Mobile Machine Learning

Ruben Teimas

Universidade de Évora, Ubiquitous Computing

May 25, 2021

What are mobile devices?

Even though there is no exact definition, they (usually) share some characteristics:

- Touchscreen interfaces with color display;
- Rechargeable batteries;
- Can connect over wireless networks.

Example of mobile devices

The perception of mobile devices are has changed over the years and some people do not consider the *Tablet* to be a mobile device anymore.

The rise of mobile devices

Impactful events for the rise of mobile devices:

- Presentation of the *IPhone* (2007);
- *Android os* launching (2008).

These events changed the perception of what a phone should be, making it closer to equipment of the time, like the *IPod* and *PDA*s, but still with everything a traditional phone had to offer.

The rise of mobile devices
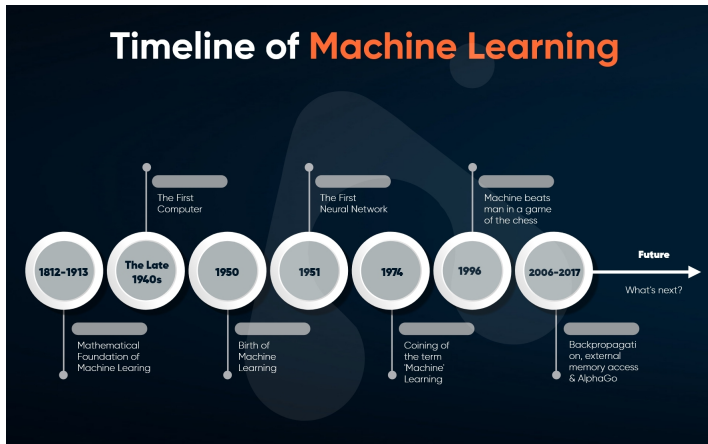

Percentage of Global Mobile Traffic, 2011-2021
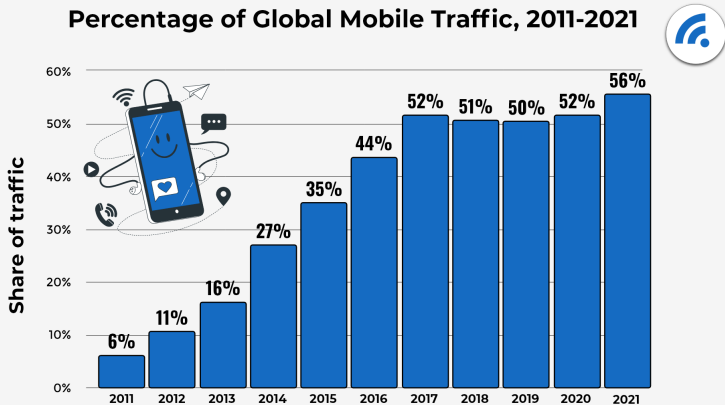
Artificial Intelligence and Machine Learning

The terms *AI* and *ML* almost always appear together, which misleads some people to believe they are the same thing.
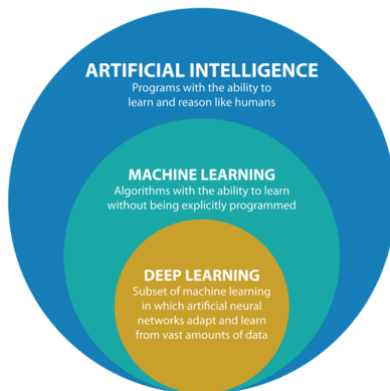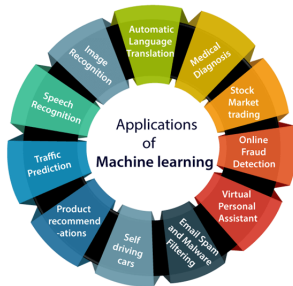
The beginning

Even thought *Machine Learning* has only achieved commercial success in 2010's it has been around since the 50's.

Fortunately *ML* has evolved immensely over the years and has given us:

What made it possible?

Large volumes of data and hardware's improvement gave *ML* the possibility to shine.

Cloud computing has also played a big part in *machine learning* development, making it easier to train models on large clusters (with fast *CPU*s and lots of *GPU*s).

