The

Machine Learning Journey

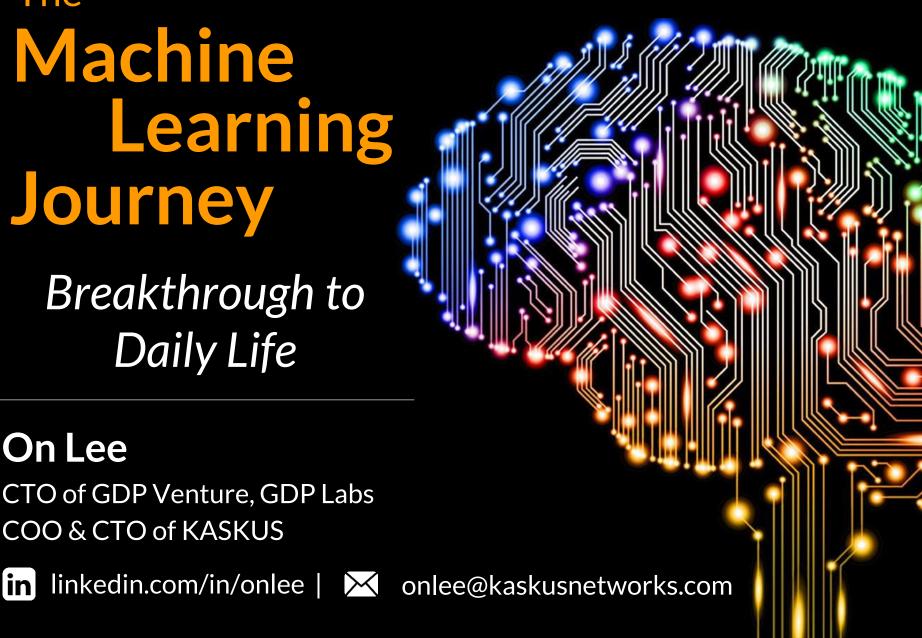
Breakthrough to Daily Life

On Lee

CTO of GDP Venture, GDP Labs COO & CTO of KASKUS







DESCRIPTION

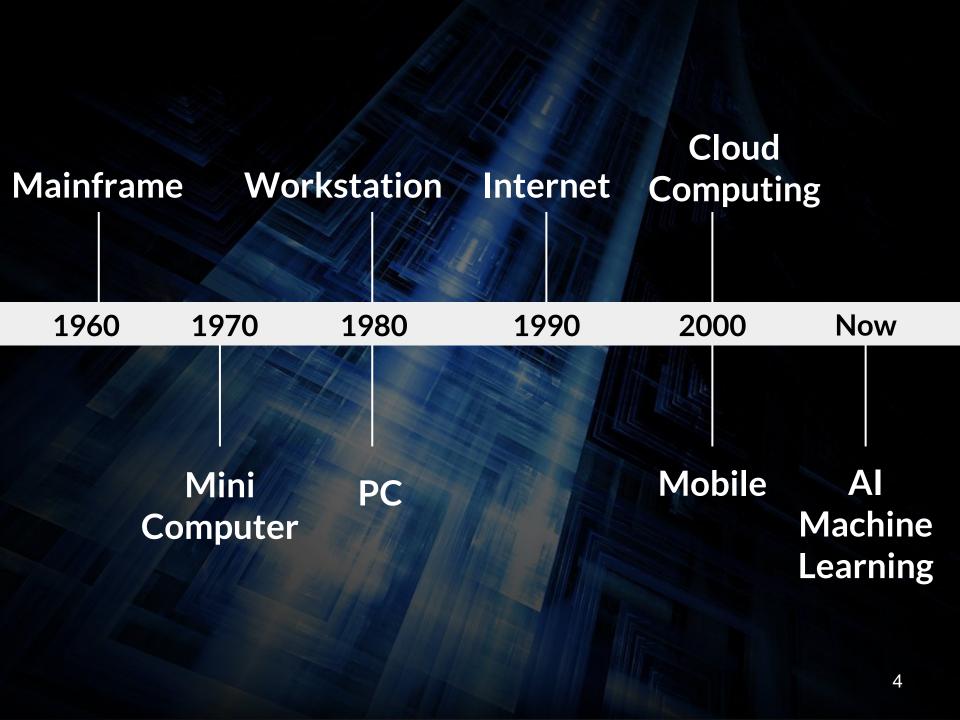
Digital conglomerates like Alibaba, Amazon, Baidu, Apple, Facebook, Google and Microsoft combined have invested billions of dollars, tens of thousands of engineers, hundreds of thousands of servers and state-of-the-art data centers to deliver intelligent, distributed and mobile applications based on Machine Learning technology.

