B. Tech. Semester 7
Deep Learning   (PE-3)-CET3012B

SCHOOL OF COMPUTER ENGINEERING AND TECHNOLOGY

Academic Planner (AY: 2023-2024)

- Academic Duration
  1st August – 16th December 2023

- Mid Term Test
  16th October – 21st October 2023

- Practical Exam
  17th November – 9th December 2023

- End Term Exam
  18th December – 30th December 2023

Program Educational Objectives (PEOs)

The program is designed with the objectives to nurture competent, multifaceted and Ethical Professionals.

After completion of program Graduates will be able to –

PEO I

Competent Professionals - Identify and effectively solve real life problems with sustainable solutions.

PEO II

Multifaceted Professionals - Exhibit technical knowledge, research aptitude and innovative mindset to excel in multidisciplinary domains.

PEO III

Ethical Professionals - Pursue ethical values, leadership and interpersonal skills during their professional careers for wellbeing of society.

Program Specific Outcomes

Computer Science and Engineering graduates will be able to:

PSO I

Analyze, design and develop computer based systems to solve real life problems by applying knowledge of Computer Science and Engineering.

PSO II

Apply knowledge acquired through self-learning to implement computing systems in diverse domains of Computer Science and Engineering.

PSO III

Constructive mindful approach to architect innovative IT solutions with acumen for entrepreneurship, research and zest for higher studies.

Program Outcomes (POs)

GRADUATE ATTRIBUTES	PROGRAM OUTCOMES (POs)
	Program Outcomes (POs)
	PROGRAM OUTCOMES (POs) **After successful completion of program, graduates will be able to:**
1) **Engineering Knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2) **Problem Analysis**	Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3) **Design and Development of Solutions**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Program Outcomes (POs)

Program Outcomes (POs)	
4) Investigation of Complex problem	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems: ▢that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical text book that can be solved using simple engineering theories and techniques; ▢that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions; ▢that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.; ▢which need to be defined (modelled) within appropriate mathematical framework; and that often require use of modern computational concepts and tools, for example, in the design of an antenna or a DSP filter.
5) Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

Program Outcomes (POs)

Program Outcomes (POs)	
6) Engineer and Society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7) Environment and Sustainability	Understand the impact of the professional engineering solutions in Societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8) Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9) Individual and Team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Program Outcomes (POs)

Program Outcomes (POs)	
10) Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11) Project Management and Finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12) Lifelong learning	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Deep Learning Course Objectives & Outcomes

Course prerequisite : Data Warehouse and Data Mining

Course Objectives: .

Knowledge: 1. To study fundamentals of Artificial Neural Network

2. To learn the concepts of Deep Learning

Skills: 1. To design the Convolution Neural Network Model

2. To develop applications using deep learning technique

Attitude: 1. To analyze and implement various Advanced Deep Learning Models

Course Outcomes:

1. Apply the fundamentals of Artificial Neural Network

2. Explore and use Deep Learning technique to solve the problems

3. Develop the model using Convolution Neural Network

4. Implement and solve real world problem using Advanced Deep Learning models

Mapping of COs with POs and PSOs

Class Continuous Assessment (CCA)- 30 Marks

Course Outcomes (CO)	Program Outcomes (PO)												Program Specific Outcomes (PSO)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-I	3	3	2	2	3	1	-	2	2	2	-	2	-	-	-
CO-II	3	3	2	2	3	1	-	2	2	2	-	2	-	-	-
CO-III	3	3	2	2	3	1	-	2	2	2	-	2	-	-	-
CO-IV	3	3	3	3	3	1	1	3	2	2	2	2	-	-	-

Deep Learning Assessment Schedule

Class Continuous Assessment (CCA)- 30 Marks

Laboratory Continuous Assessment (LCA)- 30 Marks

Term End Examination-40 Marks

Deep Learning Assessment Schedule

Class Continuous Assessment (CCA)- 30 Marks

Sr. No.	Component	Marks	Schedule	Remark
1	Active Learning	10	2nd Week October 2023	Presentation in a group of 4 students. Groups must be from Same Batch.
2	Mid Term	15	16th to 21th October 2023	--
3	Theory Assignment	5	3rd Week of September 2023	Assignment must be Handwritten

Deep Learning Assessment Schedule

Laboratory Continuous Assessment (LCA)- 30 Marks

Sr. No.	Component	Marks	Schedule	Remark
1	Practical Performance	10	Final Submission: 2nd Week of November 2023	Continuous Evaluation of every lab assignment after its completion.
2	Mini Project	10	1st week of November 2023	Group of 4 students. Groups must be from Same Batch. Title finalization and Mid Term Review for Mini Project will be taken as per available slot.
3	Oral	10	1st week of November 2023	Based on All Lab Assignments.

Deep Learning Syllabus

Module No.	Contents	Workload in Hrs
1	**Introduction To Neural Network** Introduction, The architecture of an artificial neural network, Types of ANN architecture, Advantages and disadvantages of ANN, Perceptron, Sigmoid Neurons, Activation Functions, Loss Function.	9 hrs
2	**Introduction to Deep Learning** Introduction to Deep learning, Architecture, Multilayer Perceptron(MLP), Training MLP, Chain Rule, Backpropogation, Optimization Methods, Feedforward Neural Network, Examples of Deep Learning.	9 hrs
3	**Convolutional Neural Networks:** Convolutional Network Architectures, Filters, Feature Maps, Pooling, Batch Normalization, Stride Padding, Dropouts Complete Convolutional Network for image Data.	9 hrs
4	**Advanced Deep Learning:** Deep Learning Architectures: LeNet, AlexNet, VGG, RESNET, RNN,LSTM.	9 hrs
5	**Deep Learning Platform & Applications:** Deep Learning Libraries, Introduction to Tensorflow, Tensorflow features, Building blocks of Tensorflow, Installation of Tensorflow, Using keras in Tensorflow. Deep Learning Applications	9 hrs

