



PATTERN
RECOGNITION



ARTIFICIAL
INTELLIGENCE



AUTOMATION



NEURAL
NETWORKS



ALGORITHM

100110
1.101
0011
01010

DATA MINING

**MACHINE
LEARNING**



PROBLEM
SOLVING

Practical Machine Learning and AI Seminar

COVENTRY 16TH MAY



Welcome - Agenda

Time	Topic	Presenter
8:30 – 9:00	Introduction	John Robins
9:00 – 10:15	NXP	Mark Talbot
10:15 – 10:25	Break	
10:25 - 11:30	ST	Tom Brown / Alex Watson
11:30 – 12:45	Microchip	Peter Trott
12:45	Lunch	Restaurant
13:30 – 14:45	Quicklogic	Rob Dawson / Owen Bateman
14:45 – 16:00	Lattice	Matt Holdsworth

Note: London Filmed are recording the event. If you do not wish to be filmed or have your image in final video please make this aware to them



AI presents opportunity for Innovation

VR/MR



Robotics



Drones



Shipping and Logistics



Automotive



IoT



Home and Surveillance



Medical



Mobile



Servers



Machine Learning and AI Basics

Artificial Intelligence: Umbrella term for machines acting like they are 'thinking'

Machine Learning: machines adapting algorithms based on experience (e.g. labelled pictures)

Deep Learning: machine learning using Deep Neural Network approaches

Algorithms: CNNs, RNNs, etc.



"Training"

Training data



Neural network



Model

"Inference"

New input



Neural network w/model



97.4% confidence



Enabling Tasks too Complex to Program

Tasks performed by humans

- Speech recognition
- Image/Object recognition
- Driving



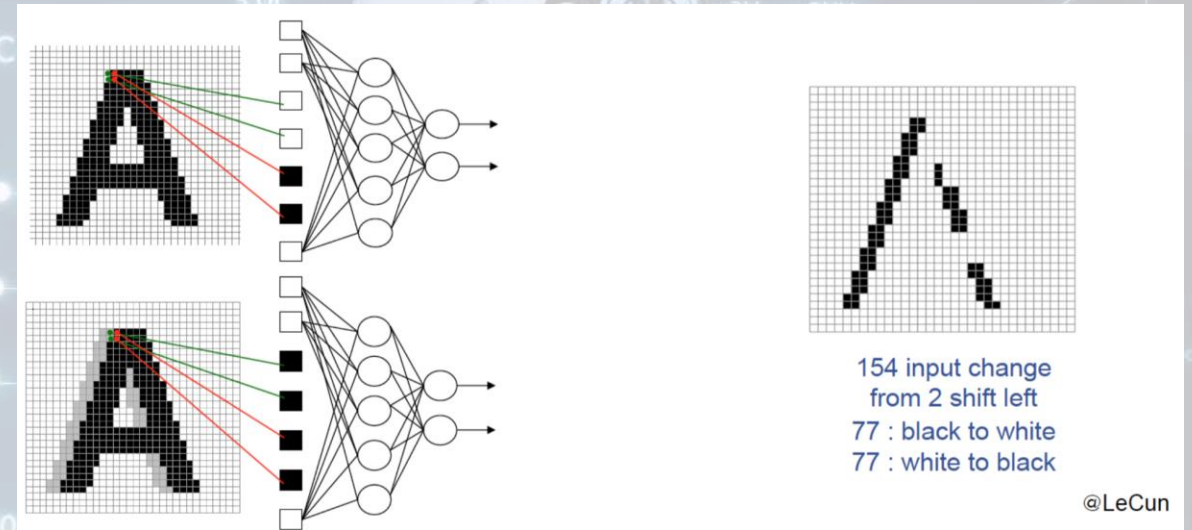
Tasks beyond human capabilities

- Processing large amounts of data
 - Turning medical archives into medical knowledge
- Prediction future behaviour
 - Hardware failure
 - Weather
- Trend spotting
 - People Movement
 - Online shopping/netflix



