



school of ai

Blockchain :Future of Artificial Intelligence

ziedkhayechi :Dean at school of ai

Artificial Intelligence
Blockchain Technology
Deep Learning
Deep Learning Chains





What are we running on networks?



Information

1980s



Value (Money)

2010s-2020s

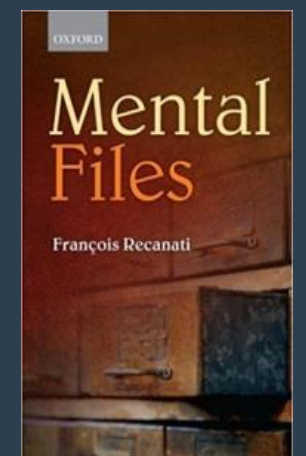
*Value-
tokening*



Intelligence (Brains)

2050s(e)

*Thought-
tokening*



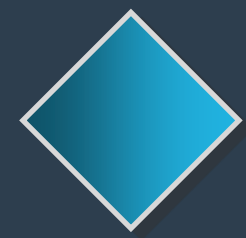
Future of AI : Smart Networks



Considering blockchain and deep learning together suggests the emergence of a new class of global network computing system. These systems are self-operating computation graphs that make probabilistic guesses about reality states of the world

Artificial Intelligence
Blockchain Technology
Deep Learning
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What is Artificial Intelligence?

Artificial intelligence (AI) is a computer performing tasks typically associated with intelligent beings

-Encyclopedia Britannica



Ke Jie vs. AlphaGo AI Go player, Future of Go Summit, Wuzhen China, May 2017



“Creeping Frontier” of Technology

- Achievements are quickly forgotten
- AI = “whatever we can’t do yet”

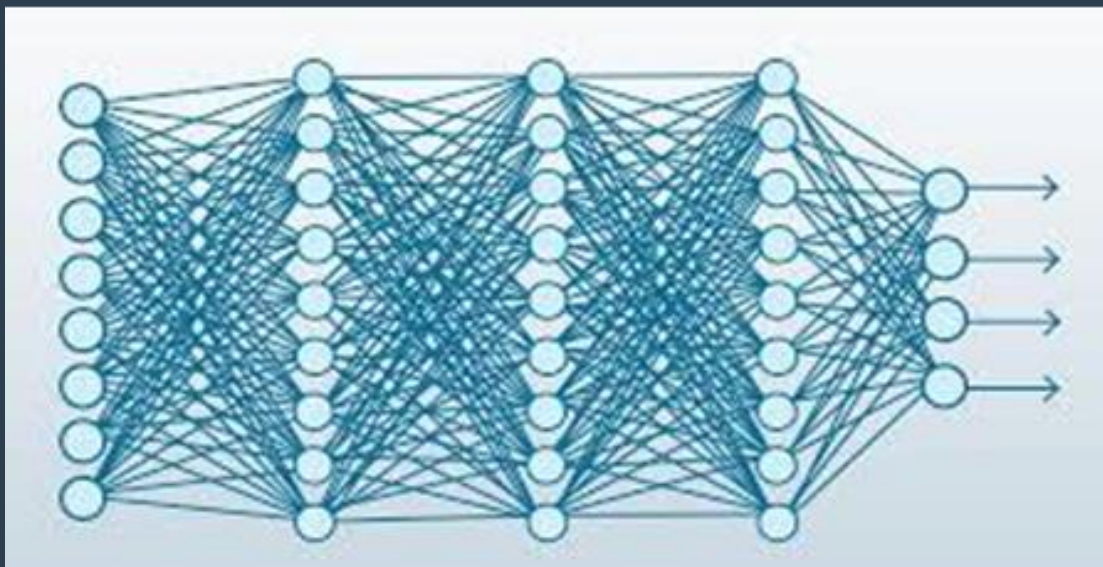


Innovation Frontier

2

Our AI Future: high-impact emerging tech

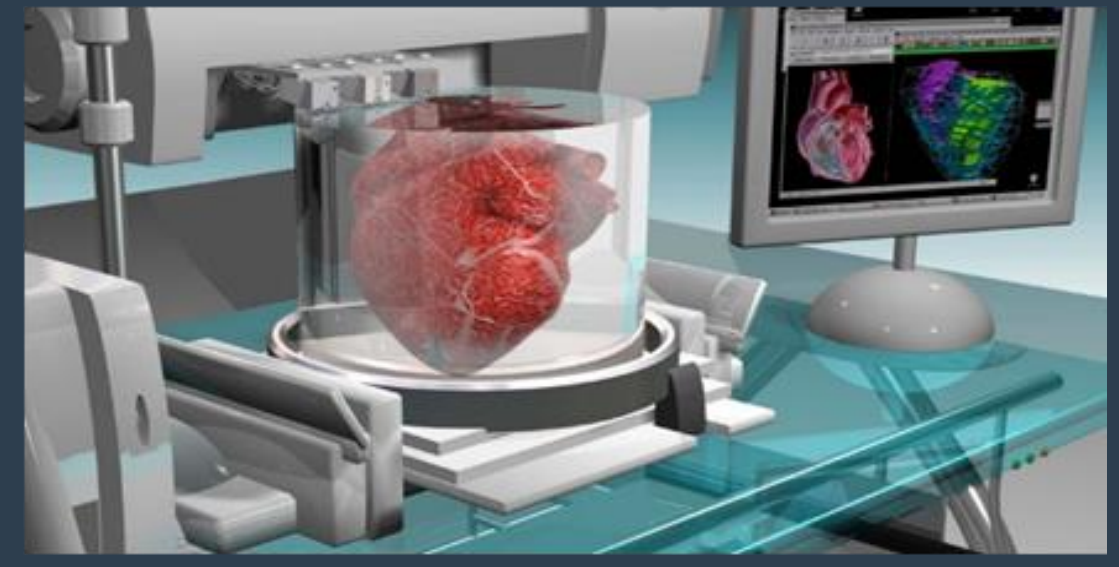
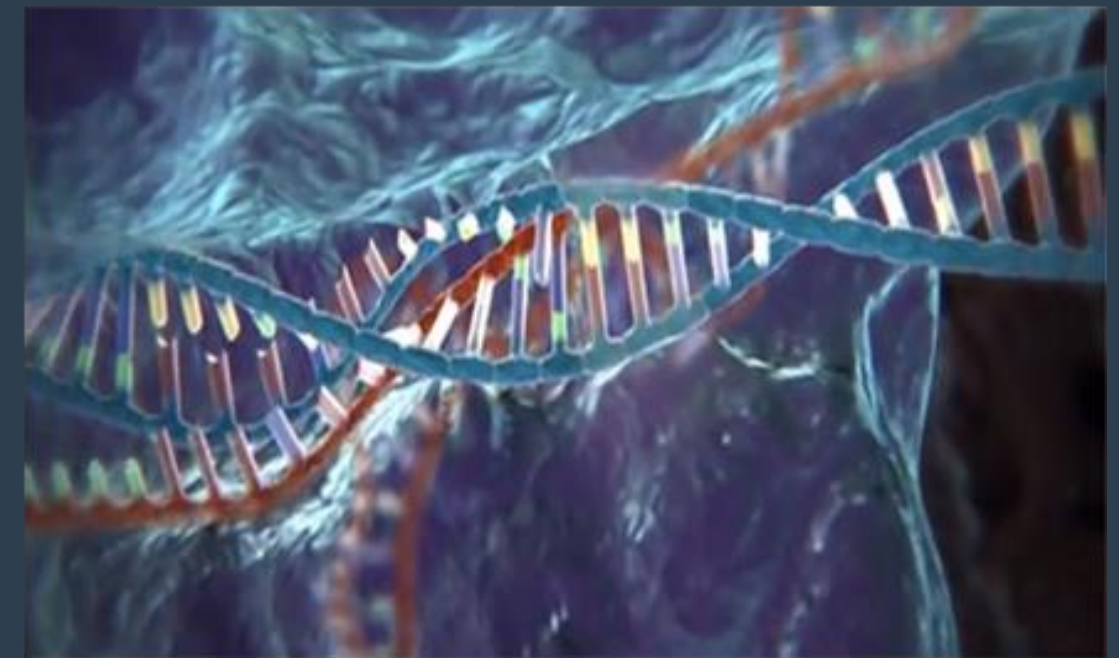
Big Data &
Deep Learning



