CS4361/5361 Machine Learning
Fall 2020
Logistic Regression
Exercise 2

Add the following functionality to the logistic_regresssion.py class provided:

a. Adaptive learning rate – reduce learning rate when mse has stopped improving
   - It receives the parameters *lr_reduction* and *patience*
   - Multiplies *lr* by *lr_reduction* if the lowest mse obtained has not decreased in *patience* epochs
   - Default values – choose values that will result in no adaptive learning rate
   - Experiment with *lr_reduction = 0.5, patience =3.*

b. Momentum – Compute gradient as a weighted average of the previous gradient estimation and the one obtained using the current batch
   - It receives the parameter *momentum*
   - Gradient = Gradient * momentum + (1-momentum) (gradient_estimate from batch)
   - Default values – choose values that will result in no momentum
   - Experiment with *momentum = 0.9*

c. Label smoothing
   - Changes target values according to formula in slides (α is the label smoothing parameter), since sigmoid function can only reach values of 0 or 1 with weights with infinite magnitude
   - Default values – choose values that will result in no smoothing
   - Suggested default value *label_smoothing = 0.9*

Thus the fit function would look like this:

def fit(self,X,y,batch_size=512,lr=0.1, tol =0.001, max_it = 100, display_period=-1, lr_reduction = ??, patience =??, momentum = ??, label_smoothing = ??)