1. **Applications:**

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| --- | --- | --- |
| **Features** | **Linear Regression** | **Logistic Regression** |
| **Definition** | In simple, we predict scores on one variable from the scores on a second variable. The variable we are predicting is called the criterion variable and is referred to as Y. The variable we are basing our predictions on is called the predictor variable and is referred to as X. The predictions of Y when plotted as a function of X form a straight line. Linear regression consists of finding the best-fitting straight line through the points. The best-fitting line is called a regression line. | It is a suitable regression analysis to conduct when the dependent variable is dichotomous or binary.  Like all regression analyses, logistic regression is a predictive analysis.  It’s used to describe data and to explain the relationship between one dependent binary variable and one or more nominal, ordinal, interval, or ratio-level independent variables |
| **Applications** | It involves all the use cases where continuous values need to be predicted.  **Examples:**   * Weather/ Rainfall Prediction * Real-estate Value Prediction * Stock Market Prediction | It involves all the use cases where the data needs to be classified into different categories.  **Examples:**   * Fraud Detection * Email Spam * Object Detection |
| **Challenges** | * Omitted Variables * Reverse Causality * Mismeasurement * Assumptions and Testing * Residual Plots Checking | * Choosing the right predictor variables * Avoiding the use of highly correlated variables * Risk Analysis * Assumptions on the relationship between input and output variables |

1. **Support Vector Machines (SVM’s):**

The SVM model is a supervised machine learning model that is mainly used for classifications (but it could also be used for regression!). It learns how to separate different groups by forming decision boundaries. Support vector classification is based on a very natural way that one might attempt to classify data points into various target classes. If the classes in our training data can be separated by a line or some boundary, then we can just classify the data depending on what side of this decision boundary the data lies on.

**Kernel Trick:**

It allows us to operate in the original feature space without computing the coordinates of the data in a higher-dimensional space. It represents the data only through a set of pairwise similarity comparisons between the original data observations x, instead of explicitly applying the transformations ϕ(x) and representing the data by these transformed coordinates in the higher-dimensional feature space.

**Importance of the Kernel Trick in SVM’s:**

In essence, what the kernel trick does for us is to offer a more efficient and less expensive way to transform data into higher dimensions. With that saying, the application of the kernel trick is not limited to the SVM algorithm. Any computations involving the dot products (x, y) can utilize the kernel trick.

**Kernel Functions:**

1. Polynomial Kernel
2. Gaussian Radial Basis Function
3. Sigmoid
4. Linear Kernel
5. Gaussian Kernel

**References:**

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