It seems that there is always a breakthrough of new technology each decade: Mainframe in 1960, Minicomputer in 1970, PC in 1980, Internet in 1990 and Mobile in 2000.

Machine Learning has been around for decades. Why is it gaining popularity now?

This talk will discuss what machine learning is and how it will impact our daily life and work.

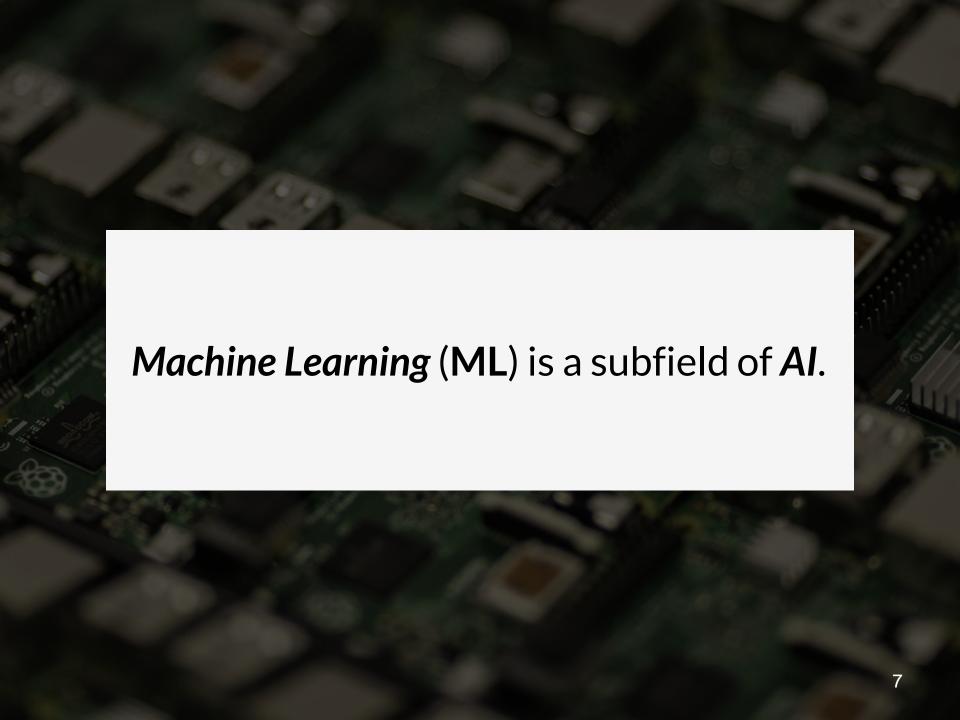
Digital Evolution



Machine Learning Definitions

Artificial Intelligence (AI)

the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.



Field of study that gives computers the ability to *learn* (from data) without being explicitly programmed.

-- Arthur Samuel (1959)

Software apps are *programmed*, Intelligent apps are *trained* (with big data).

-- Carlos Guestrin

A set of methods that can automatically detect patterns in data, then use the uncovered patterns to predict future data, or perform other kinds of decision making under uncertainty (such as planning how to make collect more data).

-- Machine Learning: A Probabilistic Perspective, Kevin P. Murphy



Deep (Machine) Learning is part of a broader family of machine learning methods based on learning representations of data.

An observation (e.g., an image) can be represented in many ways such as a vector of intensity values per pixel, or in a more abstract way as a set of edges, regions of particular shape, etc.

APPLICATIONS



SEEComputer Vision



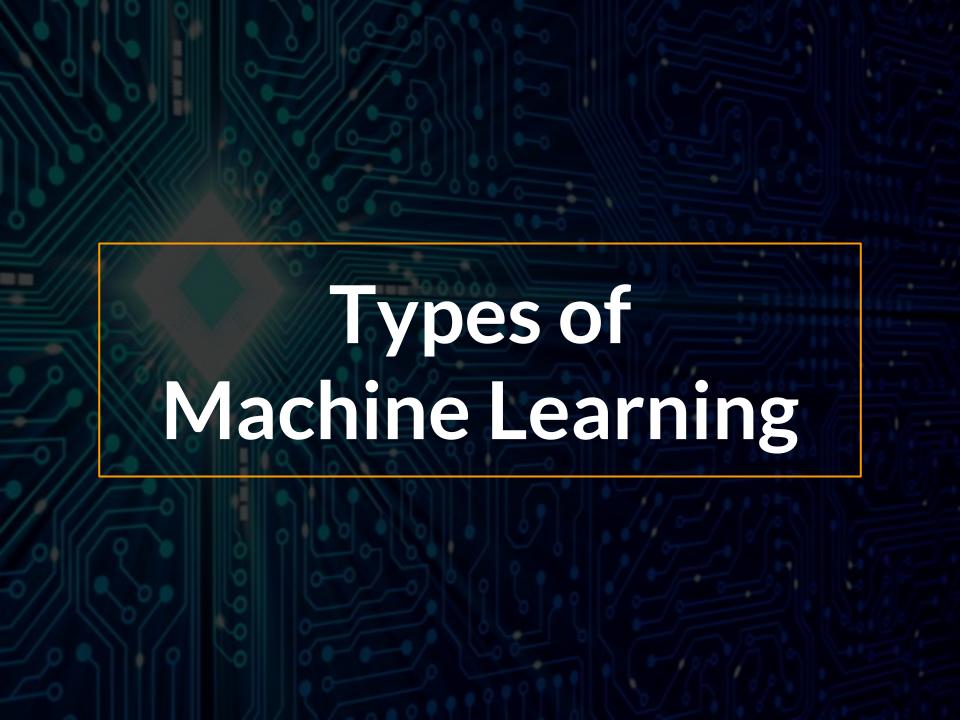
MULTI-LANGUAGE *Translation*

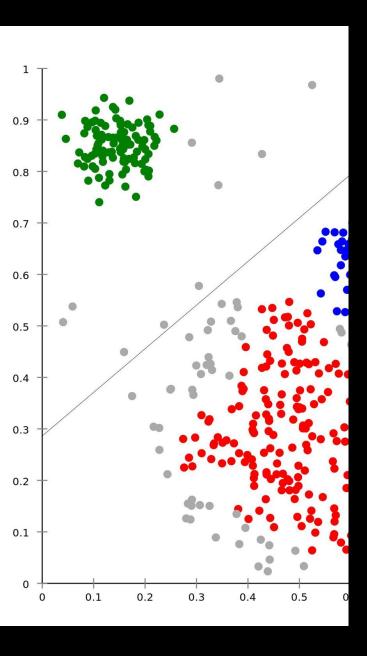


LISTENSpeech Recognition



SPEAKNatural Language Process

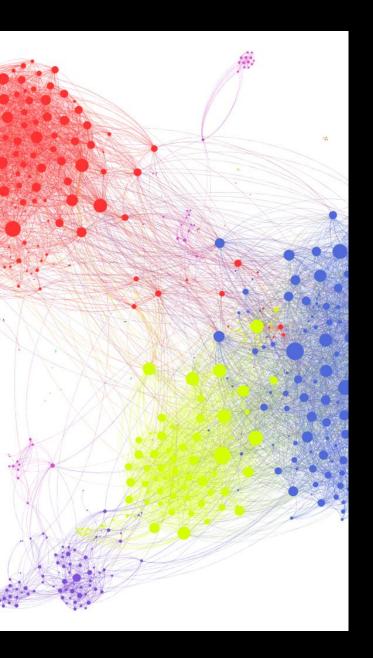




Supervised Learning (Predictive)

Learn a mapping from inputs x to outputs y

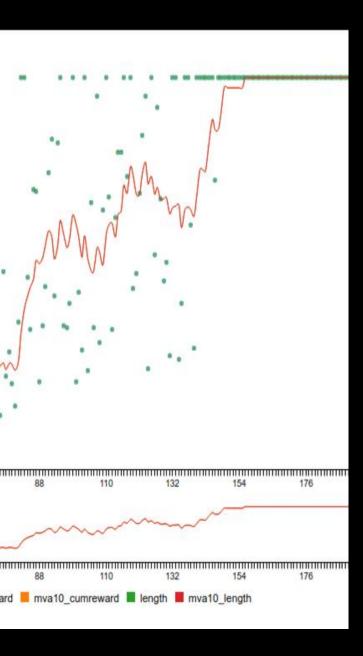
- Classification applications:
 Email spam filtering, image classification,
 handwriting recognition
- Regression applications:
 Predict stock market, climate, age viewer
 watching YouTube



