

Machine Learning

Logistic Homework 1

Mostafa S. Ibrahim

Teaching, Training and Coaching for more than a decade!

Artificial Intelligence & Computer Vision Researcher

PhD from Simon Fraser University - Canada

Bachelor / MSc from Cairo University - Egypt

Ex-(Software Engineer / ICPC World Finalist)



© 2023 All rights reserved.

Please do not reproduce or redistribute this work without permission from the author

1) Implement your Logistic Regression

- Start from the linear regression code we have in homework 2
 - `1-just-linear-regression/linear_regression_gradient.py`
- Introduce the necessary changes to convert to logistic regression
 - A few code changes
- Train on breast_cancer dataset and Train on breast_cancer dataset and achieve a good accuracy

```
X_train, X_test, y_train, y_test = load_breast_cancer_scaled()
model = LogisticRegression(solver='lbfgs')
model.fit(X_train, y_train)

y_pred_train = model.predict(X_train)
y_pred_test = model.predict(X_test)
y_pred_test_prop = model.predict_proba(X_test)[:, 1]

accuracy_train = accuracy_score(y_train, y_pred_train)
accuracy_test = accuracy_score(y_test, y_pred_test)
```

Training accuracy: 0.9623
Test accuracy: 0.9591

2) Problem #2: Focal loss

- We can improve cross entropy with 2 tricks
 - 1) Add a weight for the positive/negative class (α)
 - 2) Add [focal loss](#) which helps focus on weak examples (γ)
- Both tricks can be improve imbalance issues in datasets
- Read this [article](#) (downloaded also) to learn about both of them
- Use YouTube to learn more about focal loss if you don't get it
- Write a simple function to make this improvement

```
def focal_loss_with_class_weight(y_true, y_pred, alpha=0.25, gamma=2.0):  
    """  
    Compute focal loss for binary classification problem.  
  
    y_true: array-like, true labels; shape should be (n_samples,)  
    y_pred: array-like, predicted probabilities for being in the  
            positive class; shape should be (n_samples,)  
    alpha: float, weight for the positive class to improve further  
    gamma: float, focusing parameter for focal loss
```

“Acquire knowledge and impart it to the people.”

“Seek knowledge from the Cradle to the Grave.”

