



## DAY 10

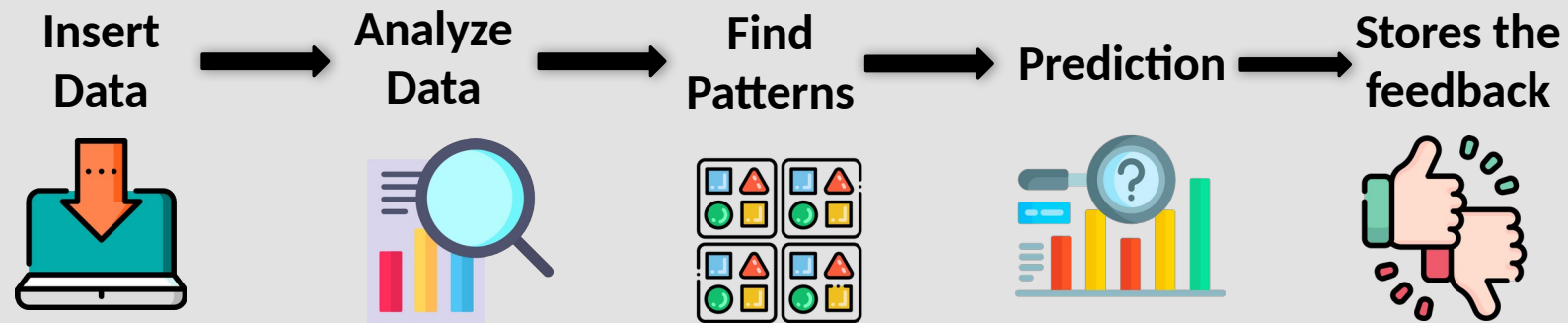
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# HOW DOES ML WORK?



<https://data-flair.training/blogs/machine-learning-tutorial/>

# DEEP LEARNING

- Deep Learning is the most exciting and powerful branch of Machine Learning.
- Teaches computers to do what comes naturally to humans: learn by example.
- Deep learning is a key technology behind driverless cars, enabling them to recognize a stop sign or to distinguish a pedestrian from a lamppost. It is the key to voice control in consumer devices like phones, tablets, TVs, and hands-free speakers.
- In deep learning, a computer model learns to perform classification tasks directly from images, text, or sound.
- Deep learning models can achieve state-of-the-art accuracy, sometimes exceeding human-level performance. Models are trained by using a **large set of labeled data** and **neural network architectures** that contain many layers.

# INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS

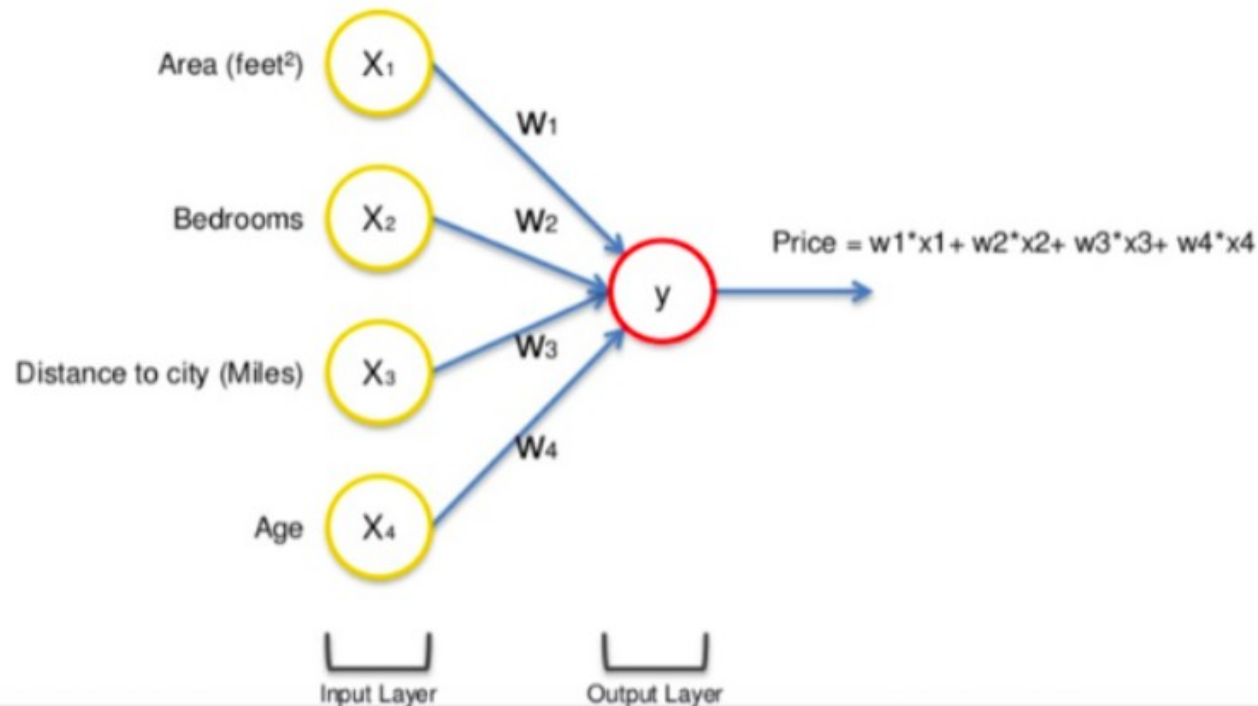
- Deep Learning models can be used for a variety of complex tasks:
  1. Artificial Neural Networks(ANN) for Regression and classification
  2. Convolutional Neural Networks(CNN) for Computer Vision
  3. Recurrent Neural Networks(RNN) for Time Series analysis
  4. Self-organizing maps for Feature extraction
  5. Deep Boltzmann machines for Recommendation systems
  6. Auto Encoders for Recommendation systems

# INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS

- **“Artificial Neural Networks or ANN is an information processing paradigm that is inspired by the way the biological nervous system such as brain process information. It is composed of large number of highly interconnected processing elements(neurons) working in unison to solve a specific problem.”**

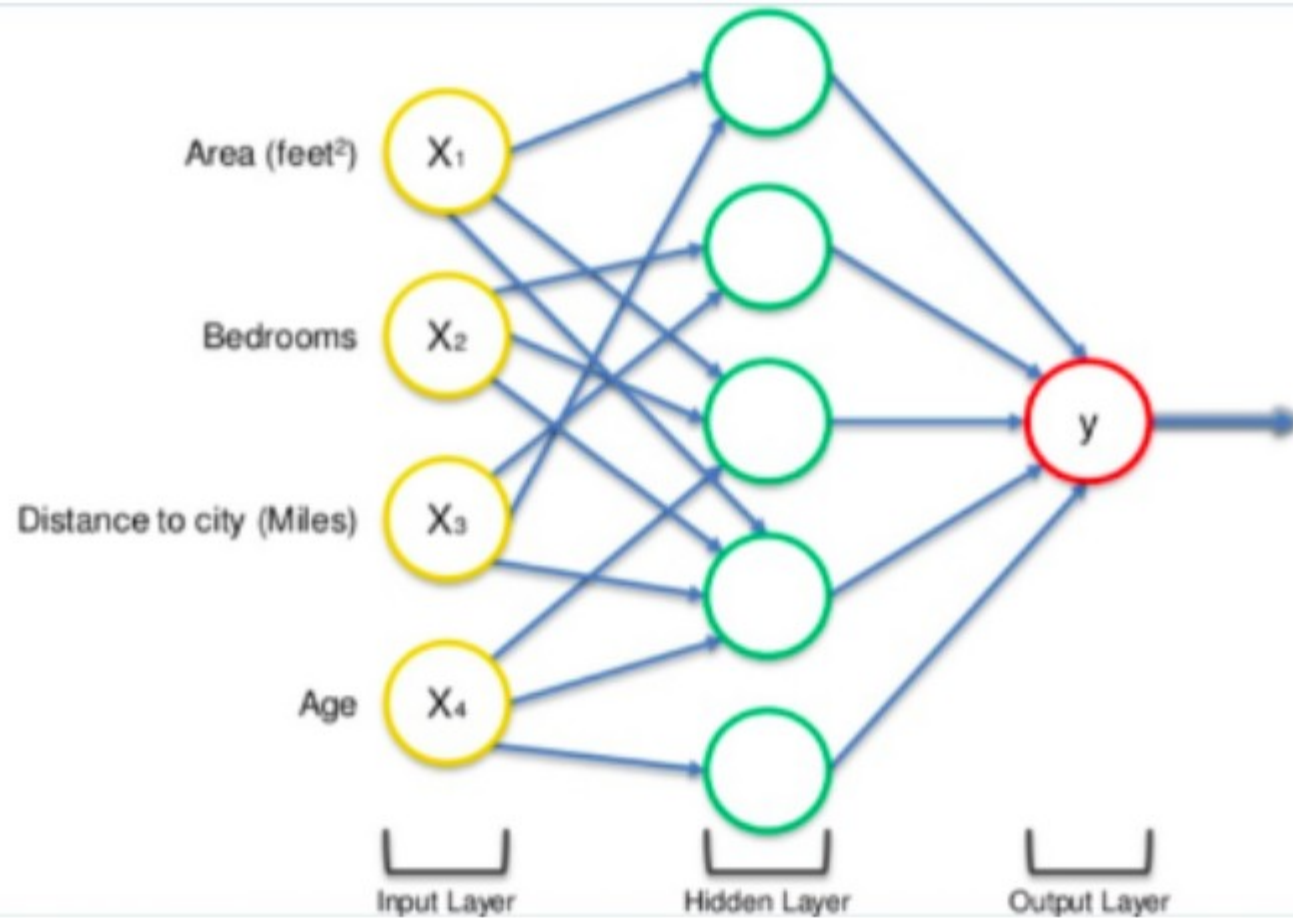
## HOW DOES THE NEURAL NETWORK WORK?