Unsupervised Learning (Descriptive)

Find "interesting patterns"

- Discovering clusters application:
 in e-commerce, cluster users into groups
 based on their purchasing behavior, and
 then to send targeted ads to each group
- Discovering latent factors (dimensionality reduction) - application: map 3D to 2D

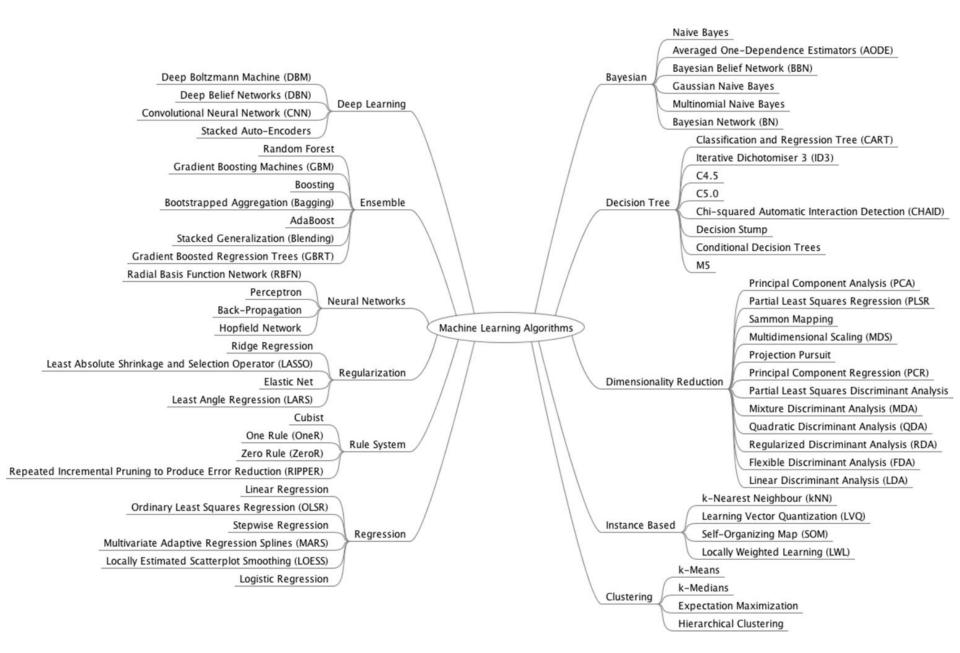


Reinforcement Learning

Decision making - given x, z, find f such that y = f(x) where y has a (non linear) relationship with z

- This is useful for learning how to act or behave when given occasional reward or punishment signals
- e.g. given lots of chess board position (x) and piece to move next (z) pairs, find what piece to move next to eventually win (y) a chess board position (x)

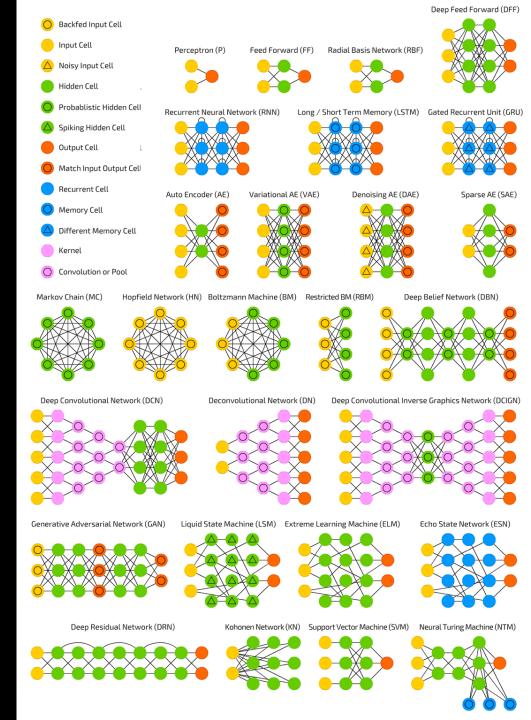
Algorithms



Source: machinelearningmastery.com

Neural Networks

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facebook

Why is it Gaining Popularity Now? Amazon





BIG DATA

at least in terabytes (one million million = $10^{12} = 2^{40}$)

