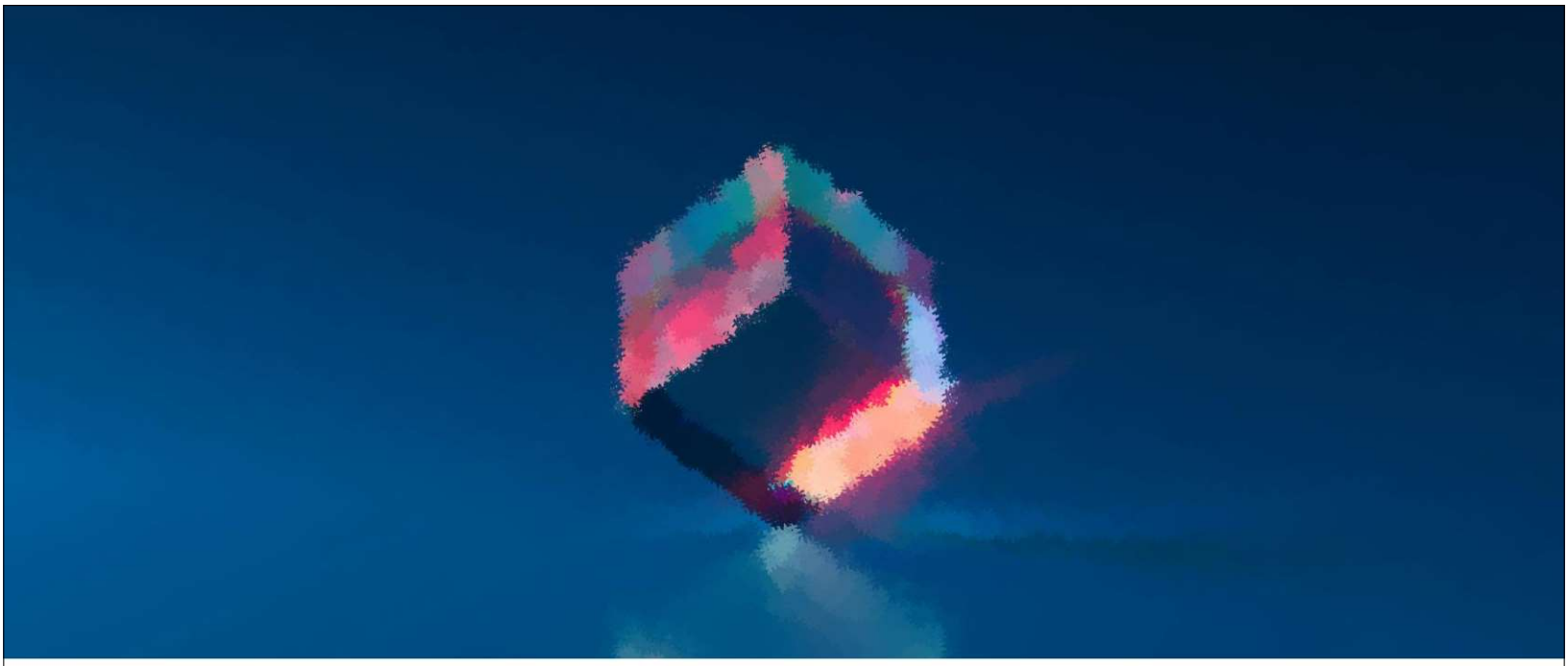


Introduction to Deep Learning

Course Instructor: Dr. M. Umair
Topic: Introduction

Agenda

1. Instructor's Introduction
2. Class Introduction
3. Course Outline Discussion
4. Introduction to Deep Learning
5. Applications of Deep Learning