- Let us take the example of the price of a property and to start with we have different factors assembled in a single row of data: Area, Bedroom





# HIDDEN LAYER

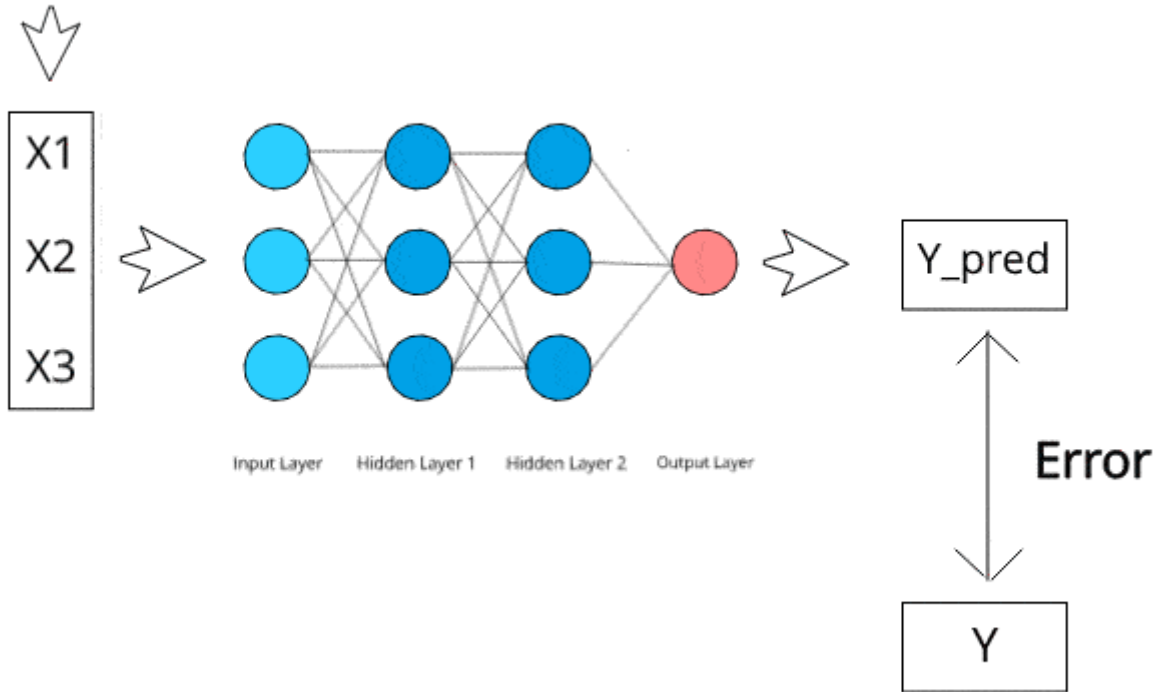


## HOW DO NEURAL NETWORKS LEARN?

- Based on the difference between the actual value and the predicted value, an error value also called **Cost Function** is computed and sent back through the system.
- ***Cost Function: One half of the squared difference between actual and output value.***
- For each layer of the network, the cost function is analyzed and used to adjust the threshold and weights for the next input. Our aim is to minimize the cost function. The lower the cost function, the closer the actual value to the predicted value. In this way, the error keeps becoming marginally lesser in each run as the network learns how to analyze values.