Text Books and Reference Books

Text Books:

1. Michael A. Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015

2. Goodfellow I Bengio Y, Courville A, Deep learning, MIT Press, 2016

3. Nikhil Budua, Fundamentals of Deep Learning, Designing Next Generation Artificial Intelligence Algorithms, First edition, O'Reilly Publications, 2016

Reference Books:

1. Introduction to Artificial Neural Systems by Jacek M. Zurada Yegnanarayana B, Artificial Neural Systems , PHP learning

2. Machine learning with neural networks An introduction for scientists and engineers, Bernhard Mehlig.

MOOCs:

https://nptel.ac.in/courses/106106184/

https://www.coursera.org/learn/deep-learning-in-computer-vision

https://cs230.stanford.edu/

Laboratory:

Module No.	Contents	Workload in Hrs
1	Data analysis using Advanced Machine Learning.	2 hrs
2	Installation of tensor flow.	2 hrs
3	Basic fundamental operations using tensors.	2 hrs
4	Implement Simple Neural Network using Python.	2 hrs
5	Implement a Convolution Neural Network (CNN) for Image dataset using Python	4 hrs
6	Implement a prediction model using pre-trained model.	4 hrs
7	Implement a prediction model for time-series data using Deep Learning method.	4 hrs
8	Mini Project	10 hrs

Why Study this Course?
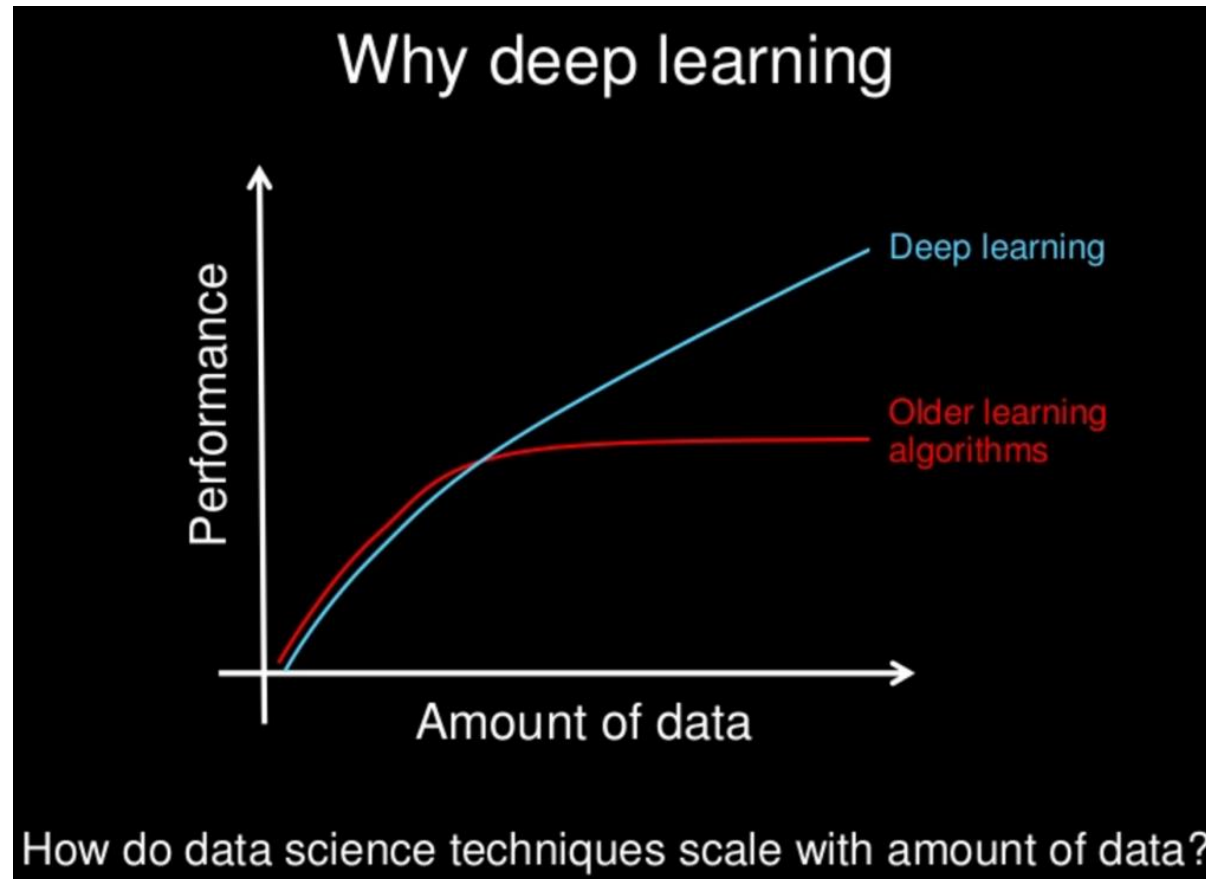
Course prerequisite

➢ Data Warehouse and Data Mining
➢ Machine Learning
➢ Cognitive Computing and Natural Language Processing

Machine Learning
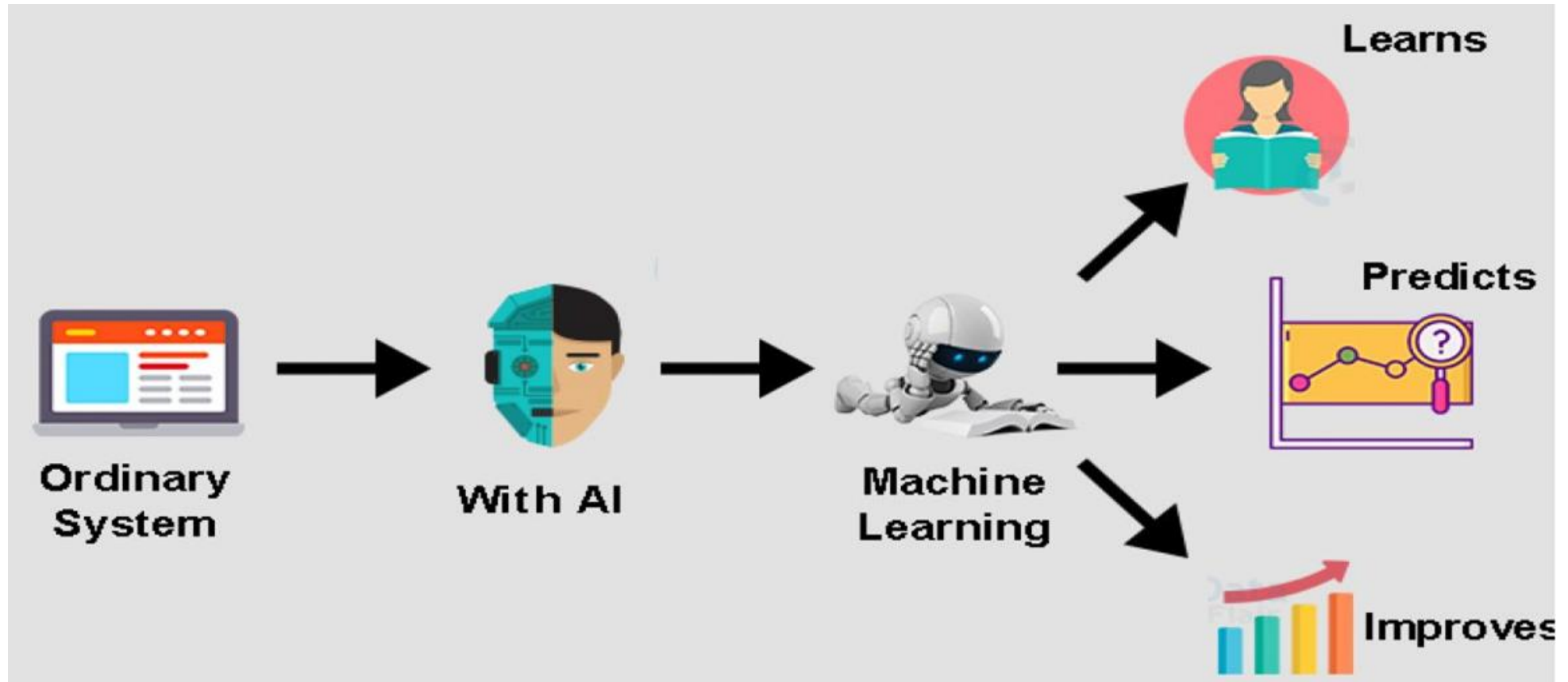
Machine Learning

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