

Deep Learning

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Contents

1. Glossary
2. Deep Learning, Machine Learning and AI
3. Deep Neural Network
4. Why is Deep Learning Important now?
5. What is a neuron?
6. What is an Activation Function?
7. Neural network is just a function...
8. Deep Learning Applications
9. Example. Colorization
10. Example. Describing photos
11. Example. Translation
12. Example. Create new images
13. Top startups in Deep Learning
14. Race To Acquire Top AI Startups
15. Bibliography

Glossary

Neuron – mathematical function conceived as a model of biological neurons, a neural network.

Neural Networks – computing systems vaguely inspired by the biological neural networks that constitute animal brains.

Activation function of a node defines the output of that node, or "neuron" given an input or set of inputs.

Deep Learning, Machine Learning and AI

ARTIFICIAL INTELLIGENCE

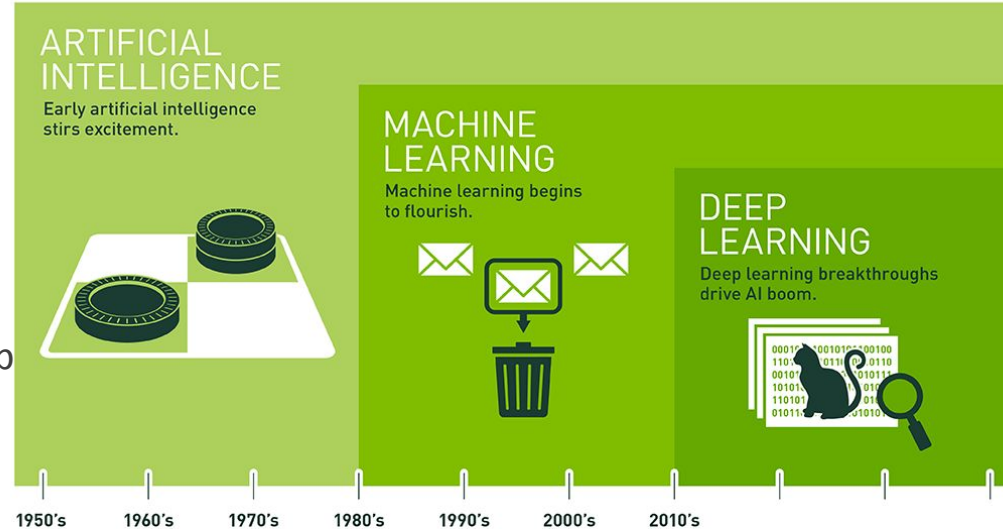
- AI is the broadest term, applying to any technique that enables computers to mimic human intelligence, using logic, if-then rules, decision trees, and machine learning (including deep learning).

MACHINE LEARNING

- The subset of AI that includes abstruse statistical techniques that enable machines to improve at tasks with experience. The category includes deep learning.

DEEP LEARNING

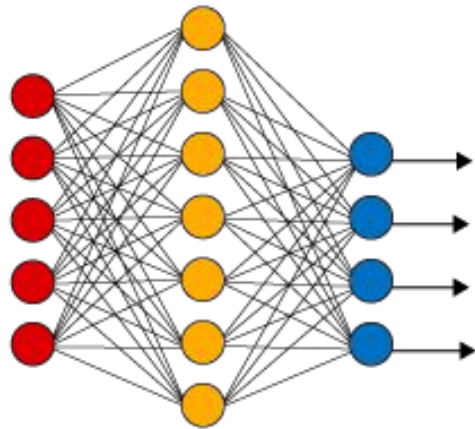
- The subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural networks to vast amounts of data.



