

**The Experiment Report of**

***Machine Learning***

**College Software College**

**Subject Software Engineering**

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**1. Topic:Logistic Regression, Linear Classification and Stochastic Gradient Descent**

**2. Time: 2017-12-02**

**3. Reporter:陈星宇**

**4. Purposes:**

（1）Compare and understand the difference between gradient descent and stochastic gradient descent.

（2）Compare and understand the differences and relationships between Logistic regression and linear classification.

（3）Further understand the principles of SVM and practice on larger data.

**5. Data sets and data analysis:**

Experiment uses a9a of LIBSVM Data, including 32561/16281(testing) samples and each sample has 123/123 (testing) features.

1. **Experimental steps:**

**6.1 Logistic Regression and Stochastic Gradient Descent**

1. Load the training set and validation set.

（2） Initialize logistic regression model parameters, you can consider initializing zeros, random numbers or normal distribution.

（3） Select the loss function and calculate its derivation.

（4） Calculate gradient G toward loss function from partial samples.

（5） Update model parameters using different optimized methods(NAG，RMSProp，AdaDelta and Adam).

（6） Select the appropriate threshold, mark the sample whose predict scores greater than the threshold as positive, on the contrary as negative. Predict under validation set and get the different optimized method loss LNAG ，LRMSProp，LAdaDelta and LAdam .

（7） Repeat step 4 to 6 for several times, and drawing graph of LNAG ，LRMSProp，LAdaDelta and LAdam with the number of iterations.

**6.2 Linear Classification and Stochastic Gradient Descent**

（1） Load the training set and validation set.

1. Initialize SVM model parameters, you can consider initializing zeros, random numbers or normal distribution.

（3） Select the loss function and calculate its derivation.

（4） Calculate gradient G toward loss function from partial samples.

（5） Update model parameters using different optimized methods(NAG，RMSProp，AdaDelta and Adam).

（6） Select the appropriate threshold, mark the sample whose predict scores greater than the threshold as positive, on the contrary as negative. Predict under validation set and get the different optimized method loss LNAG ，LRMSProp，LAdaDelta and LAdam .

（7） Repeat step 4 to 6 for several times, and drawing graph of LNAG ，LRMSProp，LAdaDelta and LAdam with the number of iterations.

**7. Code:**

**7.1 Logistic Regression and Stochastic Gradient Descent**

**7.2 Linear Classification and Stochastic Gradient Descent**

**8. The initialization method of model parameters:**

**8.1 Logistic Regression and Stochastic Gradient Descent**

**8.2 Linear Classification and Stochastic Gradient Descent**

1. **The selected loss function and its derivatives:**

**9.1 Logistic Regression and Stochastic Gradient Descent**

**9.2 Linear Classification and Stochastic Gradient Descent**

**10. Experimental results and curve:**

## Hyper-parameter selection:

* **Logistic Regression and Stochastic Gradient Descent**
* **Linear Classification and Stochastic Gradient Descent**

## Predicted Results (Best Results):

* **Logistic Regression and Stochastic Gradient Descent**
* **Linear Classification and Stochastic Gradient Descent**

## Loss curve:

* **Logistic Regression and Stochastic Gradient Descent**
* **Linear Classification and Stochastic Gradient Descent**

1. **Results analysis:**

**10.1 Logistic Regression and Stochastic Gradient Descent**

**10.2 Linear Classification and Stochastic Gradient Descent**

1. **Similarities and differences between logistic regression and linear classification：**

**13. Summary:**