AI for Smart Society

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Rise of Urbanization

According to UN data, the world population will reach up to a limit of 9.7 billion by the end of 2050.

70% of that population will be an urban population with many cities accommodating over 10m inhabitants.

encounter challenges regarding

- making a provision for resources and energy to all of the inhabitants and at the same time
- avoiding environment deterioration, mitigating traffic congestion, ensuring safety, etc.

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AI ?

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AI ?

"Artificial intelligence is the science and engineering of making computers behave in ways that, until recently, we thought required human intelligence." Prof. Andrew Moore (CMU)

- 50 years ago, a chess-playing program was considered a form of AI, since game theory, along with game strategies, were capabilities that only a human brain could perform.
- AI defeated the world's chess champion in 1997 (used a method called tree search algorithms to evaluate millions of moves at every turn

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AI ?

ML:

Machine learning (ML) is a branch of artificial intelligence, and as defined by Computer Scientist and machine learning pioneer Tom M. Mitchell:

"*Machine learning is the study of computer algorithms that allow computer programs to automatically improve through experience.*"

Why is AI growing so fast?

Availability of learning resources

Availability of open source tools

Download SW and add a few code lines and then you have an APP

TensorFlow

PYTORCH

Made open by f

Google tool for ML. G then made it open to the community

K Keras

The Python Deep Learning library

For those who are not professional programmers

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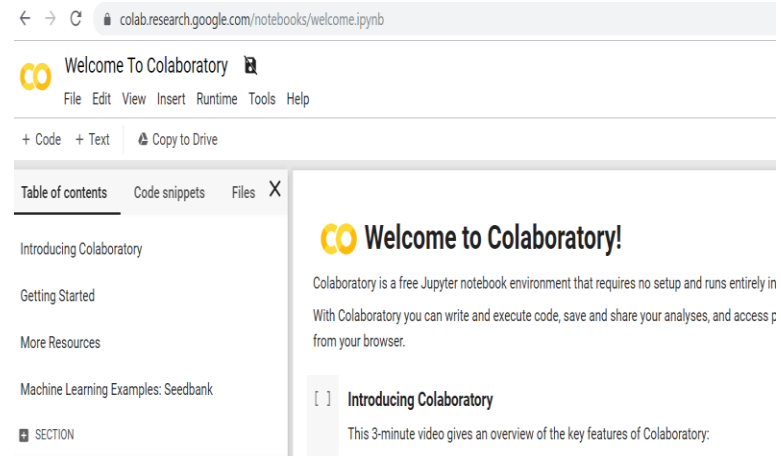
Availability of computing resources

Computing on prem

- Availability of low cost GPUs (~ $500 k)

Computing on the cloud

- Google Colab
  - Free time with a GPU (continuous 12 hr free)

- Amazon AWS
  - Low cost plans to rent GPUs

Availability of online state of the art research resources (open publication ML community)

In Arvix, more than 100 machine learning papers are uploaded, every DAY!

The largest ML conference in the world (NIPS) has an open publications model. Anyone can download the papers online!

Huge worldwide community

Codes are also uploaded with papers !

Availability of data

In Machine learning algorithms, the performance of the algorithms enhances tremendously with the availability of data.

Data, both structured and unstructured are available now with governments, and online, than ever before

AI Applications in Smart Society

1) Smart Security / Safety

- In Singapore:

➢ A network of cameras and sensors have been installed in almost every corner which helps to identify people who are smoking in prohibited zones or are loitering from a high-rise housing.

➢ The cameras enable the authorities to monitor crowd density, and also track the exact movement of all registered vehicles.

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1) Smart Security / Safety

China invents super spy camera that can find someone in crowd of 'thousands'

- A new ultra-powerful "spy camera" that could spot a single person amongst a crowd of tens of thousands has been created by researchers in China.

- The 500-megapixel camera counts real-time tracking and facial recognition technology among its features.

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1) Smart Security / Safety

Face recognition in France:
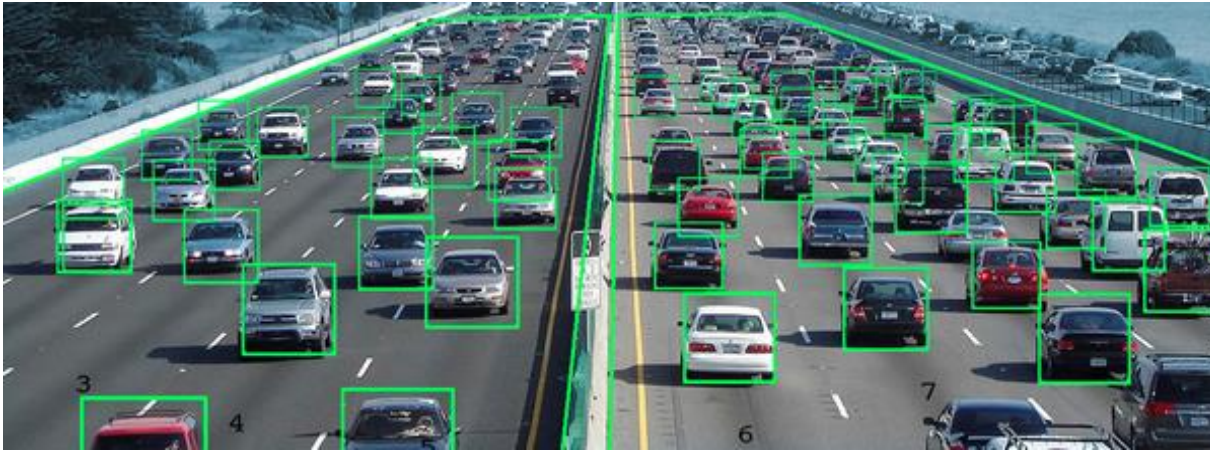
- *France Set to Implement*