Blockchain



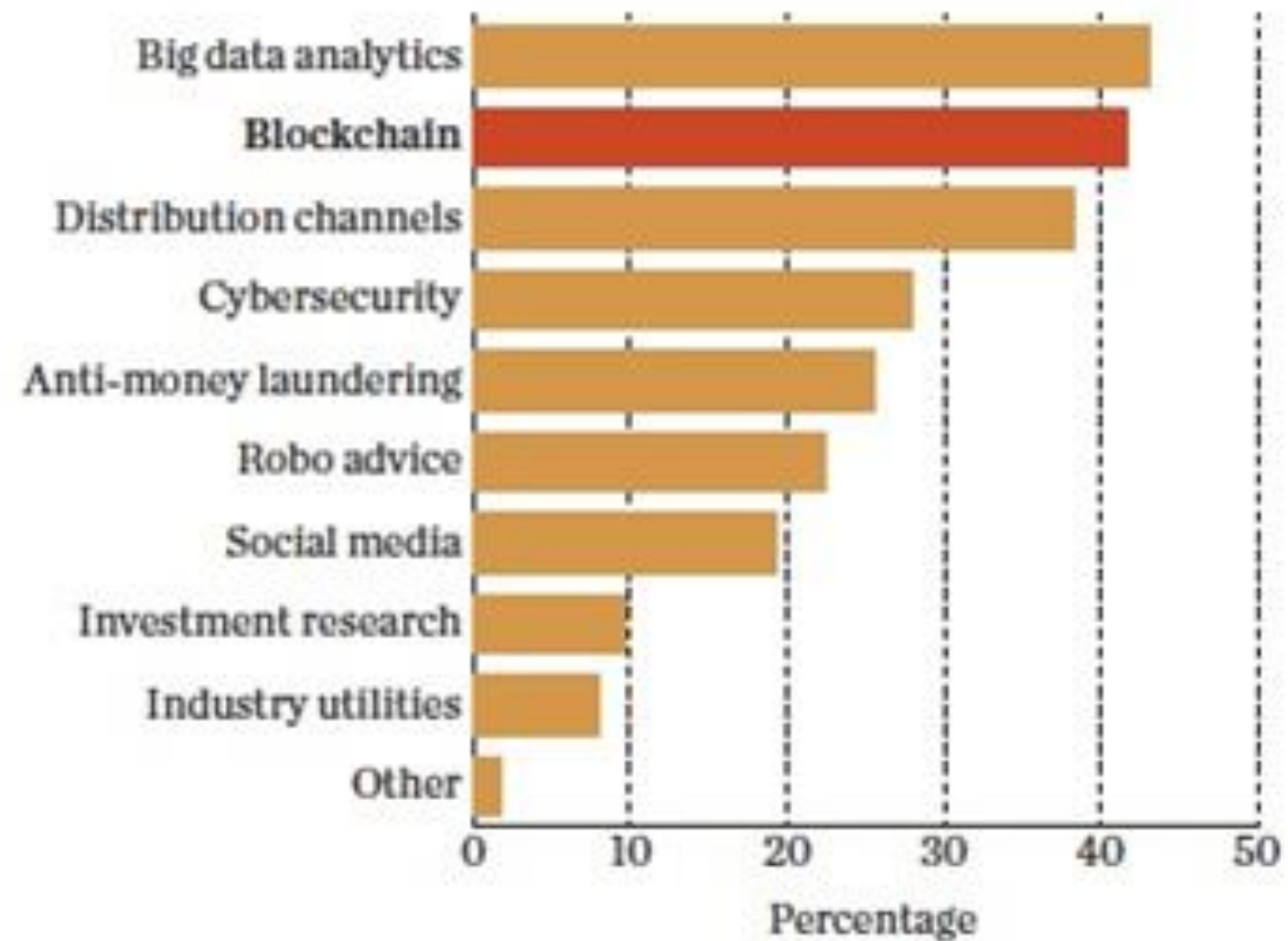
CRISPR &
Bioprinting



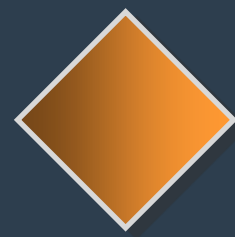


Top disruptors: Deep Learning & Blockchain

1. Areas where disruptors will have most impact

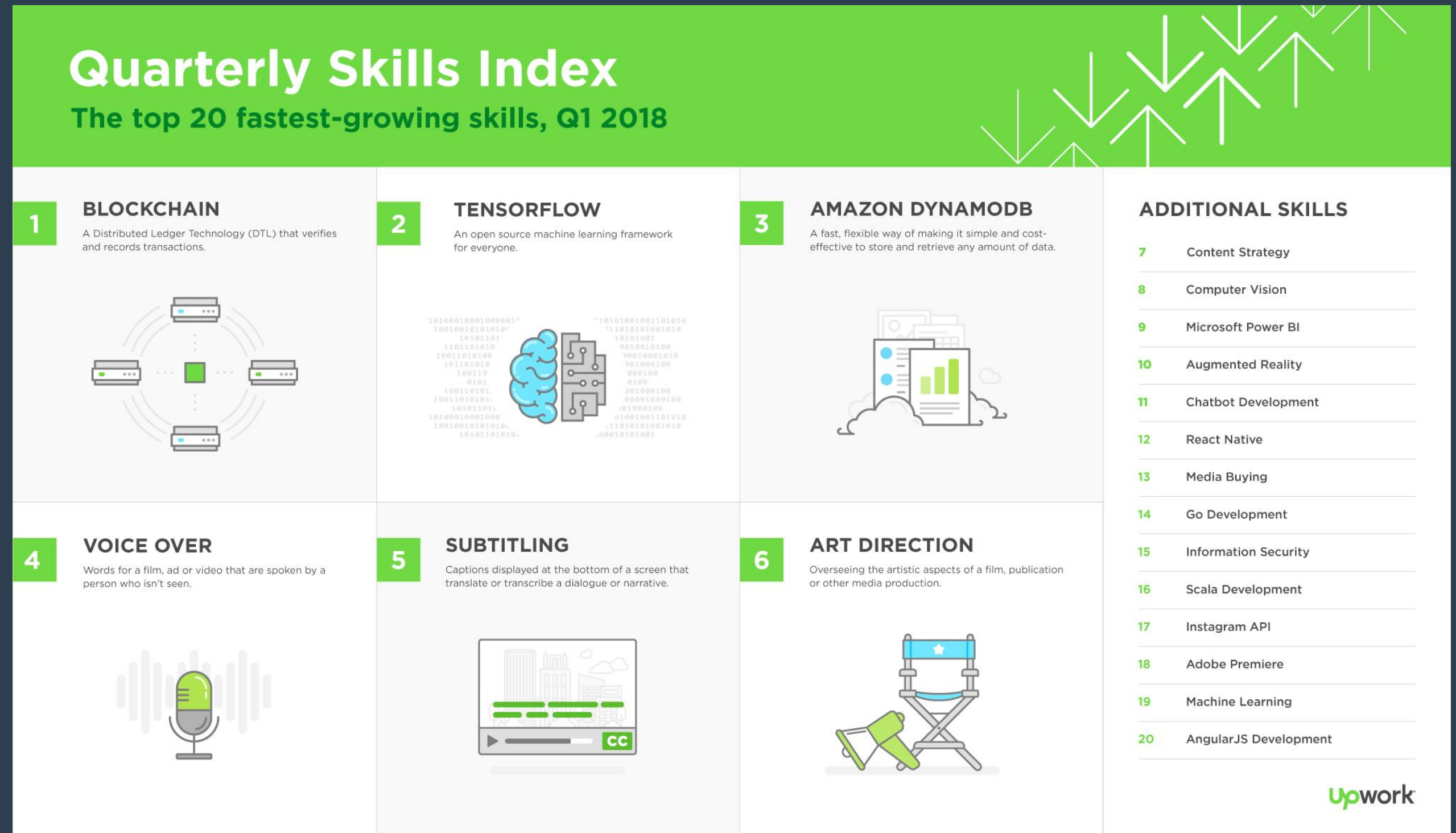


Source: Multifonds

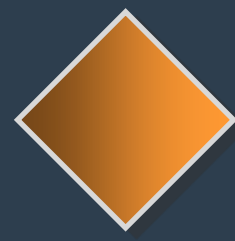


Job Growth Skills in Demand

1. Blockchain
2. Machine learning /deep learning

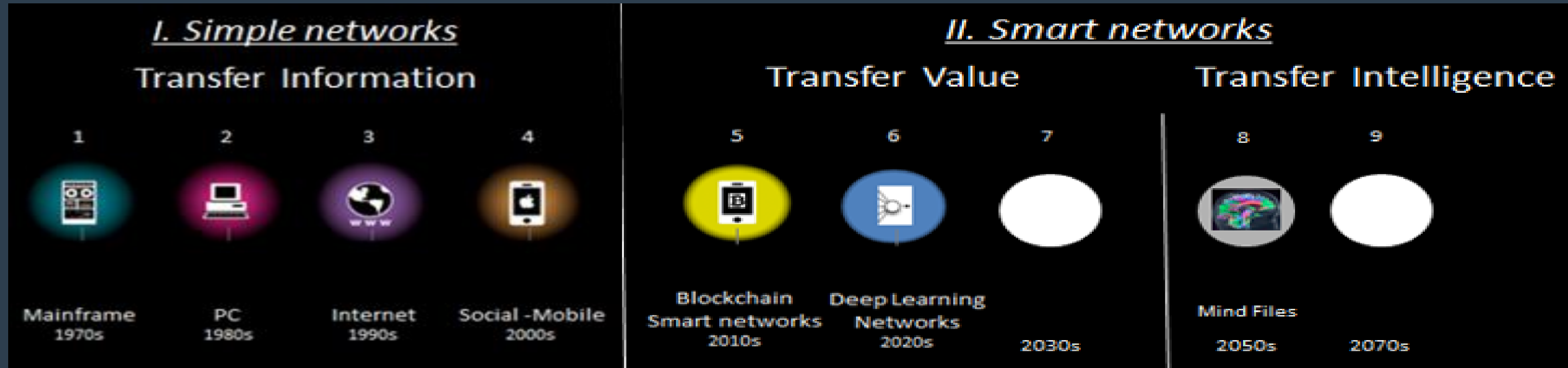


<https://www.computerworld.com/article/3235972/it-careers/blockchain-moves-into-top-spot-for-hottest-job-skills.html>



Future of AI: Smart Networks

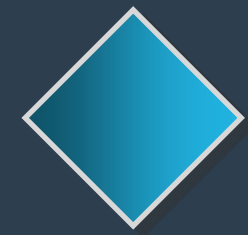
Fundamental Eras of Network Computing



- Network computing to bring about next-gen AI
- Future of AI: intelligence “baked in” to smart networks
 - Blockchains to confirm authenticity and transfer value
 - Deep Learning algorithms for predictive identification

Artificial Intelligence
Blockchain Technology
Deep Learning Algorithms
Deep Learning Chains





What is Blockchain/Distributed Ledger Tech?

Blockchain is

- the tamper-resistant (book)*
- for recording and transferring data and assets such as financial transactions and real estate titles (files)*
- distributed ledger software (software)*
- via the Internet without needing a third-party intermediary*

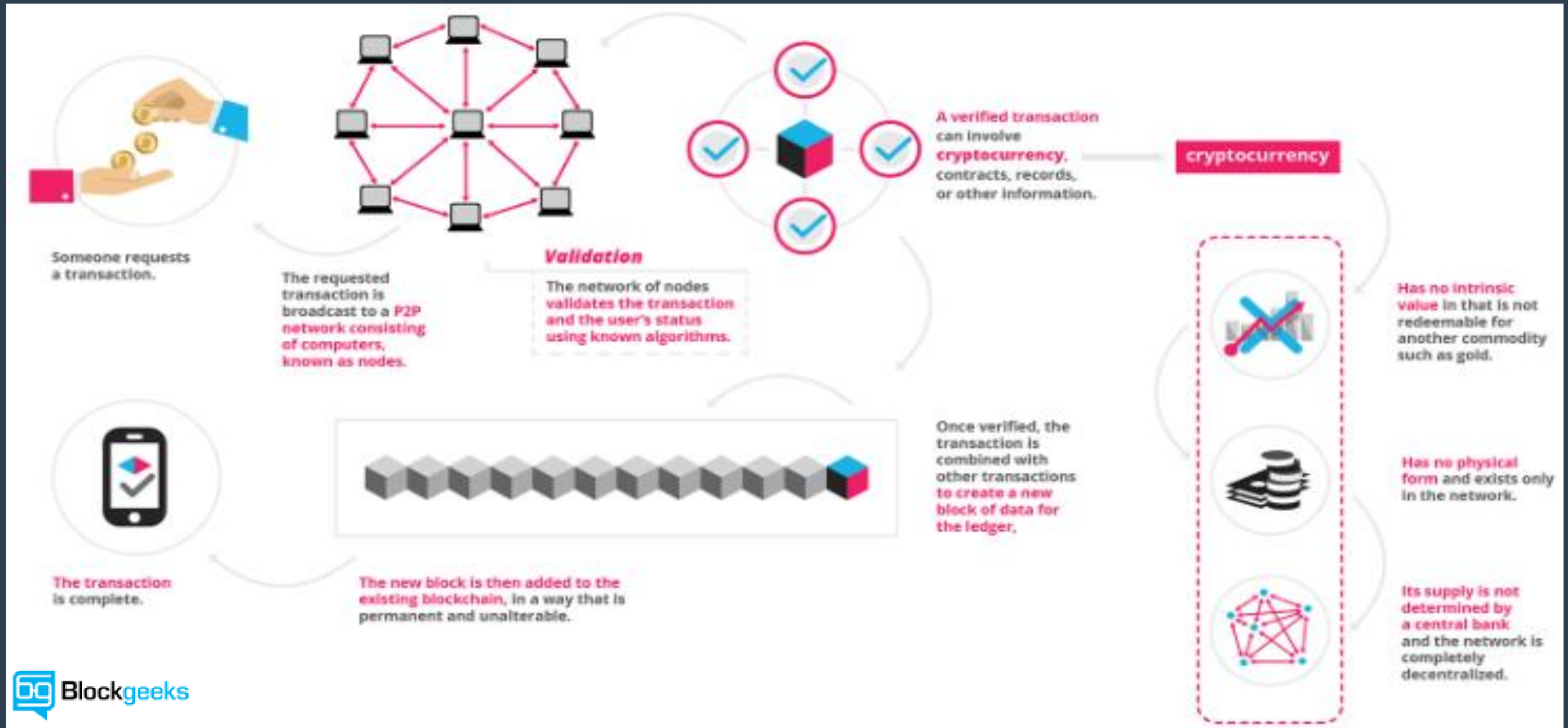


What is Blockchain/Distributed Ledger Tech?

