LETTER TO EDITOR CODEN: AAJMBG

Linear and logistic regression: A medical perspective

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Dear Editor:

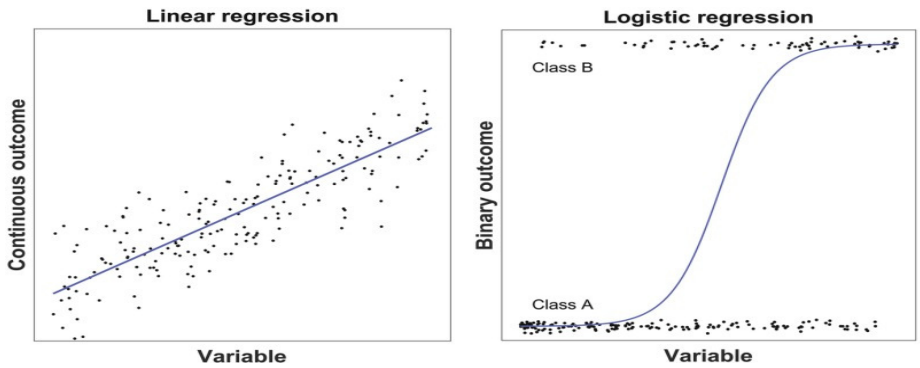
Logistic regression as the standard tool for extending the concepts of linear regression to binary outcomes. Binary outcomes have two states, such as death (dead or alive) or allergic reaction (present or absent), in contrast to continuous variables, like blood pressure or glucose levels, which lie on a continuum of possible values. Logistic regression concepts such as odds, odds ratio, logit transformation, logistic curve, assumption, selecting dependent and independent variables, model fitting, reporting and interpreting were presented [1]. Logistic Regression is used when the research method is focused on whether or not an event occurred, rather than when it occurred (time course information is not used) [2]. It is particularly appropriate for models involving disease state (diseased or healthy) and decision making (yes or no), and therefore is widely used in studies in the health sciences. One drawback to log-linear models is that unlike logistic regression models, they cannot be used to model the effect of a continuous predictor without breaking the predictor into categories.

Scrutinizing Linear and Logistic Regression:

Regression and classification problems are solved in different ways by linear models called logistic and linear, respectively. To categorise events as binary or multiclass outcomes (i.e., yes/no or true/false), logistic regression uses a sigmoid function, whereas linear regression uses a linear approach [3]. Logistic and linear regressions have different cost functions. The cost function for logistic regression is the negative log-likelihood, whereas the cost function for linear regression is the sum of squared errors [4].

Additionally, while logistic regression coefficients are learnt using the maximum likelihood approach, linear regression coefficients are learned using the least-squares method [5]. Different assessment metrics are used to compare linear and logistic regressions. While logistic regressions are assessed using accuracy and AUC -ROC Curve for linear regressions and RMSE and R-square. Linear and Logistic regression in Healthcare sector: Fig1 Linear regression shows that there is a positive correlation between the two continuous variables and the Logistic regression shows that there is a correlation between binary outcome and the continuous variable.

Fig-1: Scatter plot for Linear and Logistic Regression



Some Examples of Linear Regression

- Predicting the weight of an adult based on the mother's and father's weight.
- Predicting the tomato sales volume based on the price, time of year and store location.
- Predicting the price of train ticket based on origin, destination, time of year and type of train.
- Predicting the hospital length of stay based on the diagnosis and medical condition.

Some Examples of Logistic Regression:

- Predicting if a person with thyroid based on BMI, working shift and genetic predisposition.
- Predicting the heart attack based on the number of cigarette per day, BMI and family history.
- Predicting the price of train ticket based on origin, destination, time of year and type of train.

Benefits of Regression Analysis:

1. It provides a functional relationship between two or more related variables
2. Assist in prediction and forecasting
3. Increase operational efficiency
4. Assist us to making decisions
5. Analyzing data and resolving errors
6. Discovering new possibilities.

Limitations of Regression Analysis:

1. It is assumed that the cause and effect relationship between the variables remains unchanged. This assumption may not always hold good and may lead to misleading results.
2. It involves very lengthy and complicated procedure of calculations and analysis
3. It cannot be used in case of qualitative phenomenon viz. honesty, crime et

Conclusion

For continuous and dichotomous outcomes, respectively, linear and logistic regression are helpful tools for understanding the relationship between predictor/explanatory and outcome variables that can be used in clinical practise, such as for comprehending potential risk factors related to a medical condition of attention.

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