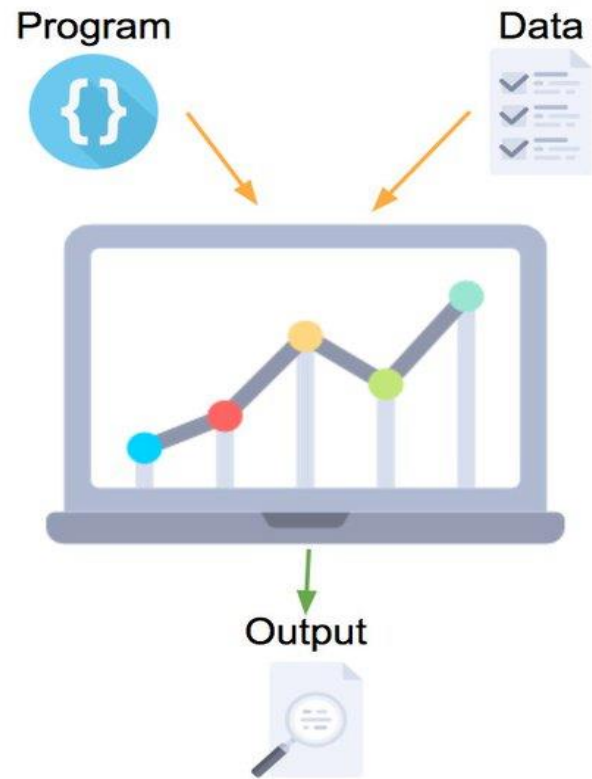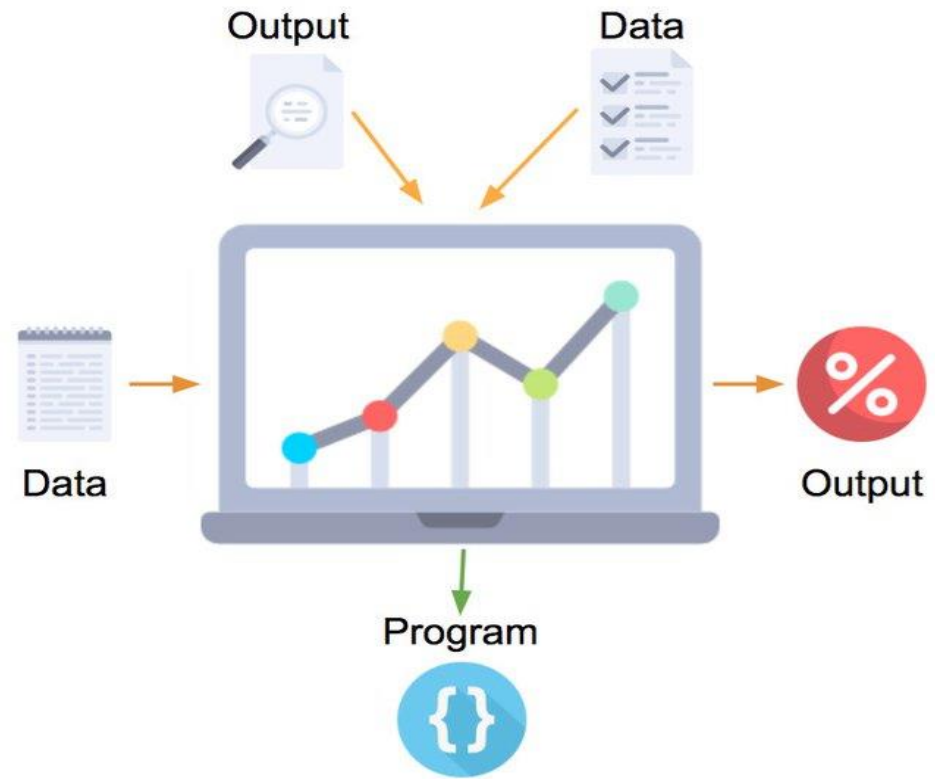