Introduction to Machine Learning

Lab 1: Grip Force Prediction using Regression

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1. Regression Equation in Basic Part

$$gripForce_i = w_0 + w_1 weight_i$$

2. Variables and Regression Equation in Advanced Part

In the basic part, the model takes only one type of attribute (weight) as input, whereas in the advanced part, the model receives seven different types of attributes as input.

$$
gripForce_i = \begin{cases} \begin{bmatrix} w_{m,0,1} & w_{m,1,1} & w_{m,2,1} & w_{m,3,1} & w_{m,4,1} & w_{m,5,1} & w_{m,6,1} \end{bmatrix} \begin{bmatrix} age_i \\ 0 \\ height_i \\ weight_i \\ bodyFat_i \\ diastolic_i \\ systolic_i \end{bmatrix} + \sum_{j=0}^{6} w_{m,j,0}, & gender_i = male \\[4em] \begin{bmatrix} w_{f,0,1} & w_{f,1,1} & w_{f,2,1} & w_{f,3,1} & w_{f,4,1} & w_{f,5,1} & w_{f,6,1} \end{bmatrix} \begin{bmatrix} age_i \\ 0 \\ height_i \\ weight_i \\ bodyFat_i \\ diastolic_i \\ systolic_i \end{bmatrix} + \sum_{j=0}^{6} w_{f,j,0}, & gender_i = female \end{cases}
$$

- **$w_{g,j,o}$:**
  It is a coefficient. g means gender. j means attribute. o means order.
  For example, $w_{m,0,1}$ is the coefficient of age_i^1 while $gender_i$ is male.
- **Attributes enumeration:**
  $\{ age: 0, gender: 1, height: 2, weight: 3, bodyFat: 4, diastolic: 5, systolic: 6 \}$

3. Difficulty

I'm not familiar with the modules imported in this lab, so I spent a lot of time debugging data type mismatches. Additionally, I'm not familiar with matrix operations in Python, which also took me a lot of time to resolve.

4. How I Solve the Difficulty and My Reflections

There is no other way to solve my problems except by reading Python documentation and some tutorial articles on the internet. Overall, the hints in the template are sufficient for me to complete this lab. However, if there were some guidelines on data analysis, it would be easier for me to think about how to design the model rather than relying on guesswork.