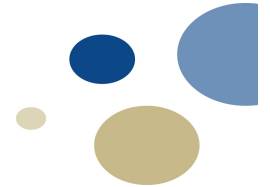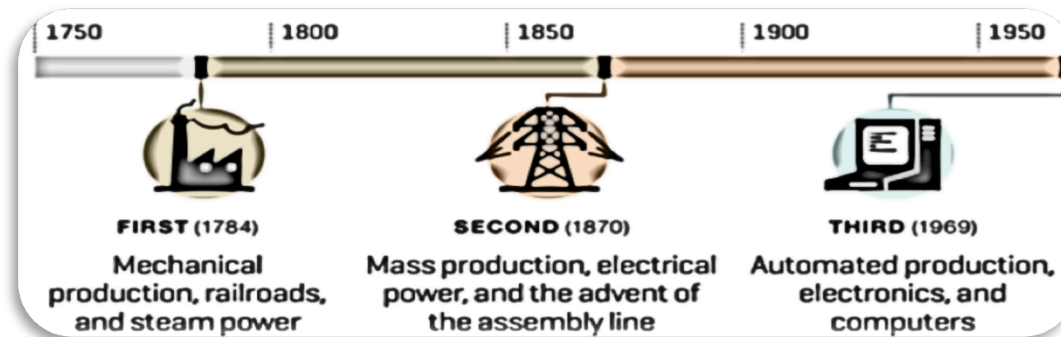# Digital transformation – opportunities and challenges

Anniken Karlsen, Head of Department, Dept. of ICT and Natural Sciences, Faculty of Information Technology and Electrical Engineering, The Norwegian University of Science and Technology
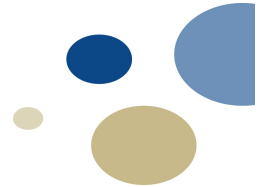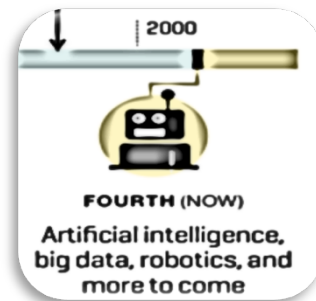
Industrial revolutions

- The First Industrial Revolution used water and steam power to mechanize production
- The Second used electric power to create mass production
- The Third used electronics and information technology to automate production

| 1750 | 1800 | 1850 | 1900 | 1950 |

FIRST (1784)
Mechanical production, railroads, and steam power

SECOND (1870)
Mass production, electrical power, and the advent of the assembly line

THIRD (1969)
Automated production, electronics, and computers

The Fourth Industrial Revolution

- Now a Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century

- It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.

- For the past 50 years, the performance of digital technology has literally exploded. IT spreads through organizations across the globe!

2000

FOURTH (NOW)
Artificial intelligence, big data, robotics, and more to come

Velocity, Scope, and Systems impact

- There are three reasons why today's transformations represent not merely a prolongation of the Third Industrial Revolution but rather the arrival of a Fourth and distinct one.