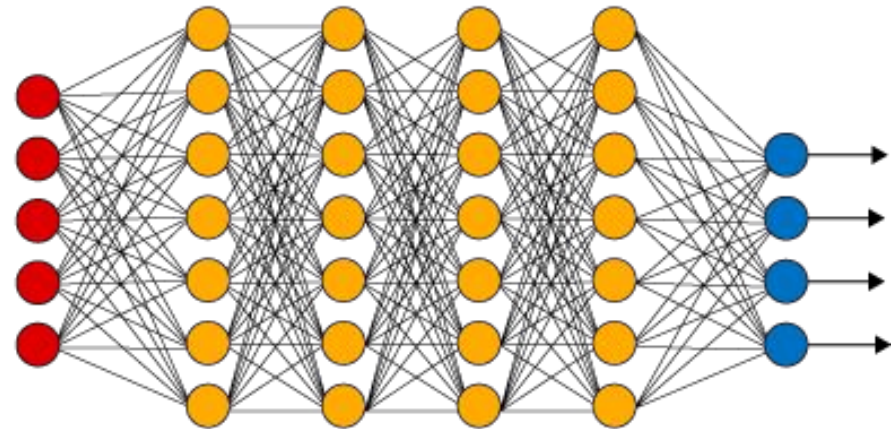
Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

Deep Neural Network

Simple Neural Network



Deep Learning Neural Network



● Input Layer

● Hidden Layer

● Output Layer

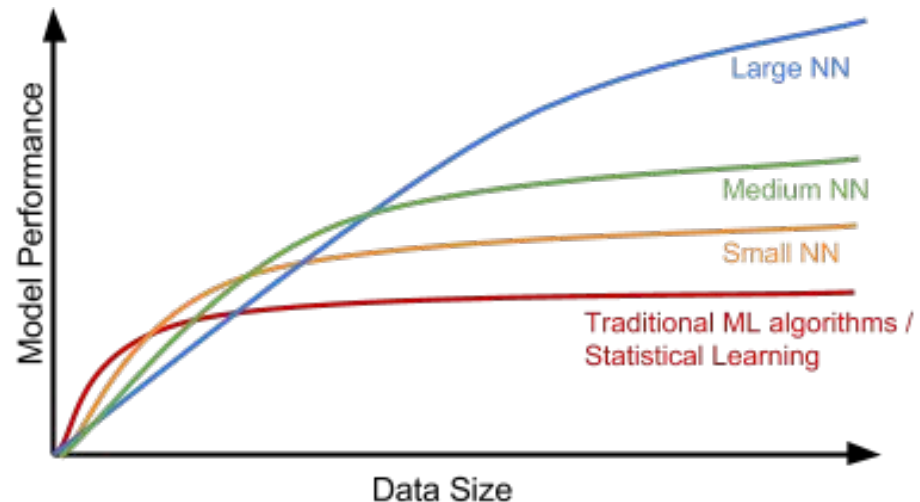
Why is Deep Learning Important now?

Deep learning requires large amounts of data

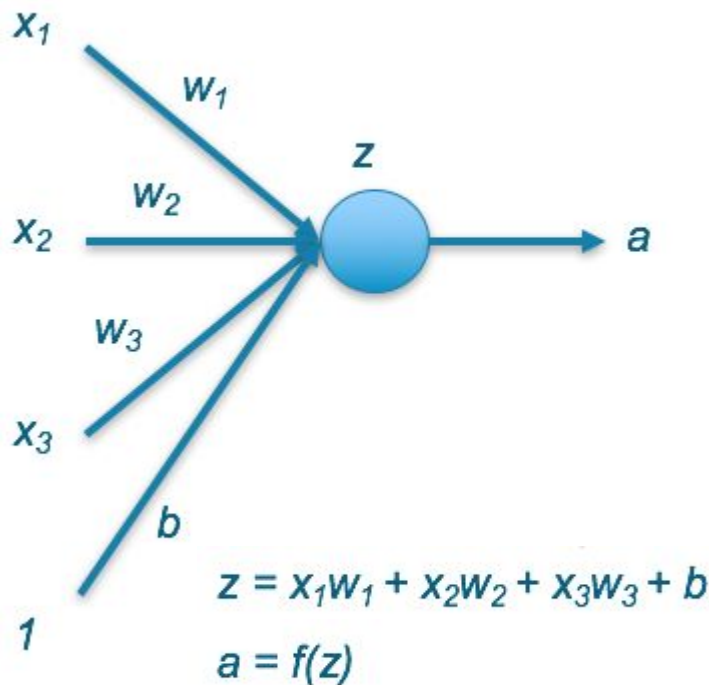
Deep learning requires substantial computing power

- High-performance GPUs have a parallel architecture that is efficient for deep learning

Well-trained Deep Neural Network can handle tasks that were previously considered impossible



What is a neuron?



