

Instituto Superior de Agronomia, ULisboa

Green Data Science

Practical Machine Learning/Aprendizagem Automática Aplicada

Questionnaire #3, March 10, 2023 – One possible resolution

Name: _____

1. Let **preds** be the predicted values and **acts** the actual values of the response variable. Which of the following functions could be used as a loss function? (you can choose more than one)

- `def f(preds, acts): return (torch.abs(preds-acts)).mean()` (X)
- `def f(preds, acts): return (preds-acts).mean()`
- `def f(preds, acts): return ((preds-acts)**2).mean()` (X)
- `def f(preds, acts): return (torch.abs(preds+acts)).mean()`

2. In the following code that implements a gradient descent and updates the weights **abc** of the model, what is called the learning rate?

```
▶ with torch.no_grad():  
    abc -= abc.grad*0.01  
    loss = quad_mae(abc)
```

R: 0.01 is the learning rate, which is used to how large is the variation of the weights when they are updated.

3. When you rely on gradient descent (like in the code above) to update the model weights, are you sure that the loss will decrease in the following iteration? What does this question have to do with the learning rate?

R: If the learning rate is very small, it's more likely that the loss will decrease in the following iteration. When the learning rate is large, gradient descent can move the current set of weights "too far". In either case, there is no absolute guarantee that loss will decrease in the following iteration.

4. Given the definition of the function below, and knowing that **torch.clip(y,0)** returns the maximum between y and 0, write the value of **rectified_linear(1,0,-2)**. Write down your calculations.

```
[ ] def rectified_linear(m,b,x):  
    y = m*x+b  
    return torch.clip(y, 0.)
```

if $m=1$, $b=0$, $x=-2$, then $y=-2$. `torch.clip(-2,0.)` returns 0. Therefore `rectified_linear(1,0,-2)` will be 0.

5. What is called **transfer learning**? (Choose one option below)
- Replace a deep neural network with another with more layers
 - Start training with parameters from another model that does a similar task (X)
 - Do a prediction over a new image with a saved model
 - Deploy your model to a public site so other users can test it