  Nationwide Facial Recognition ID Program

The application is said to enable "any individual who decides to use it to prove his identity on the Internet in a secure manner," says the interior ministry website.

The program functions through an app that reads the chip on an electronic passport. The app then cross-references its biometric photo with the phone user via facial recognition to confirm the identity.
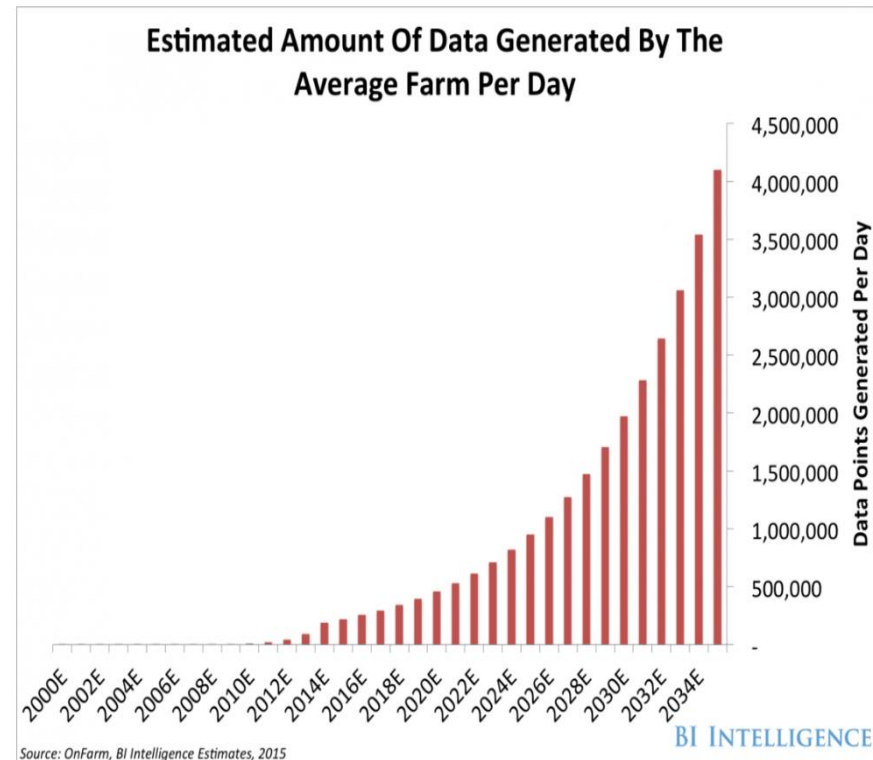
2) Smart Transportation

Road-surface sensors and CCTV cameras send real-time updates about the traffic flow to a central traffic management system.

The data feed from cameras is analyzed and notifies the users regarding the congestion and traffic signal malfunctions.

3) Smart Agriculture

The amount of data generated by the average farm per day is increasing dramatically and shows the potential of artificial intelligence (AI) in this domain.

Estimated Amount Of Data Generated By The Average Farm Per Day

Source: OnFarm, BI Intelligence Estimates, 2015

BI INTELLIGENCE

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3) Smart Agriculture

Crop Diseases (major threat to food security)

Increasing global smartphone penetration

+ advances in computer vision (by deep learning)

➡ smartphone-assisted disease diagnosis.

Using a public dataset of 54,306 images of diseased and healthy plant leaves collected under controlled conditions, a group from Cornell University trained a deep convolutional neural network to identify 14 crop species and 26 diseases

3) Smart Agriculture

Agricultural Robot:

Robots can be used in livestock applications such as automatic milking and washing. New robot applications include fruit picking robots, sheep shearing robots and shepherd drones.

Smart Irrigation

Unlike traditional irrigation controls (operating on a pre-programmed schedule and timers) intelligent irrigation systems monitor the weather, soil conditions, evaporation and water consumption of plants to automatically adapt the irrigation plan to the actual conditions of the site.

4) Smart Governance

Smart city infrastructure is not complete without smart governance.

Smart governance

implies the <u>use of ICT</u>

<u>intelligently in order to improve decision making through better collaboration among different stakeholders</u>, including government and citizens (using data, evidence, and other resources to improve decision making and compliance towards the needs of the citizens.

THANK YOU