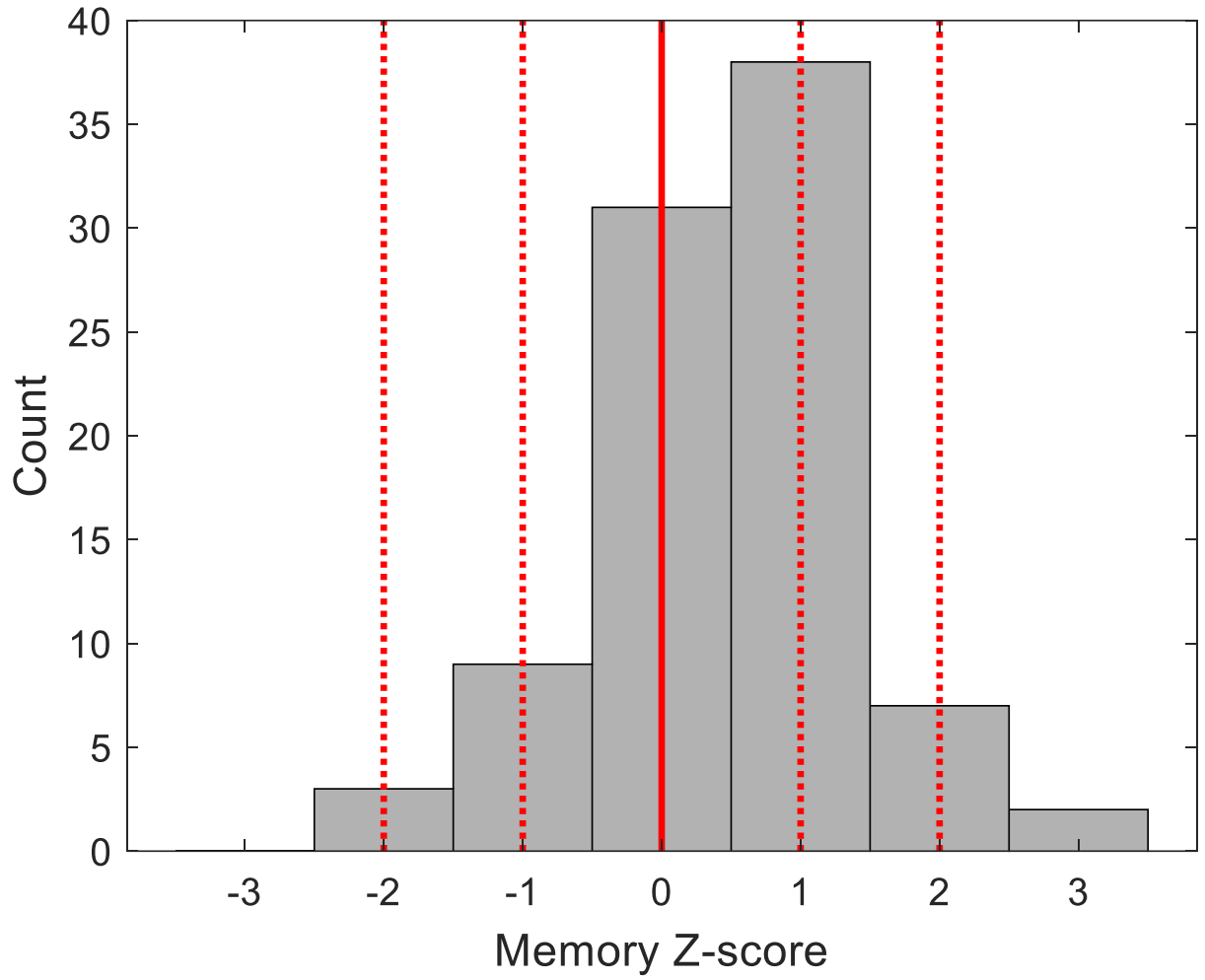
Medical/Bio Research Topics Ⅰ: Week 16 (17 June 2025)

