Deep Learning for Business

Deep Learning Products & Services

Prof. Jong-Moon Chung

Deep Learning for Business

Deep Learning Products & Services

Future Industry Evolution & Artificial Intelligence

Future Industry Evolution & Artificial Intelligence

1st Industrial Revolution (1IR)

- 18^{th} to 19^{th} centuries in Europe and America
- Agriculture & rural societies experience industrialization & urbanization
- Driving Technology
  - Iron industry
  - Steam engine
  - Textile industry

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2nd Industrial Revolution (2IR)

- 1870 to 1914 (right before World War I) in America, Europe, Japan, etc.
- Rapid growth of new industries and technology
- Mass production becomes possible due to Electric Power, Oil, and Steel

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2nd Industrial Revolution (2IR)

- Driving Technology
  - Telephone
  - Light bulb
  - Phonograph
  - Internal combustion engine

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3rd Industrial Revolution (3IR)

- 1980s to today, World Wide
- Advancements in digital electronics and mechanical devices
- 3IR is also called the Digital Revolution
- Driving Technologies
  - PC (Personal Computer)
  - Internet
  - ICT (Information & Communications Technology)

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3rd Industrial Revolution (3IR)

— Current Industry Driving Technologies
  - Smartphones, Smartwatches
  - Wireless (Wi-Fi, Bluetooth)
  - Mobile Communications (LTE, 4G)
  - Big Data
  - Clouds (SaaS, PaaS, IaaS)
  - Mobile Internet
  - SNS (Social Networking Services)
  - AI (Artificial Intelligence)

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4th Industrial Revolution (4IR)

— *The Fourth Industrial Revolution*
  - Author: Klaus Schwab
  - World Economic Forum, 2016

— "This Fourth Industrial Revolution is, however, fundamentally different. It is characterized by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human."

Future Industry Evolution & Artificial Intelligence

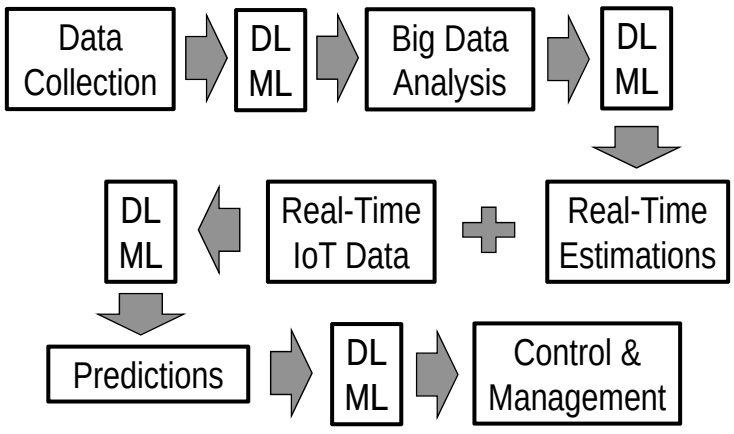
Future Industry Evolution

- 4IR is an evolution from the Digital Revolution of 3IR

- In future industries, DL (Deep Learning) and ML (Machine Learning) are expected to drive improvements in all technology areas

Future Industry Evolution & Artificial Intelligence

Where and How will DL (Deep Learning) & ML (Machine Learning) be used in future industry?



Future Industry Evolution & Artificial Intelligence

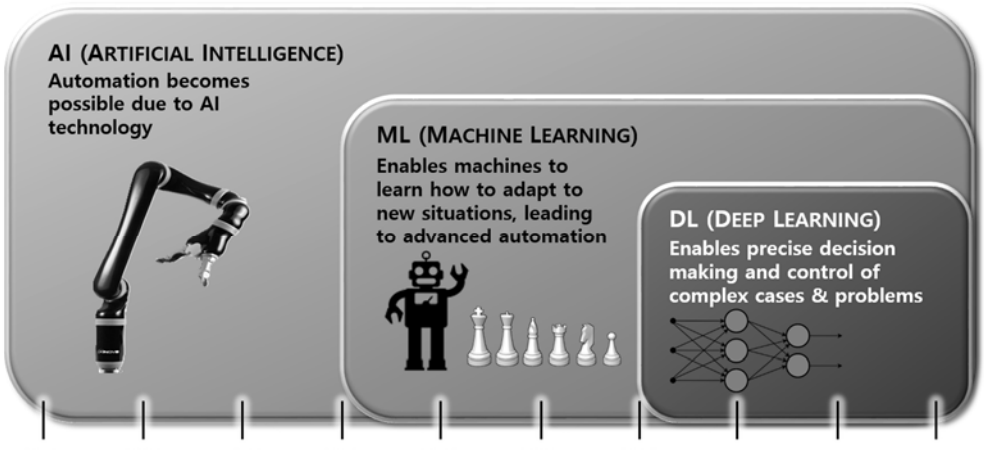
Future Industry Evolution

– Driving Technology

- AI, ML, DL (Deep Learning)
- Nanotechnology
- Biotechnology
- 3D Printing
- Robotics (Industrial, Collaborative, etc.)
- Autonomous Vehicles (UAV, USV, UWV)
- IoT, 5G, Smart Devices, Clouds