The x values refer to inputs, either the original features or inputs from a previous hidden layer

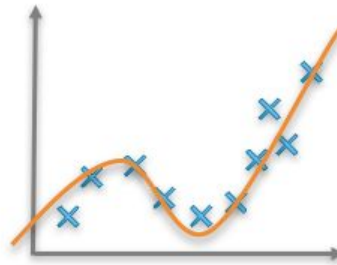
At each layer, there is also a bias b which can help better fit the data

The neuron passes the value a to all neurons it is connected to in the next layer, or returns it as the final value

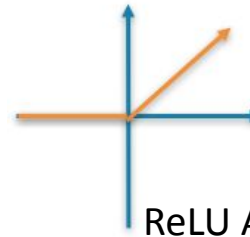
What is an Activation Function?



Linear function



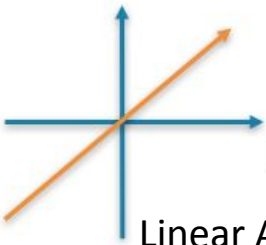
Non-linear function



ReLU Activation Function

$$relu(z) = \max(0, z)$$

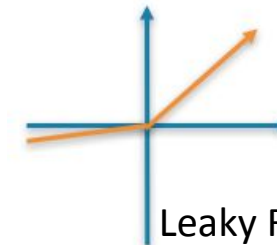
Range: 0 to infinity



Linear Activation Function

$$f(z) = az$$

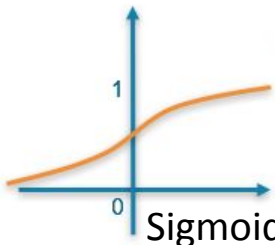
Range: -infinity to infinity



Leaky ReLU Activation Function

$$leakyrelu(z) = \begin{cases} 0.01z & \text{for } z < 0 \\ z & \text{for } z \geq 0 \end{cases}$$