Technologies

Some of the technologies that have made *ML* easier to train and develop:

Data Collection

Data is *Machine Learning*'s fuel.
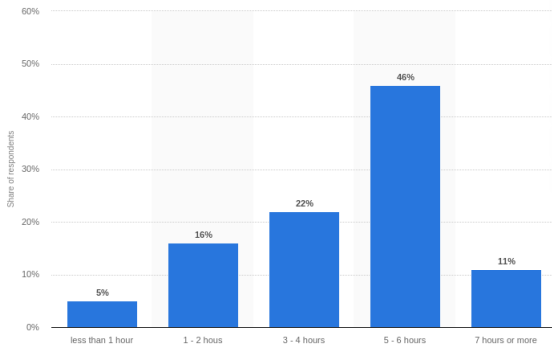
A person living in the *USA* spends, on average, 3,5 hours on their phone, thus making it a good source of data by keeping track of user's behaviour.

ML on Mobile

Thanks to *Google*, *Machine Learning* development for *Mobile* is easier than ever. Some of the technologies that can be used to integrate *ML* into *mobile apps* are:

- *ML Kit.*
- *TensorFlow Lite.*

ML on Mobile

If *Cloud Computing* has been extremely important for *Machine Learning*, one of the newest trends in *On-Device* training (which both these tools allow).
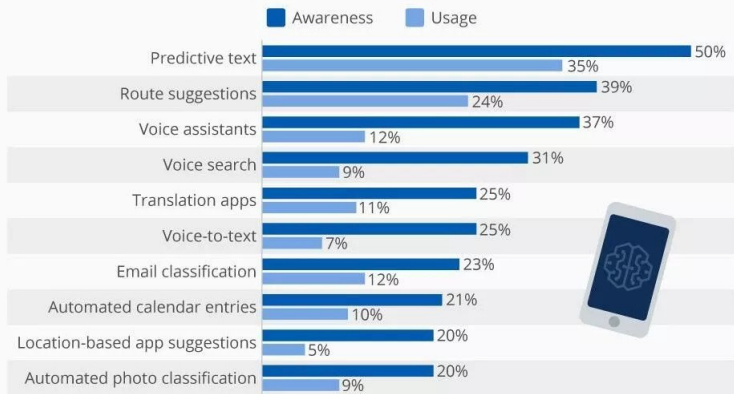Today's mobile devices are very powerful and have the capability to train models.
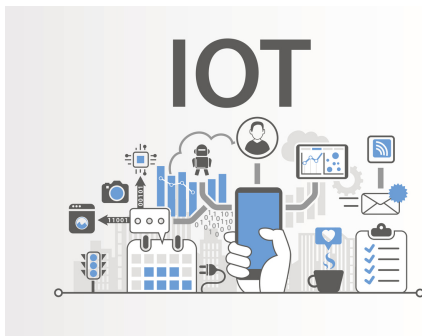
Advantages of *On-Device* training

- Increased privacy;
- No internet connection is required;
- Decreased latency, since there is no communication with the server.

How Smartphone Users Benefit From Artificial Intelligence

Awareness and usage of smartphone applications featuring machine learning in 2017

Awareness   Usage

	Awareness	Usage
Predictive text	50%	35%
Route suggestions	39%	24%
Voice assistants	37%	12%
Voice search	31%	9%
Translation apps	25%	11%
Voice-to-text	25%	7%
Email classification	23%	12%
Automated calendar entries	21%	10%
Location-based app suggestions	20%	5%
Automated photo classification	20%	9%

Based on a survey of 24,563 smartphone owners in 16 developed markets conducted between May and July 2017

@StatistaCharts   Source: Deloitte's Global Mobile Consumer Survey

statista

Brave new world

Internet of Things (*IoT*) connects multiple devices (with embedd sensors and software) over the network.

Usually these devices can be controlled via *smartphone*.

Brave new world

ML is now being applied to *IoT* devices, for example:

- *Google Assistant*
- *Nest Thermostat*

Future perceptive

The way we interact with technology, and the world, has been changing and will, most likely, keep changing towards a more fluid experience.

This is possible due to *mobile devices*, making our computer smaller and smaller, and to *ml* which creates more intelligent and "*humanized*" systems.

Thank you for listening!

Ruben Teimas

m47753@alunos.uevora.pt
https://github.com/TeimasTeimoso
https://www.linkedin.com/in/ruben-teimas/