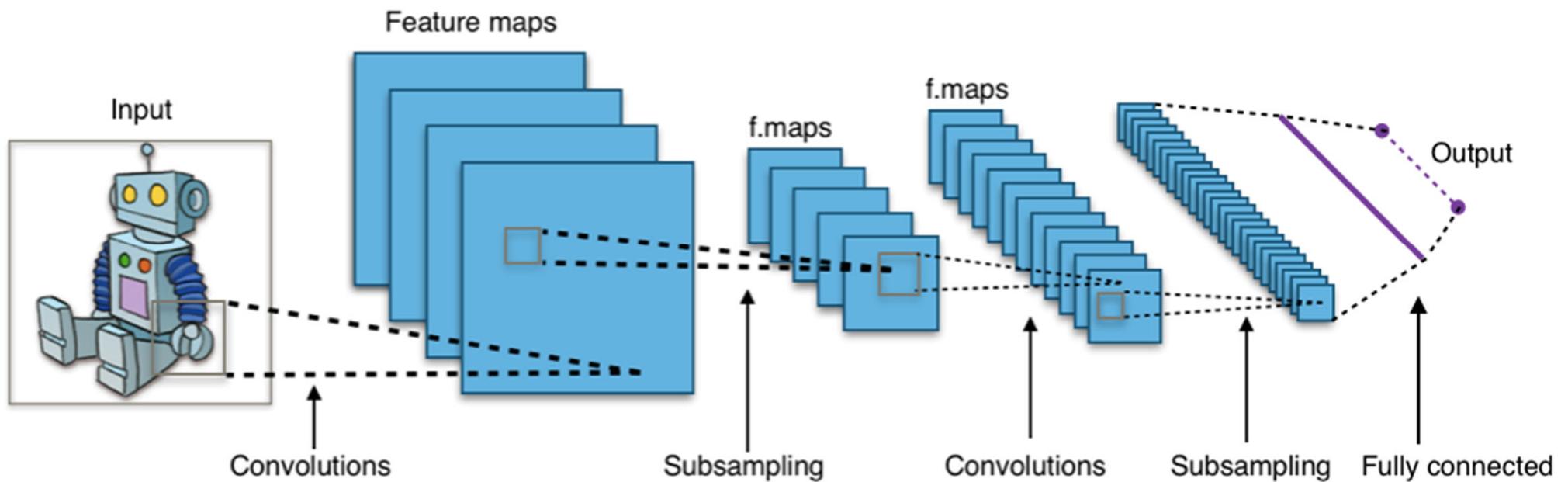
At the 2012 ImageNet computer image recognition competition:

- Alex Krizhevsky used machine to implement machine learning based deep learning algorithm (CNN).
- First time that machine learning based algorithm beat, by a huge margin, handcrafted software written by computer vision domain experts.