- Context of Internet protocol stack, Bitcoin is just the first blockchain app

Application Layer	Gmail	Bitcoin (Btc) – \$\$, the digital currency
Application Protocol Layer	SMTP – simple mail transfer protocol	Bitcoin protocol – protocol for transferring the Bitcoin cryptocurrency
General Protocol Layer	TCP/IP – transmission control protocol/Internet protocol	The Bitcoin Blockchain – the cryptographic ledger on which Bitcoin runs

How does Bitcoin work?





How robust is the Bitcoin p2p network?

GLOBAL BITCOIN NODES DISTRIBUTION

Reachable nodes as of Wed Nov 07 2018
05:17:01 GMT+0100 (heure normale d'Afrique de l'Ouest).

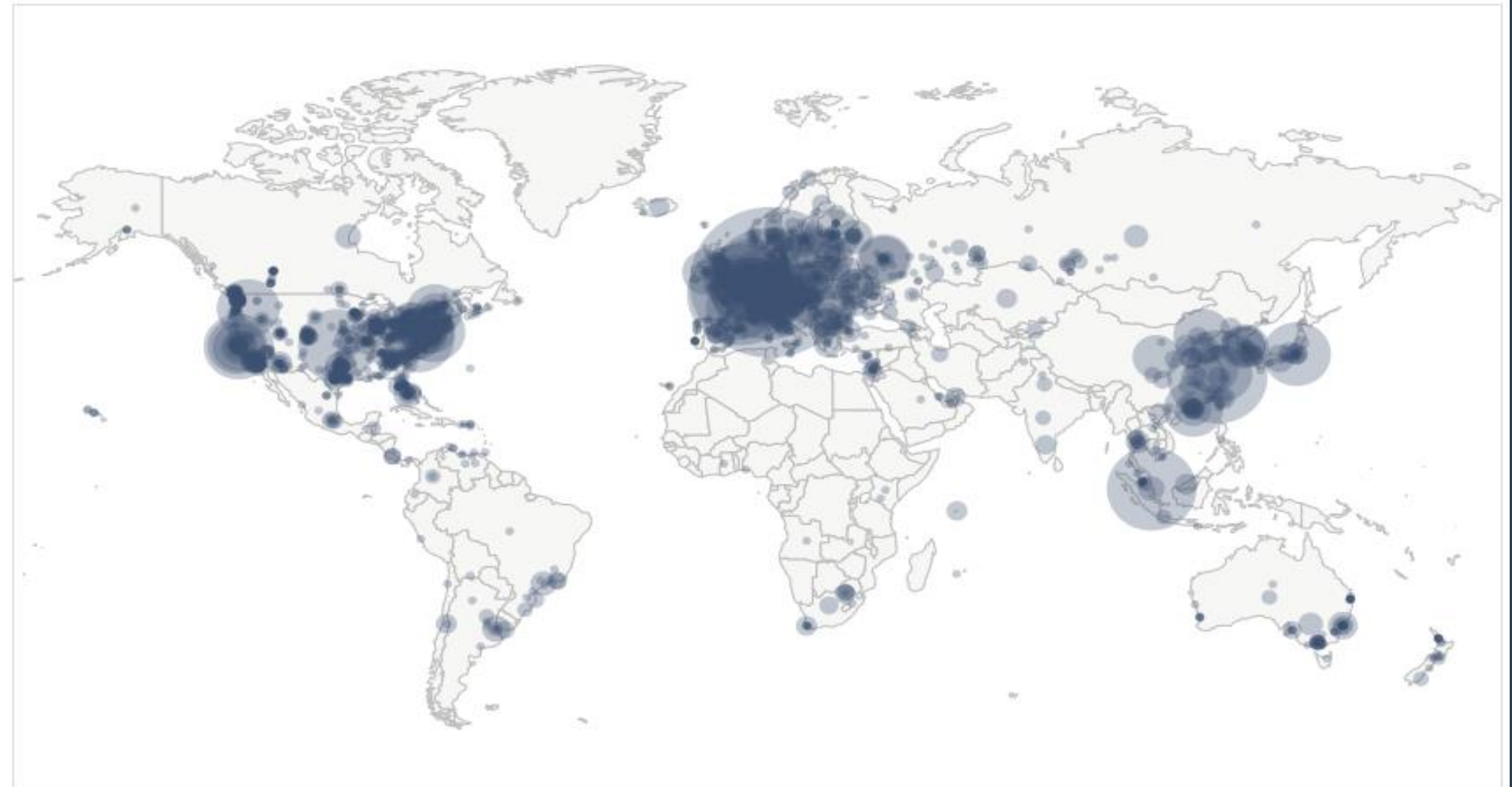
10001 NODES

24-hour charts »

Top 10 countries with their respective number of reachable nodes are as follow.

RANK	COUNTRY	NODES
1	United States	2372 (23.72%)
2	Germany	1938 (19.38%)
3	France	666 (6.66%)
4	China	655 (6.55%)
5	Netherlands	512 (5.12%)
6	n/a	487 (4.87%)
7	Canada	356 (3.56%)
8	United Kingdom	290 (2.90%)
9	Russian Federation	271 (2.71%)
10	Singapore	245 (2.45%)

More (106) »

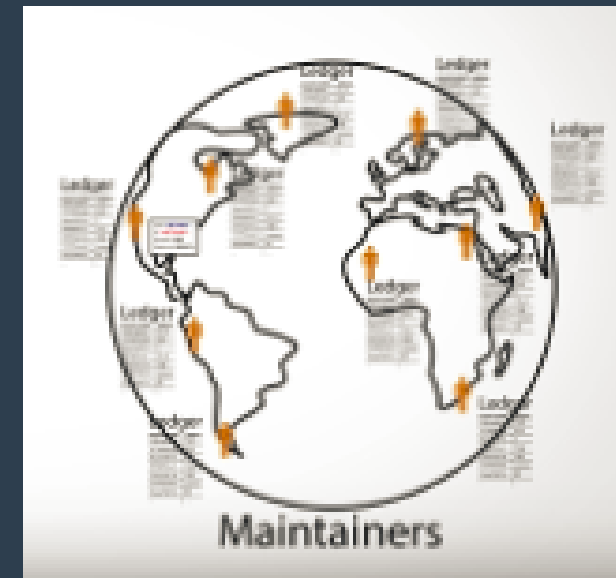


Map shows concentration of reachable Bitcoin nodes found in countries around the world.

LIVE MAP



What is Bitcoin mining?



- * Mining is the accounting function to record transactions, fee-based
- * Mining ASICs “discover new blocks”
 - Mining software makes nonce guesses to win the right to record a new block (“discover a block”)
 - At the rate of 2^{32} (4 billion) hashes (guesses)/second
 - One machine at random guesses the 32-bit nonce
- * Winning machine confirms and records the transactions, and collects the rewards
 - All nodes confirm the transactions and append the new block to their copy of the distributed ledger

 [bitcoin / bitcoin](#)



```
while (hash_256(hash_256(block_header, nonce) >= target_string) do  
    nonce = nonce + 1  
end while
```

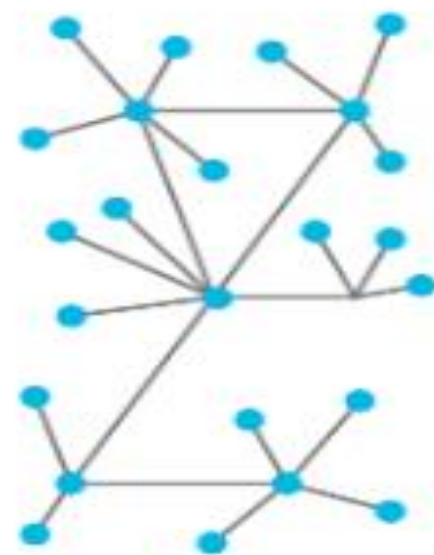


Distributed Networks

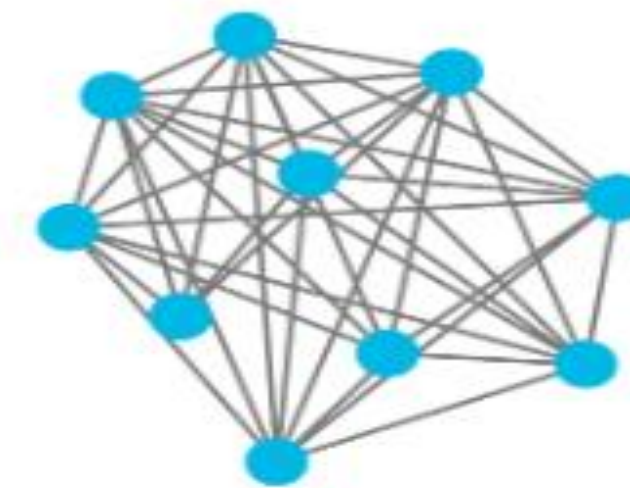
Centralized



Decentralized



Distributed Ledgers



The New Networks

Distributed ledgers can be public or private and vary in their structure and size.