Practical Implementation Review

실습 검토

Hands-on Machine Learning (1): Predicting Memory Performance

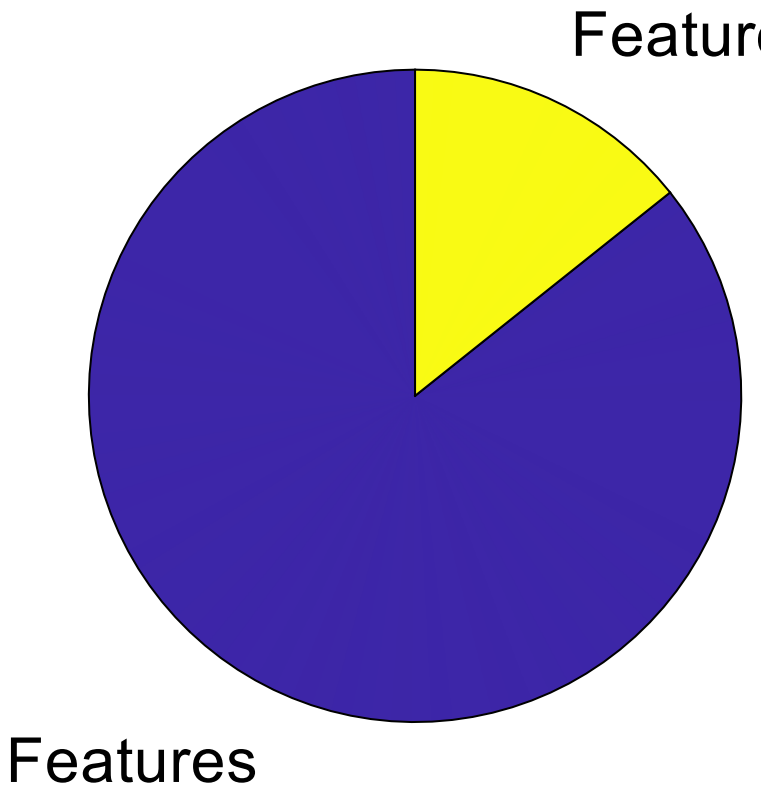
- Memory
  - Fundamental brain function that encompasses the processes of encoding, storing, and retrieving information
  - Decline in certain types of memory abilities, particularly those related to episodic and working memory, in normal aging
- Subjects (n = 90)
  - Age: 72.2±5.5 years
  - Sex: 75 females and 15 males
  - Years of education: 10.5±3.6 year



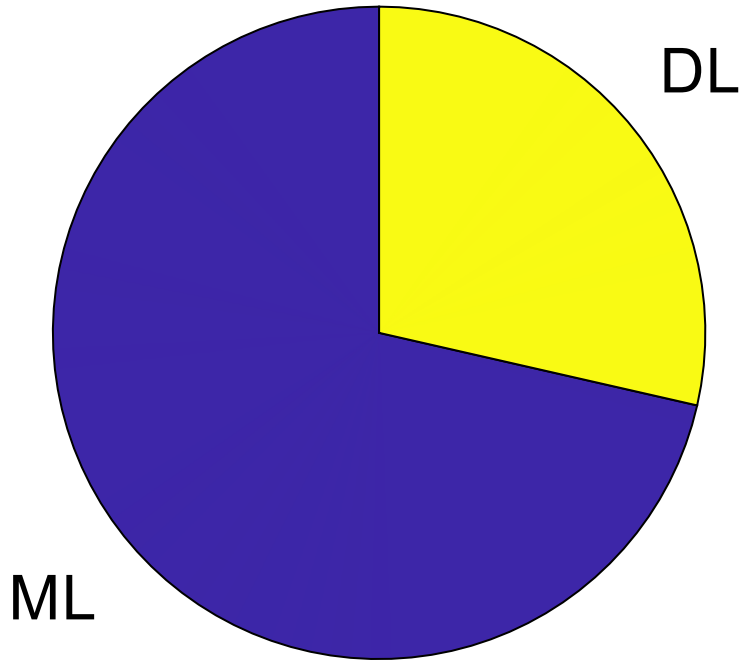
Distribution of Memory Performance Scores

- Task: predicting memory performance
  - Dataset from locally acquired data
    - sMRI, resting state fMRI, and dMRI
    - Demographic information including age, sex, and years of education
    - Memory performance scores
  - Training (n = 80) and test (n = 10) sets
  - Input maps/features
    - Grey matter and white matter maps/features from sMRI
    - Regional homogeneity and posterior cingulate gyrus-based correlation maps/features from resting state fMRI
    - Fractional anisotropy and mean diffusivity maps/features from dMRI

