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Department of Artificial Intelligence and Machine Learning

Course Name: 19AMT301- Deep Learning

III Year : VI Semester

Unit I –INTRODUCTION

Topic : Logistic Regression

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Logistic regression

- Logistic Regression is also known as Logit, Maximum-Entropy classifier is a supervised learning method for classification. It establishes a relation between dependent class variables and independent variables using regression.

Types of Logistic Regression

There are two broad categories of Logistic Regression algorithms
1. Binary Logistic Regression when the dependent variable is strictly binary
2. Multinomial Logistic Regression when the dependent variable has multiple categories.

Types of Multinomial Logistic regression

There are two types of Multinomial Logistic Regression
1. Ordered Multinomial Logistic Regression (dependent variable has ordered values)
2. Nominal Multinomial Logistic Regression (dependent variable has unordered categories)

Activation function

$P(y = 1) = \text{Sigmoid}(Z) = 1/(1 + e^{-z})$

$P(y = 0) = 1 - P(y = 1) = 1 - (1/(1 + e^{-z})) = e^{-z}/(1 + e^{-z})$

$y = 1$ if $P(y=1|X) > .5$, else $y = 0$

where the default probability cut off is taken as 0.5.

$$logLoss = \frac{-1}{N} \sum_{i=1}^{N} (y_i(logp_i) + (1 - y_i)log(1 - p_i))$$

This method is also called the Odds Log ratio.

Assumptions:

1. The dependent variable is categorical. Dichotomous for binary logistic regression and multi-label for multi-class classification

2. Attributes and log odds i.e. $\log(p / 1-p)$ should be linearly related to the independent variables

3. Attributes are independent of each other (low or no multicollinearity)

4. In binary logistic regression class of interest is coded with 1 and other class 0

5. In multi-class classification using Multinomial Logistic Regression or OVR scheme, class of interest is coded 1 and rest 0(this is done by the algorithm)

Note: the assumptions of Linear Regression such as homoscedasticity, normal distribution of error terms, a linear relationship between the dependent and independent variables are not required here.

Quiz

1. Which Regression technique assumes that the independent variables should be categorical?
a.   Linear Regression
b.   Polynomial Regression
c.   Logistic Regression
d.   LDA

Quiz

2. (1/1-e^-z) is a
a. Sine function
b. Threshold function
c. Sigmoid function
d. Ramp function

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Quiz

3. If P(y)=1, 1-P(x)=

a. 0

b. 1

c. infinity

d.   cannot be determined

THANK YOU !!!

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