Ranking of the best results from each team

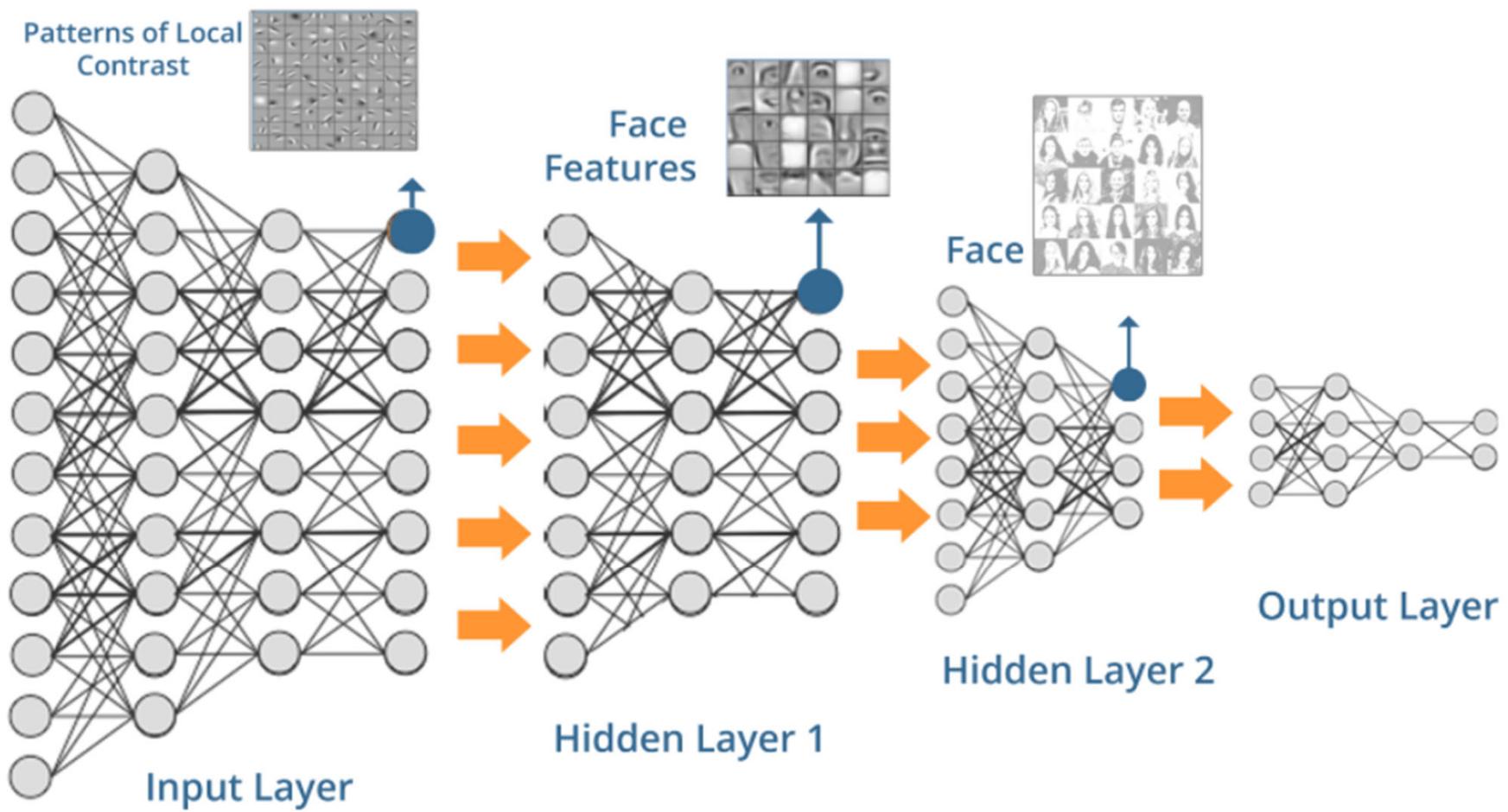


CNN for Image Recognition



Face Detection Training and Inference

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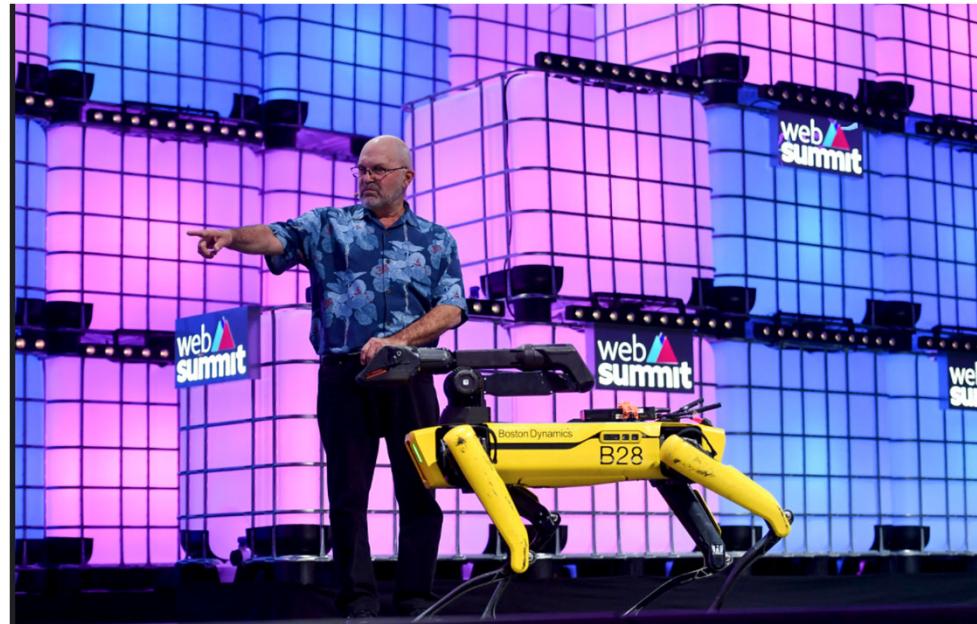


AI Applications

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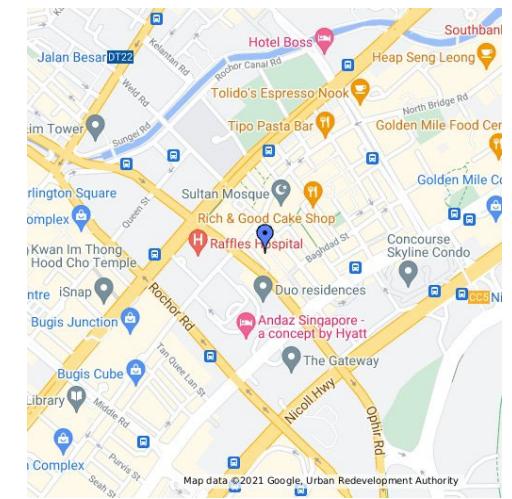
Application: Robotics