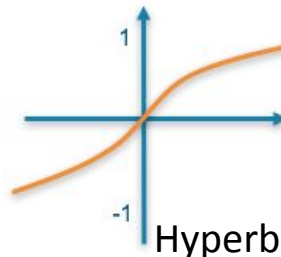
Range: -infinity to infinity



Sigmoid Activation Function

$$sigmoid(z) = \frac{1}{1 + e^{-z}}$$

Range: 0 to 1

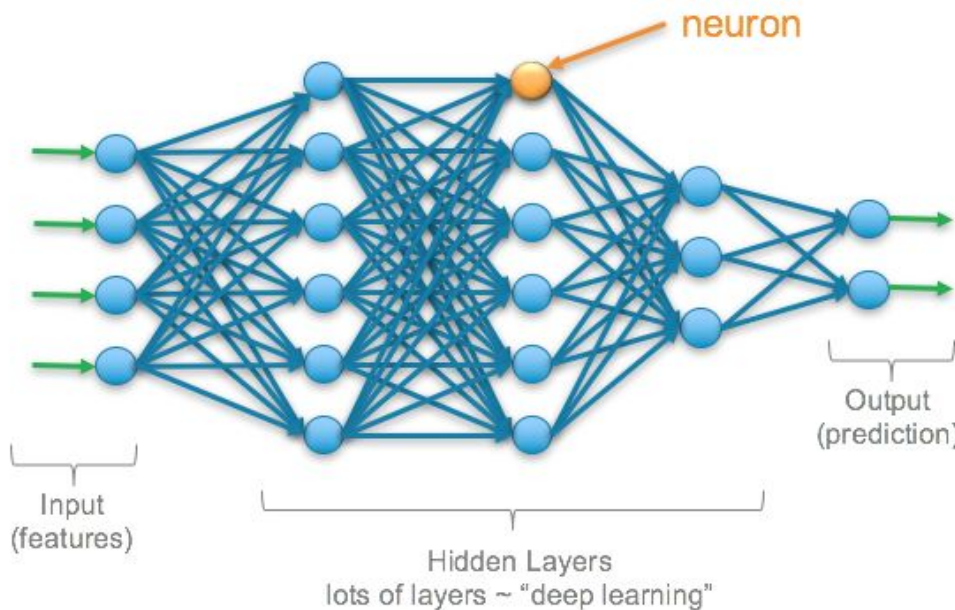


Hyperbolic Tangent Activation Function

$$\tanh(z) = \frac{e^z - e^{-z}}{e^z + e^{-z}}$$

Range: -1 to 1

Neural network is just a function...



that represented by various **combinations of neurons**, their **connections** and neuron **activation functions**.

According to **Universal approximation theorem**, any existing function can be approximated by a neural network.

Deep Learning Applications

Customer experience

Translations

Language recognition

Autonomous vehicles

News aggregator based on sentiment

Deep-learning robots

Healthcare

Automatic Text Generation

Image Recognition

Automatic Colorization Photo and Video

Advertising

Predicting Earthquakes

Text Generation

Music composition

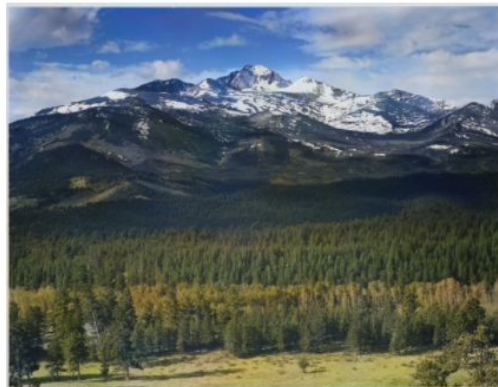
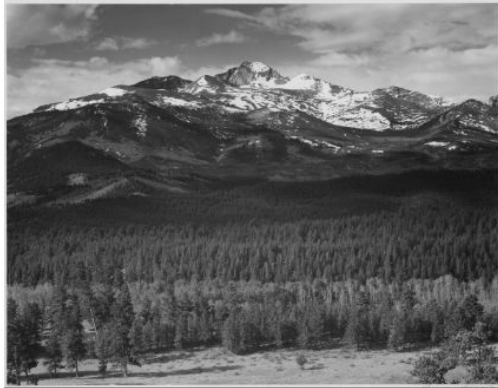
Picture Generation

