AI for Oil & Gas

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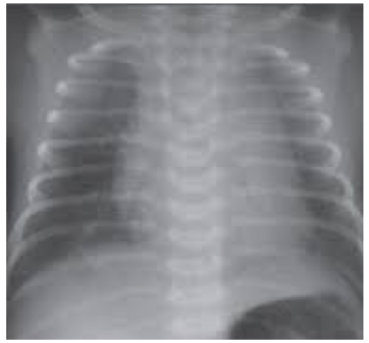
AI is around us

Self-driving cars



Health

Wearables

Voice assistant

Surveillance

Smart home

Translation

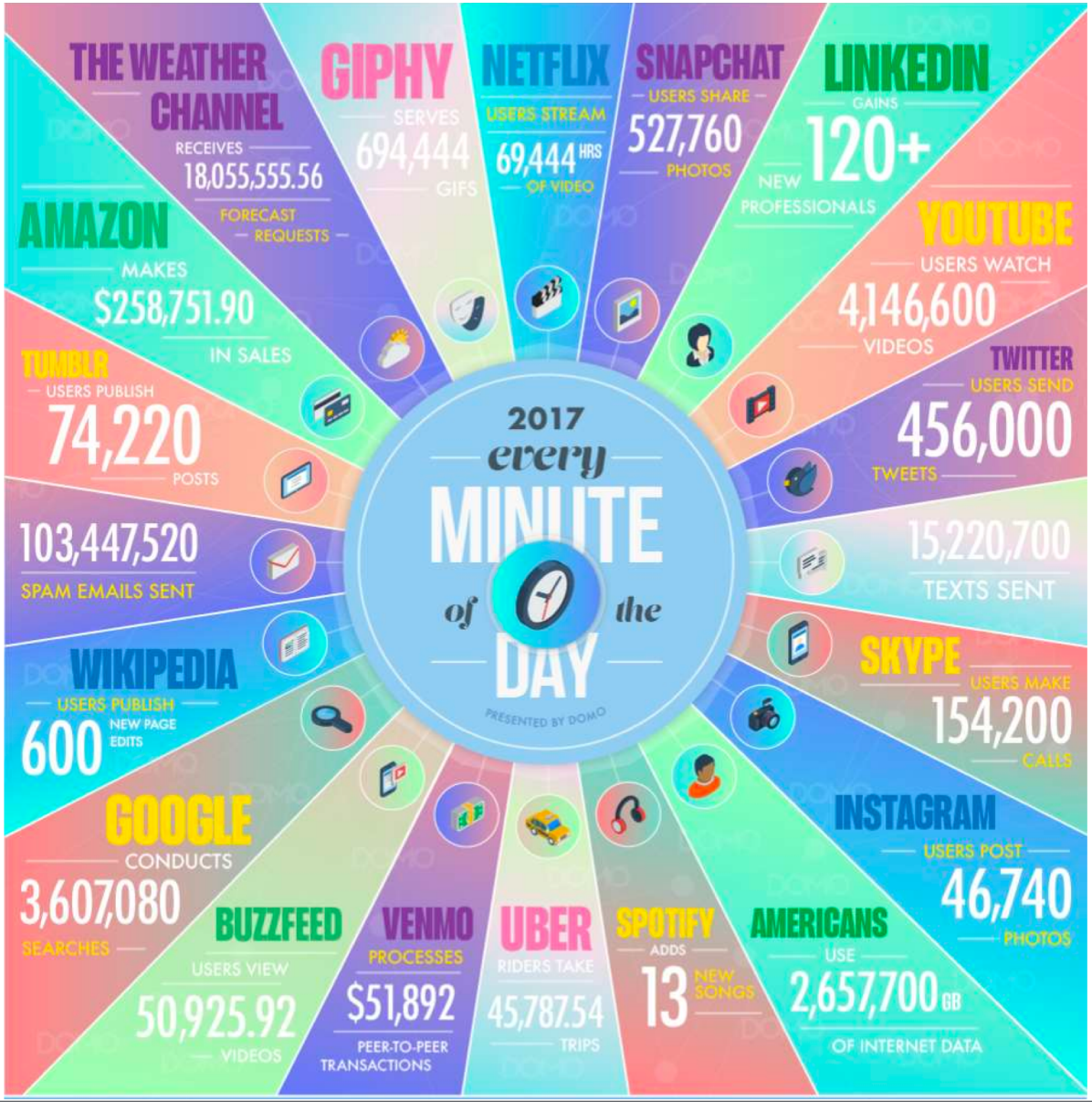
Video synthesis

https://www.youtube.com/watch?v=5zlcXTCpQqM

Video synthesis

https://www.youtube.com/watch?v=p1b5aiTrGzY

BIG data


2017
every
MINUTE
of the
DAY
PRESENTED BY DOMO
THE WEATHER CHANNEL
RECEIVES
18,055,555.56
FORECAST REQUESTS
GIPHY
SERVES
694,444
GIFS
NETFLIX
USERS STREAM
69,444 HRS
OF VIDEO
SNAPCHAT
USERS SHARE
527,760
PHOTOS
LINKEDIN
GAINS
120+
NEW PROFESSIONALS
AMAZON
MAKES
$258,751.90
IN SALES
YOUTUBE
USERS WATCH
4,146,600
VIDEOS
TUMBLR
USERS PUBLISH
74,220
POSTS
TWITTER
USERS SEND
456,000
TWEETS
103,447,520
SPAM EMAILS SENT
15,220,700
TEXTS SENT
WIKIPEDIA
USERS PUBLISH
600
NEW PAGE EDITS
SKYPE
USERS MAKE
154,200
CALLS
GOOGLE
CONDUCTS
3,607,080
SEARCHES
INSTAGRAM
USERS POST
46,740
PHOTOS
BUZZFEED
USERS VIEW
50,925.92
VIDEOS
VENMO
PROCESSES
$51,892
PEER-TO-PEER TRANSACTIONS
UBER
RIDERS TAKE
45,787.54
TRIPS
SPOTIFY
ADDS
13
NEW SONGS
AMERICANS
USE
2,657,700 GB
OF INTERNET DATA