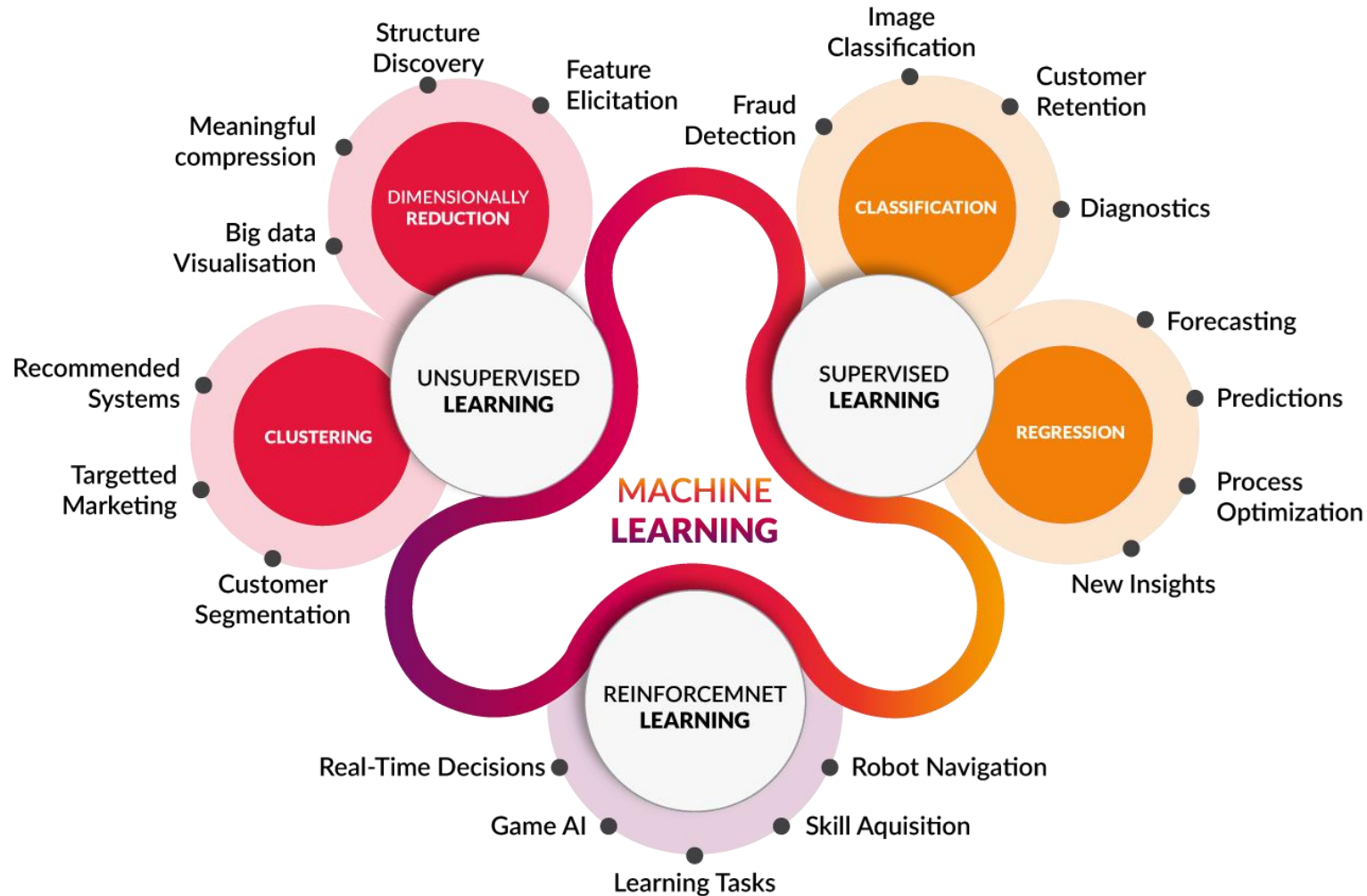
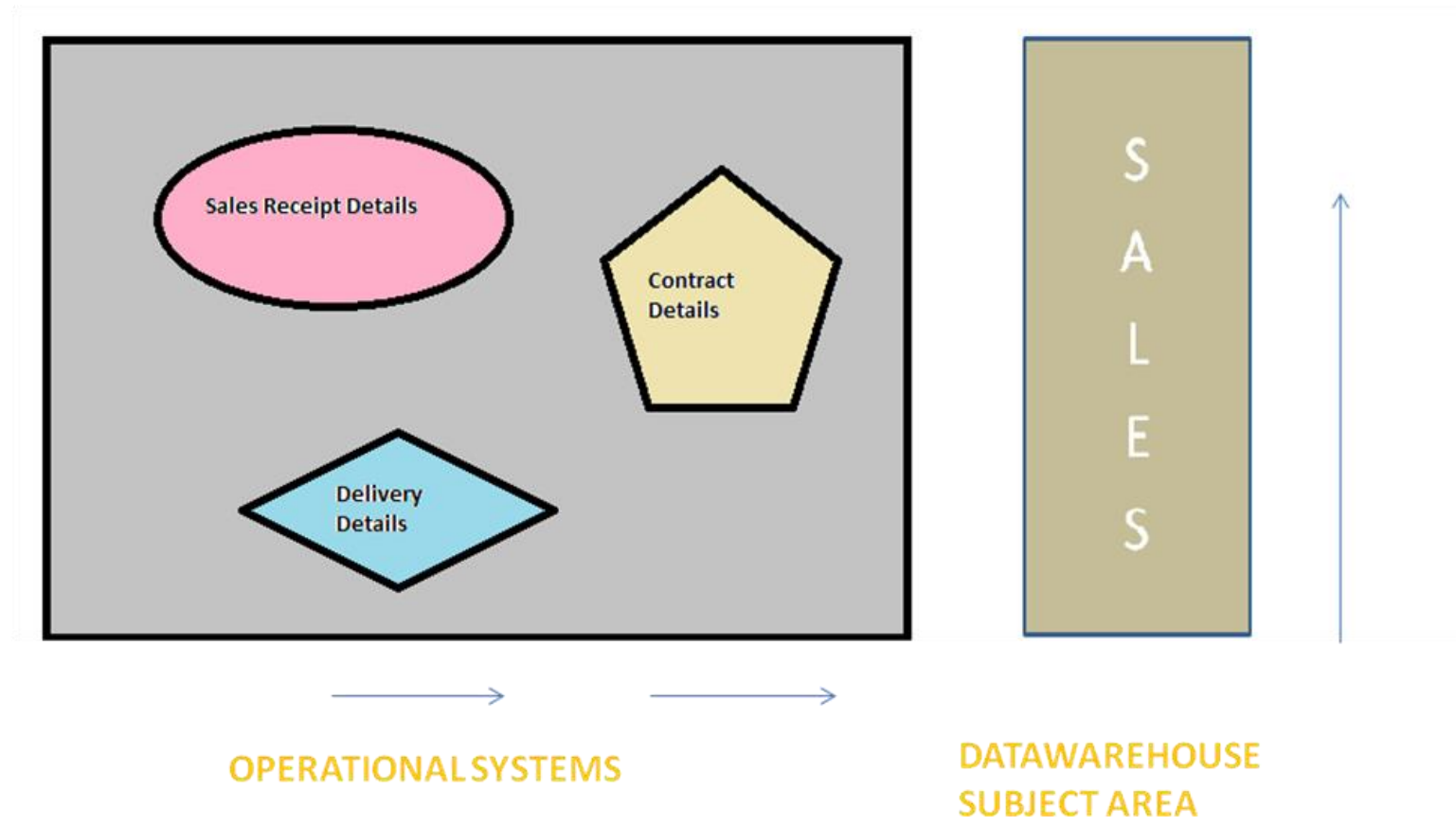# Machine Learning