Restoring sound in videos

Data mining

Creating Deep Learning Networks

Example. Colorization



Colorado National Park, 1941



Textile Mill, June 1937

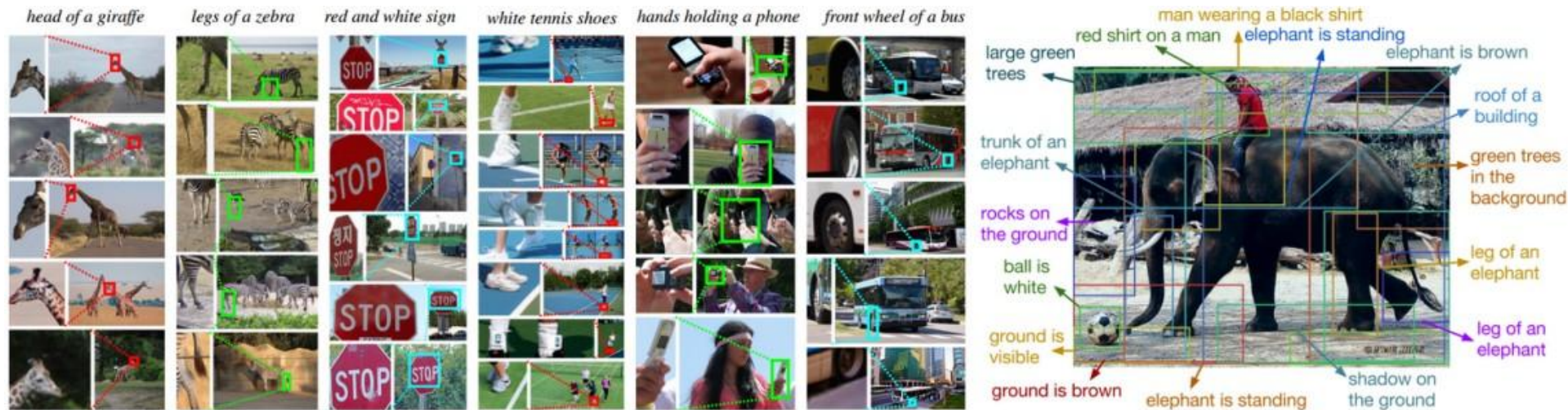


Berry Field, June 1909

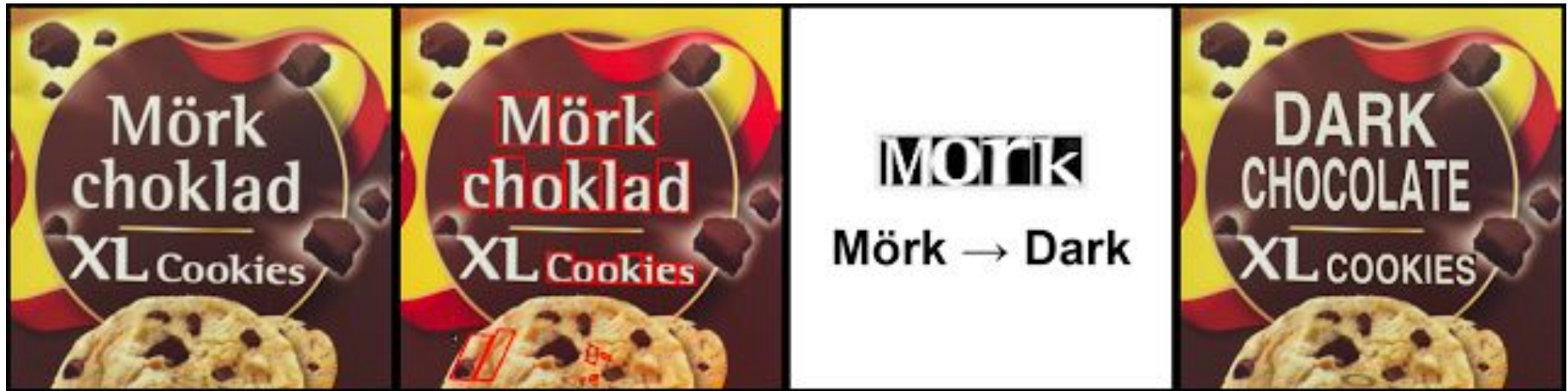


Hamilton, 1936

Example. Describing photos



Example. Translation



Example. Create new images



Top startups in Deep Learning



THE COGNITE VENTURES TOP STARTUPS IN DEEP LEARNING FEBRUARY 2018

DEEP LEARNING CLOUD COMPUTE/DATA PLATFORM AND SERVICES

DataRobot **H2O** **Cogito** **Vicarious**
NanoNets **Digital Reasoning** **OpenAI** **minds.ai**
ARIMO **groq inc.** **Numenta** **Vertex.ai**
deepsense.io **Cirrascale** **sentient** **skymind**
DATALOGUE **rapidminer** **ELEMENT** **KIMERA**
loop **SIGOPT** **horoback** **Cycorp** **FLOYD**
Paradigm **Preferred Networks** **Arya.ai** **hocrox** **gb**
diffblue **Intellegens** **AURORA-AI** **massense**
NEURENCE **seldon** **artelnic** **deepomatic**
SPARKBEYOND **KUZNECH** **RAINBIRD**