BIG data in Oil & Gas

Drilling Data
0.3 GB/well/day

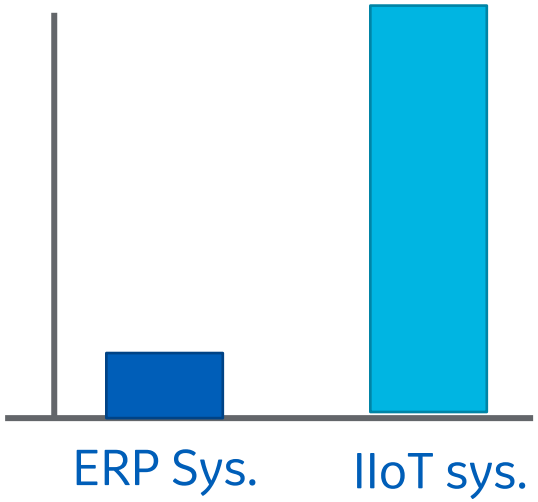
Ultrasound: Tubes
1.2 TB/ 8 hrs

Wireline Data
5 GB/well/day

Pipeline Inspection
1.5 TB / 600 km

Seismic Data
100 GB/survey

Process Data
6 GB/plant/day

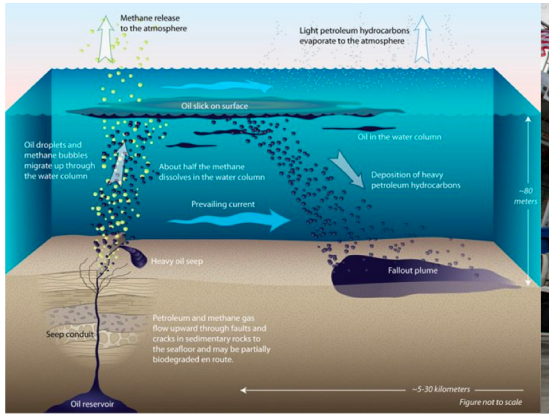


- ~10-100x more volume
- ~100-1000x more velocity

AI in Oil & Gas

ExxonMobil

- working with MIT to design AI robots for ocean exploration
- The robots fly over the ocean to detect natural seeps which occur when oil escapes from rock found in the ocean floor



Sinopec

- long-term plan to build 10 AI-driven plants, 20% reduction in operation costs
- Collaboration with Huawei (an AI giant) in April 2017 to design a “smart manufacturing platform” for centralized data management and integration of data to manage factory operations
- AI will interpret data and look for opportunities to improve factory operations

AI in Oil & Gas

Siemens

- Uses AI to control GT combustion (GT-ACO, Gas Turbine Autonomous Control Optimizer)
- NOx emission reduced by 20% with respect to settings from an expert control engineer
- Used in pilot operations in the United States and South Korea