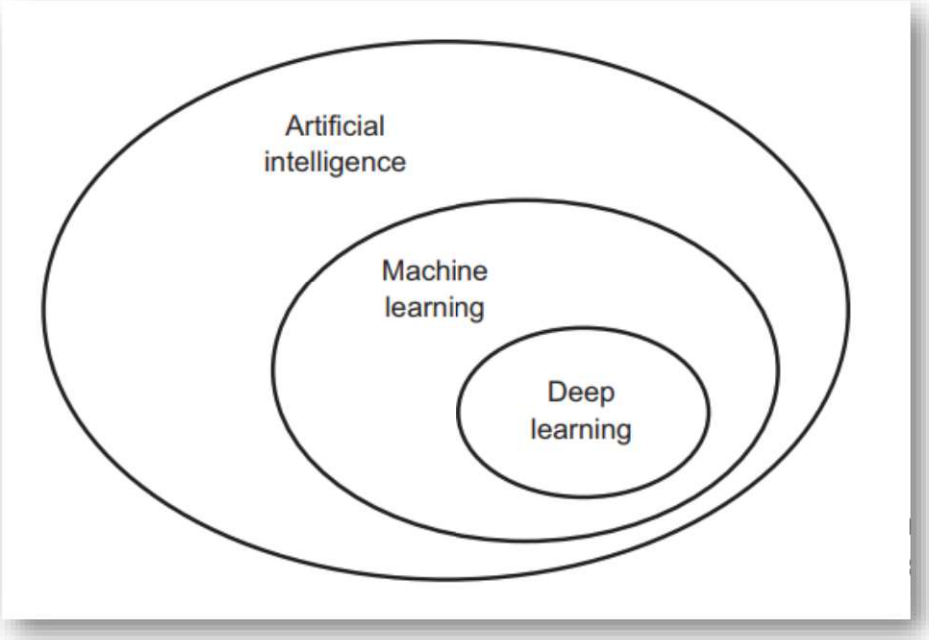
Introduction to Deep Learning

Introduction to Deep Learning

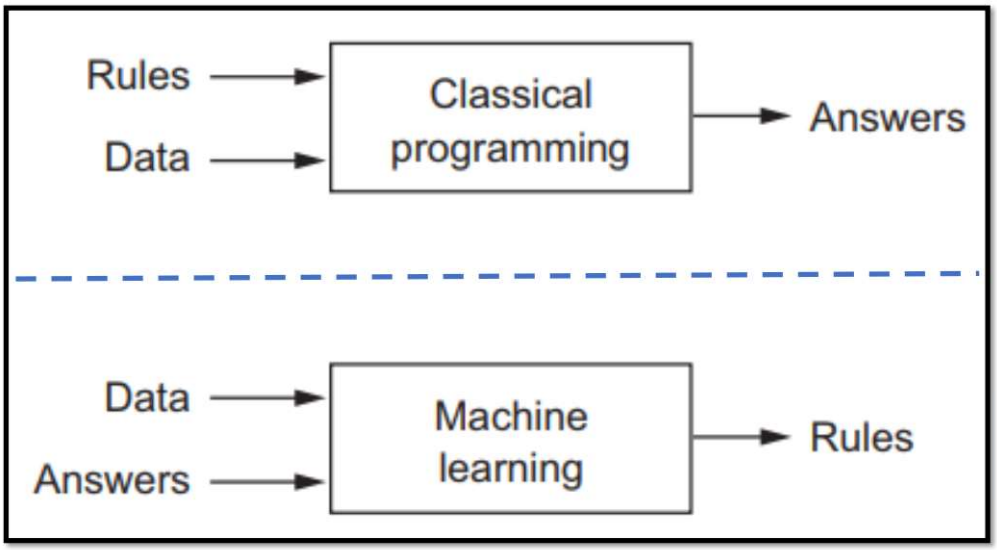
Artificial Intelligence

- **Artificial Intelligence** (AI) refers to a field of computer science dedicated to the creation of *systems performing tasks that usually require human intelligence.*
- In AI, machines complete the task based on the stipulated rules and algorithms.
- AI is an umbrella term for any computer program that has the touch of human intelligence and encompasses **machine learning** (ML) and **deep learning** (DL).

AI, ML, and DL



Machine Learning



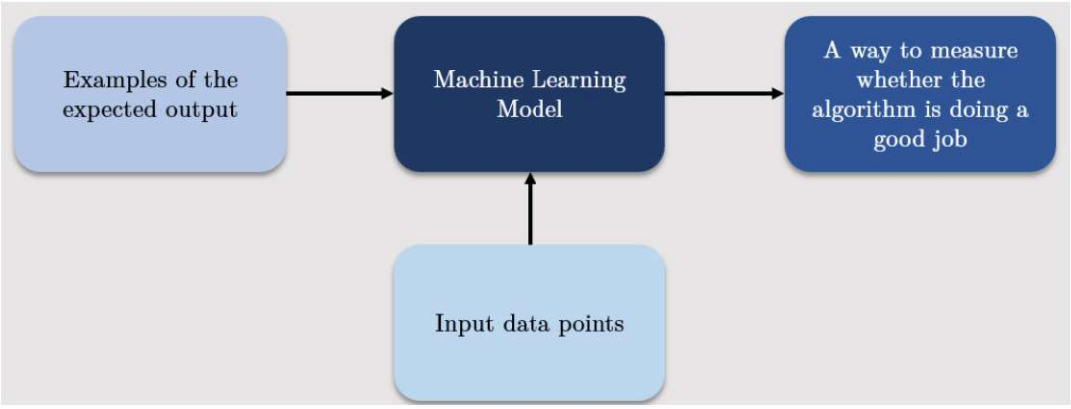
A machine-learning system is trained rather than explicitly programmed.

Machine Learning

- **Machine Learning** (ML) is a subset of AI, which includes all the approaches that allow machines to *learn from data without being explicitly programmed.*
- The intention of ML is to *train machines based on the provided data and algorithms.*
- Using the *processed data* and information, the machines learn *how to make decisions.*

Introduction to Deep Learning

Machine Learning



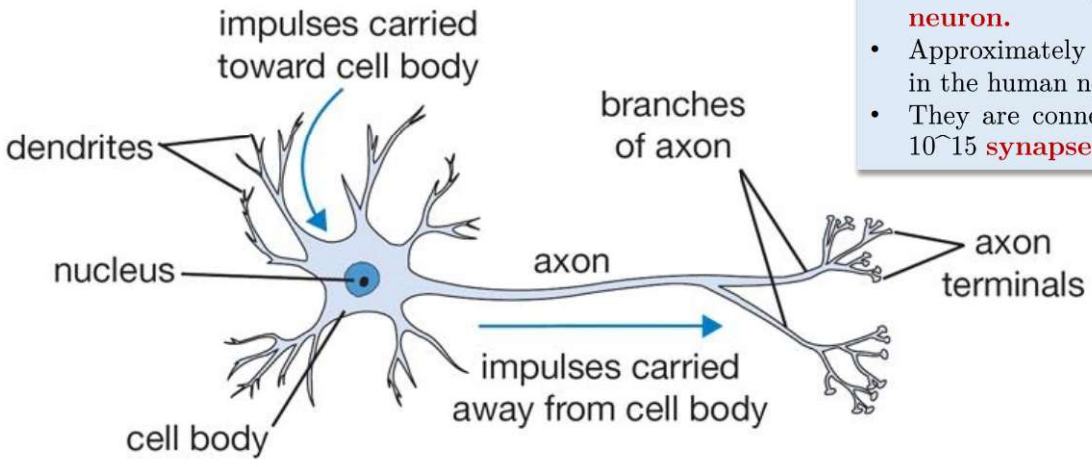
Deep Learning

- **DEEP LEARNING** (DL) is a subset of ML.
- It incorporates computational models and algorithms that *imitate* the *architecture of the biological neural networks in brain* - artificial neural networks (ANNs).
- **DEEP** is a technical term, and refers to the number of layers in an ANN.