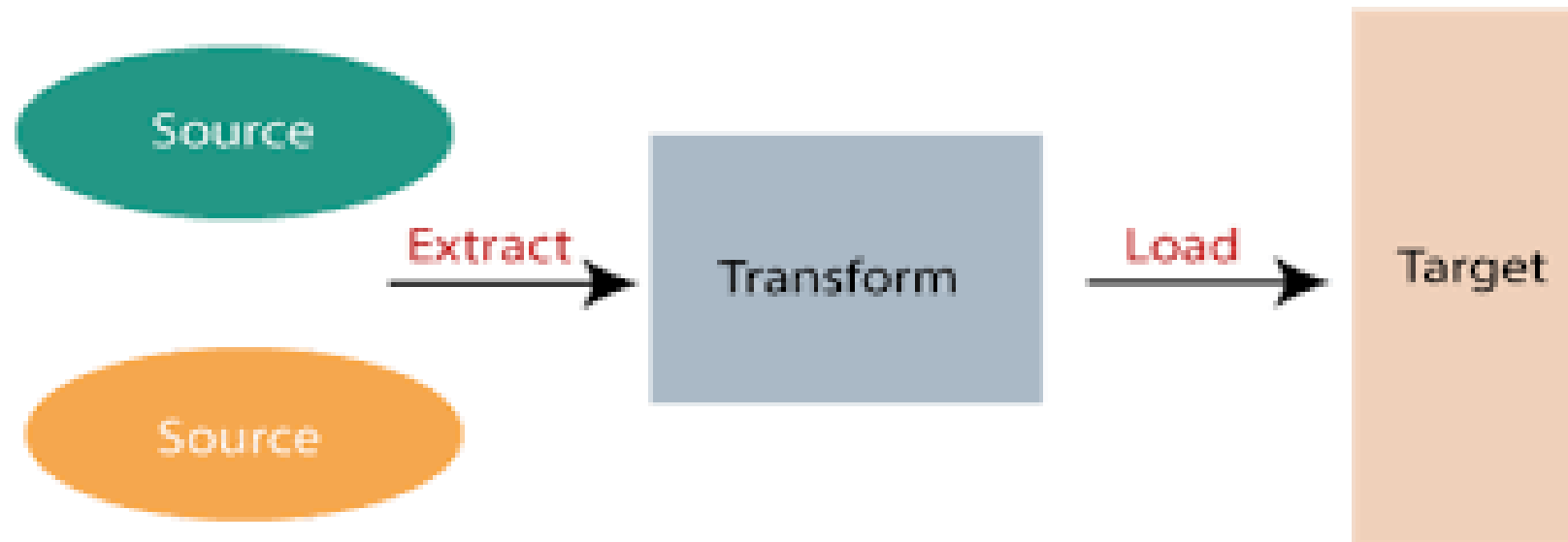# Machine Learning / Deep Learning
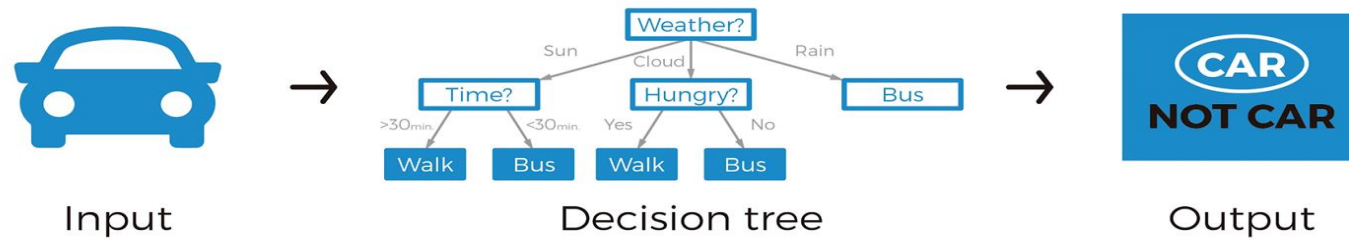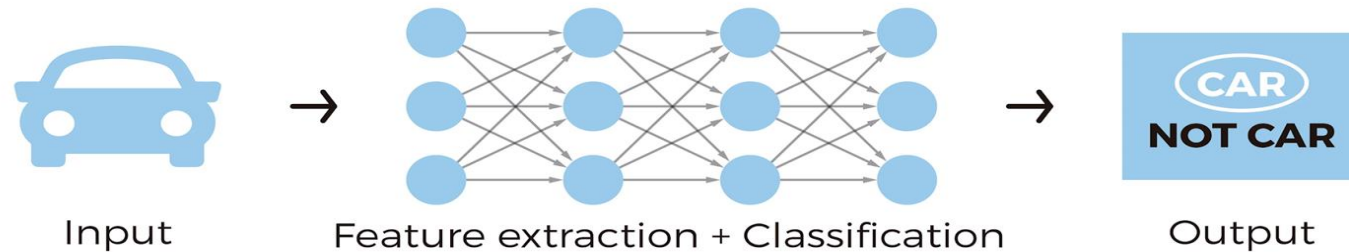
Data Warehouse and Data Mining