AI in Oil & Gas

Many, many others

- Shell
- Total
- Gazprom
- AkerBP
- The list grows every month

Shell RechargePlus: Managed Smart Charging for Electric Vehicles

A bionic inspector rolls in

Eye in the sky

See how we are using high-tech drones to go places

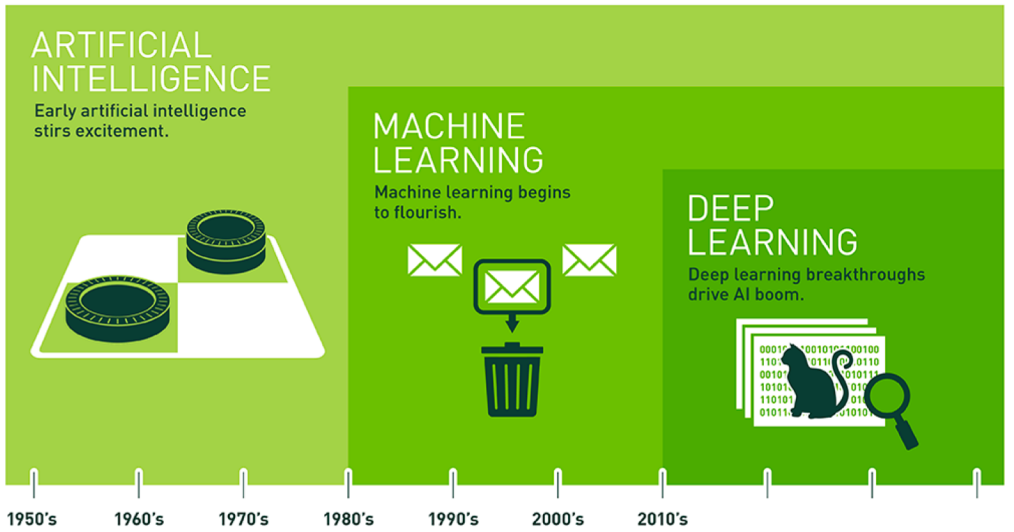
SHELL AI RESIDENCY PROGRAMME - ADVANCING THE DIGITAL REVOLUTION

But what is AI?

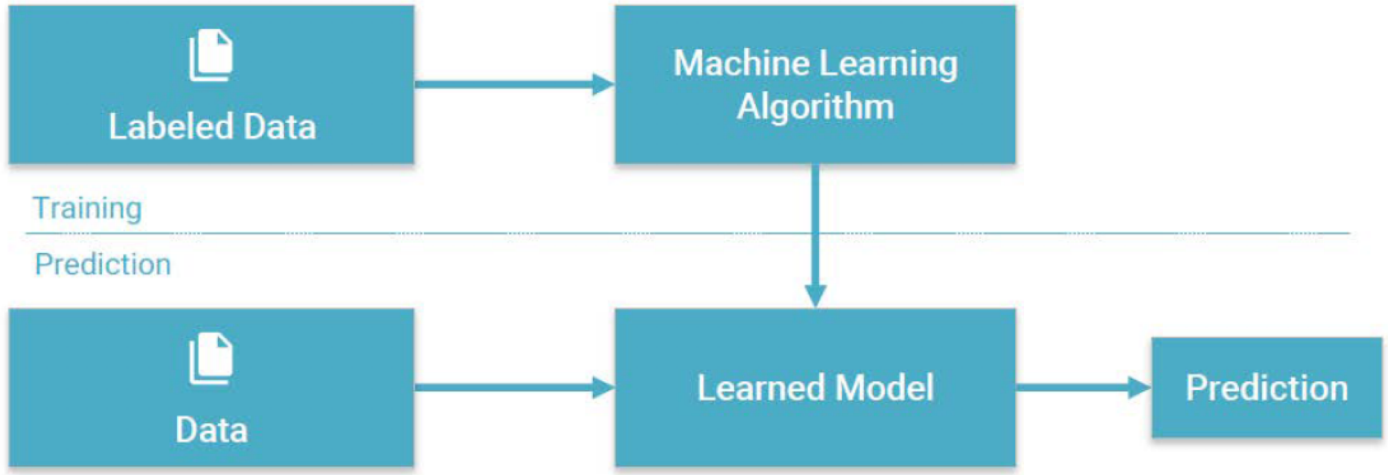
- At least 8 different definitions, according to the reference textbook
- We define AI as the study of computer agents that interact with their environment, adapt to change, pursue goals and take actions to achieve the best expected outcome
- AI is not new: its conventional birth date is the Darmouth conference (1956)
- Big enthusiam in 1950-1970, but excessive optimism and failure to meet expectations led to AI winter in 1974
- In the ‘80, success of expert systems (logic inference, symbolic AI) followed by another AI winter («expert systems work well in tightly defined subject areas [..] but are unable to learn concepts that children learn by the time they are 3 years old», Marvin Minsky)