Public blockchains

Require computer processing power to confirm transactions ("mining")

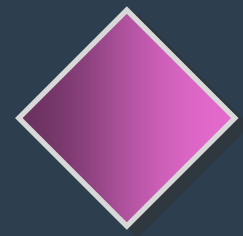
- Users (●) are anonymous

- Each user has a copy of the ledger and participates in confirming transactions independently

- Users (●) are not anonymous

- Permission is required for users to have a copy of the ledger and participate in confirming transactions





P2P Network Nodes provide services

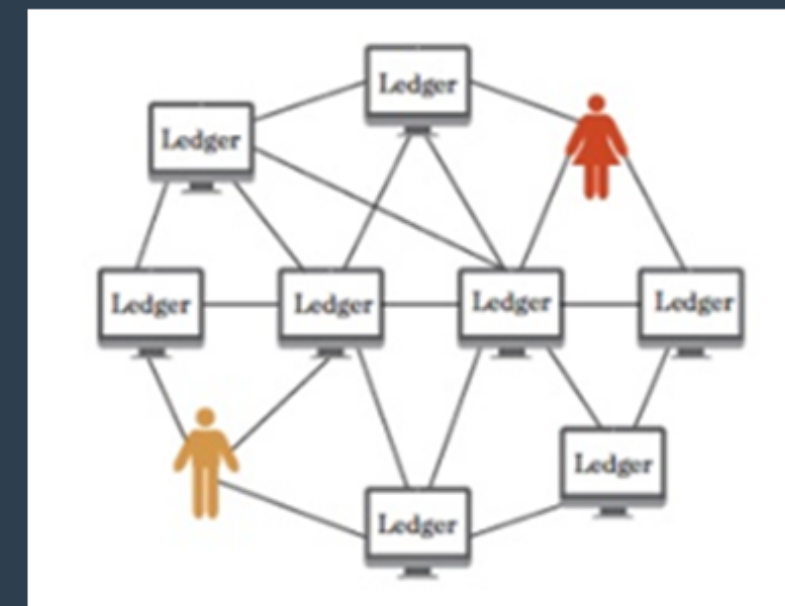
- Nodes deliver services to others, for a small fee
 - Transaction ledger hosting (~11,960 Bitcoin nodes)
 - Transaction confirmation and logging (mining)
 - News services (“decentralized Reddit”: Steemit, Yours)
 - Banking services (payment channels (netting offsets))
 - Direct peer-to-peer digital clearing = no central bank needed

“Classic”
Banking

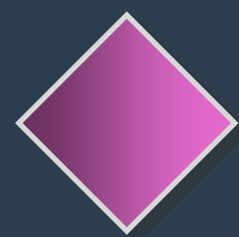


Centralized bank tracks
payments between clients

Peer
Banking





Network nodes store transaction
record settled by many individuals



Public and Private Distributed Ledgers



	Public Blockchain Eg: Bitcoin & Ethereum	Private Blockchain Eg: R3 & Hyperledger	Federated/Consortium Blockchain
Access	<ul style="list-style-type: none">Anyone 	<ul style="list-style-type: none">Single organization 	<ul style="list-style-type: none">Multiple selected organizations
Participants	<ul style="list-style-type: none">PermissionlessAnonymous	<ul style="list-style-type: none">PermissionedKnown identities	<ul style="list-style-type: none">PermissionedKnown identities
Security	<ul style="list-style-type: none">Consensus mechanismProof of Work / Proof of Stake	<ul style="list-style-type: none">Pre-approved participantsVoting/multi-party consensus	<ul style="list-style-type: none">Pre-approved participantsVoting/multi-party consensus
Transaction Speed	<ul style="list-style-type: none">Slow	<ul style="list-style-type: none">Lighter and faster	<ul style="list-style-type: none">Lighter and faster

Artificial Intelligence
Blockchain Technology
Deep Learning
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Blockchain Applications Areas

- Impacting all industries because allows secure value transfer in four application areas



Finance

Trade and settle securities at a fraction of the time and cost.

Money, Payments,
Financial Clearing



Property

Permanently record and access real-time property rights.

Smart Property
Cryptographic Asset
Registries



Contracts

Self-enforcing contracts based on predefined conditions.

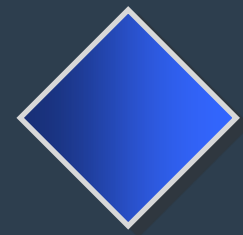
Smart Contracts
IP Registration



Identity

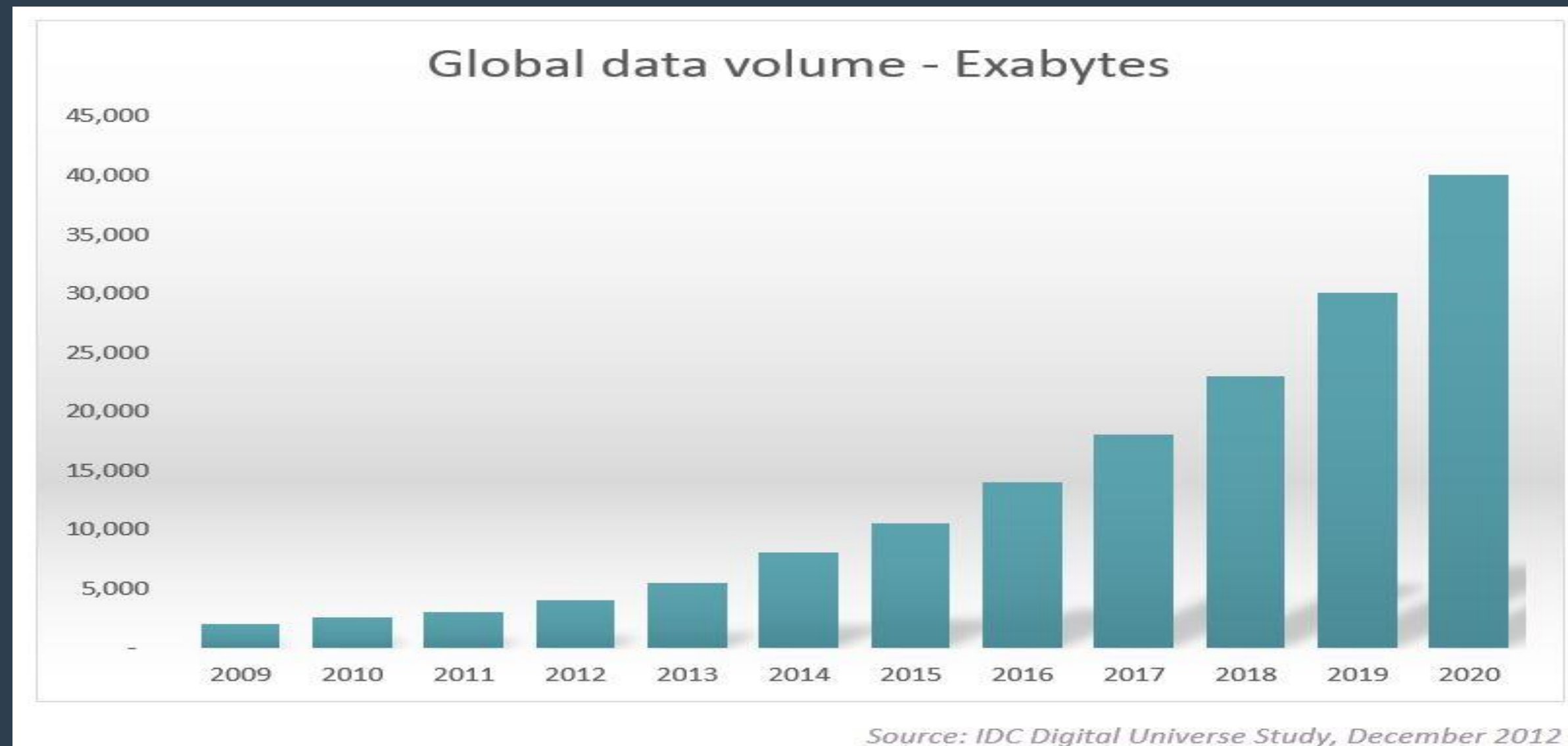
Eliminate invasive identity practices via digital identities.

Identity
Confirmation



Big Data...is not Smart Data

- Global Data Volume: 40 EB 2020e
- Scientific, governmental, corporate, and personal



Big data

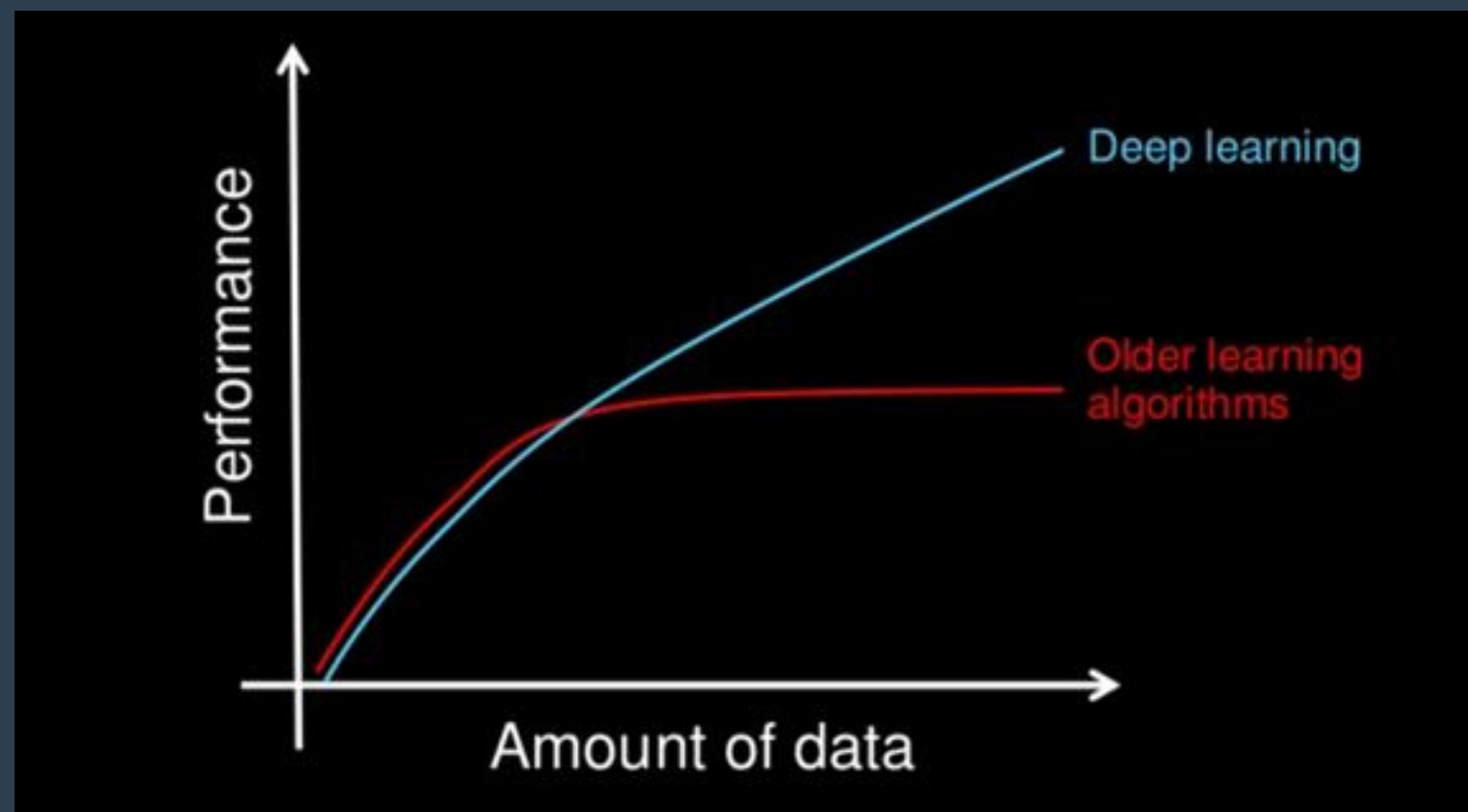
Data explosion –
doubling every 12-18
months