- **Keywords: Velocity**, **Scope**, and **Systems impact**

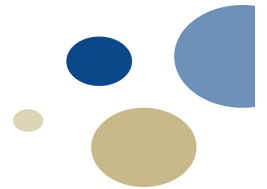The confluence and convergence of emerging technologies
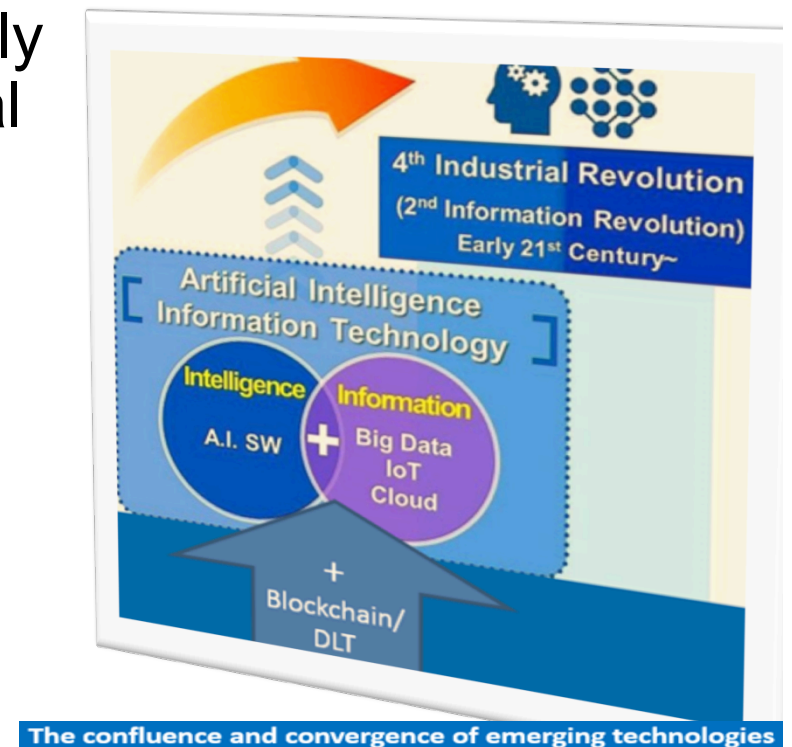
Digital disruption
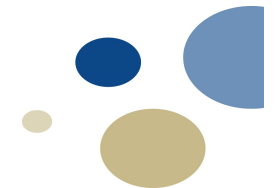
- We have seen different waves occurring across different types of industry segments.
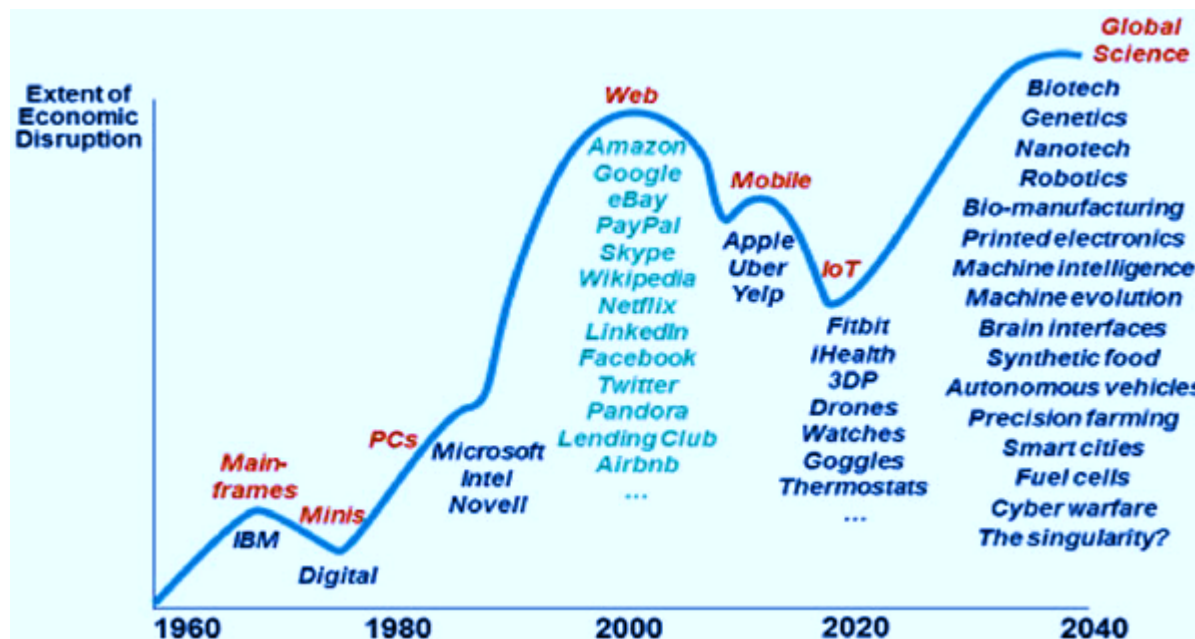
Digital Transformation – A matter of speed

- **Customers want things faster now than ever before in our always connected, always-on world**

- This relates both in the professional workplace, but in their regular lives as well

- **Customers cannot wait** for a product or service, they expect it to either be maintained or available at any time

- Speed is essential. **It is a matter of acting fast; adapting and adopting faster technologies**

- Example: Companies such as amazon are introducing drone services for faster deliveries, or same day deliveries
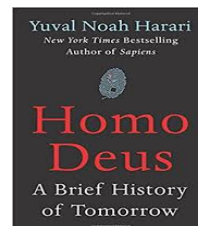
Already,
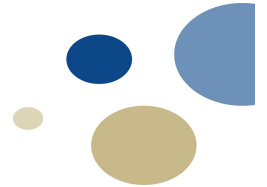
- AI is all around us, from self-driving vehicles to virtual assistants and software that translate or invest

