What are the three types of logistic regression and can you provide examples for each type?

Authored by

stats writer

May 5, 2024

Logistic regression is a statistical modeling technique used to predict the probability of a binary outcome based on one or more independent variables. There are three main types of logistic regression: binary, multinomial, and ordinal.

Binary logistic regression is used when the dependent variable has only two possible outcomes, such as yes or no, true or false, or success or failure. An example of this type of logistic regression could be predicting whether a student will pass or fail a test based on their study habits and previous grades.

Multinomial logistic regression is used when the dependent variable has more than two categories that are not ordered, such as different types of diseases or political affiliations. An example of this type of logistic regression could be predicting which type of cancer a patient has based on their age, gender, and lifestyle factors.

Ordinal logistic regression is used when the dependent variable has more than two ordered categories, such as levels of satisfaction or income brackets. An example of this type of logistic regression could be predicting the level of customer satisfaction based on their age, gender, and buying behavior.

In summary, logistic regression is a versatile tool with different types that can be applied in various scenarios to predict the likelihood of a binary or categorical outcome.

The 3 Types of Logistic Regression (Including Examples)

Logistic regression refers to any regression model in which the is categorical.

There are three types of logistic regression models:

Binary logistic regression: The response variable can only belong to one of two categories.Multinomial logistic regression: The response variable can belong to one of three or more categories and there is no

natural ordering among the categories.Ordinal logistic regression: The response variable can belong to one of three or more categories and there *is* a natural ordering among the categories.

The following table summarizes these differences:

Types of Logistic Regression Models

	Binomial Logistic Regression	Multinomial Logistic Regression	Ordinal Logistic Regression
Number of Categories for Response Variable	2	3 or more	3 or more
Does Order of Categories Matter?	No	No	Yes

This tutorial provides a brief explanation of each type of logistic regression model along with examples of each.

Type #1: Binary Logistic Regression

Binary logistic regression models are a type of logistic regression in which the response variable can only belong to two categories.

Here are a couple examples:

Example 1: NBA Draft

Suppose a sports data scientist wants to use the predictor variables (1) points, (2) rebounds, and (3) assists to predict the probability that a given college basketball player gets drafted into the NBA.

Since there are only two possible outcomes (drafted or not drafted) for the response variable, the data scientist would use a binomial logistic regression model.

Example 2: Spam Detection

Suppose a business wants to use the predictor variables (1) word count and (2) country of origin to predict the probability that a given email is spam.

Since there are only two possible outcomes (spam or not spam) for the response variable, the business would use a binomial logistic regression model.

Type #2: Multinomial Logistic Regression

Multinomial logistic regression models are a type of logistic regression in which the response variable can belong to one of three or more categories and there is no natural ordering among the categories.

Example 1: Political Preference

Suppose a political scientist wants to use the predictor variables (1) annual income and (2) years of education to predict the probability that an individual will vote for one of four different presidential candidates.

Since there are more than two possible outcomes (there are four potential candidates) for the response variable and there is no natural ordering among the outcomes, the political scientist would use a multinomial logistic regression model.

Example 2: Sports Preference

Suppose a sports analyst wants to use the predictor variables (1) TV hours viewed per week and (2) age to predict the probability that an individual will pick either basketball, football, or baseball as their preferred sport.

Since there are more than two possible outcomes (there are three sports) for the response variable, the sports analyst would use a multinomial logistic regression model.

Type #3: Ordinal Logistic Regression

Ordinal logistic regression models are a type of logistic regression in which the response variable can belong to one of three or more categories and there *is* a natural ordering among the categories.

Here are a couple examples:

Example 1: School Ratings

Suppose an academic advisor wants to use the predictor variables (1) GPA, (2) ACT score, and (3) SAT score to predict the probability that an individual will get into a university that can be categorized into "bad", "mediocre", "good", or "great."

Since there are more than two possible outcomes (there are four classifications of school quality) for the response variable and there *is* a natural ordering among the outcomes, the academic advisor would use an ordinal logistic regression model.

Example 2: Movie Ratings

Suppose a movie critic wants to use the predictor

variables (1) total run time and (2) genre to predict the probability that a given movie will receiving a rating between 1 and 10.

Since there are more than two possible outcomes (there are 10 possible ratings) for the response variable and there *is* a natural ordering among the outcomes, the movie critic would use an ordinal logistic regression model.

The following tutorials provide more details on logistic regression models: