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Exp 3: logistic regression

Code:

```
import numpy as np
from sklearn.datasets import load_breast_cancer
from sklearn.model_selection import train_test_split

class LogisticRegression:
  def __init__ (self):
    self.params = np.zeros(int(np.random.random()), float)[:,np.newaxis]

  def fit (self, X, y):
    bias = np.ones (len (X))
    X_bias = np.c_[bias, X]
    inner_part = np.transpose (X_bias) @ X_bias
    inverse_part = np.linalg.inv (inner_part)
    outer_part = inverse_part @ np.transpose (X_bias)
    least_square_estimate = outer_part @ y
    self.params = least_square_estimate
    return self.params

  def predict (self, X):
    y_hat = list ()
    bias_testing = np.ones (len (X))
    X_test = np.c_[bias_testing, X]
```

```
        z = X_test @ self.params
        sigmoid = 1 / (1 + np.exp (-z))
        for _ in range (len (sigmoid)):
            if sigmoid[_] >= 0.5:
                y_hat.append (1)
            else:
                y_hat.append (0)
        return sigmoid, y_hat

if __name__ == '__main__':

    dataset = load_breast_cancer ()
    X = dataset.data
    y = dataset.target
    print (X.shape)

    X_train, X_test, y_train, y_test = train_test_split (X, y, test_size=0.1)

    model = LogisticRegression ()
    parameters = model.fit (X_train, y_train)
    # print (parameters)

    sig, y_pred = model.predict (X_test)
    print (f'The predicted outcome is {y_pred} and calculated sigmoid value is {sig}')

    print (f'First value of y_test : {y_test[14]} and first value of y_pred : {y_pred[14]}')
```

```
print (f'The sigmoid probability for the tested value : {sig[14]}')
```

Output:

```
(569, 30)
The predicted outcome is [1, 1, 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1]
and calculated sigmoid value is [0.69409447 0.76048995 0.35800313 0.71977913 0.76038956 0.73763393
 0.66396178 0.41993426 0.47910496 0.55671507 0.66358899 0.47355917
 0.68571722 0.68788005 0.74082321 0.68458336 0.64102051 0.68407462
 0.75530973 0.76547083 0.70818983 0.53506308 0.52882675 0.63945629
 0.56536245 0.7131131  0.58181316 0.68154458 0.74577703 0.7444259
 0.5053433  0.46299957 0.49661769 0.45050064 0.65606225 0.46997518
 0.65818825 0.7688854  0.69273987 0.58132299 0.72097184 0.69627512
 0.74420188 0.45222878 0.7302284  0.75123978 0.69774428 0.7100635
 0.72419814 0.75469149 0.54204581 0.74141832 0.7252615  0.56434339
 0.4889283  0.70264012 0.74297734]
First value of y_test : 1 and first value of y_pred : 1
The sigmoid probability for the tested value : 0.740823206277136
```