- Impressive progress has been made in AI in recent years

- The progress is driven by exponential increases in computing power and by the availability of vast amounts of data, from software used to discover new drugs to algorithms used to predict our cultural interests
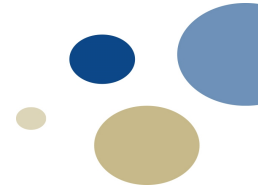
Already,
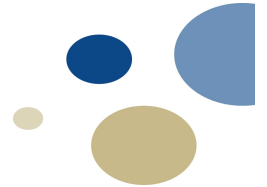
- digital fabrication technologies are interacting with the biological world on a daily basis

- engineers, designers, and architects are combining computational design, additive manufacturing, materials engineering, and synthetic biology to pioneer a symbiosis between microorganisms, our bodies, the products we consume, and even the buildings we inhabit

Yuval Noah Harari
New York Times Bestselling
Author of *Sapiens*

Homo
Deus
A Brief History
of Tomorrow

Technology and change

- It is not the availability of technology that hinders necessary change in organizations and society:
    - It is a lack of knowledge on what technology exists
    - It is a lack of knowledge on how technolgy and processes play together and how technology enables business improvement

- We need fantasy to develop smarter ways to use technology to solve new challenges of society
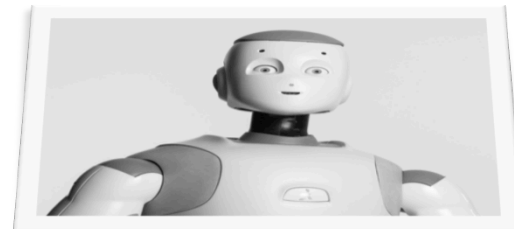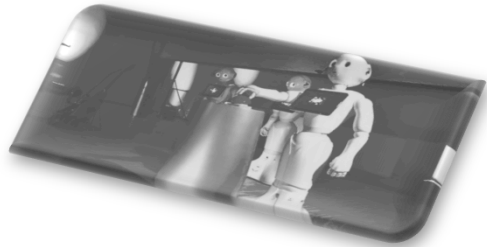
Angela Merkel emphasizes
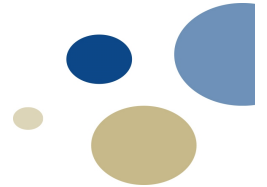
- We must modernize and embrace the digitalization of our society and economy, no matter how disruptive such technological change might be. Otherwise there is a risk of being left behind.

- **The next few years to come will have to be under the heading of bringing digital into our education system**

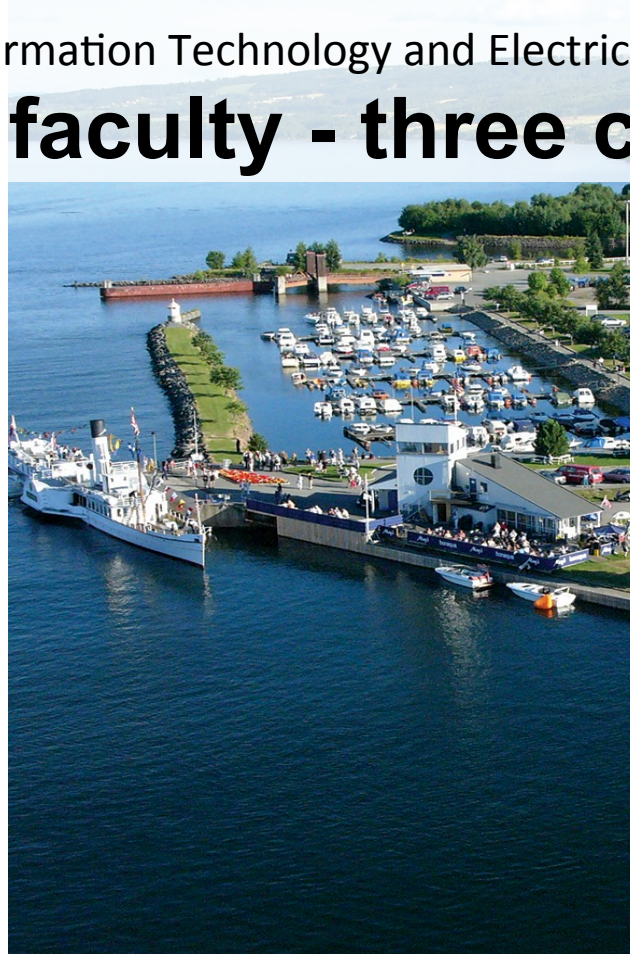- **Digitization means there has to be lifelong learning!**

→ → → → → →

One faculty - three cities

TRONDHEIM   GJØVIK   ÅLESUND

DIGITAL TRANSFORMATION

9 projects – 48 PhD positions

Autonomous All-Electric Passenger Ferries for Urban Water Transport (Autoferry)