<https://www.oyster-ims.com/>



Big Data requires Deep Learning

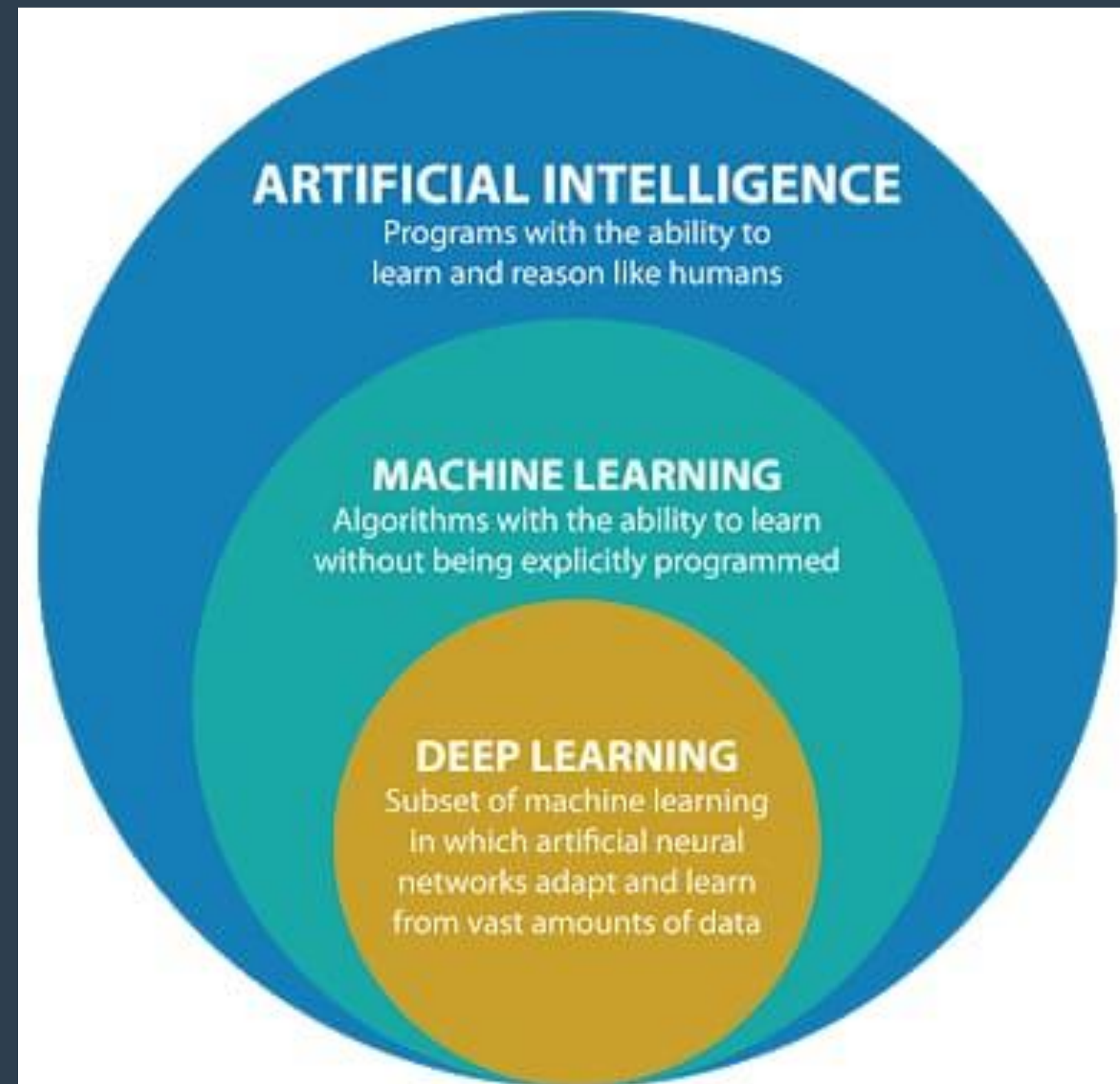
- Older algorithms cannot keep up with the growth in data, need new data science methods





Broader Computer Science Context

- Within the Computer Science discipline, in the field of Artificial Intelligence, Deep Learning is a class of Machine Learning algorithms, that are in the form of a Neural Network





What is Deep Learning?

Conceptual Definition:

Deep learning is a computer program that can identify what something is

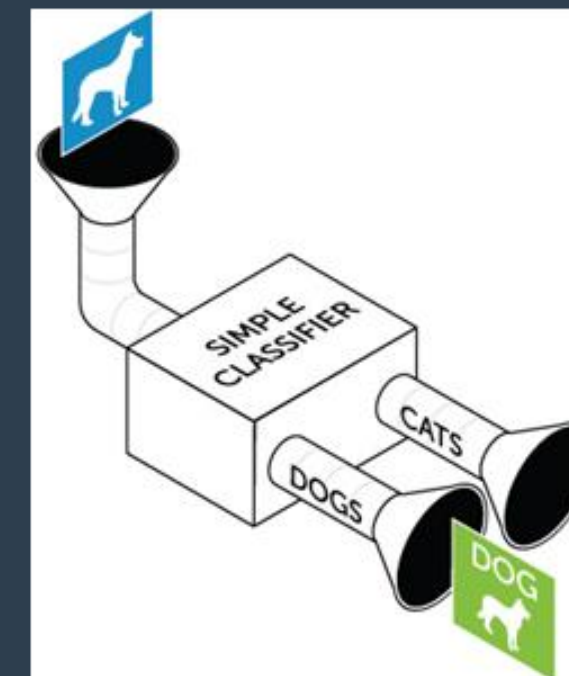
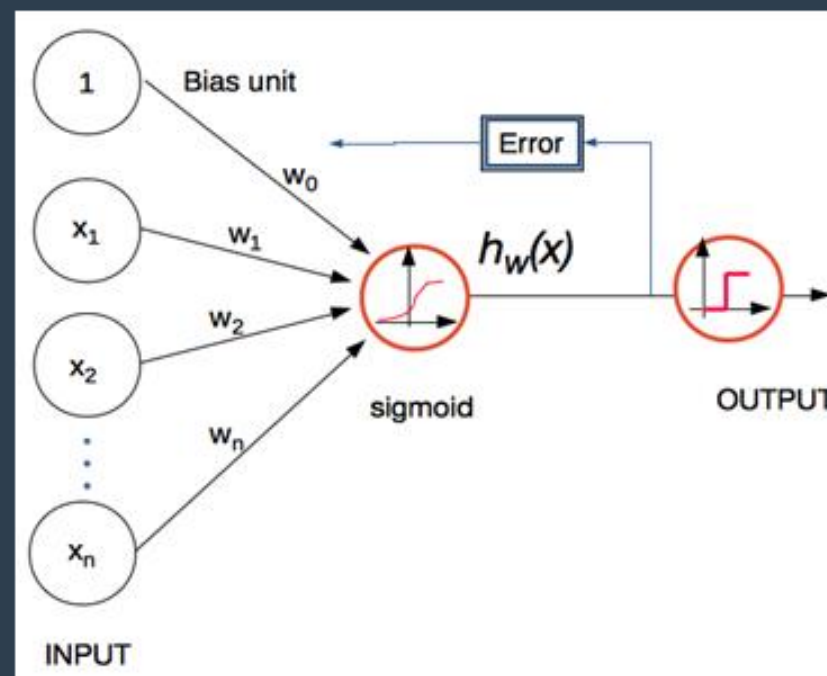
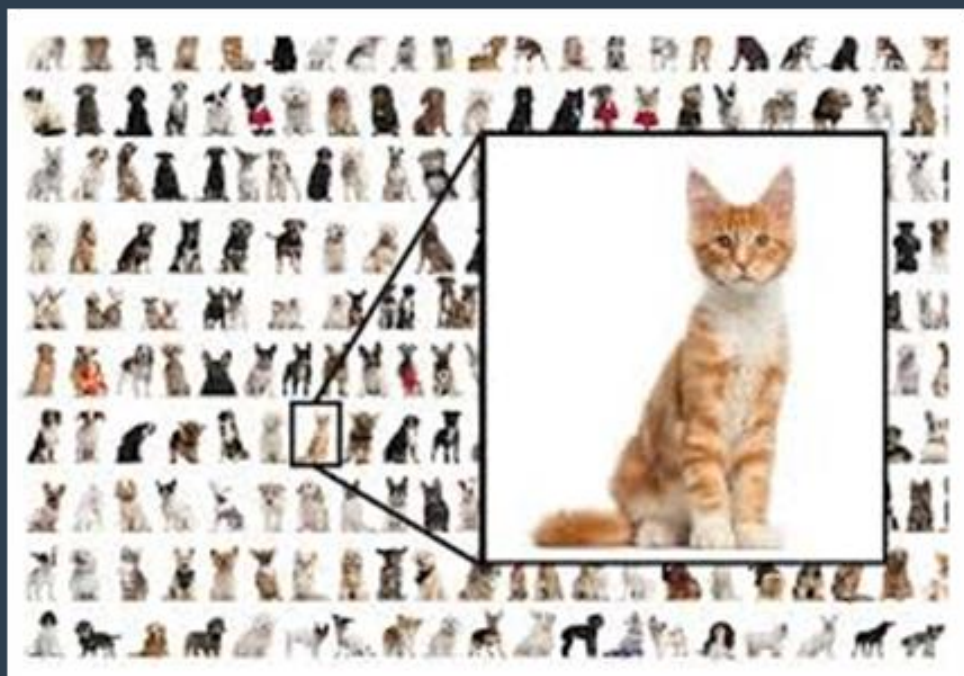
Technical Definition:

Deep learning is a class of machine learning algorithms in the form of a neural network that uses a cascade of layers (tiers) of processing units to extract features from data and make predictive guesses about new data



