1. State any four business applications of machine learning

The four applications of machine learning are as follows

1. **Email Spam and Filtering**

There are a number of spam filtering approaches that email clients use. To ascertain that these spam filters are continuously updated, they are powered by machine learning.

1. **Online Customer Support**

A number of websites nowadays offer the option to chat with customer support representative while they are navigating within the site. However, not every website has a live executive to answer your queries. In most of the cases, it is a chatbot. These bots tend to extract information from the website and present it to the customers.

1. **Online Fraud Detection**

Machine learning is proving its potential to make cyberspace a secure place and tracking monetary frauds online is one of its examples. For example: Paypal is using ML for protection against money laundering.

1. **Entertainment**

A familiar application of AI in everyday life is seen with services like Netflix or Amazon, wherein ML algorithms analyze the user’s activity and compare it with that of other users to determine which shows or products to recommend.

1. **Difference between supervised and un supervised learning with examples as below**

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| --- | --- | --- |
| SNO | **Supervised Learning** | **Unsupervised Learning** |
| 1 | Input variables and output variables will be given | Only input data will be given |
| 2 | Supervised learning goal is to determine the function so well that new input data set given, can predict  ***Supervised Learning:*** Fit a model that relates response to the feature tuples, with the aim of accurately predicting the response for future observation or better understanding the relationship between response and features. | Unsupervised learning goal is to model the hidden patterns  ***Unsupervised Learning:*** To discover groups of similar examples within the data set |
| 3 | **Examples:**  Classification  Regression  Linear regression  **Case in point Examples:**  Employability Prediction  Email Spam Prediction | **Examples:**  Clustering  Association  k-means  Association  **Case in point Examples:**  Feature tuple: (Zip Code, Family Income, # of visits in a month, Average Money spent in a month) |
| 4 | Used for export systems in image recognition, forecasting, financial analysis and training neural networks and decision trees etc | Unsupervised learning algorithms are used to preprocess the data during exploratory analysis or to pre train supervised learning algorithms |

1. **Key Differences Between Classification and Regression with examples as follows.**

The Classification process models a function through which the data is predicted in discrete class labels. The key in classification is discrete sets in the Classification

Classification problems are supervised Learning problems where target/response variables take only discrete (finite/countable) values.

**Classification predicts unordered data while regression predicts ordered data.**

Examples:

* Employability Prediction
* Email Spam Prediction
* Patient having Malaria Prediction
* US Visa or Visa of any country Prediction

On the other hand, regression is the process of creating a model which predict continuous quantity.

***Regression*** problems are supervised learning problems where target / response is a continuous variable (or equivalently can take any real number).

Regression can be evaluated using root mean square error. On the contrary, classification is evaluated by measuring accuracy.

Examples:

* Predicting a house property price
* Predicting a stock price
* Predicting annual performance numbers of a Company
* Predicting Sales of a Product
* Predicting Weather

1. Difference between Linear Regression and Polynomial Regression

**Linear Regression**

Linear regression is a linear approach to modeling the relationship between a scalar response (or dependent variable) and one or more explanatory variables (or independent variables). The case of one explanatory variable is called simple linear regression.

Y(predicted) = (w1\*x + wo) + Error value

Here, the w1 it’s are the parameters (also called weights) wo is the y-intercept and Єi is the random error term whose role is to add bias. The above equation is the linear equation that needs to be obtained with the minimum error.

**Polynomial regression**

Polynomial regression is a form of regression analysis in which the relationship between the independent variable x and the dependent variable y is modelled as an nth degree polynomial in x

This is the general equation of a polynomial regression is:

Y=wo + w₁X + w₂X² + … + wₘXᵐ + residual error

3. Business Context for question 3 is as follows

Interpreting from the Coefficient that is obtained which is 1.42.

For Event Unit of Change in Percentage of Poverty the change to the Birth rate for 15 to 17 year old females is about 1.42 %. That means it is a generally a linear relationship on average with a positive co –efficient.

Interpreting from the Intercept value

The interpretation of the intercept (value=3.96) is that if there were states with poverty rate = 0, the predicted average for the 15 to 17 year old birth rate would be 3.96 for those states. Since there are no states with poverty rate = 0 this interpretation of the intercept is not practically meaningful for this example.

In the graph with a regression line present, we also see the information that *s* =6.097 and *r*2 = 48.7%.

* The value of *s* tells us roughly the standard deviation of the differences between the y-values of individual observations and predictions of y based on the regression line.
* The value of *r*2 can be interpreted to mean that poverty rates "explain" 48.7% of the observed variation in the 15 to 17 year old average birth rates of the states

The root mean squared error is about 6.97 is more than 10% of percentages of all the 15 to 17 year old birth rates mean value of 22.28. This means that the algorithm is not very perfect but can make decent predictions.