Boston Dynamics



Application: Autonomous Automotive and Navigation



Application: Social Media



Facebook



Instagram



Twitter

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Google
Discover

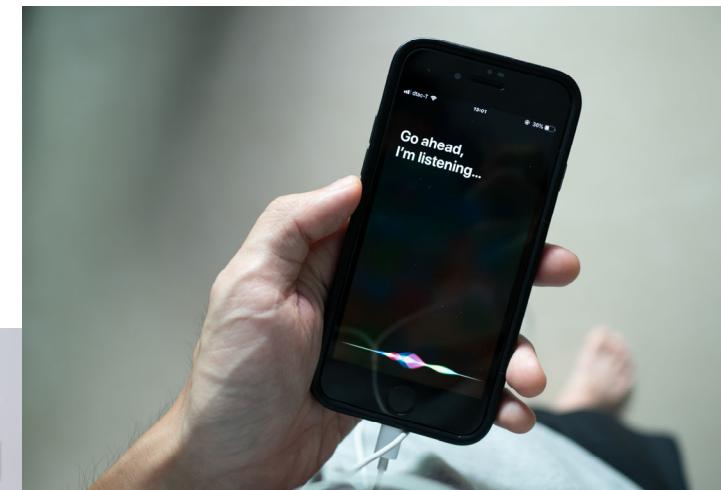
Google
Discover



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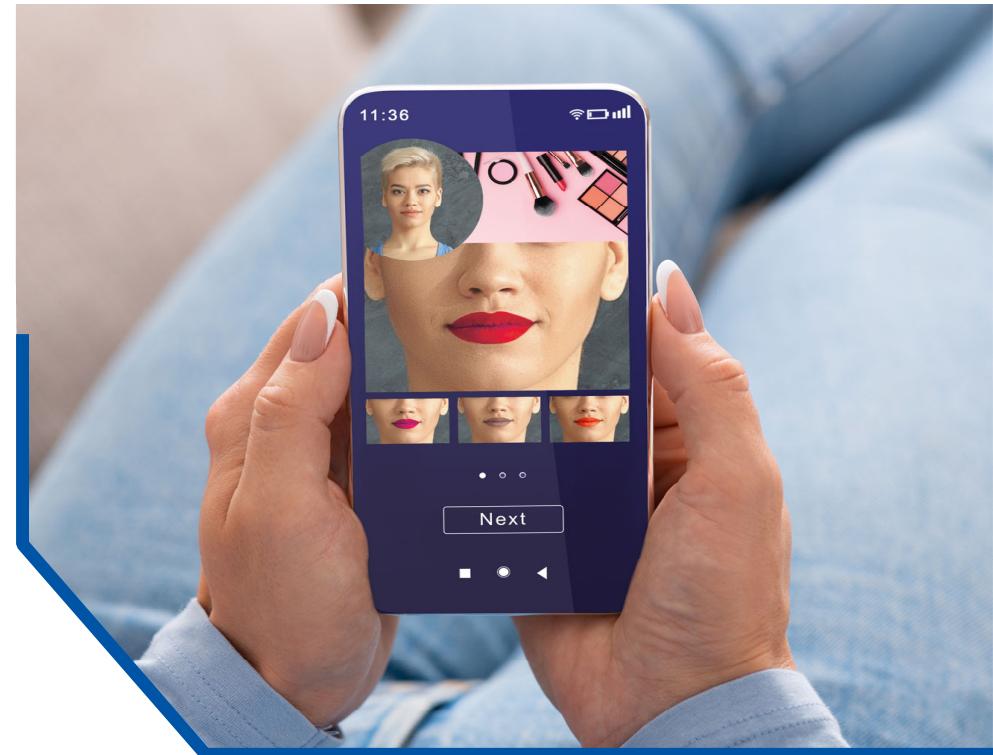
Application: Consumer Electronics

- Smartphone with AI-driven apps such as Siri, Google Assistant, Alexa, Cortana
- Smart household devices such as TV, refrigerators, ovens
- Smart Floor vacuum cleaners
- Smart security camera



Application: Business and E-Commerce

- Inventory management
- Demand forecasting
- Personalised merchandising
- Chatbots
- Improve customer experience



