

# Glossary

## Advanced Data Analytics

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## Terms and definitions from Course 5

### A

**Absolute values:** (Refer to **observed values**)

**Accuracy:** The proportion of data points that were correctly categorized

**Adjusted  $R^2$ :** A variation of  $R^2$  that accounts for having multiple independent variables present in a linear regression model

**Analysis of Variance (ANOVA):** A group of statistical techniques that test the difference of means between three or more groups

**ANCOVA (Analysis of Covariance):** A statistical technique that tests the difference of means between three or more groups while controlling for the effects of covariates, or variable(s) irrelevant to the test

### B

**Backward elimination:** A stepwise variable selection process that begins with the full model, with all possible independent variables, and removes the independent variable that adds the least explanatory power to the model

**Best fit line:** The line that fits the data best by minimizing some loss function or error

**Bias:** Simplifying the model predictions by making assumptions about the variable relationships

**Bias-variance trade-off:** Balance between two model qualities, bias and variance, to minimize overall error for unobserved data

**Binomial logistic regression:** A technique that models the probability of an observation falling into one of two categories, based on one or more independent variables

**Binomial logistic regression linearity assumption:** An assumption stating that there should be a linear relationship between each X variable and the logit of the probability that Y equals one

## C

**Causation:** Describes a cause-and-effect relationship where one variable directly causes the other to change in a particular way

**Chi-squared ( $\chi^2$ ) Goodness of Fit Test:** A hypothesis test that determines whether an observed categorical variable follows an expected distribution

**Chi-squared ( $\chi^2$ ) Test for Independence:** A hypothesis test that determines whether or not two categorical variables are associated with each other

**Confidence band:** The area surrounding a line that describes the uncertainty around the predicted outcome at every value of X

**Confusion matrix:** A graphical representation of how accurate a classifier is at predicting the labels for a categorical variable

**Confidence interval:** A range of values that describes the uncertainty surrounding an estimate

**Correlation:** Measures the way two variables tend to change together

## D

**Dependent variable (Y):** The variable a given model estimates

## E

**Errors:** In a regression model, the natural noise assumed to be in a model

**Explanatory variable:** (Refer to **independent variable**)

**Extra Sum of Squares F-test:** A test that quantifies the difference between the amount of variance that is left unexplained by a reduced model that is explained by the full model

## F

**Feature selection:** (Refer to **variable selection**)

**Forward selection:** A stepwise variable selection process that begins with the null model—with 0 independent variables—considers all possible variables to add; incorporates the independent variable that contributes the most explanatory power to the model

## H

**Hold-out sample:** A random sample of observed data that is not used to fit the model

**Homoscedasticity assumption:** An assumption of simple linear regression stating that the variation of the residuals (errors) is constant or similar across the model

**Hypothesis testing:** A statistical procedure that uses sample data to evaluate an assumption about a population parameter

## I

**Independent observation assumption:** An assumption of simple linear regression stating that each observation in the dataset is independent

**Independent variable (X):** The variable whose trends are associated with the dependent variable

**Interaction term:** The term that represents how the relationship between two independent variables is associated with changes in the mean of the dependent variable

**Intercept (constant  $B_0$ ):** The y value of the point on the regression line where it intersects with the y-axis

## L

**Likelihood:** The probability of observing the actual data, given some set of beta parameters

**Line:** A collection of an infinite number of points extending in two opposite directions

**Linearity assumption:** An assumption of simple linear regression stating that each predictor variable ( $X_i$ ) is linearly related to the outcome variable (Y)

**Linear regression:** A technique that estimates the linear relationship between a continuous dependent variable and one or more independent variables

**Link function:** A nonlinear function that connects or links the dependent variable to the independent variables mathematically

**Logistic regression:** A technique that models a categorical dependent variable (Y) based on one or more independent variables (X)

