Assignment #3

Course: *Machine learning*
Due date: *November 17th, 2023*

Assignment

In this assignment, you will learn about regularization methods. You will also implement the ridge regularization method using gradient descent and stochastic gradient descent and test it on "Wine quality" data.
Be careful not to use the same data for training (any stage of training) and testing your model.

> Use the "Communities and Crime" dataset you used in the previous assignment with the same preprocessing.

The last column of the dataset (ViolentCrimesPerPop) is your target variable. Remove the attributes state, county, community, community name, and fold (columns 1 to 5).
`https://archive.ics.uci.edu/dataset/183/communities+and+crime`

> Fit models using ridge and lasso regression. Try different values of the regularization parameter and evaluate its effect. Choose the optimal regularization parameter.

Use the Scikit-learn functions for ridge, lasso, and for the selection of the regularization parameter.

> Compare the results of the feature selection you implemented in the previous assignment with the attributes lasso selected.

> Download the "Wine quality" dataset. Choose only the white wine data. Prepare your data for modeling.

The data is available at `https://archive.ics.uci.edu/dataset/186/wine+quality`. You will be doing a regression of the wine quality grades (last column).

> Implement ridge regression with:
> - gradient descent
>
> - stochastic gradient descent
>
> and test it on the "Wine quality" data.

It is expected that the gradient descent is implemented from scratch. You can check out these slides
`https://courses.cs.washington.edu/courses/cse446/17wi/slides/ridgeregression-annotated.pdf` .

Test different learning rates and try to find the optimal one.

Compare the time to convergence and the results of the two gradient descents you implemented.