Course Content
- Pre Processing
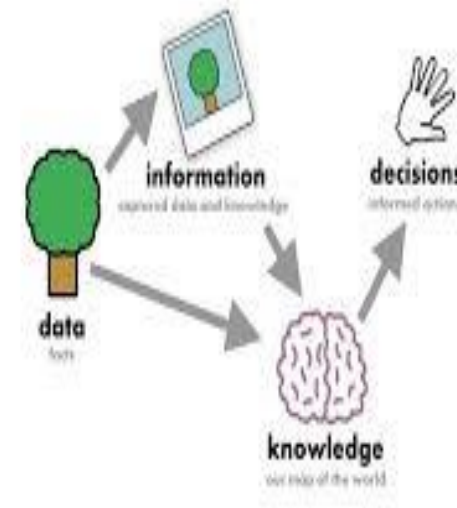- Data Warehouse
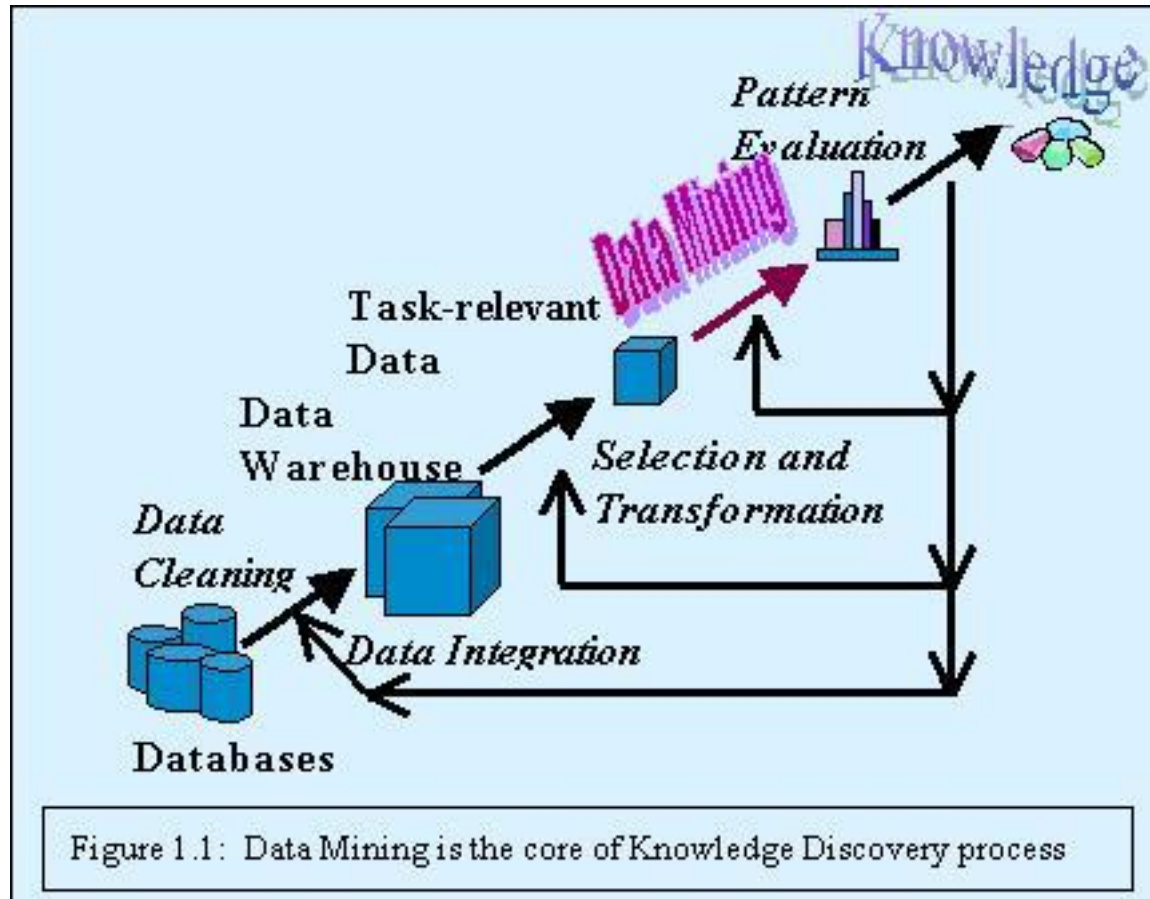- Data Mining
- Classification and Clustering

