

# **Shaping the Future via ICT:**

## **Opportunities, Challenges and Emerging Issues**

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#ICT4SDG

**ICT-centric economic  
growth, innovation  
and job creation**

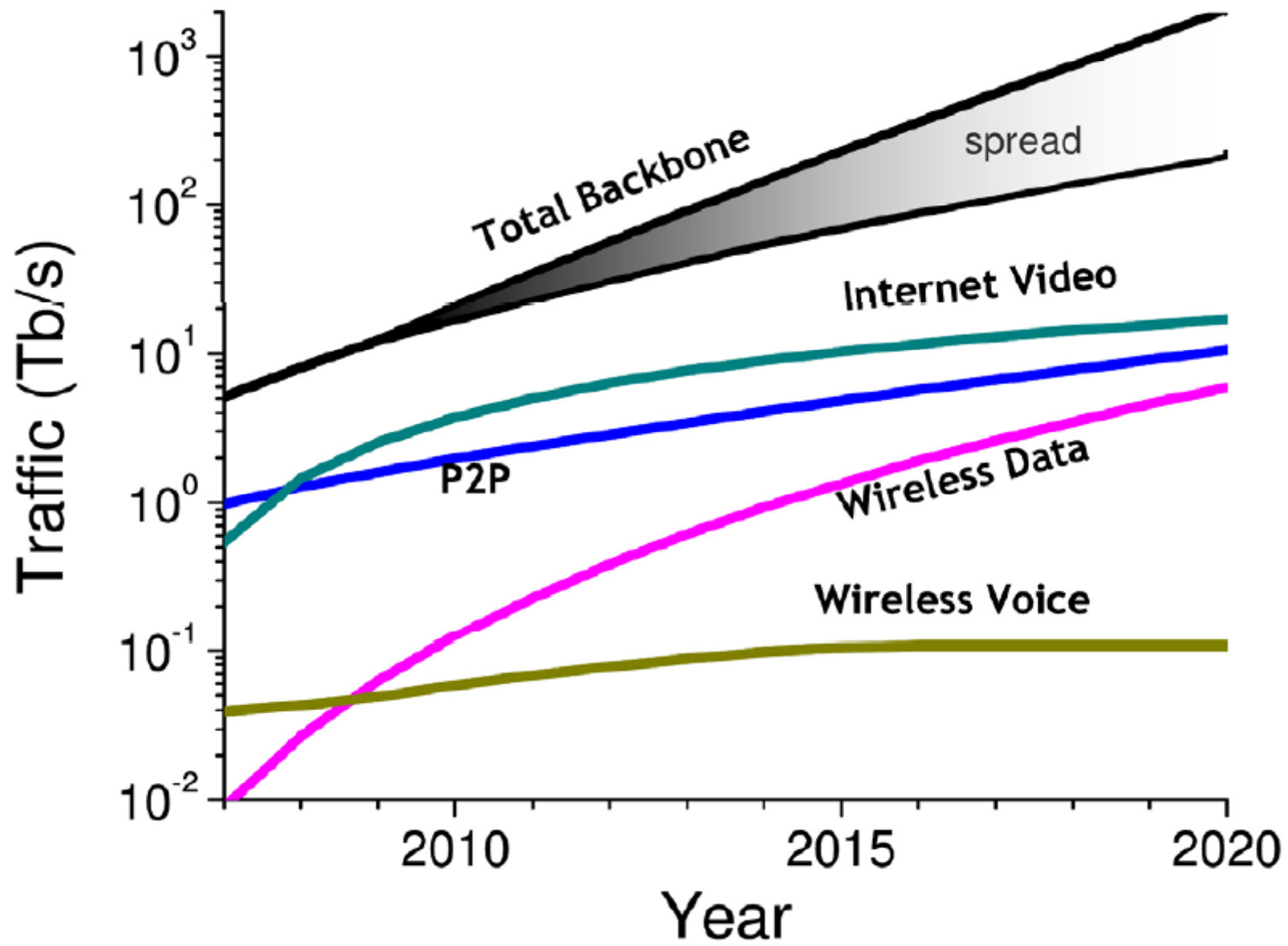




**51%**  
of the world  
population is online

Measuring the Information Society Report  
#ITUdata





- ▶ **Innovation** is **indispensable** in today's world
  - Population, resources, expectations, social issues
- ▶ **Technology** drives **innovation**
  - people can do more, do better
- ▶ **Technology** drives **higher quality of life**
  - people can live better
- ▶ We need to **master technology**
  - joint efforts by all players

## Hot Topics and Enabling Technologies:

1. **Generating and Cleansing Mass Data:** Internet of things (IoT), big data analytics, artificial intelligence / machine learning (AI / ML), etc.
2. **Digital Health:** Early detection of diseases and tailor-made treatments
3. **Cyber Security, Privacy, Data Protection, Quantum Computing**
4. **Fintech and Block Chain**
5. **5G and Beyond (6G):** Future trends in infrastructure development: From longhaul to local access
6. **Fourth Industrial Revolution:** Massive use of robotics and automation in manufacturing

# Emerging Social Issues: A Paradigm Shift of Major Unknown Consequences in All Aspects of Life

1. **The Future of jobs** in ICT-centric economies
2. **Mobile addiction**
3. **Opinion formation** and fake news in social media
4. Banks, money, insurance, transportation, industry, leisure, etc.