- Model generation

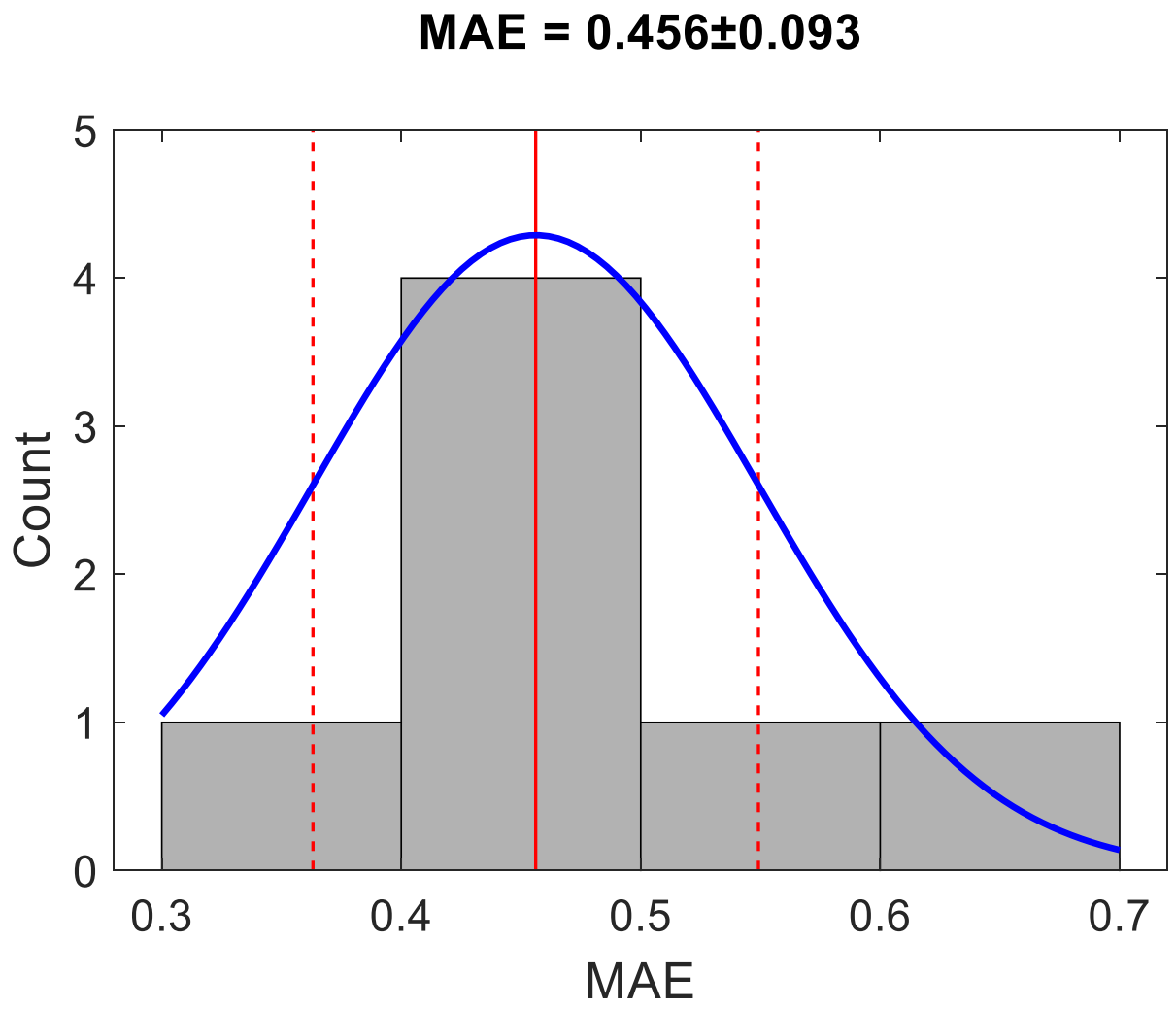


Data types



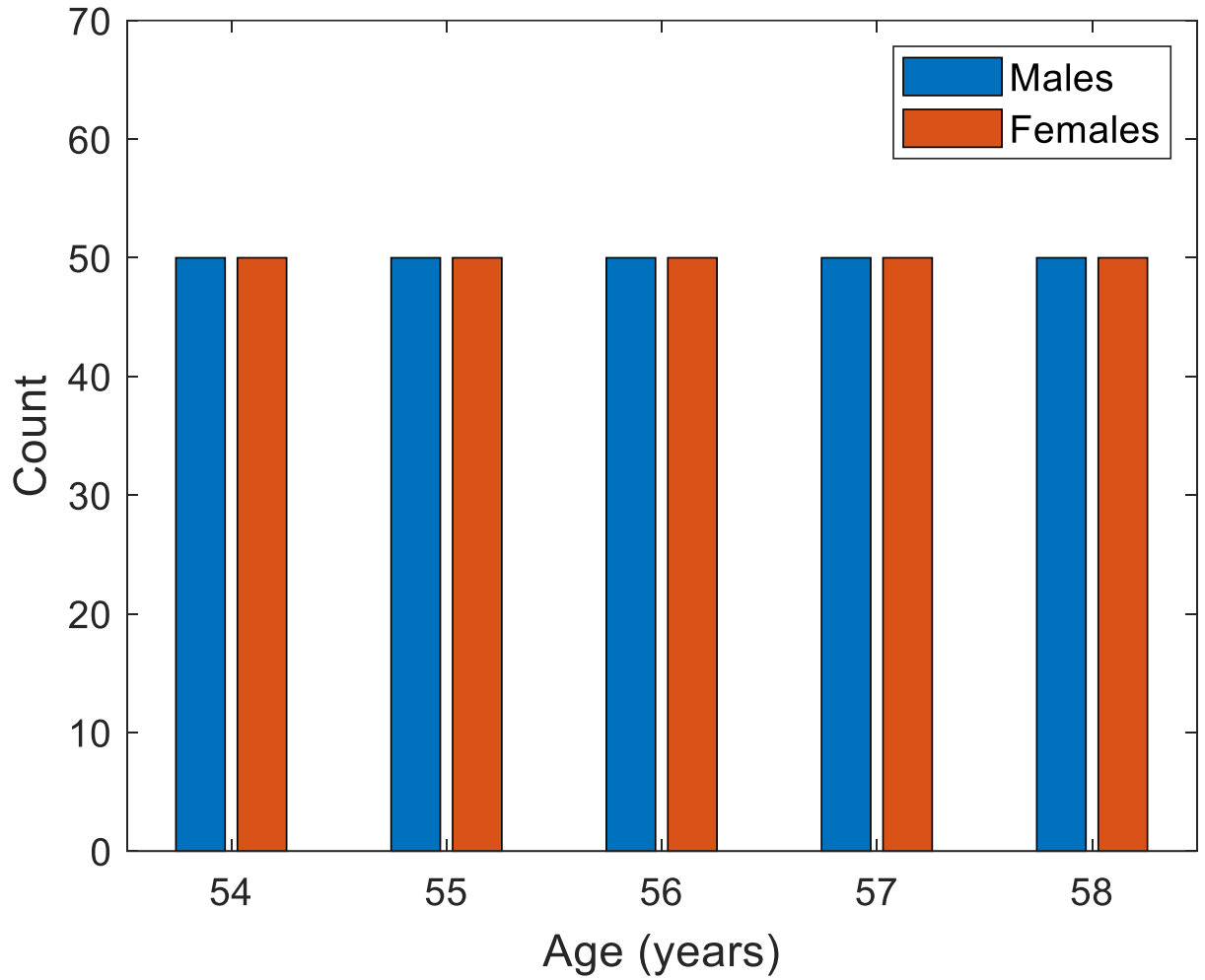
Learning paradigms

– Predictive performance (mean absolute error (MAE)) on the test set



Hands-on Machine Learning (2): Predicting Sex

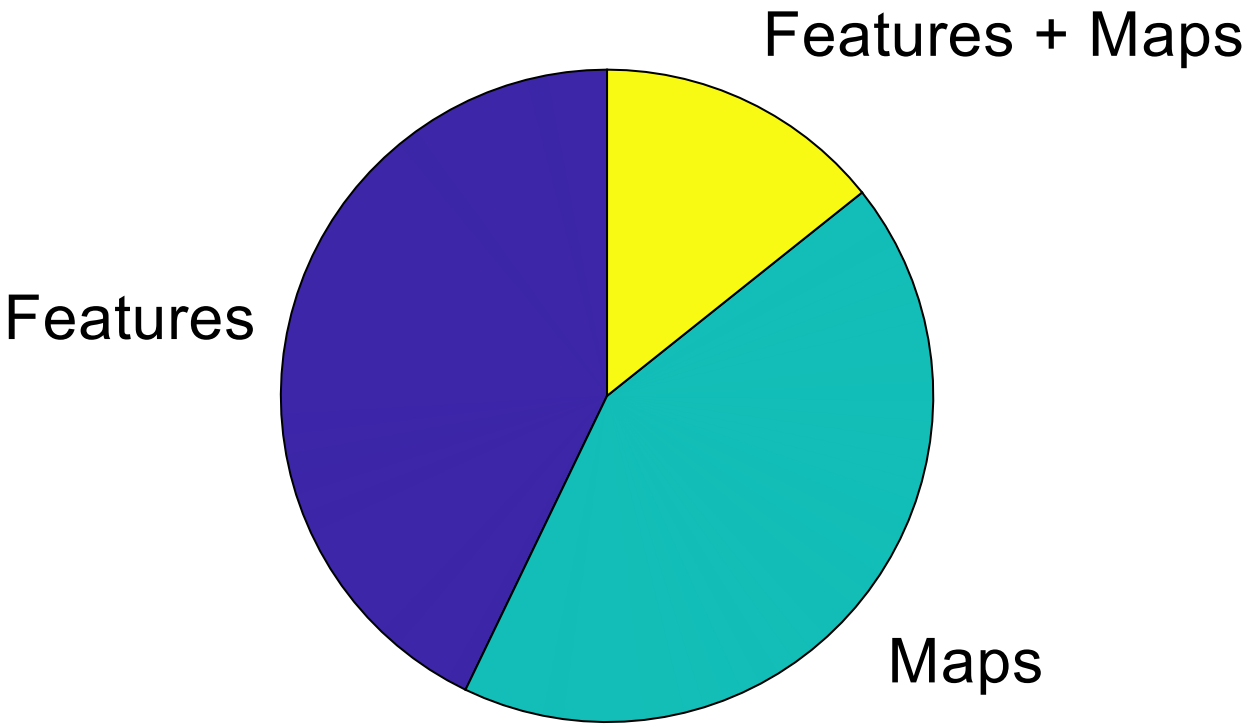
- Sex
  - Typically refers to the biological and physiological characteristics that define males and females