INTRODUCTION TO DEEP LEARNING

Deep Learning

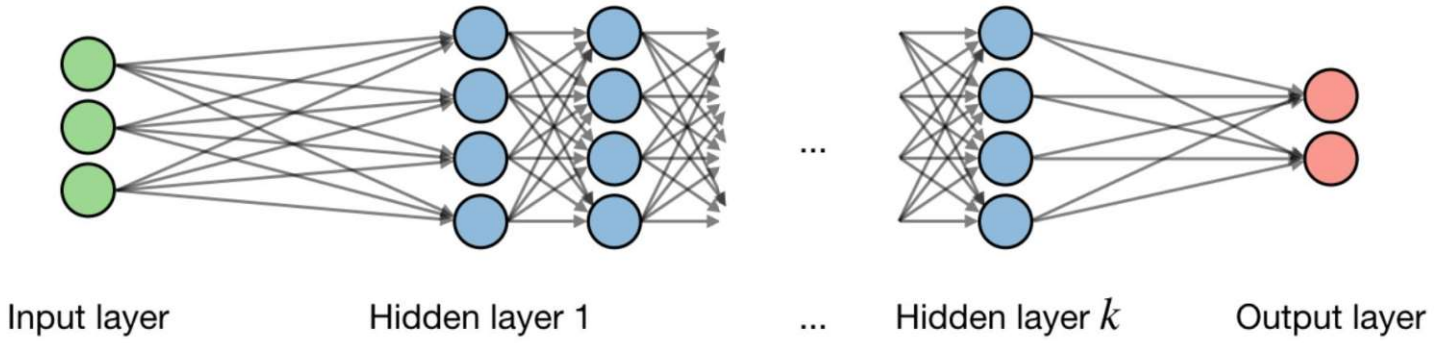
- **BIOLOGICAL NEURAL NETWORKS IN BRAIN**



- The basic computational unit of the brain is a **neuron.**
- Approximately **86 billion** neurons can be found in the human nervous system.
- They are connected with approximately 10^14 - 10^15 **synapses**.

Deep Learning

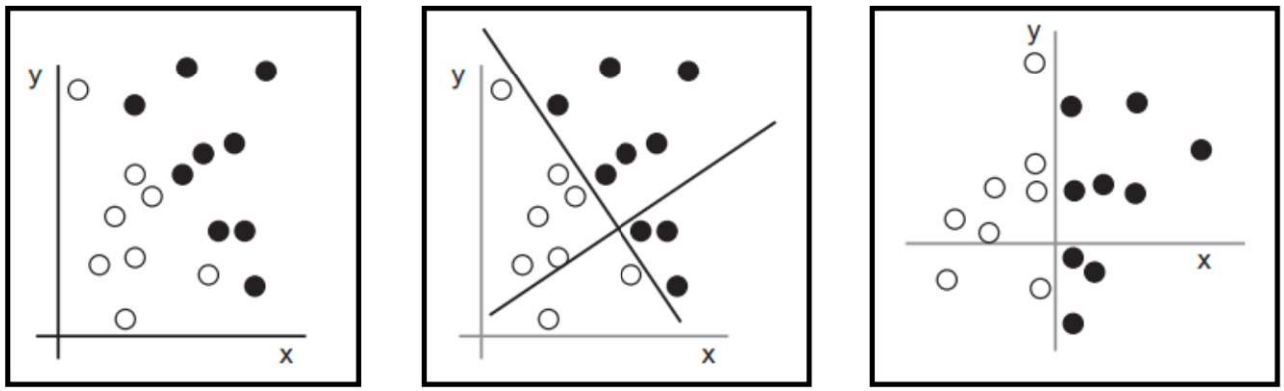
- ARTIFICIAL NEURAL NETWORKS (ANNs) are a class of *models* that are *built with layers*. Commonly used types of neural networks include *convolutional* and *recurrent neural networks*.