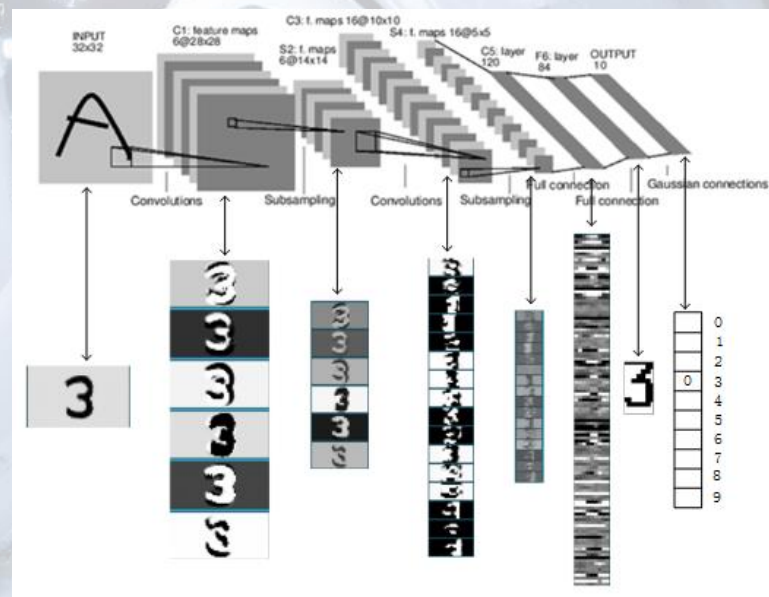
History of AI

- Concept of FC Neural Networks exist since the 50's
- Proven as a universal approximator, in theory very powerful
- But very difficult to train, and practically not used
- Very sensitive to slight changes in the training set



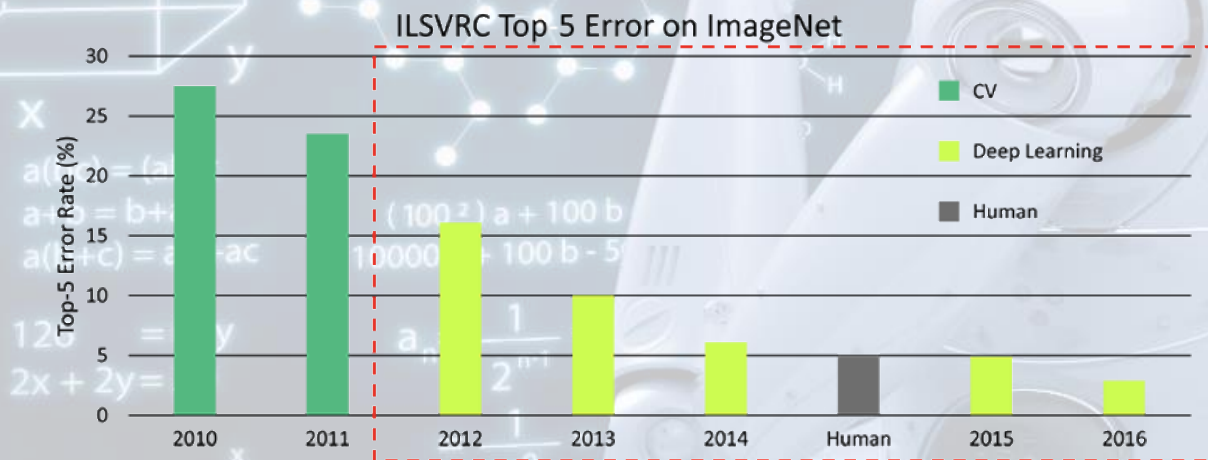
First successful neural network 1994 (LeNet5)

- Recognition of handwritten numbers (classification between 0,1,...,9)
- Implemented by Yann LeCun at AT&T Labs and successfully deployed in the US for the recognition of ZIP codes
- “Deep” architecture still employed today
- Difference with previous approaches: trained filters. Deep Neural Network



Deep Learning Revolution, 2012

- Since 2005, PASCAL Visual Object Classes (VOC) competition organized by ETH Zurich, Oxford and Edinburgh,
 - 20,000 images to classify in 20 classes.
 - Largely dominated by handcrafted techniques.
- In 2010, new challenge: ImageNet Large Scale Visual Recognition Competition (ILSVRC) is proposed by Stanford Univ.
 - Based on the ImageNet DB
 - 1,200,000 images in 1,000 classes
- In 2012, the challenge is won by the University of Toronto with a Deep Learning engine



The introduction of Deep Learning techniques drove performance on image categorization from 30% error rates in 2010, down to <2% in 2017

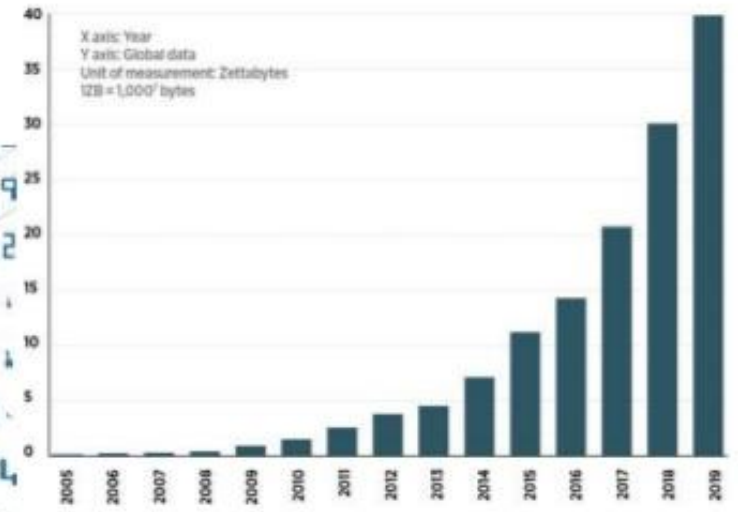


Data Explosion

90% of data used for
model generation
generated in last 3
years



DATA EXPLOSION - A PREREQUISITE



300 hours per minute uploaded

Where is Machine Learning happening?