Machine Learning

- We skip through the rest of AI history
- The field of AI which is most successful today is **Machine Learning**, and in particular its subfield, **Deep Learning**



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.



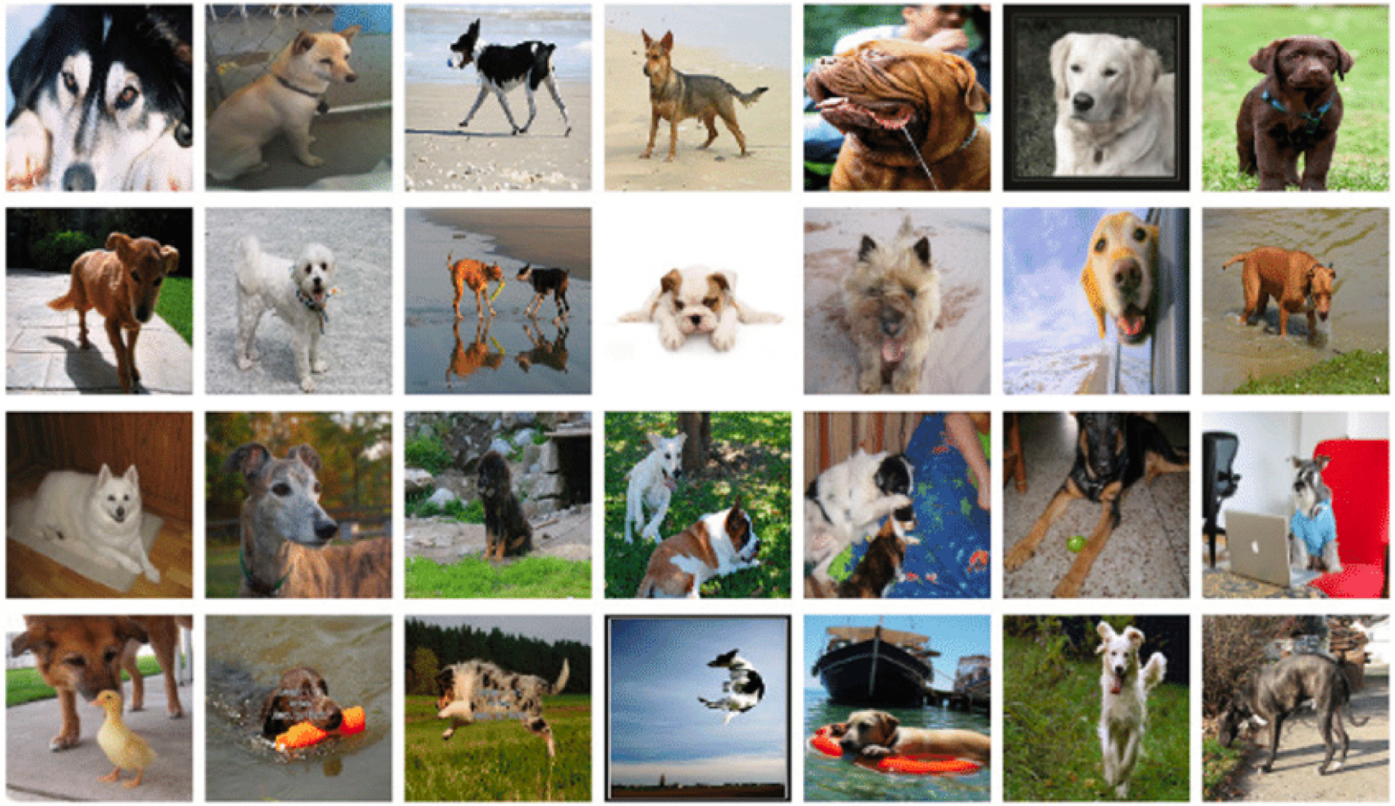
Provides various techniques that can learn from and make predictions on data

What is Machine Learning?