INTRODUCTION TO DEEP LEARNING

Learning in Machine Learning

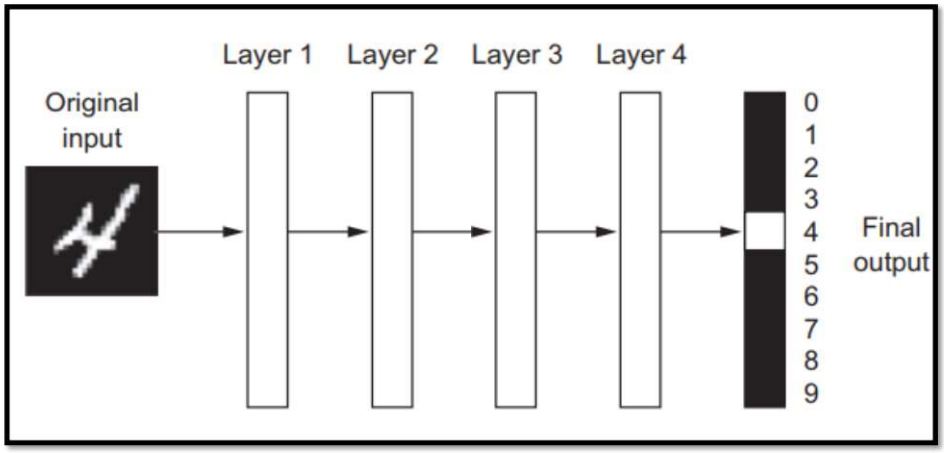
- Learning, in the context of MACHINE LEARNING, describes an *automatic search process* for *better representations*.



Black points are such that $x > 0$

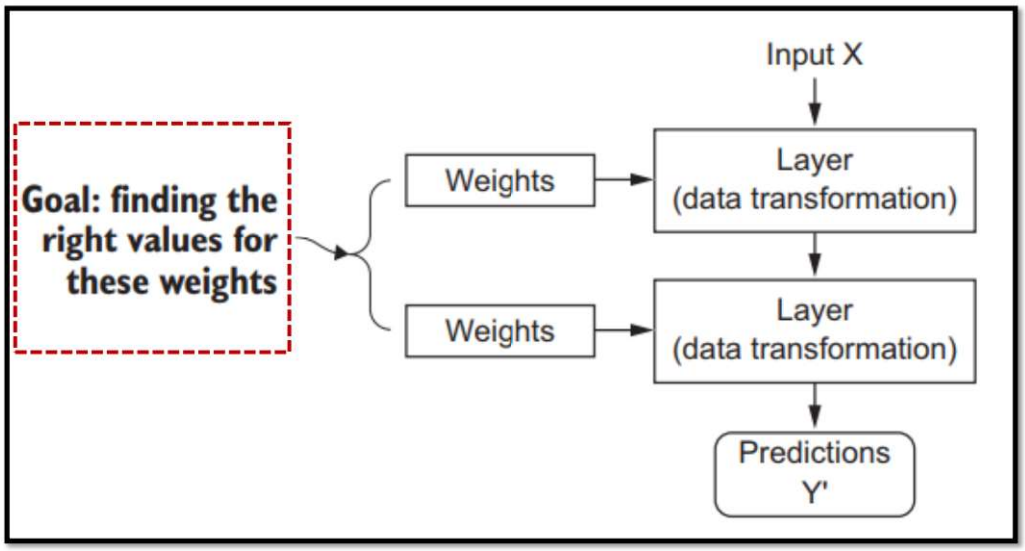
Learning in Deep Learning

- In **DEEP LEARNING**, the emphasis is on *learning successive layers* of *increasingly meaningful representations*.