Future Industry Evolution & Artificial Intelligence

DL (Deep Learning), AI and ML



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Future Industry Evolution & Artificial Intelligence

DL (Deep Learning) Applications

- Computer Vision & Image Processing
- Handwriting Recognition
- Speech Recognition
  - Apple's Siri
  - Google’s Voice Search
  - Samsung's S Voice
- Data Analysis & Information Extraction
- Management & Control & Automation
- Predictions & Estimations
- Program Code Generation

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Nanotechnology

- Atomic, molecular or supramolecular scale matter manipulation at dimension scales of 1~100 nm in at least one dimention or more
- Nanotechnology Science & Engineering Fields
  - Surface science
  - Organic chemistry
  - Molecular biology
  - Semiconductor physics
  - Microfabrication
  - Molecular engineering

Future Industry Evolution & Artificial Intelligence

Biotechnology

- Bioinformatics
  - Computational techniques applied to solving biological problems
- Blue Biotechnology
  - Marine and aquatic biological technologies and applications
- Red Biotechnology
  - Biological technology to improve medical processes and treatments

Future Industry Evolution & Artificial Intelligence

Biotechnology

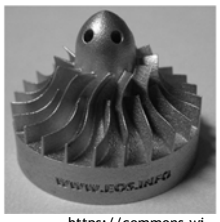
- Green Biotechnology
  - Biological technology to improve agricultural processes and production
- **White Biotechnology**
  - Biological technology used for energy or industrial production, transformation, or dissolving

Future Industry Evolution & Artificial Intelligence

3D Printing & AM (Additive Manufacturing)

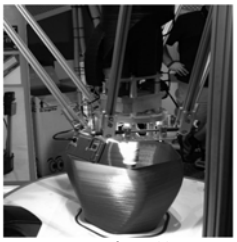
– 3D Modeling & AM Technology Types

- Binder Jetting
- Material Extrusion
- Material Jetting
- Directed Energy Deposition
- Powder Bed Fusion
- Sheet Lamination
- Vat Photopolymerization



https://commons.wikimedia.org/wiki/File%3ATurbine_(3D_printing).jpg

Author: Hkm1233 https://commons.wikimedia.org/wiki/File%3A3d_printer_richards.jpg



Author: Z22 https://commons.wikimedia.org/wiki/File:Large_delta-style_3D_printer.jpg#/media/File:Large_delta-style_3D_printer.jpg

Future Industry Evolution & Artificial Intelligence

Robots

– Industrial Robot

- Automatically controlled robot for industrial applications, which commonly have jointed arm(s) and end effector(s)

– Modular Robot

- Modularized robot designed to enhance utilization and functional effectiveness in various other systems

Future Industry Evolution & Artificial Intelligence

Robots

— Service Robot

- Fully or semi autonomous robot that can perform services useful to humans and equipment

— Collaborative Robot (Cobot)

- Robot designed to interact with human workers to enhance productivity, reliability, accuracy, or safety

Future Industry Evolution & Artificial Intelligence

Robots

— Educational Robot

- Robot to serve as an educational assistants for teachers or self-learning facilities

— Mobile Robot

- Robot that can move around an environment
- Used in factories and assembly lines
- Commonly follows markers, rails, or wires
  - ✓ AGV (Automatic Guided Vehicle)

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Autonomous Vehicles

- UAV (Unmanned Aerial Vehicle)
  - Drones
- USV (Unmanned Surface Vehicle)
  - Autonomous Cars, Carts, Trucks, Trains
  - Autonomous Boats, Watercrafts
- UWV (Unmanned Under-Water Vehicle)
  - Submersibles, Robotic Submarines

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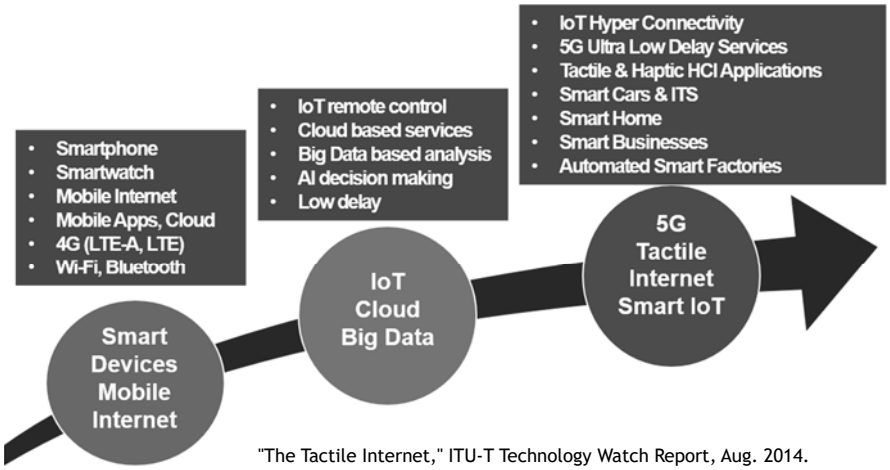
IoT · 5G · Tactile Internet Evolution



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Deep Learning Systems & Services

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