Rational Alloy Design (ALLDESIGN)

Digital Economy (DigEco)

My Medical Digital Twin

Digital Infrastructures and Citizen Empowerment (DICE)

Trust and Transparency in Digital Society Through Blockchain Technology

Transforming Citizen Science for Biodiversity

Trondheim Analytica

World of Wild Waters (WoWW) Gamification of Natural Hazards

Department of ICT and Natural Sciences

Programmes of study

Automation Engineering

Computer Engineering

Electric Power Systems

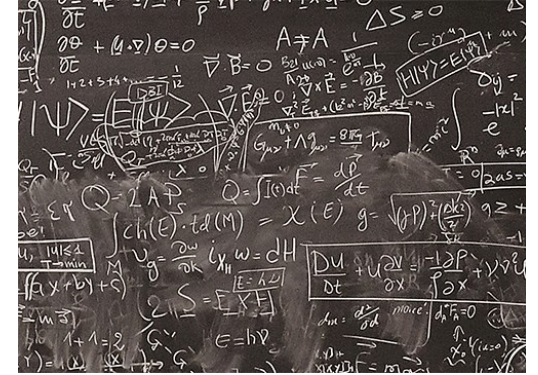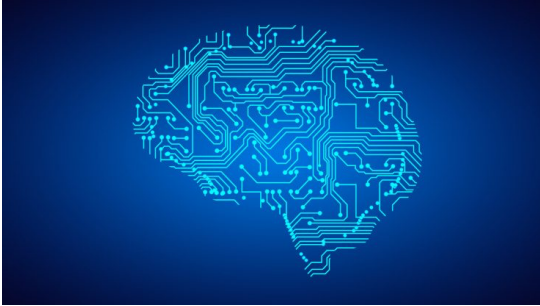Preparatory Course for Engineering

Simulation and Visualization

- Research at the department is organized within two Labs:

1. The Cyber-Physical Systems Lab
   – Maritime Technology
   – Medical Technology and Health Informatics

2. The Digital Transformation Lab
   – Big Data and Digital Business
   – Social Robots

The digital revolution – good or bad?

14
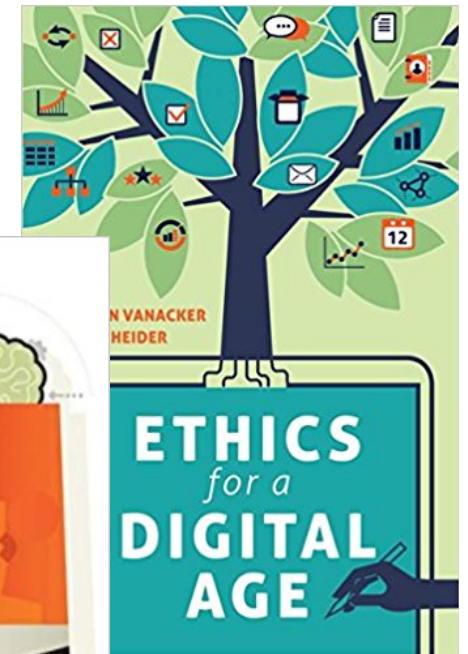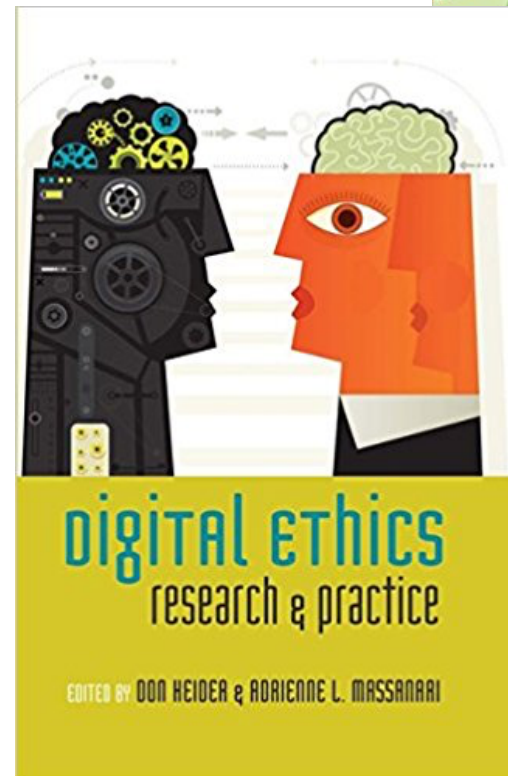
The IE vision:

Creating a smart, safe, sustainable future

Thank you – enjoy the IPIT workshop in Aalesund!