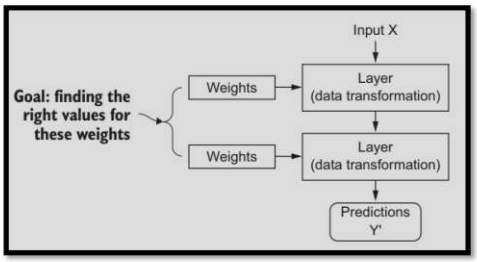


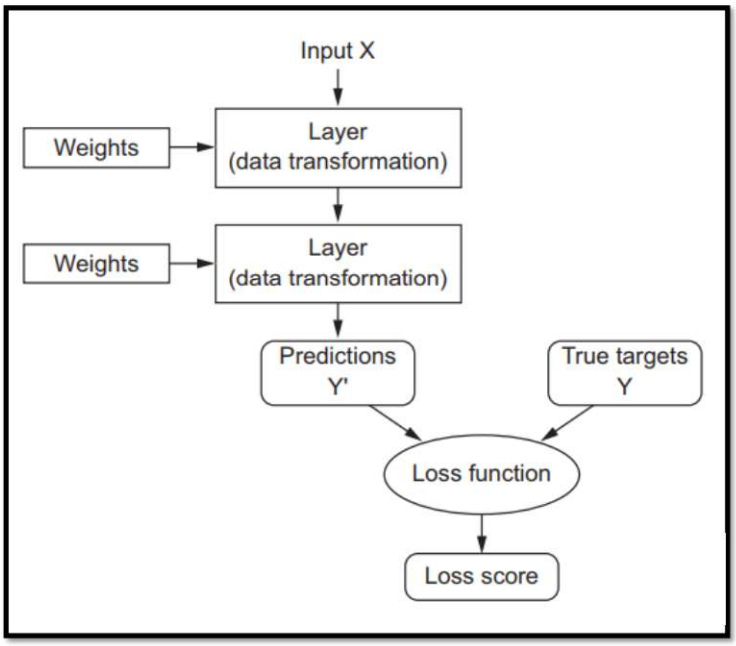
INTRODUCTION TO DEEP LEARNING

Learning in Deep Learning



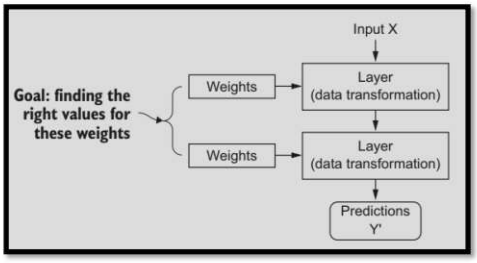
Learning in Deep Learning

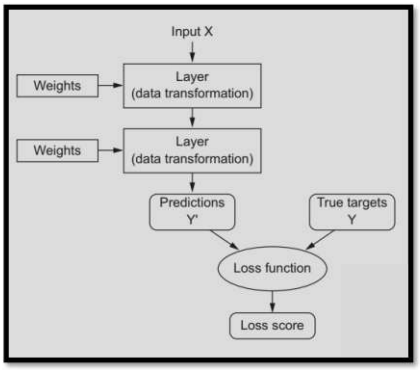


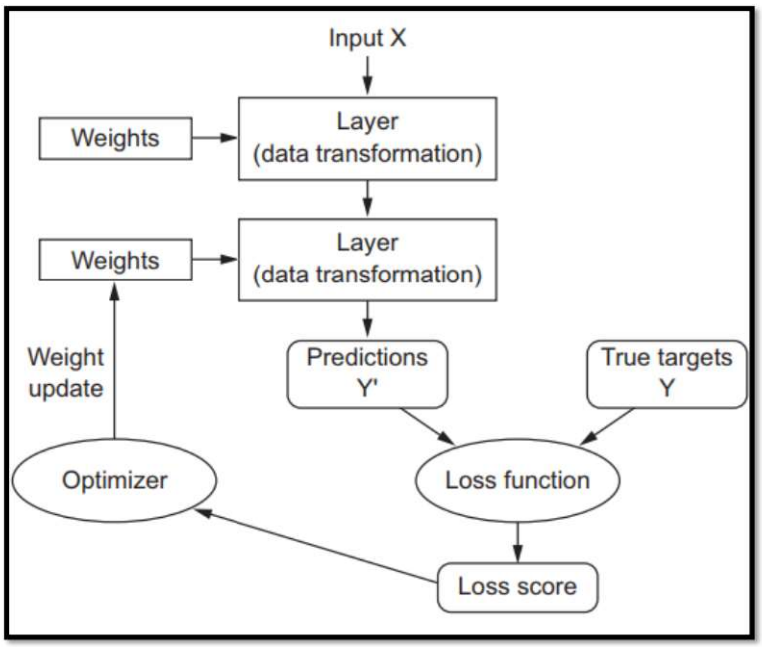


Introduction to Deep Learning

Learning in Deep Learning







Application of Deep Learning

Application of Deep Learning

Some Applications of Deep Learning

- Image classification
- Speech recognition
- Handwriting transcription
- Machine translation
- Autonomous driving

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