Deep Learning & AI

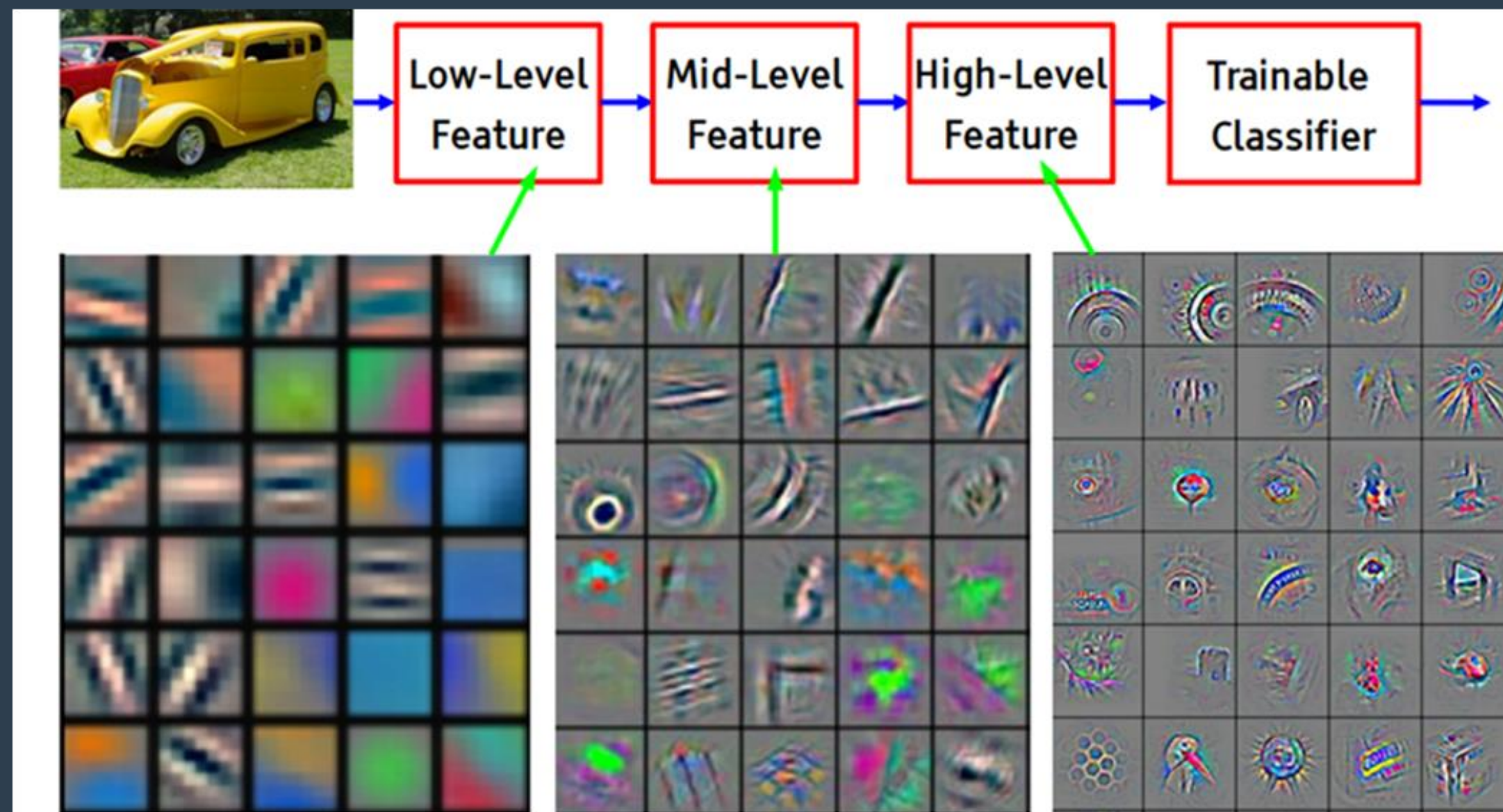
- System is “dumb” (i.e. mechanical)
 - “Learns” with big data (lots of input examples) and trial-and-error guesses to adjust weights and bias to identify key features
 - Creates a predictive system to identify new examples
- AI argument: big enough data is what makes a difference (“simple” algorithms run over large data sets)





Sample task: is that a Car?

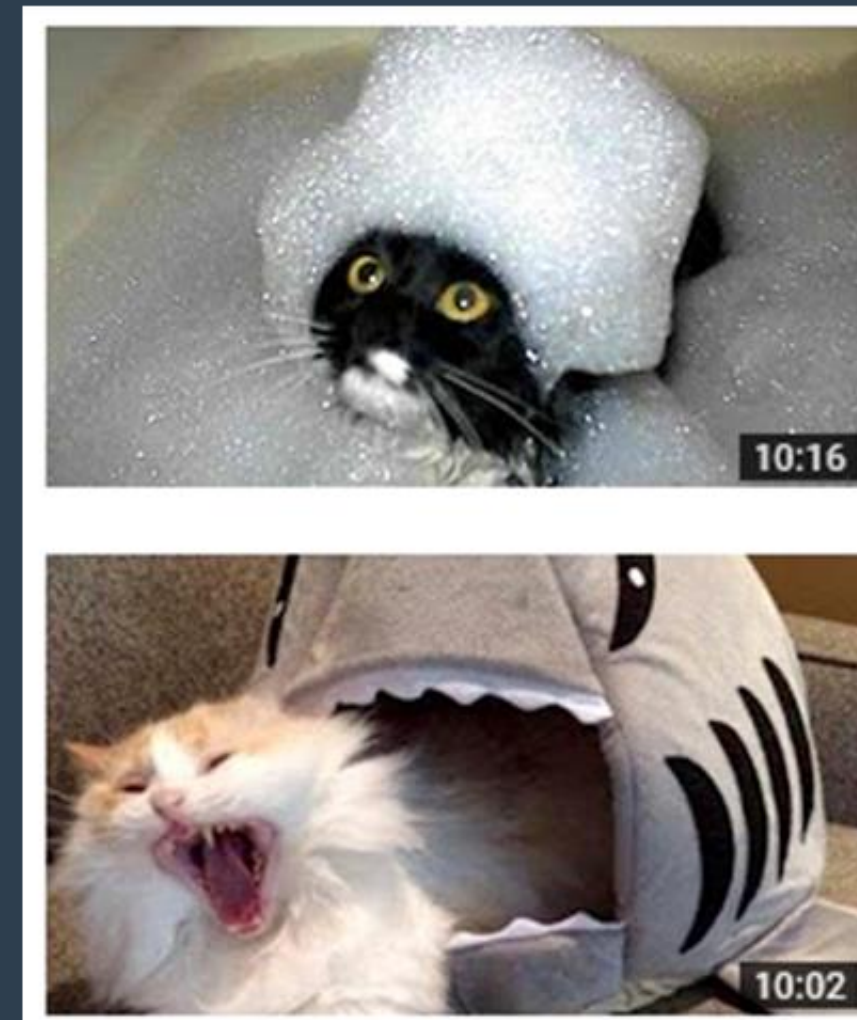
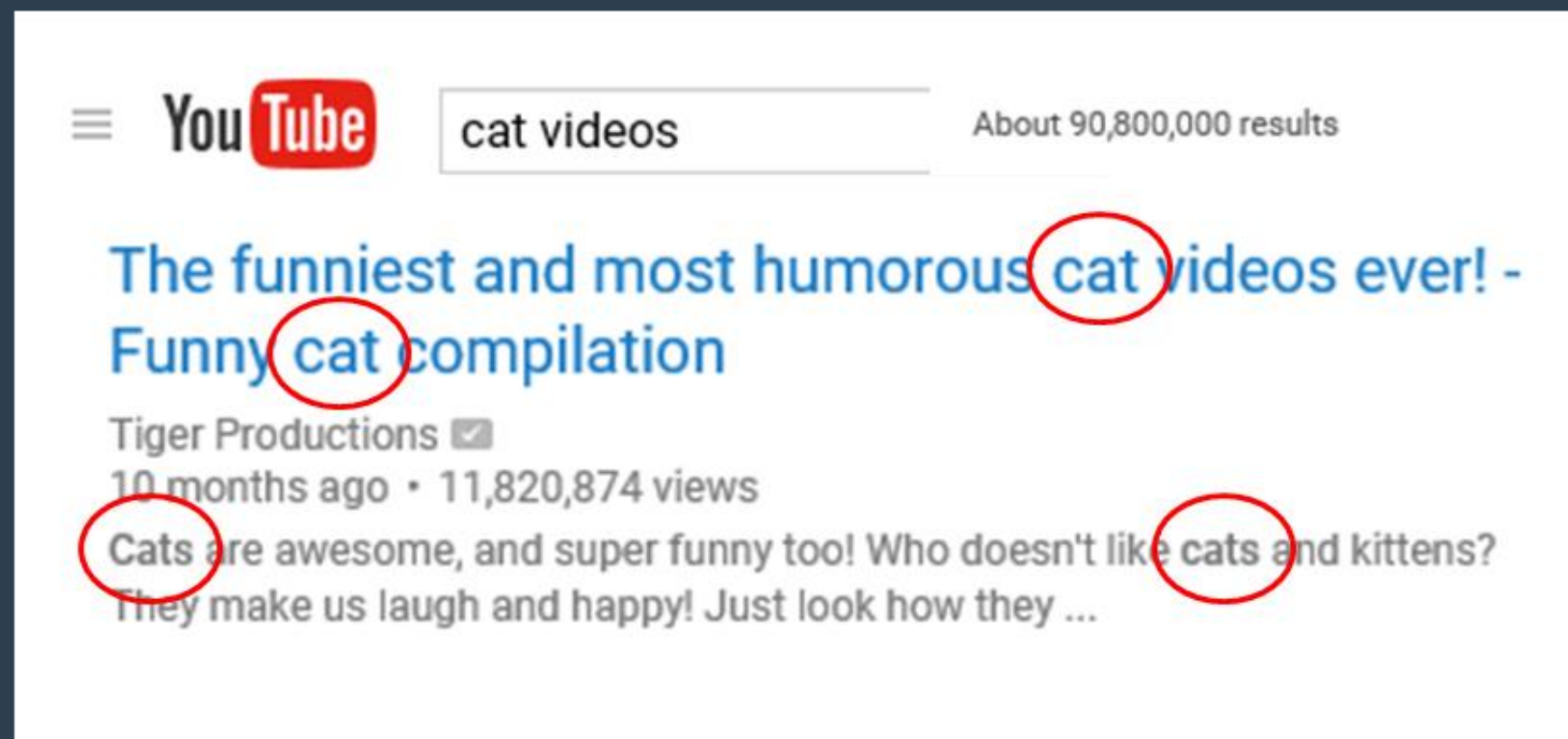
- Create an image recognition system that determines which features are relevant (at increasingly higher levels of abstraction) and correctly identifies new examples





Early success in Supervised Learning (2011)