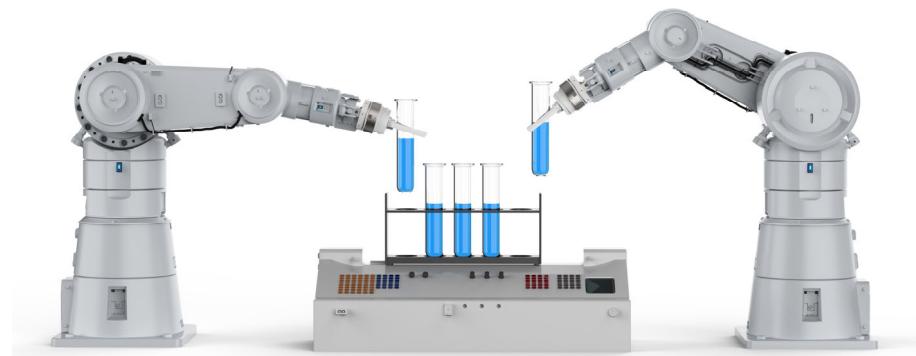
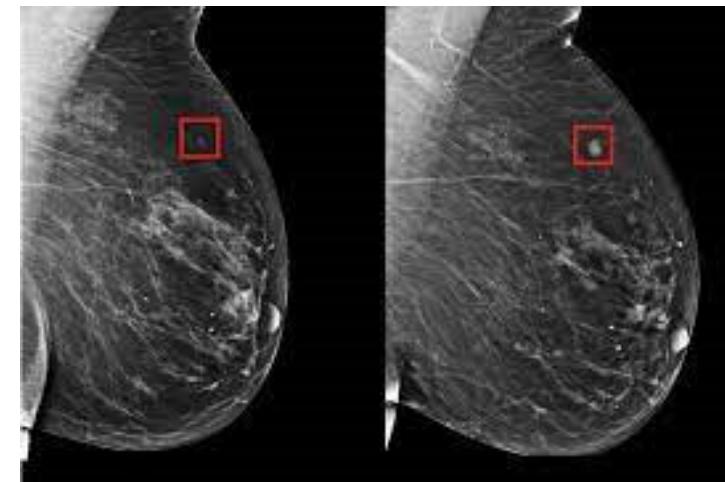
Application: Banking and Finance

- Better Business Analytics
- Algorithm Trading
 - execute trades at optimal prices
- Credit Risks Assessment
- Wealth Management
 - automated portfolio manager
- Fraud detection



Application: Healthcare

- Analyse medical images
- Early detection (e.g., cancer)
- Develop new drugs
- Genomic profiling



Application: Farming and Precision Agriculture

- Nutrient and water management
- Detect pests and diseases in plants
- Detect weeds
- Analyse crop health (e.g., by drones)
- Improve harvest quality and accuracy



Application of AI: Education

- Improve teaching and learning strategies
- AI e-tutors
- Automatic grading
- AI based e-proctoring





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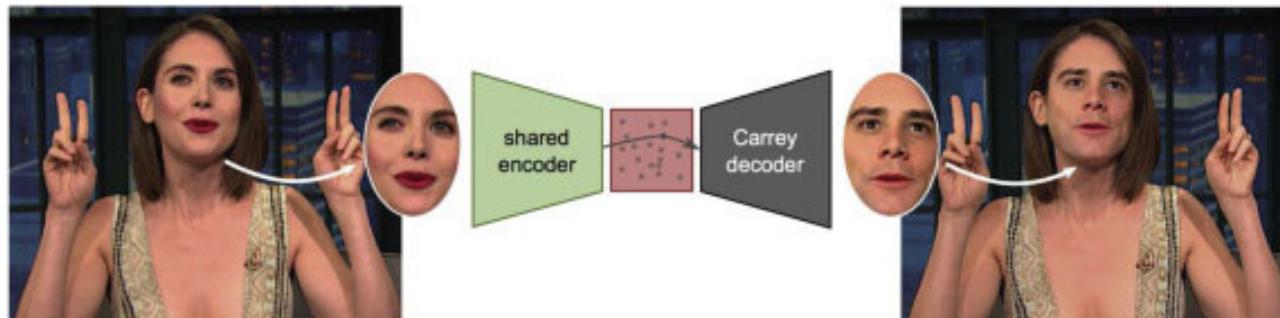
AI Concerns

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Concerns About AI

- Job loss
- Misuse of AI (e.g., Deepfake)
- AI explainability
- AI bias
- AI ethics in decision making (e.g., weapon)



Step 1: extract Brie face

Step 3: insert fake Carrey face

Step 2: create fake Carrey face



Summary

- AI is rapidly transforming the way we live:
 - Helps to makes things run more efficiently
 - Improves safety and work productivity
 - Frees up time for human to do more creative things
 - Enables better quality of life
- Current generation of AI technologies are still considered as Artificial Narrow Intelligence (ANI)
 - Goal is to eventually achieve Artificial General Intelligence (AGI)
- But there are also many concerns about the potential risk that we need to be aware of
 - Responsible AI