DBMS

Data Warehouse

Data Warehousing Process
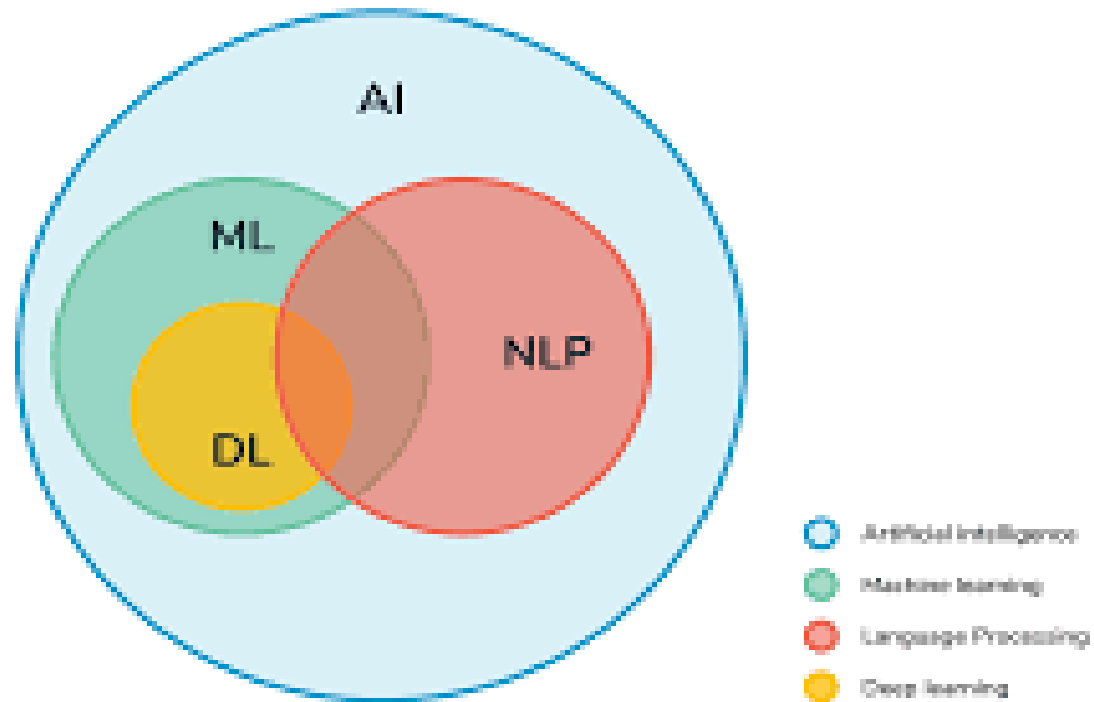
Data Mining

Figure 1.1: Data Mining is the core of Knowledge Discovery process

NLP and Deep Learning

NLP

- AI Specialization area
- Understand and illustrate **Cognitive mechanism** that mimics human behaviour
- Process and analyze large data in **textual and verbal form**
- Helps computer to **understand, interpret and manipulate human language**
- Make human language accessible to computers in real time
- DL gives multiple benefits in learning multiple levels of representation of natural language
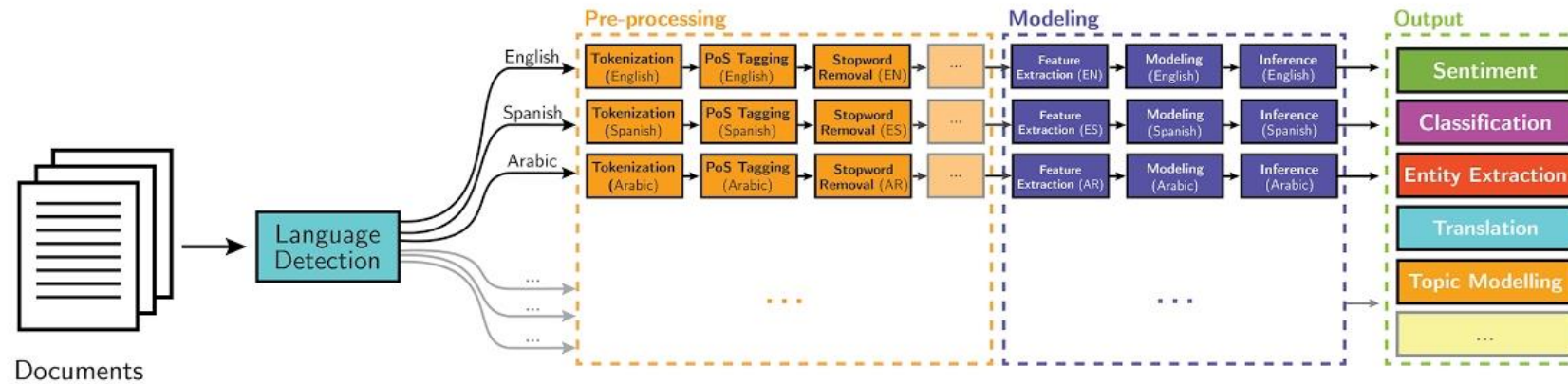- DL approaches gives very high performance foe NLP tasks

NLP
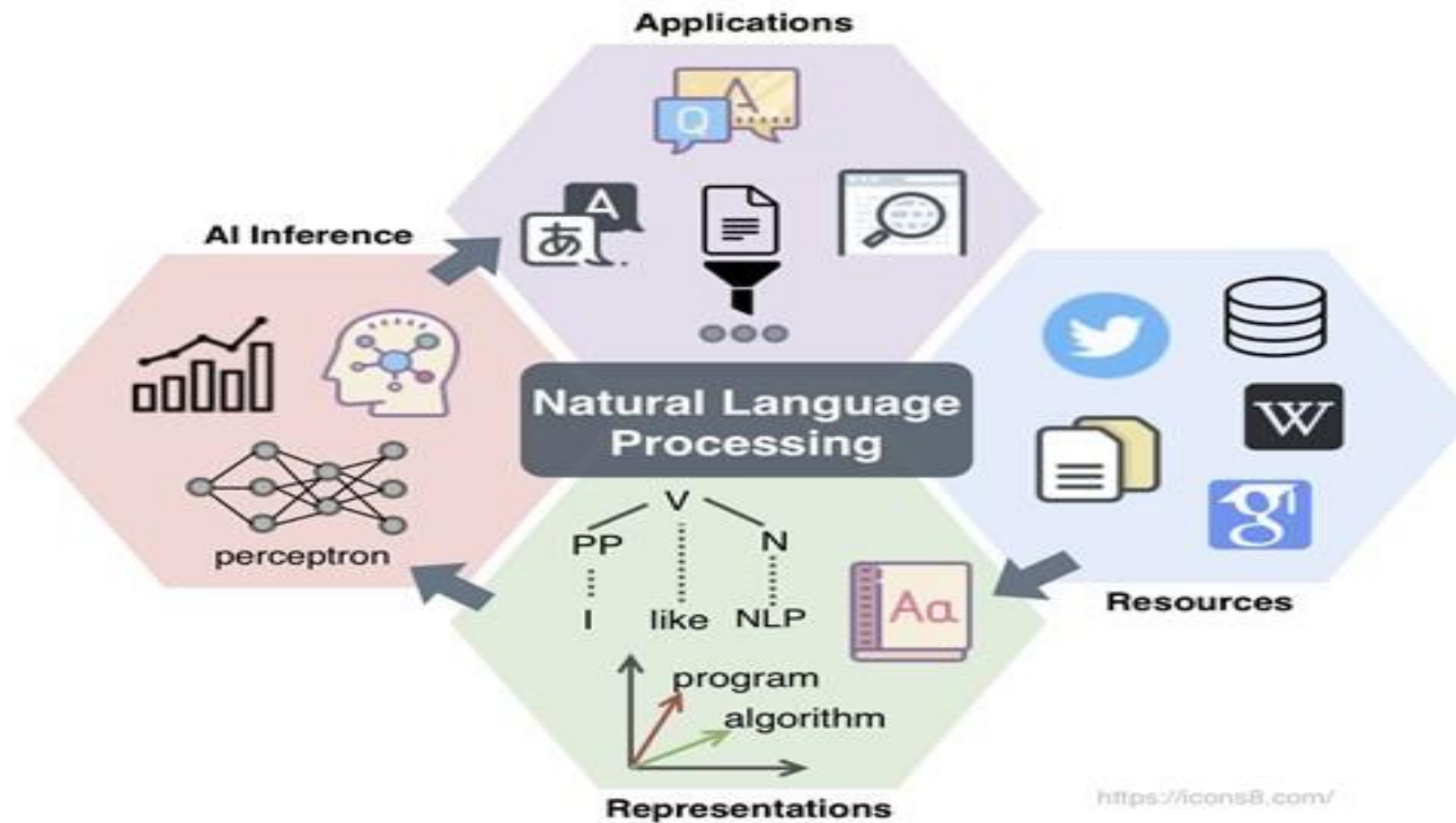
NLP Applications

- Sentiment analysis – products, politics, economy, environment, stock, health care
- Fraud detection – classifying spam emails
- Speech recognition
- Machine Translation
- Question Answering system
- Chatbots & Smart Virtual Assistants
- Deriving insights from big data/Information Extraction
- Cognitive systems
- Topic identification
- Automatic text summarization, text classification
- Image Captioning

NLP and Deep Learning