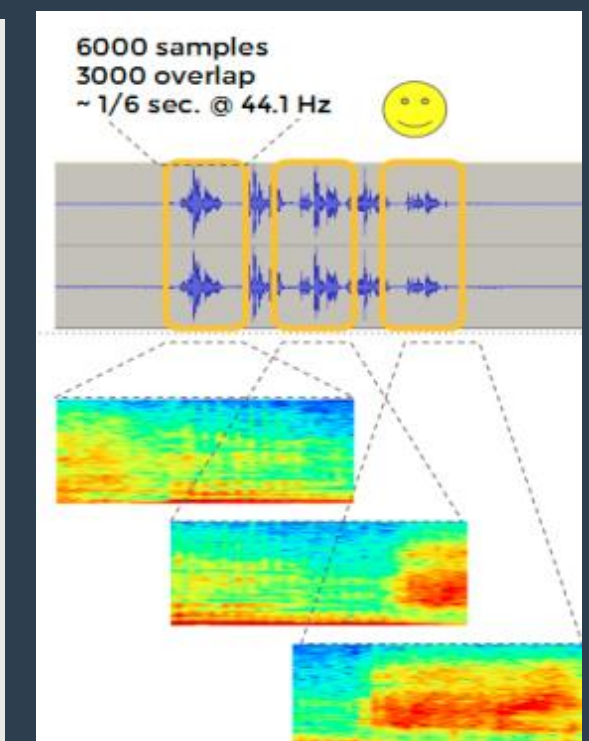
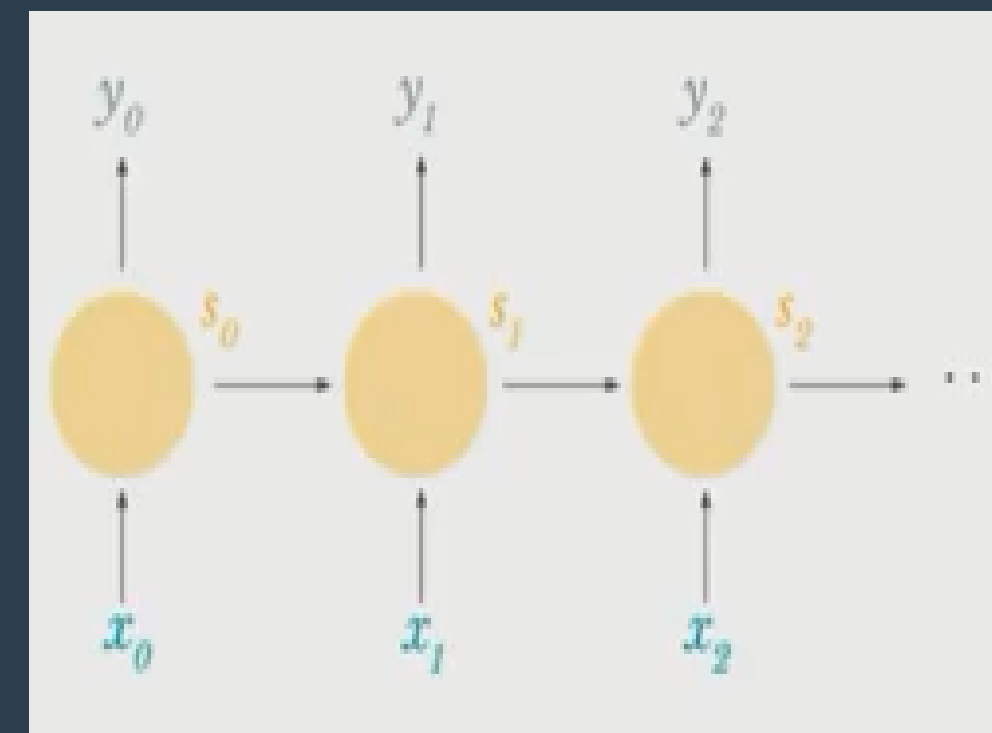
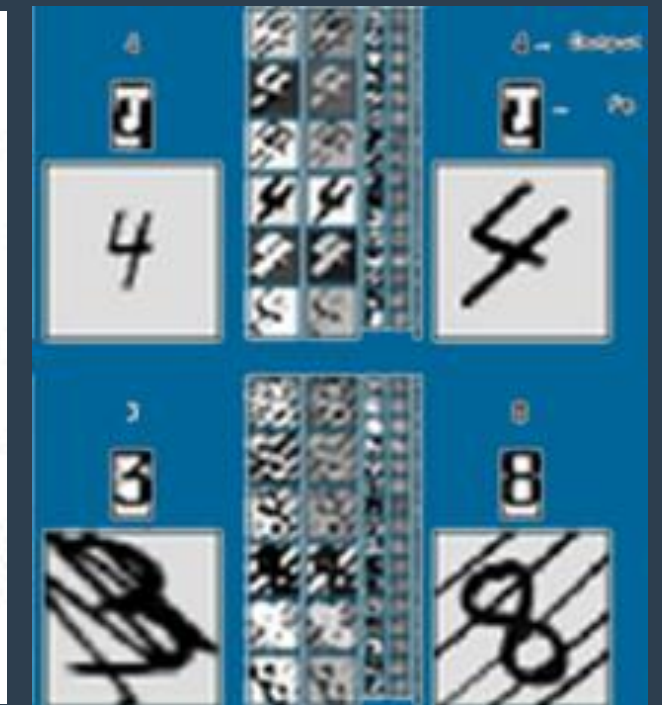
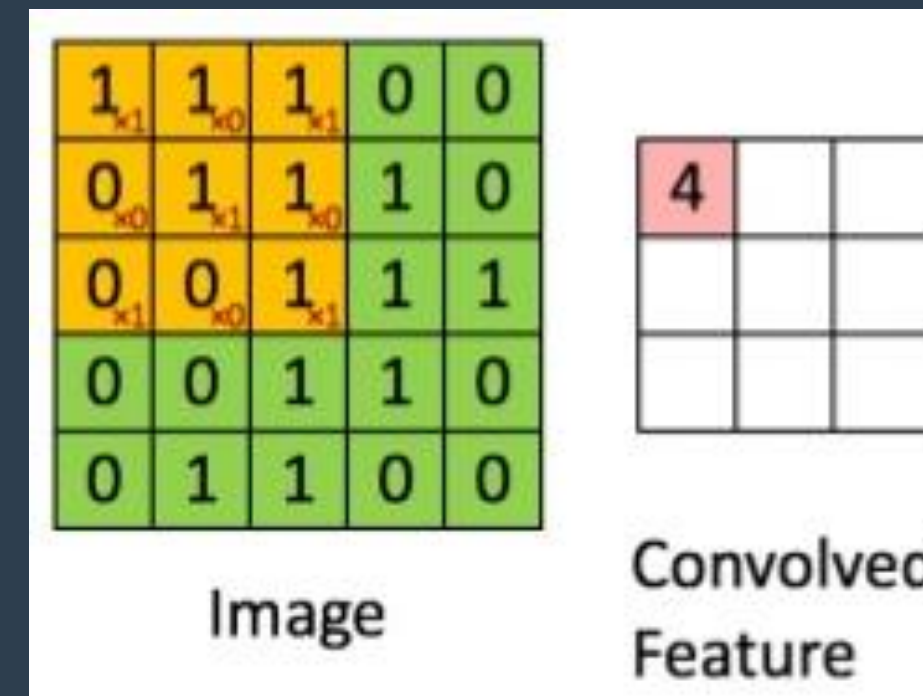
- YouTube: user-classified data perfect for Supervised Learning



10

2 main kinds of Deep Learning neural nets

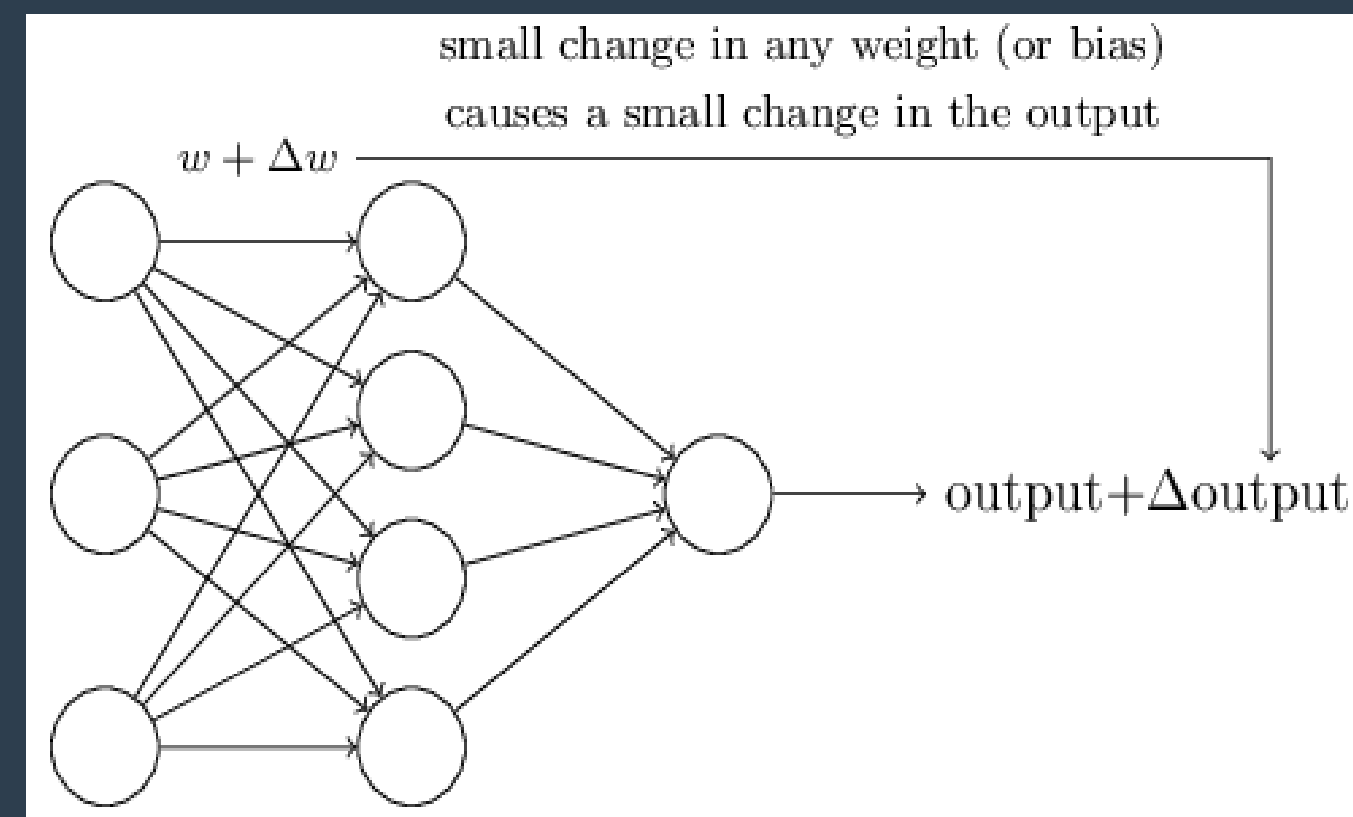
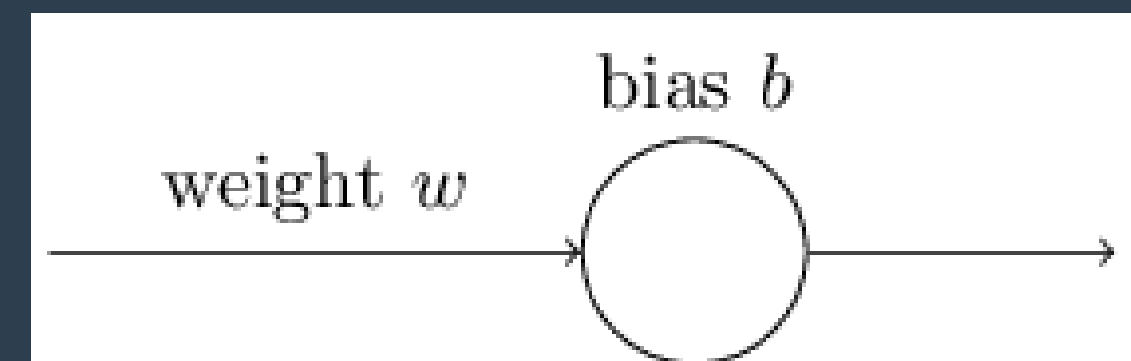
- Convolutional Neural Nets
 - Image recognition
 - Convolve: roll up to higher levels of abstraction in feature sets
- Recurrent Neural Nets
 - Speech, text, audio recognition
 - Recur: iterate over sequential inputs with a memory function
 - LSTM (Long Short-Term Memory) remembers sequences and avoids gradient vanishing





How does the neural net actually learn?