MEDICINE AND HEALTH CARE

imag **AiCure** **CureMatrix** **zephyr** **Numerate**
GRAIL **DEEP 6 AI** **babblabs**
LUMINIST **BAYLABS** **RECURSION** **QLOOMEDX**
VUNO **CarbonX** **Unit**
AVALON **ContextVision** **KHEIRON** **camerEye**
Intellegens **zebra** **MARENTIG** **MedyMatch**

FINANCE, INSURANCE AND COMMERCE

CEREBELLUM CAPITAL **KENSHIC** **it.ai**
SENTIENT **ZEPI**
FEATURE SPACE **BMILL** **OSVERN** **T**

MARKETING AND ADVERTISING

VIEW.AI **ISENTIUM** **Ampero** **automat**
PRODUCTAI **SOTERIA**
LAYER **PRODIGY** **PRODUCTAI**
AYLIEN **NUDGE** **MIST**
viisights **ReVuz** **CORTEXICA**
WebClip **real eyes**

VISION AS A SERVICE

clarifai **PRISMA** **Sighthound** **tend**
Hubino **HYPERVERGE** **SetaTech**
TURBOTECH **YITU** **SENSEMORE**
Birds.ai **deepomatic** **inoven** **VILYNX**
TRACKABLE **VALOSSA** **RE SNAP** **COFFICE**

AERIAL IMAGING AND MAPPING

Orbital Insights **planet** **PLANET** **arc4aware**
VIDEO **FETALOUPE**

SOCIAL MEDIA, ENTERTAINMENT AND LIFESTYLE

OnePoint **SECOND SPECTRUM** **SOTERIA**
QLY **Jukedeck** **Neural Painting** **VAULT**
Sensifai **Sonalytic Systems**

AUDIO AND LANGUAGE AS A SERVICE

AI Sense **babblabs** **CAPIO** **CTI** **gridshift**
Indico **KITT.AI** **LEXALYTICS** **MindMeld**
MOD9 **PAR** **semantic machines** **volley**
capricity **IntelliGo** **MIND**
Blasembury AI **COGNICOR** **cortical.io** **Checker**
Intelligent Voice **LASTMILE** **LEVERTON** **aido**
Replika **retechnica** **spaCy** **speech** **They Say**
ids **Linguistics** **audioburst** **BEYONVERBAL**

HUMAN-MACHINE INTERFACE

neuro **neron** **LIGHTHOUSE** **SKINDROID**
TERADEEP **gyrfalcon** **ZERO AI** **IMOTIONS**
Mashgin **MOD9** **KITT.AI** **AI**
Research **trueface** **EVPIS** **SoundHound Inc.**
Sighthound **QML** **ASRAIN INC** **babblabs**
AKA **Rekte** **Face** **AI SPEECH**
VEO **intuition robotics** **LIPSIGHT** **emtec**
eyeSight **IMAGRY** **JUNGO** **ORCAM** **snips**

IT OPERATIONS AND SECURITY

BYLANE **graphistry** **sparkcognition**
deepinstinct **Cognitive ID** **Cyberlytic** **DARKTRACE**

DRONES AND ROBOTS

abundant **robotics**
CLEARPATH **AIROAR**
ACCELERATED DYNAMICS **LIL**
Iris Automation
UNIVERSAL **Qelzal**
OSARC
brain **AI SPEECH**
MINORED **HOVER CAMER**
DLR **robot**