- An algorithm is a sequence of steps (the instructions) each of which is simple and well defined, and that stops after a finite number of steps.
- In many real-world problems, it is much easier to identify **desirable behavior** of an algorithm than to explicitly define the steps. Example: identify the presence and the breed of a dog in a picture (see next slide)
- A computer program is a **map** between input space and output space
- A computer program is a **point** in the space of such maps
- **Search** the space of programs until desired behavior is obtained
- Surprisingly, it works!
- **Learning from examples** instead of explicit modelling

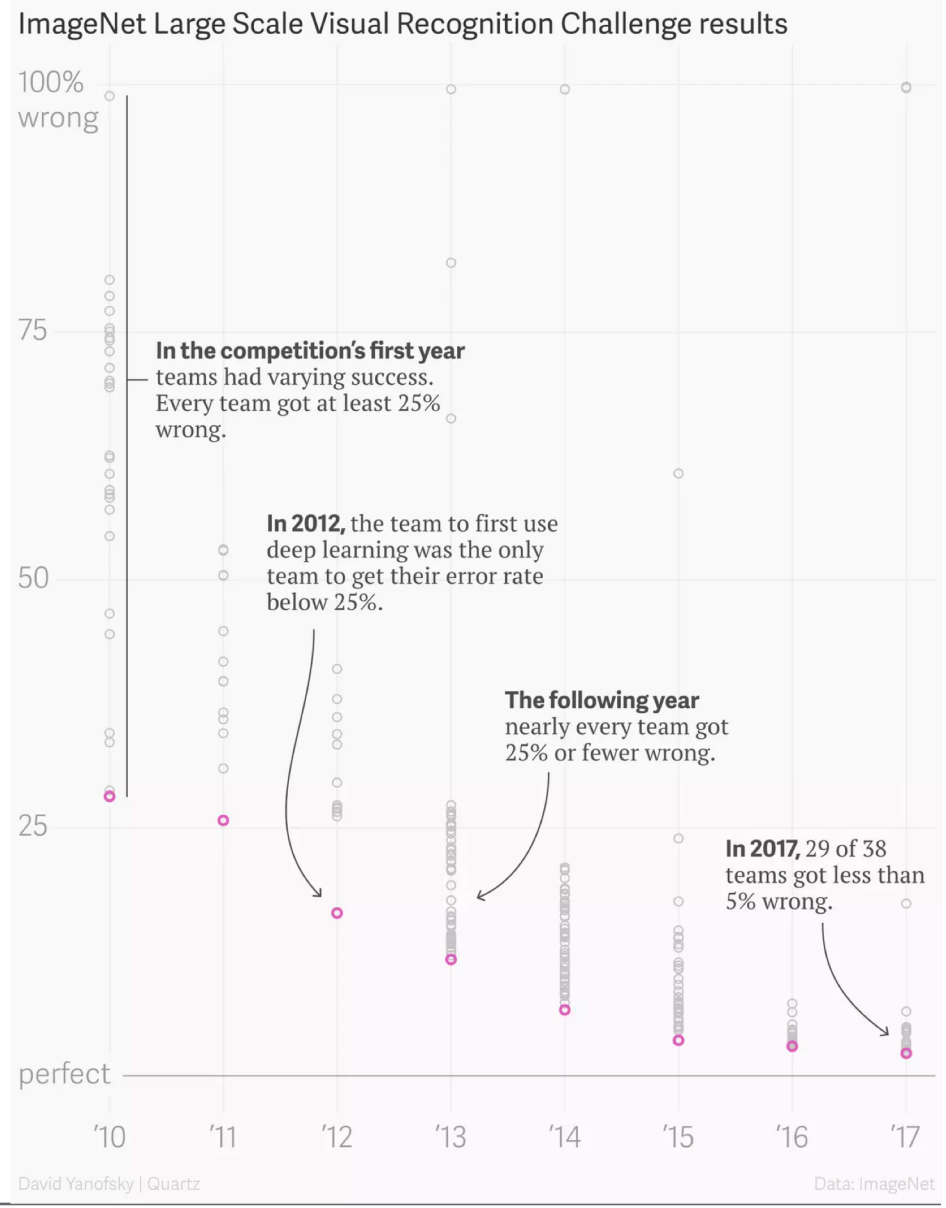
ImageNet

- The event which led to contemporary success, global interest and hype about AI was the 2012 edition of the ILSVRC competition, also known as ImageNet competition
- Classify correctly 1.2 millions of images, 1000 classes



