EFC3 - Exercise 3

Rafael Claro Ito (R.A.: 118430)

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1 Source files

All code cited and all figures showed here can be found at the following GitHub repository:
`https://github.com/ito-rafael/IA006C-MachineLearning/tree/master/efc2`
In this repository, one can found the following files:

- Jupyter Notebook
  - efc2_pre-ex1.ipynb
  - efc2_ex1_binary_classification.ipynb
  - efc2_ex2_multiclass_classification.ipynb
  - efc2_ex2_knn.ipynb
- LaTeX
  - efc2.tex

The notebook "efc2_pre-ex1" plots the histograms for the exercise 1 and it is used for data visualization. It shows the input features histograms for the raw data and after a data standardization. Also, it shows the correlation between these data.

The notebook "efc2_ex1_binary_classification" effectively implements the logistic regression used to perform a binary classification proposed in exercise 1.

The notebooks "efc2_ex2_multiclass_classification" and "efc2_ex2_knn" implements the algorithms to perform a multiclass classification proposed in exercise 2. The former one uses the softmax approach while the latter one implements the K-Nearest Neighbors (kNN) algorithm.

2 Part 1 - Error backpropagation

$u_1 = 1 \cdot v_{00} + x_1 \cdot v_{10} + x_2 \cdot v_{20}$
$u_2 = 1 \cdot v_{01} + x_1 \cdot v_{11} + x_2 \cdot v_{21}$
$u_3 = 1 \cdot v_{02} + x_1 \cdot v_{12} + x_2 \cdot v_{22}$

$s_1 = f(u_1)$
$s_2 = f(u_2)$
$s_3 = f(u_3)$

$y_1 = 1 \cdot w_{00} + s_1 \cdot w_{10} + s_2 \cdot w_{20} + s_3 \cdot w_{30}$
$y_2 = 1 \cdot w_{01} + s_1 \cdot w_{11} + s_2 \cdot w_{21} + s_3 \cdot w_{31}$

3 Part 2 - Multiclass Classification