Slide 1

Introduction to machine learning

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1

Slide 2

- By the end of this module, you will be able to answer the following questions:
  - What is machine learning?
  - Why does machine learning matter?

2

Slide 3

What is machine learning?

3

Slide 4

- Who came up with machine learning and when?
- Arthur Samuel, a computer scientist at IBM, introduced the term "Machine Learning"
- He developed the first computer learning program (i.e., the game of checkers) in 1959

" *Give machines the ability to learn without explicitly programming them*

- Arthur Samuel, 1959

https://medium.com/ibm-data-ai/the-first-of-its-kind-ai-model-samuels-checkers-playing-program-1b712fa4ab96

4

History of machine learning

- He believed that a computer could learn from its own mistakes and improve its chess game based on its experience against human opponents

[YouTube Video Clip]

https://www.youtube.com/watch?v=iT_Un3xo1qE&t=14s

Definition of machine learning

- What is machine learning?

" *Machine learning is a branch of Artificial Intelligence that focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.*

IBM

" *Machine learning is a subfield of Artificial Intelligence, which is broadly defined as the capability of a machine to imitate intelligent human behavior.*

MIT

" *Machine learning is a branch of Artificial Intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention.*

SAS

" *Machine learning involves constructing algorithms that can analyze and learn from data in order to categorize such data and make related predictions.*

Georgia Tech

Discussion

- What is the difference between machine learning and artificial intelligence?

Machine Learning vs. Artificial Intelligence

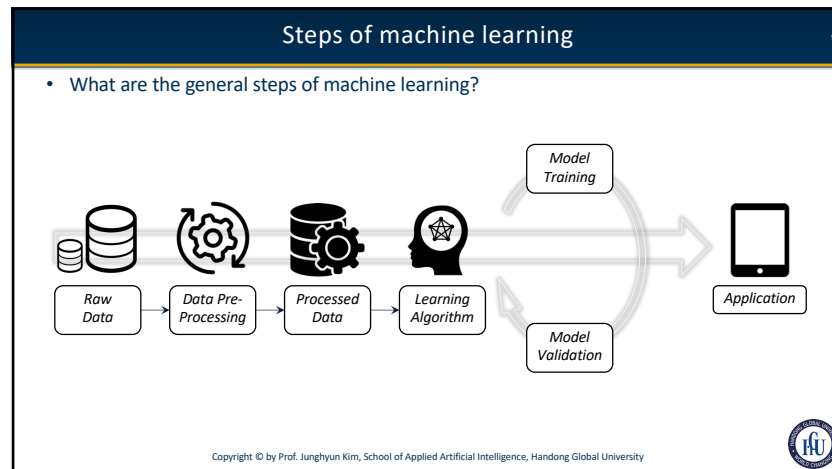- Artificial intelligence vs. Machine Learning vs. Deep learning

Artificial Intelligence (AI) ·········→ A concept that makes a computer mimic human behavior (e.g., recognition, inference, prediction, …)

Machine Learning ·········→ A technique that enables the concept of AI (e.g., neural network, support vector machine, K-Means, …)
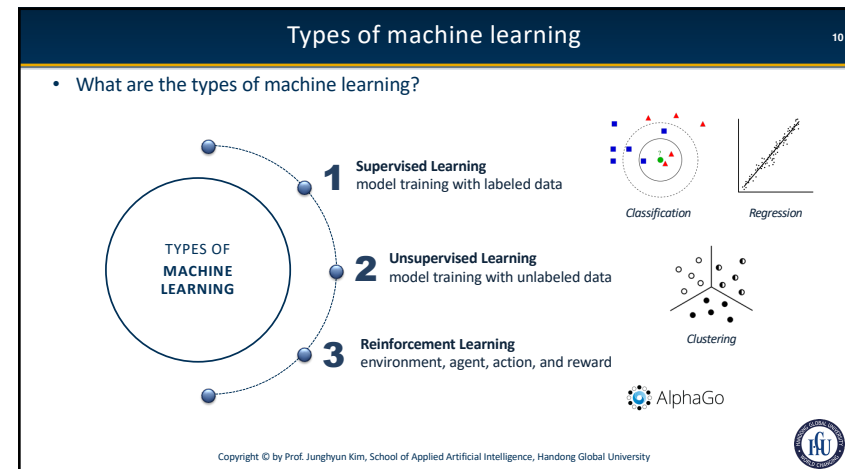
Deep Learning ·········→ A subset of machine learning based on neural networks that currently drives the AI boom (e.g., CNN, RNN, LSTM, …)

- What are the general steps of machine learning?

Model Training

Model Validation

Raw Data → Data Pre-Processing → Processed Data → Learning Algorithm

Application

- What are the types of machine learning?