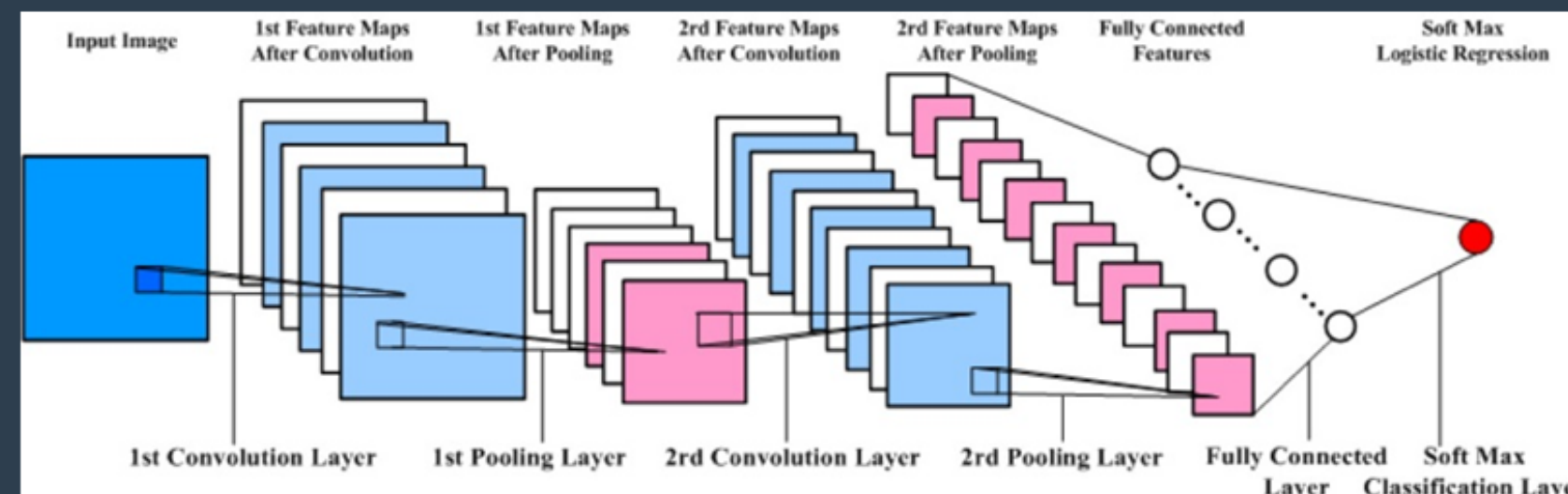
- Structural system based on cascading layers of neurons with variable parameters: weight and bias
- System varies the weights and biases to see if a better outcome is obtained
- Repeat until the net correctly classifies the data





Backpropagation

- Problem: Inefficient to test the combinatorial explosion of all possible parameter variations
- Solution: Backpropagation (1986 Nature paper)
- Backpropagation of errors and gradient descent are an optimization method used to calculate the error contribution of each neuron after a batch of data is processed



Artificial Intelligence
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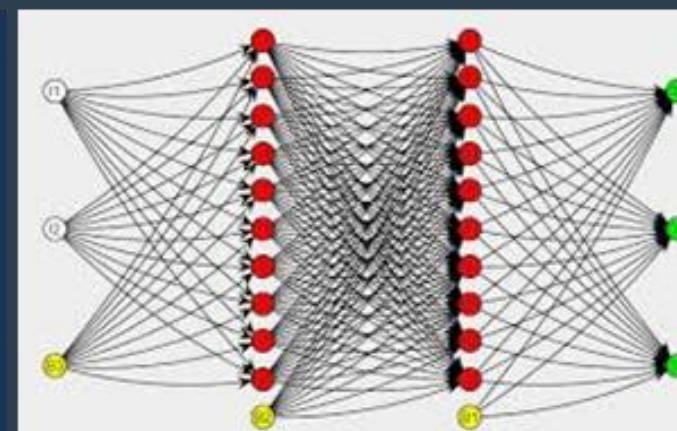
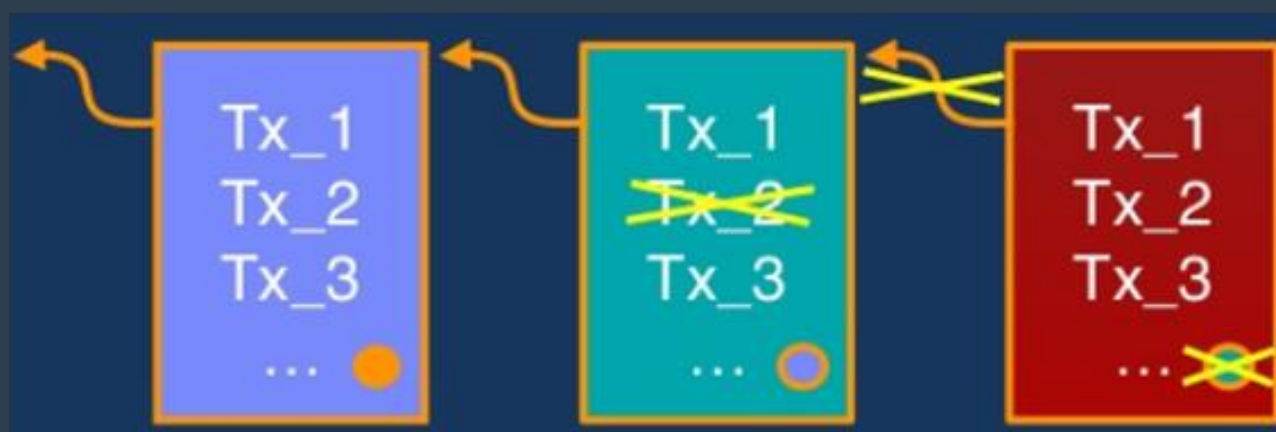


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How does the neural net actually learn?

- Blockchain & Deep Learning
 - Robust self-operating computational systems
 - Probabilistic guesses about reality states of the world; state engines
 - New forms of automation technology that might orchestrate entire classes of human activity





Deep Learning Chains: cross-functionality

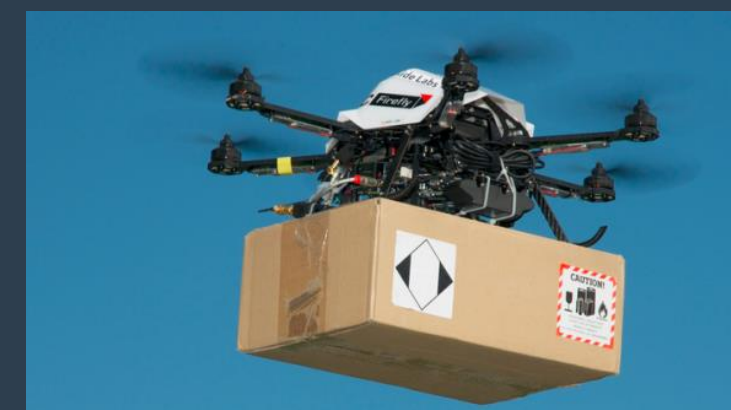


- Deep Learning Applications for Blockchain
 - TensorFlow for Fee Estimation
 - Predictive pattern recognition for security
 - Fraud, privacy, money-laundering
 - Deep Learning techniques (backpropagations of errors, gradient descent, loss curves) to optimize financial graphs
 - Formulate debt-credit-payment problems as sigmoidal optimizations to solve with machine learning
- Blockchain Applications for Deep Learning
 - Secure automation, registry, logging, tracking + remuneration functionality for deep learning systems as they go online
 - BaaS for network operations (LSTM is like a payment channel)
 - Blockchain P2P nodes provide deep learning network services: security (facial recognition), identification, authorization



Next Phase: Deep Learning Chains

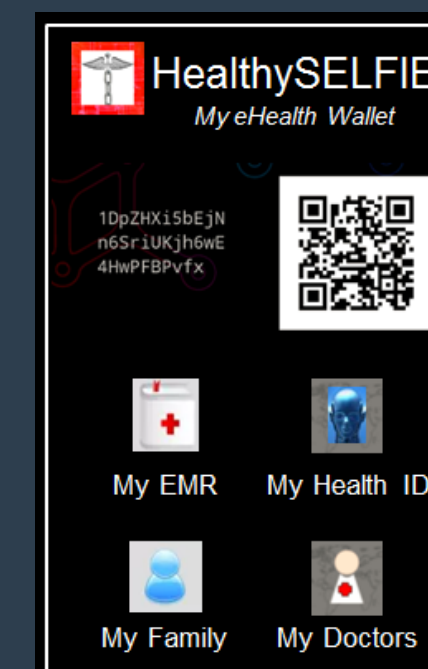
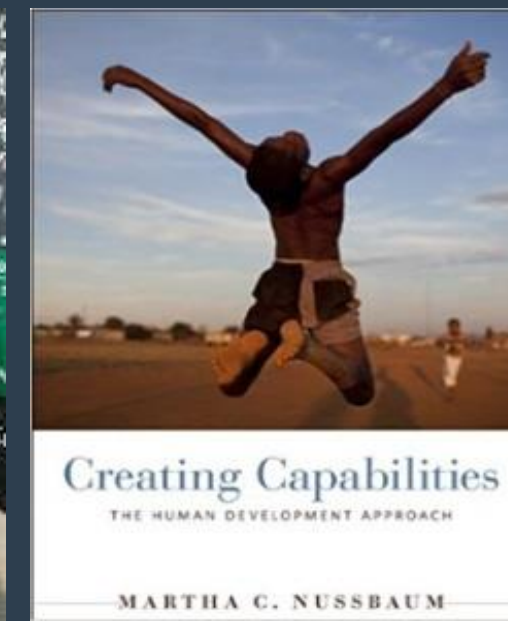
- Put Deep Learning systems on the Internet
 - Need blockchain security for registration and audit-tracking
 - Blockchain P2P nodes provide deep learning network services: security (facial recognition), identification, authorization
- Application : Autonomous Driving and Drone Delivery
 - Deep Learning (CNNs): identify what things are
 - Blockchain: secure automation technology
 - Track arbitrarily-many units, audit, upgrade
 - Legal liability, accountability, remuneration





Applications: Enable human potential

- Financial Inclusion
 - 2 bn under-banked, 1.1 bn without ID
 - 70% lack access to land registries
- Health Inclusion
 - 400 mn no access to health services
- Does not make sense to build out brick-and-mortar bank branches and medical clinics to every last mile in a world of digital services
 - eWallet banking and deep learning medical diagnostic apps



Digital health wallet

CONCLUSION



Conclusion

- Deep learning chains: needed for next-generation challenges
 - Financial inclusion, big health data, global energy markets, and space
- Smart networks: a new form of automated global infrastructure
 - Identify (deep learning)
 - Validate, confirm, and route transactions (blockchain)
- Future of AI is smart networks
 - Running value
 - Running intelligence
- Possible answer to AI worries





THANK YOU FOR YOUR ATTENTION!

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