

## Towards a Digital Society





#### Data tsunami



Source: Cisco VNI, 2017

#### tsunami



Source: Cisco VNI, 2017

#### Data tsunami

#### **Internet traffic triples in just 5 years!**



Source: Cisco VNI, 2017

#### **Connected devices**



#### Source: Statista, www.statista.com

#### **Internet of Things**

- connected machines
- robots
- digitalized systems
- sensors

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#### **Connected devices**



#### Factor 5 in 10 years!

#### **Internet of Things**

- connected machines
- robots
- digitalized systems
- sensors

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#### Source: Statista, www.statista.com

#### **Data centers**

- Can have up to 50-100,000 servers
- In US alone, the data centers consume 90 billion kWh a year, more than 30 giant power plants (500+ MW)
- 3% of total US electricity





#### Access networks

#### It is estimated that

- cellular systems: there are 7 millions of sites (several BSs each) worldwide
- WiFi: 340 million WiFi hotspots (1 every 20 people)



#### ICT as a primary need



Source: "World Development Report 2016: Digital Dividends," The World Bank Group, 2016

## **Computing power: Moore's law**



No. transistors per chip doubles every 18 months

What are these digital systems? Which benefits are possible?

## Digital systems today

Pervasive presence of Artificial Intelligence (AI)

#### What is AI?

systems that think rationally (like humans)
systems that act rationally (like humans)

# They are coded to learn according to rules, based on

some concept of utility that has to be maximized
past history (data)



#### **Benefits**

#### Al and digital systems can

- Substitute humans in automatic tasks
- Control physical-world equipment
- Make consequential decisions, support decision process

# Al is about computing power, algorithms and data

 Possible today due to computational power and storage capacity



# Benefits along different dimensions...

**Micro-scale:** Services and products tailored and customized for individuals' needs

**Macro-scale:** Evolution of services and products to dynamically adapt to evolving scenarios

- → climate change<sup>1</sup>
- → urban transformation
- society composition, given ageing and migration flows



## **Examples of benefits**



Self-driving cars will save about half of the lives that are usually lost in car accidents, which totals around 30,000 in the US alone



#### Physical assistance for elderly people

 $\rightarrow$  About 15% of people in the US and 26% in Japan are older than 65



#### Healthcare diagnostics and targeted treatments



#### **Optimized transportation and routing**

Estimated to reduce 25% energy consumption and pollution

## **Examples of benefits**



Google translate service (already available for more than 90 languages) → 20% of Google queries are done by voice with natural language processing



#### Personalized education



#### **Robotics**



Face recognition capability of any of our cameras

#### **Benefits to development**

#### IoT can contribute to Sustainable Development Goals

- Climate change: climate monitoring, energy management systems
- Disaster management: monitoring of extreme weather
- Agriculture: precision agriculture, management of water, drones
- Megacities: transportation, electric grids, water management

Needs to be well integrated in policies and government strategies



#### **Risks?**

## **Risks to widen gaps**

#### Intra-society gaps

- Digital educated / non educated people
- With or without access
- Among generations

#### Inter-society gaps:

- → Rich and poor countries
- Dominant positions in the markets aggregate few very large groups that can afford huge investments that reinforce their already dominant position
- Dynamic/static society that can keep the pace and lead the transformations



# Risks of slowing down cultural growth

Automatic decision making, recommendation systems, are built based on current "normal" or "popular" behaviors, including → prejudice, racism, sexism, ...

- Diversity, minority instances, niche cultures and interests risk to be marginalized
- Social inclusion of multiple cultures might be slowed down
- Cultural (and economical) dominant positions are strengthened



## **Controlling the risks**

To transform opportunities into benefits, we need to understand and control risks

Elaborate and disseminate new ethical concepts and culture about

- Development and design of AI products (for technicians and engineers)
- → Usage of AI (for all)



## **Technicians and engineers**

#### Need a deep understanding of

Technical risks and their implications, including sociological, cultural and economical implications

A new awareness of the cultural influence that the developers have on the machine behavior

- Their coding reflects what they are, including believes, attitudes and cultural influence
- Machine "objective functions" hide technicians' understanding of final targets of decision processes



## **Community of users**

Awareness of risks and their implications, as well as benefits and potentialities, from the community of users leads to

- users engagement for pervasive system monitoring and control
- reduction of impacts and risk management
- identification of commonly agreed ethical R&D guidelines

## Creation of an international community that involves all stakeholders:

- $\rightarrow$  citizens and users
- → policy makers



### **Policy makers**

Development of control mechanisms and benchmarking for digital systems

Guidelines and rules for an ethical design

#### Steps

- Define a path toward increasing technical expertise in technologies at all levels of government
- Promote research on the fairness, security, privacy, and social impacts of AI systems
- Increase public and private funding for interdisciplinary studies of the societal impacts of AI



#### The labour market changes, new needs in education

#### Labour market

Robots and computers in addition to routine physical work activities can accomplish tasks that include cognitive capabilities

- **opportunities:** labor cost reductions and performance benefits
- challenges: the nature of work will change

**Technical automation potential** % 100 <5% of occupations consist of activities that are 100% automatable 90 80 70 60 50 About 60% of occupations have at least 30% of their 40 activities that are automatable 30 20 10 0 10 20 30 40 50 60 70 80 90 100 0 Share of roles 100% = 820 roles

*Source*: "A future that works: Automation, employment and productivity", January 2017, McKinsey Global Institute

#### Education



Need for more people that are skilled and trained in STEM disciplines (Science, Technology, Engineering, Mathematics)

Source: Eurostat.





Need for more investments in high education and a more pervasive scientific and technical culture

Source: Eurostat.

"Niente nella vita va temuto, dev'essere solamente compreso. Ora è tempo di comprendere di più, così possiamo temere di meno."