Opinion formation (manipulation) and fake news are major sources of concerns in many societies.



# MIT Task Force on **the Work of the Future**



Facebook's top scientist:

Without **artificial intelligence**, there wouldn't be much of Facebook. Facebook today would be **dust** without **deep learning**. Social networks today **cannot function** without deep learning.

Facebook has **2.4 B monthly active users!**

**Yelp** is a local-search service powered by **crowd-sourced** review forum

Market value: \$4.0 B (2018)

In Q4 2017, Yelp had **77 million** unique visitors via desktop computer and **64 million** unique visitors via mobile website on a monthly average basis. By the end of 2017, Yelp has **148 million** reviews. The company's revenues come from businesses advertising.

**Illumina** manufactures integrated systems for the analysis of **genetic variation and biological function**. Illumina's technology had reduced the cost of **sequencing a human genome** to \$4,000 from \$1 million in 2007.

Market Value: \$55.0 B (2018)

**Square** is a financial services, merchant services aggregator and mobile payment company, which markets several software and hardware payments products. Square Register allows merchants to accept **offline** debit and credit cards.

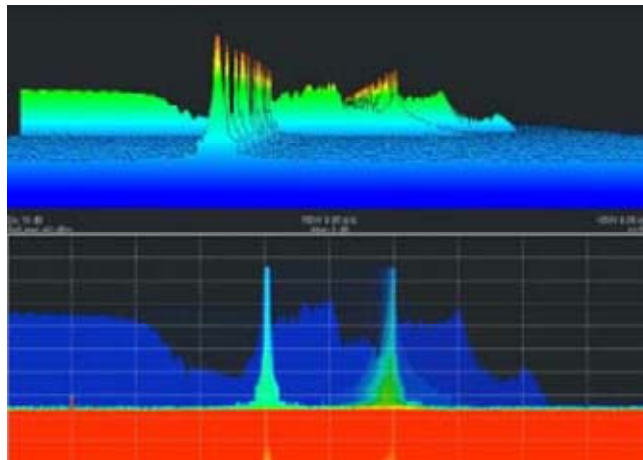
Market Value: \$40.0 B (2018)

## **AI in ICT:** Code and network flows



Observe **real-time cyber attacks** at scale

## AI in ICT: Electromagnetic spectrum



Overcome **spectrum scarcity**  
to meet wireless data demand

- Worldwide spending on AI: **\$12.3 B** in 2017, **\$19.1 B** in 2018, and **\$52.2 B** in 2021.
- Biggest spenders: Amazon, AOL, Apple, Facebook, Google, Intel, Microsoft, Salesforce, Twitter, Uber.
- **Tangible, useful, and readily applicable** research results (not just reports!).

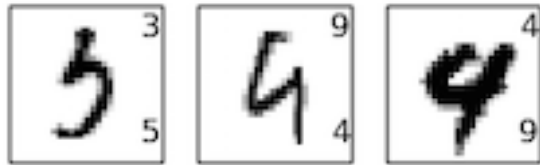


Artificial Intelligence / Machine Learning:

## **Understanding** and **reasoning** in **context** by **machines**

### **Three Waves of AI:**

- 1. Handcrafted Knowledge** (the structure of knowledge is defined by humans, the specifics are explored by machines; applicable to relatively simple cases with limited states: autonomous vehicles)
- 2. Statistical Learning** (Engineers create statistical models for specific problem domains and train them on big data; statistically impressive, but individually unreliable: neural nets)
- 3. Contextual Adaptation** (Systems construct contextual explanatory models for classes of real world phenomena)



## Generative model

Generates explanations of how a test character might have been created



Artificial Intelligence / Machine Learning:

**Understanding** and **reasoning** in **context** by **machines**

**New Capabilities**

**Robust AI**

**Adversarial AI**

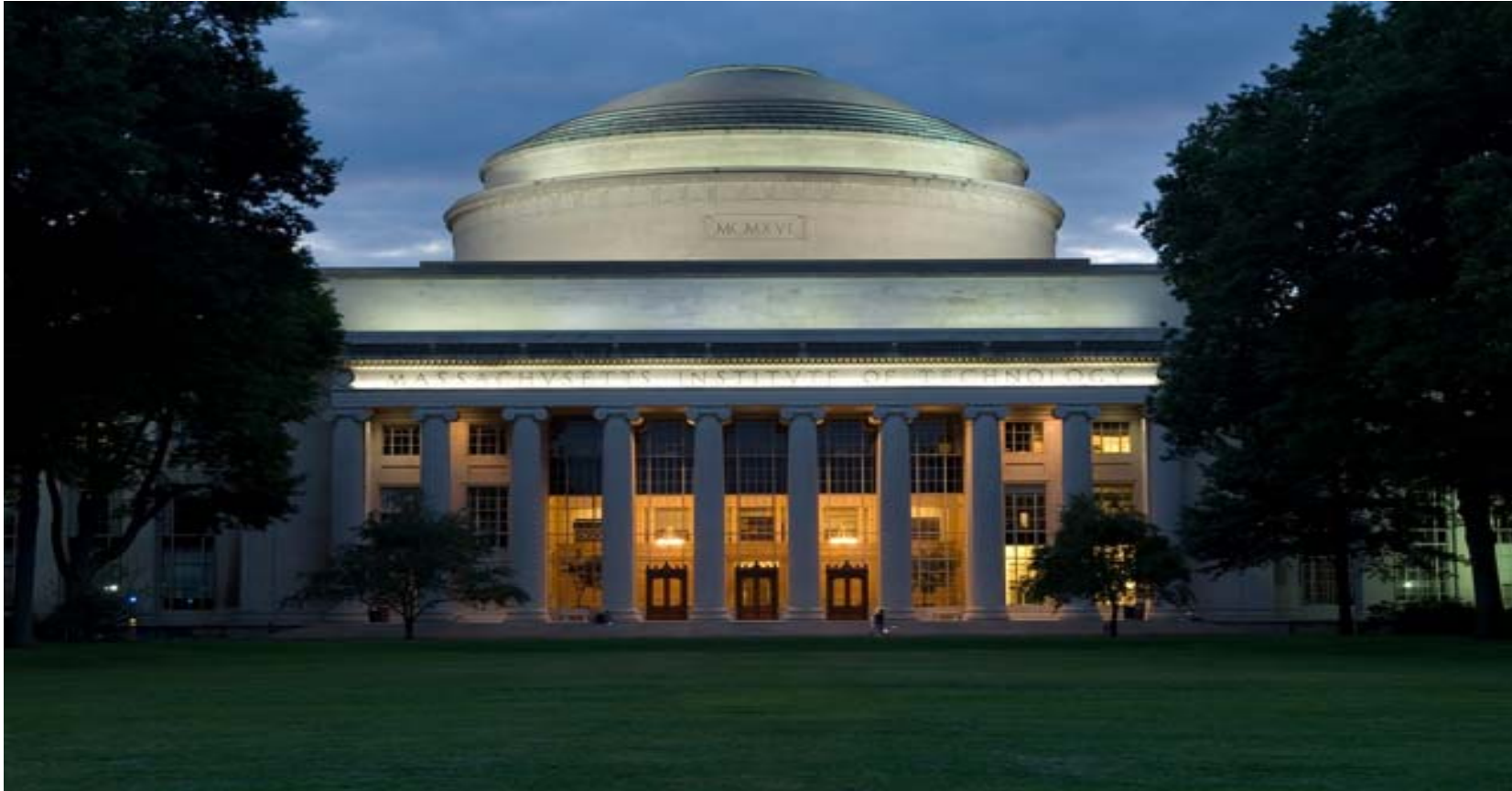
**High Performance AI**

**Next Generation AI**



**ALIGN PROGRAMS WITH THE JOB MARKET**  
Higher Education

- We have a so called “great track record” of teaching students “**hard skills**”, but the test-focused education system has placed little emphasis on the development of anything else
- According to McKinsey, there is a short supply of graduates with “**soft skills**” such as **strong communication, analytical** and **managerial** skills



## **MIT reshapes itself to shape the future**

**A Strategic decision and a bold move:** The new **College of Computing and Artificial Intelligence**, **\$1 billion commitment** to world-changing breakthroughs and their ethical application.

# Conclusion

- ICT is causing a **fundamental redrawing of industry boundaries** with **significant consequences**:
  - ✓ **AirBnB** (a tech company) is bigger than the world's top five hotel brands put together without owning any property;
  - ✓ **Uber** (another tech company) is the world's largest taxi firm with no cars;
  - ✓ **Facebook** is the world's most popular media company (2.4 B users) creates no content; and
  - ✓ **Alibaba** is the world's largest retailer with not stocks!

# Conclusion

- The objective and focus is on **monetizing data**.
- Artificial intelligence and machine learning are **indispensible tools** in **ALL** aspects of our future, including the foundations and infrastructure.
- With foresight and careful, diligent and timely planning in **ALL sectors** (including higher education) by **ALL players**, we need to prepare ourselves for the **very competitive future** that we will be facing **sooner than we expect**.



**Thank you!**