  - Determined by biological factors, primarily chromosomal (XX for females, XY for males) and anatomical differences
- Subjects (n = 500)
  - Age and sex: 50 females and 50 males for each age from 54 to 58 years



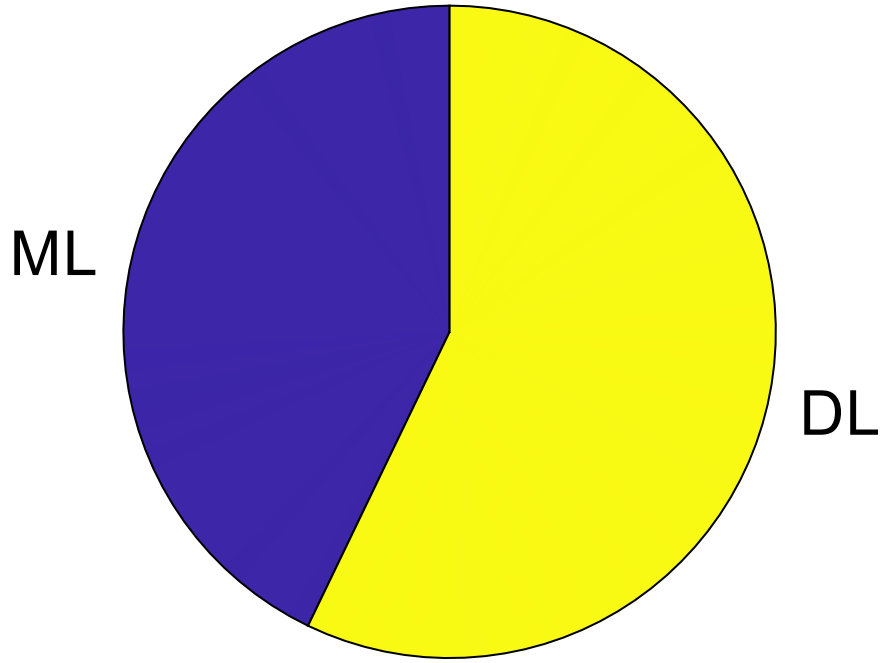
Sex Distribution across Ages

- Task: predicting sex
  - Dataset from UK Biobank (https://www.ukbiobank.ac.uk/)
    - sMRI, resting state fMRI, and dMRI
    - Demographic information including sex and age
  - Training (n = 450) and test (n = 50) sets
  - Input maps/features
    - Grey matter and white matter maps/features from sMRI
    - Default mode network maps/features from resting state fMRI
    - Fractional anisotropy and mean diffusivity maps/features from dMRI

- Model generation



Data types



Learning paradigms

– Predictive performance (accuracy) on the test set