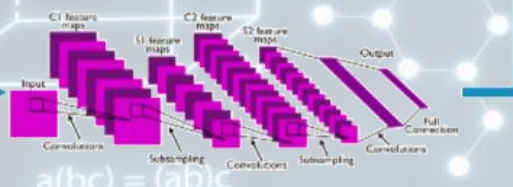
Cloud



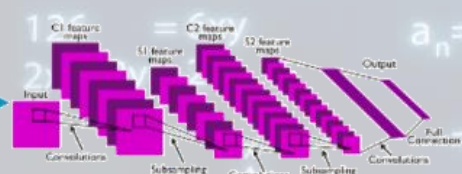
Training



Training
Data



Inference



Device/Edge



« Hello »



Moving to the edge

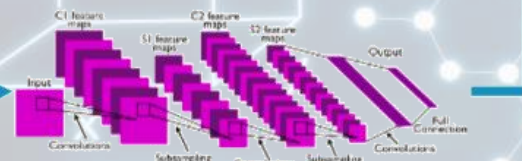
Cloud



Windows Azure
Virtual Machines

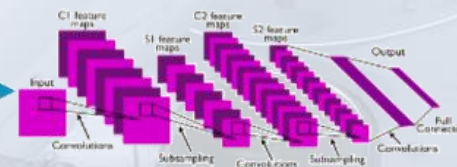
Training

Training
Data



Upload on device

Inference



Device/Edge

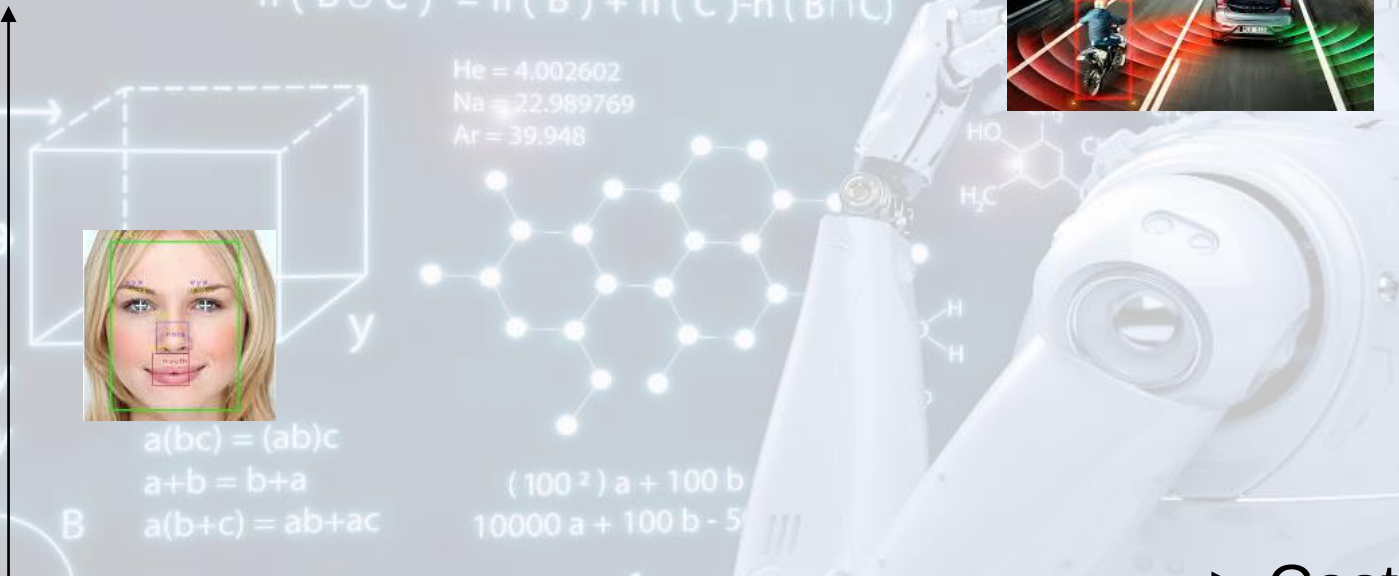


« Hello »



Let the Application Choose the Hardware

Inference
Time & Accuracy



FPGA

MCU

MPU

Desktop

GPU

Cost

Future Engineering Support