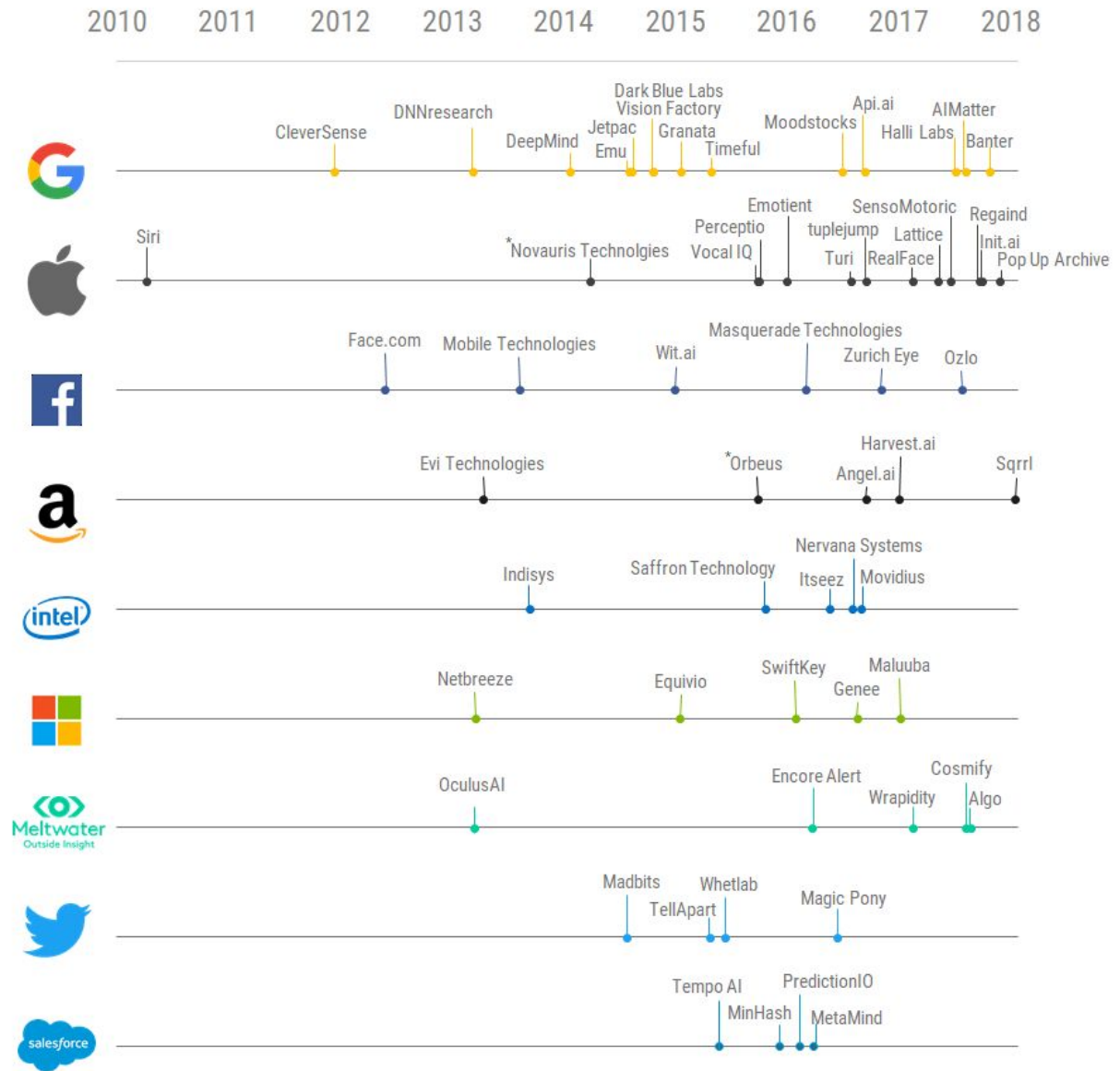
CRM AND HR

BICYCLE
Digital Genius
vufind
Eloquent Labs
MARAX AI
SentiSum **CYR**
AYLIEN
re-infer

SILICON PLATFORMS

REM **thin**
groq inc. **Wave Comput**
TENSTORRENT **gyrfalcon**
branchip **DEEP VISION**
NOVEMIND **MYTHIC**
intelliGo **AIROAR**

Race To Acquire Top AI Startups



Source: cbinsights.com

*approximate dates of acquisition

CBINSIGHTS

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