Tutorial 4

Machine Learning and Big Data for Economics and Finance

List of activities

I. Complete **Section 4.6 Lab: Logistic Regression, LDA, QDA, and KNN**, subsections 4.6.1, 4.6.2 and 4.6.5.

II. Complete the list of exercises in this tutorial.

Exercise 1. Logistic and logit transformations

- Show step by step that the inverse of

$$f(x) = \log\Big(\frac{x}{1-x}\Big)$$

is given by

$$f^{-1}(x) = \frac{1}{1+\mathrm{e}^{-x}}.$$

- Show that f^{-1} is strictly increasing.
- Show that as $x \to -\infty$, $f^{-1}(x) \to 0$ and as $x \to \infty$, $f^{-1}(x) \to 1$.

Exercise 2. Write an `R` function `loglik_logit` that takes data and a parameter β as input and that outputs the logarithm of the likelihood of the logistic regression model.

Test your function on the dataset in the file `LR1.csv` where the model is

$$\text{logit}(\Pr\{Y=1|X=x\}) = -5 + x\beta$$

Maximize the likelihood and compare to the function `glm`.