CPU

GPU

MEMORY

STORAGE

MOORE'S LAW

Computing power doubles every year



Internet



Cloud Computing



Improved Algorithms

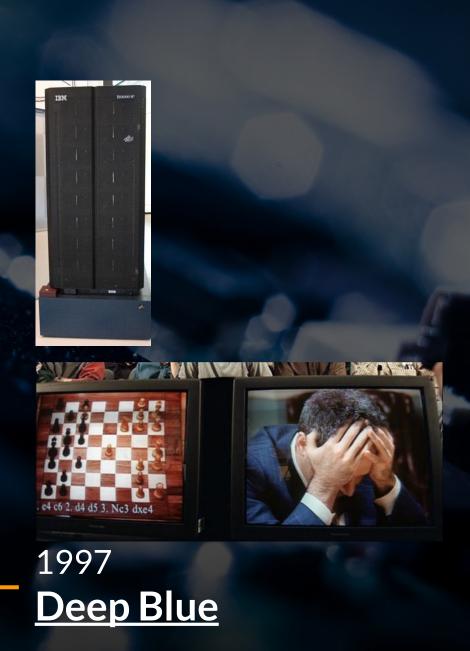
Breakthrough

A breakthrough in machine learning would be worth ten Microsofts.

-- Bill Gates

Checker





2011 <u>Watson against</u> <u>Jeopardy</u>



2012 **Google Artificial Brain Learns to find cat videos**



2016 AlphaGo versus Lee Sedol



Autonomous car



News

facebook

Search Google

Daily Life Applications

Healthcare



FinTech



Recommender System

Speech Recognition

Face Recognition Robotic





amazon





Cortana







Character Recognition



Language Translation (Natural Language Processing)



Fingerprint Identification



Auto-correct on smart phone



autoocor

28

Amazon Echo Daily Tasks

WHAT TASKS HAVE ECHO OWNERS TRIED WITH ALEXA?

ECHO TASKS

Tasks owners have tried at least once

٠	Set a timer	84.9%	٠	Add an item to your to-do list	32.7%
•	Play a song	82.4%	٠	Buy something on Amazon Prime	32.1%
•	Read the news	66.0%	•	Control smart thermostat	30.2%
•	Set an alarm	64.2%	•	Play children's music	28.9%
•	Check the time	61.6%	٠	Check or add an item to calendar	21.4%
•	Tell a joke	60.4%	•	Other	19.5%
•	Control smart lights	45.9%	•	Spell something	17.6%
•	Add item to shopping list	45.3%	•	Call an Uber	6.3%
•	Connect to paid music service	40.9%	•	Connect to phone via Bluetooth	3.5%
٠	Provide the traffic	36.5%			

Survey respondents have tried an AVERAGE OF HEIGHT TASKS from the above list.



60+ STARTUPS USING DEEP LEARNING

CORE AI: COMPUTER VISION



CORE AI: OTHER



BI, SALES & CRM



CORE AI: VOICE INTERFACE



ROBOTICS & AUTO







••• DEEP **LEARNING CBINSIGHTS** 0-0 istock.com/a-image

SECURITY



OTHER

Alpaca i∩dico

Iris Automation

E-COMMERCE





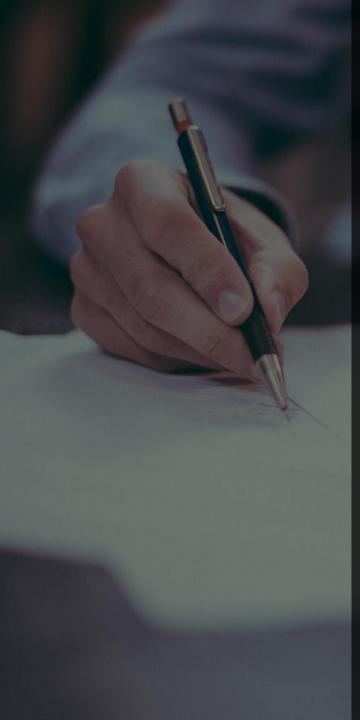






Computer Scientist & Engineer

- Prerequisites
 - Computer Science
 - Mathematics
 - Statistics
- Take ML classes
- Learn ML Cloud-Based & Open
 - Source APIs



Business People

- Audit ML class
- Apply ML in your business
- Learn various case studies
- Don't be overwhelmed with the technical details

Human + Machine

(not Human vs. Machine)

Machine Learning complements

your knowledge just like

calculator, computer, car, train & plane

Thank You! Questions?