**Loss function:** A function that measures the distance between the observed values and the model's estimated values

**Logit:** The logarithm of the odds of a given probability

**Log-Odds function:** (Refer to **logit**)

## M

**MAE (Mean Absolute Error):** The average of the absolute difference between the predicted and actual values

**MANCOVA (Multivariate Analysis of Covariance):** An extension of ANCOVA and MANOVA that compares how two or more continuous outcome variables vary according to categorical independent variables, while controlling for covariates

**MANOVA (Multivariate Analysis of Variance):** An extension of ANOVA that compares how two or more continuous outcome variables vary according to categorical independent variables

**Maximum Likelihood Estimation (MLE):** A technique for estimating the beta parameters that maximize the likelihood of the model producing the observed data

**Model assumptions:** Statements about the data that must be true in order to justify the use of a particular modeling technique

**MSE (Mean Squared Error):** The average of the squared difference between the predicted and actual values

**Multiple linear regression:** A technique that estimates the relationship between one continuous dependent variable and two or more independent variables

**Multiple regression:** (Refer to **multiple linear regression**)

## N

**Negative correlation:** An inverse relationship between two variables, where when one variable increases, the other variable tends to decrease, and vice versa

**Normality assumption:** An assumption of simple linear regression stating that the residuals are normally distributed

**No multicollinearity assumption:** An assumption of simple linear regression stating that no two independent variables ( $X_i$  and  $X_j$ ) can be highly correlated with each other

## O

**Observed values:** The existing sample of data, where each data point in the sample is represented by an observed value of the dependent variable and an observed value of the independent variable

**One hot encoding:** A data transformation technique that turns one categorical variable into several binary variables

**One-Way ANOVA:** A type of statistical testing that compares the means of one continuous dependent variable based on three or more groups of one categorical variable

**Ordinary least squares estimation (OLS):** A common way to calculate linear regression coefficients

**Outcome variable (Y):** (Refer to **dependent variable**)

**Overfitting:** When a model fits the observed or training data too specifically and is unable to generate suitable estimates for the general population

## P

**P-value:** The probability of observing results as extreme as those observed when the null hypothesis is true

**Positive correlation:** A relationship between two variables that tend to increase or decrease together

**Post hoc test:** An ANOVA test that performs a pairwise comparison between all available groups while controlling for the error rate

**Precision:** The proportion of positive predictions that were true positives

**Predicted values:** The estimated Y values for each X calculated by a model

**Predictor variable:** (Refer to **independent variable**)

## R

**$R^2$  (The Coefficient of Determination):** The coefficient that measures the proportion of variation in the dependent variable, Y, explained by the independent variable(s), X

**Recall:** The proportion of positives the model was able to identify correctly

**Regression analysis:** A group of statistical techniques that use existing data to estimate the relationships between a single dependent variable and one or more independent variables

**Regression coefficient:** The estimated betas in a regression model

**Regression models:** (Refer to **regression analysis**)

**Regularization:** A set of regression techniques that shrinks regression coefficient estimates towards zero, adding in bias, to reduce variance

**Residual:** The difference between observed or actual values and the predicted values of the regression line

**Response variable:** (Refer to **dependent variable**)

## S

**Scatterplot matrix:** A series of scatterplots that show the relationships between pairs of variables

**Simple linear regression:** A technique that estimates the linear relationship between one independent variable,  $X$ , and one continuous dependent variable,  $Y$

**Slope:** The amount that  $y$  increases or decreases per one-unit increase of  $x$

**Sum of squared residuals (SSR):** The sum of the squared difference between each observed value and its associated predicted value

## T

**Two-Way ANOVA:** A type of statistical testing that compares the means of one continuous dependent variable based on three or more groups of two categorical variables

## V

**Variable selection:** The process of determining which variables or features to include in a given model

**Variance:** Model flexibility and complexity, so the model learns from existing data

**Variance inflation factors (VIF):** Factors that quantify how correlated each independent variable is with all of the other independent variables