

Softmax

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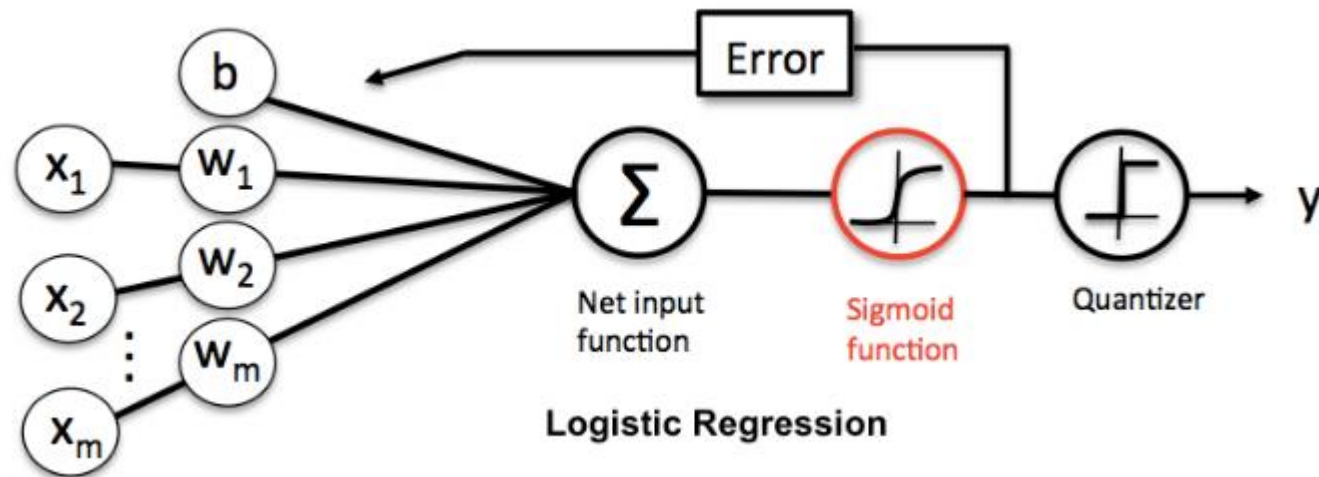
Softmax Regression

- Classification is a large domain in the field of statistics and machine learning. Generally, classification can be broken down into two areas
 - **Binary classification**, where we wish to group an outcome into one of two groups.
 - **Multi-class classification**, where we wish to group an outcome into one of multiple (more than two) groups.

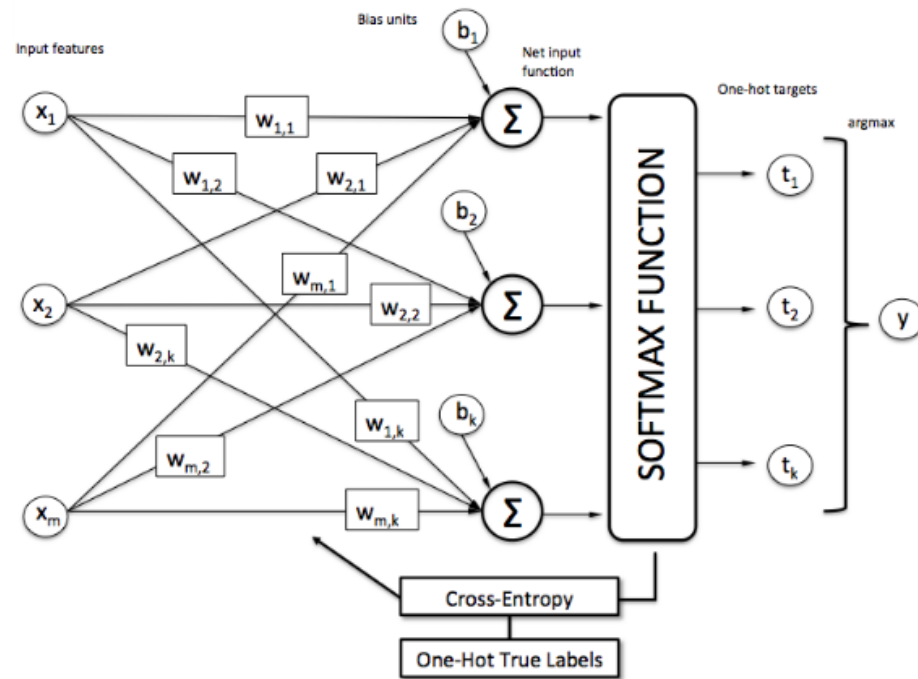
Softmax Regression

- Softmax Regression (synonyms: Multinomial Logistic, Maximum Entropy Classifier, or just Multi-class Logistic Regression) is a generalization of logistic regression that we can use for multi-class classification (under the assumption that the classes are mutually exclusive).
- In contrast, we use the (standard) Logistic Regression model in binary classification tasks.
- Softmax classifiers give you probabilities for each class label.

Softmax Regression



Softmax Regression



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Softmax Regression

Implementing Softmax Regression with Scikit-Learn

- Importing libraries

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

Softmax Regression

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- Importing iris dataset :
 - `from sklearn import datasets`
 - `iris = datasets.load_iris()`
 - `X = iris.data`
 - `y = iris.target`

Softmax Regression

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- **Training the Algorithm**
 - ✓ The fit method of **Softmax Regression** class is called to train the algorithm on the training data, which is passed as a parameter to the fit method.
 - ✓ `from mlxtend.classifier import SoftmaxRegression`
 - ✓ `soft_regressor = SoftmaxRegression()`
 - ✓ `soft_regressor.fit(X_train, y_train)`

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- **Making Predictions**

- ✓ To make predictions, the predict method of the **Softmax Regression** class is used.

- ✓ `y_pred = soft_regressor.predict(X_test)`

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- **Evaluating the Algorithm**

- ✓ Confusion matrix, precision, recall, and F1 measures are the most commonly used metrics for classification tasks.
 - ✓ `from sklearn.metrics import classification_report, confusion_matrix`
 - ✓ `print(confusion_matrix(y_test,y_pred))`
 - ✓ `print(classification_report(y_test,y_pred))`

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- Evaluating the Algorithm

- ✓ The output of the **Softmax Regression** looks like this:

```
##### softmax Regression #####  
[[10  6  0]  
 [ 0 18  0]  
 [ 0 11  0]]
```

	precision	recall	f1-score	support
0	1.00	0.62	0.77	16
1	0.51	1.00	0.68	18
2	0.00	0.00	0.00	11
avg / total	0.56	0.62	0.55	45

The End