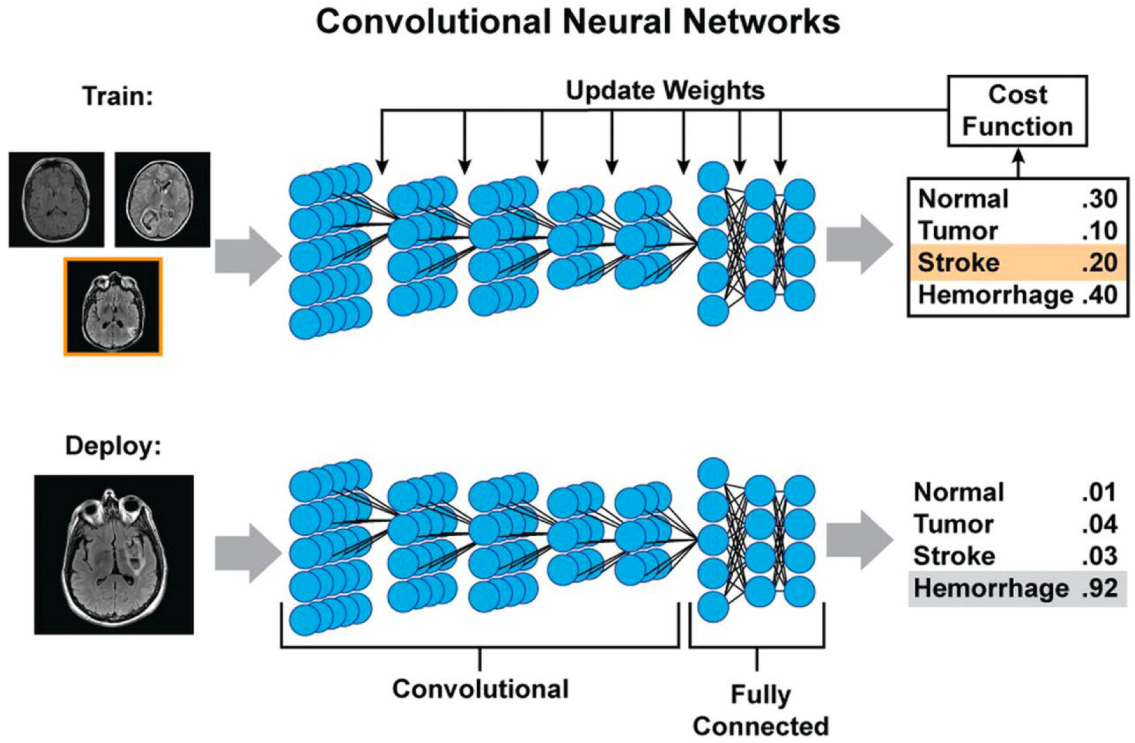
The “ImageNet moment”

- In 2010 (ILSVRC first year), every competing team got at least 25% images wrong
- In 2012, using **Deep Learning**, team of AI legend Geoffrey Hinton reduced the error rate by nearly 50%
- This was a quantum leap, with respect to usual advance rate in AI
- Deep Learning has been used by ILSVRC winning teams since 2012, and it’s now being used in all the fields seen in slide 3



Deep Learning in 1 slide 😅

- Using **huge** ($O(10^6) \div O(10^9)$ of parameters) neural networks (NN) as the trainable model in Machine Learning
- Backpropagation-trained NN have been around since at least 1986, however the «old» NN were **much** smaller (~ 25 parameters)
- Only later, hardware (GPU), large amount of data **and** algoritmic innovations (SGD, dropout, BatchNorm, residual connections, Fixup initialization, etc.) made possible to train **Deep** neural networks



The huge amount of money being spent by FAANG on Deep Learning is making the field progress as never before (GAN, VAE, BERT, GPT-2, etc.)

Why should you care?

- Machine Learning and in particular Deep Learning are fueling a revolution in many businesses, including Oil & Gas
- Customers know about AI, and are asking us to provide AI-powered services
- OEMs are already using it to strengthen their offering (Siemens GT low NOx emissions)
- DL will be key to building a technology competitive advantage for TPS products and services

Conclusions

- AI is changing the world we live in, including the way we do business
- In order to build a technology competitive advantage for TPS products and services, we need to build strong AI skills now
- By developing focused AI demonstrators, promoting a culture of AI and fostering external collaborations and partnership, our team is making sure that we stay on top of this rapidly evolving technology


That's all Folks!