# Course Introduction

# Course Information

- Course introduction
  - This course introduces the fundamental concepts and practical applications of deep learning, a powerful subfield of machine learning.
  - Students will gain a comprehensive understanding of various neural network architectures, training methodologies, and their use of in solving real-world problems in areas such as computer vision and natural language processing.
  - The course emphasizes hands-on implementation using popular deep learning frameworks.
  - In this course, we will use PyTorch (https://pytorch.org/) as deep learning library.

# Course Information

- Prerequisites
  - Programming: proficiency in Python
  - Mathematics
    - Linear algebra: vectors, matrices, matrix operations, dot products, etc.
    - Calculus: derivatives, partial derivatives, chain rule, etc.
  - Probability and Statistics: basic probability concepts, distributions
  - Machine learning: basic understanding of supervised/unsupervised learning, linear regression, logistic regression, etc.

# Course Information

- General information
  - Class time: Tue 14:00 ~ 17:00
  - Location: Frontier Hall 511

- Instructor
  - Sangheum Hwang (황상흠), Frontier Hall 618, shwang@seoultech.ac.kr

- Teaching Assistant
  - UiChan Lee (이의찬), 무궁관 717, uichan@ds.seoultech.ac.kr
  - MinHyeong Lee (이민형), 무궁관 717, mhlee@ds.seoultech.ac.kr

| Week | Topic | Week | Topic |
|---|---|---|---|
| 1 | Course introduction<br>Introduction to deep learning | 9 | Recurrent neural networks (1) |
| 2 | Machine learning basics<br>Linear regression | 10 | Recurrent neural networks (2) |
| 3 | How deep learning works<br>MNIST classification<br>Tensor and tensor operations | 11 | Attention mechanism and Transformers |
| 4 | Gradient-based optimization<br>Multilayer perceptron | 12 | Large language models |
| 5 | Optimizers and regularizers | 13 | Deep generative models (1) |
| 6 | Convolution and pooling<br>Convolutional neural networks (1) | 14 | Deep generative models (2) |
| 7 | Convolutional neural networks (2) | 15 | *Final Exam* |
| 8 | *Midterm Exam* | | |

# Course Information

- Evaluation criteria
  - 30% Midterm exam
  - 30% Final exam
  - 30% Homework
  - 10% Attendance and participation

# Course Information

- Homework (30%)
  - Two mini (individual) projects
  - GPU infra
    - Use your own GPUs if you have, or you can use colab service provided by Google or cloud resources like AWS, GCP.
    - TAs will let you know how to set up GCP a few weeks later.

# Course Information

- No textbook
- Reading materials
  - Zhang et al., “Dive into Deep Learning”, https://d2l.ai/
  - Simon J.D. Prince, “Understanding Deep Learning”, https://udlbook.github.io/udlbook/

# Academic Integrity

- Students are responsible for maintaining high standards of academic integrity in all of their class activities.
- Cheating or plagiarism in any form will not be tolerated.
- Any violation of academic integrity is a serious offense and is therefore subject to an appropriate sanction or penalty.
  - Cheating or plagiarism on exam/assignment → Fail