TYPES OF **MACHINE LEARNING**

1 **Supervised Learning**
model training with labeled data

Classification *Regression*

2 **Unsupervised Learning**
model training with unlabeled data

Clustering

3 **Reinforcement Learning**
environment, agent, action, and reward

AlphaGo

Why does machine learning matter?
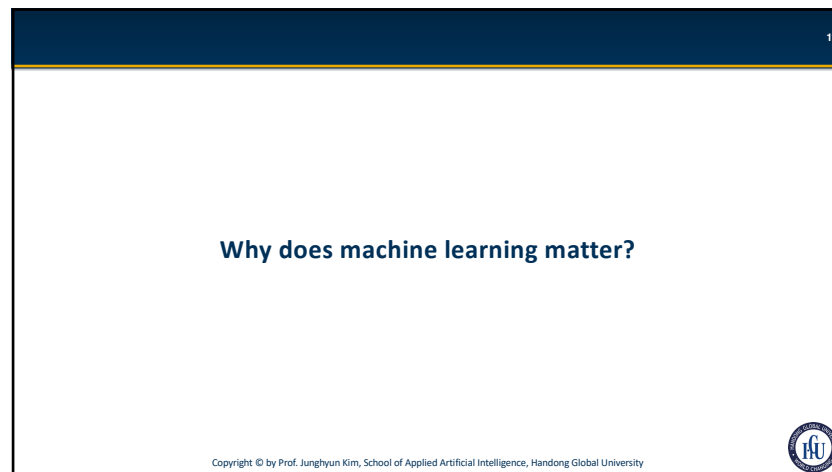
- Quotes on machine learning by the top leaders

" *A breakthrough in machine learning would be worth ten Microsoft*

- Bill Gates (CEO of Microsoft)

" *Machine learning is probably the most important thing humanity has ever worked on*

- Sundar Pichai (CEO of Google)

" *It is amazing that you could write a few lines of code and have it learned to do interesting things*

- Andrew Ng (CEO of Landing AI)

Discussion

- Do you think that Artificial Intelligence rules over human beings?

13

Debate on artificial intelligence

- Jack Ma vs. Elon Musk

Elon Musk (Space X)

Computers are already smarter than people in so many dimensions.

Jack Ma (Alibaba)

Man can never make another man. A computer is just a computer.

https://www.youtube.com/watch?v=yG6Ay3nlB84

14

Opportunities of artificial intelligence

- No matter what a computer is better than a human being, machine learning techniques have provided a better way of living for people
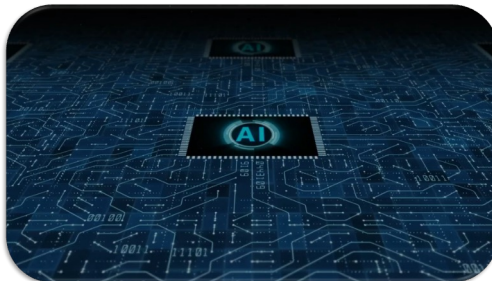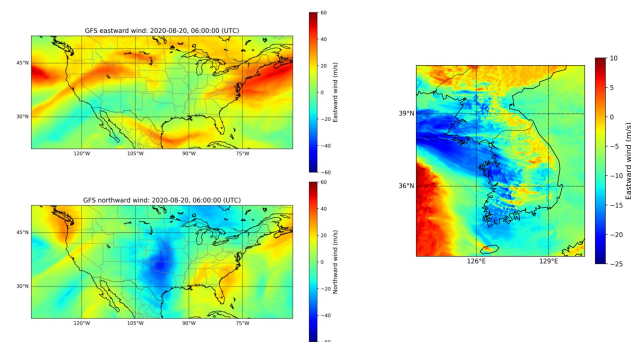

https://www.youtube.com/watch?v=8jhspHdXGBQ

15

Opportunities of artificial intelligence

- Wind prediction – National Oceanic and Atmospheric Administration (NOAA)

16

Slide 17

- Digital twin – National Aeronautics and Space Administration (NASA)

[YouTube Video Clip]

Kennedy Space Center

The Space Shuttle Challenger disaster

Physical System

Digital Twin

Avoid further disaster

https://www.researchgate.net/figure/The-vision-of-the-Digital-Twin-throughout-the-product-life-cycle-in-analogy-to-6_fig1_335630854

Slide 18

- Smart gating – American Airlines

https://www.youtube.com/watch?v=7oX0C1uXaJw

Slide 19

- Self-driving car – Tesla

https://www.youtube.com/watch?v=tlThdr3OSQo

Slide 20

- Speech recognition – Amazon

https://report.roa.ai/article/140438

- Dangers of Artificial Intelligence – Jeffry Hinton

https://www.youtube.com/watch?v=DsBGaHywRhs

21

- Throughout this module, you have learned:
  - What is machine learning?
  - Why does machine learning matter?

22

THANK YOU

For more information, please reach out to Prof. Junghyun Kim at
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23