Feed new data



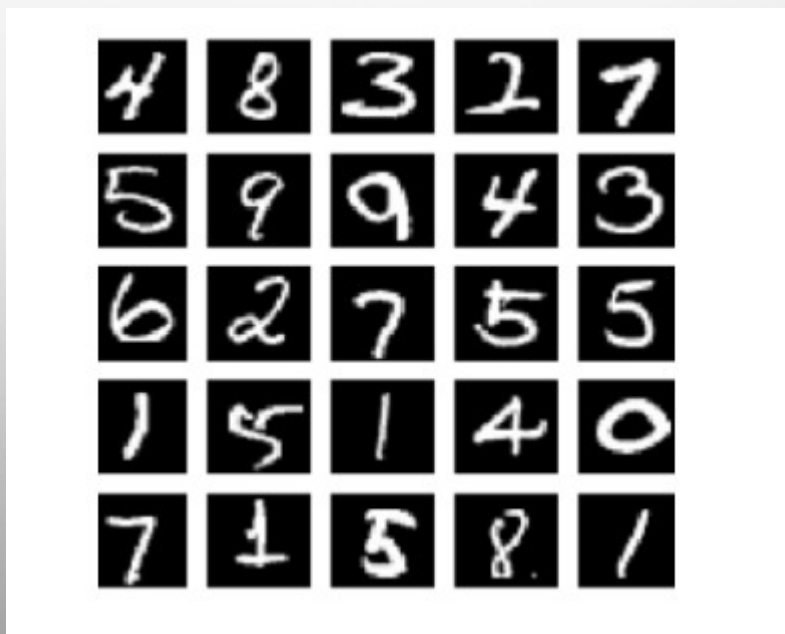
• <https://www.kdnuggets.com/2019/10/introduction-artificial-neural-networks.html>

# SCIKITLEARN - MLPCLASSIFIER, MLPREGRESSOR

- MLPRegressor trains iteratively since at each time step the partial derivatives of the loss function with respect to the model parameters are computed to update the parameters
- MLPClassifier stands for **Multi-layer Perceptron classifier** which in the name itself connects to a Neural Network. Unlike other classification algorithms such as Support Vectors or Naive Bayes Classifier, MLPClassifier relies on an underlying Neural Network to perform the task of classification

## DATASET MNIST

- The **National Institute of Standards and Technology** dataset, or MNIST, is considered as the Hello World! Deep Learning datasets.
- MNIST is a collection of digits ranging from 0 to 9. It has a training set of 60,000 images and 10,000 tests classified into categories



# WHAT IS MNIST DATASET?

- The MNIST database (Modified National Institute of Standards and Technology database) is a large database of handwritten digits that is commonly used for training various image processing systems. The database is also widely used for training and testing in the field of machine learning.
- It was created by "re-mixing" the samples from NIST's original datasets. The creators felt that since NIST's training dataset was taken from American Census Bureau employees, while the testing dataset was taken from American high school students, it was not well-suited for machine learning experiments. Furthermore, the black and white images from NIST were normalized to fit into a 28x28 pixel **bounding box** and anti-aliased, which introduced grayscale levels.

# WHAT IS MNIST DATASET?

label = 5



label = 0



label = 4



label = 1



label = 9



label = 2



label = 1



label = 3



label = 1



label = 4



label = 3



label = 5



label = 3



label = 6



label = 1



A decorative graphic consisting of blue lines and circles, resembling a circuit board or neural network connections, is positioned along the left and right edges of the slide.

## TOP DEEP LEARNING LIBRARIES

- Keras
  - Developed by Francois Chollet
  - The open-source library is written in Python
- TensorFlow
  - Developed by Google Brain Team
  - Written in C++, Python, and CUDA



# CONVOLUTIONAL NEURAL NETWORKS

- In deep learning, a convolutional neural network is a class of artificial neural network, most commonly applied to analyze visual imagery

# RNN

- Recurrent neural networks (RNN) are **a class of neural networks that are helpful in modeling sequence data**. Derived from feedforward networks, RNNs exhibit similar behavior to how human brains function. Simply put: recurrent neural networks produce predictive results in sequential data that other algorithms can'