



ACADEMIC YEAR
2026-27

AI

Artificial Intelligence

Machine
Learning



Data Insights



Deep Learning



B.TECH

COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)



JOIN THE FUTURE

Be Smart with AI & ML

Innovate. Learn. Lead.
Be a part of tomorrow.



IARE
INSTITUTE OF
AERONAUTICAL ENGINEERING

nirf NATIONAL
INSTITUTIONAL
RANKING
FRAMEWORK

NAAC ACCREDITATION **A++** GRADE

26
YEARS
OF EXCELLENCE

VISION AND MISSION OF THE INSTITUTE

VISION

To bring forth students, professionally competent and socially progressive, capable of working across cultures meeting the global standards ethically.

MISSION

To provide students with an extensive and exceptional education that prepares them to excel in their profession, guided by dynamic intellectual community and be able to face the technically complex world with creative leadership qualities.

Further, be instrumental in emanating new knowledge through innovative research that emboldens entrepreneurship and economic development for the benefit of wide spread community.

VISION AND MISSION OF THE DEPARTMENT

VISION

To become a leading force in Artificial Intelligence with skills and knowledge to develop innovative and sustainable AI solutions and AI based ventures.

MISSION

To empower students with advanced knowledge and skills in Artificial Intelligence and Machine Learning, fostering innovation, ethical practice, and sustainable AI solutions that drive technological and societal impact.

Program Educational Objectives (PEOs)

PEO-I

Students will establish a strong foundation in computer science, artificial intelligence and machine learning principles enabling them to design, develop, and implement intelligent systems for diverse applications.

PEO-II

Students will apply artificial Intelligence and machine Learning techniques to solve real-world problems, contribute to new advancements through research and explore entrepreneurial opportunities in emerging technologies.

PEO-III

Students will demonstrate their ability to adapt to a rapidly changing environment by having learned and applied new skills and new technologies.

PEO-IV

Students will demonstrate ethical integrity, social responsibility, and effective teamwork while developing AI-driven solutions that address real-world problems ensuring inclusivity, fairness, and sustainability.

Knowledge and Attitude Profile

WK1

A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2

Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3

A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4

Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5

Knowledge, including efficient resource use, environmental impacts, whole-life cost, reuse of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6

Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7

Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8

Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9

Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (POs)

PO-1 Engineering Knowledge

Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO-2 Problem Analysis

Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO-3 Design/Development of Solutions

Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO-4 Conduct Investigations of Complex Problems

Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO-5 Engineering Tool Usage

Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO-6 The Engineer and The World

Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO-7 Ethics

Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO-8 Individual and Collaborative Team work

Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO-9 Communication

Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO-10 Project Management & Finance

Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multi-disciplinary environments.

PO-11 Life-Long Learning

Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs)

PSO-I

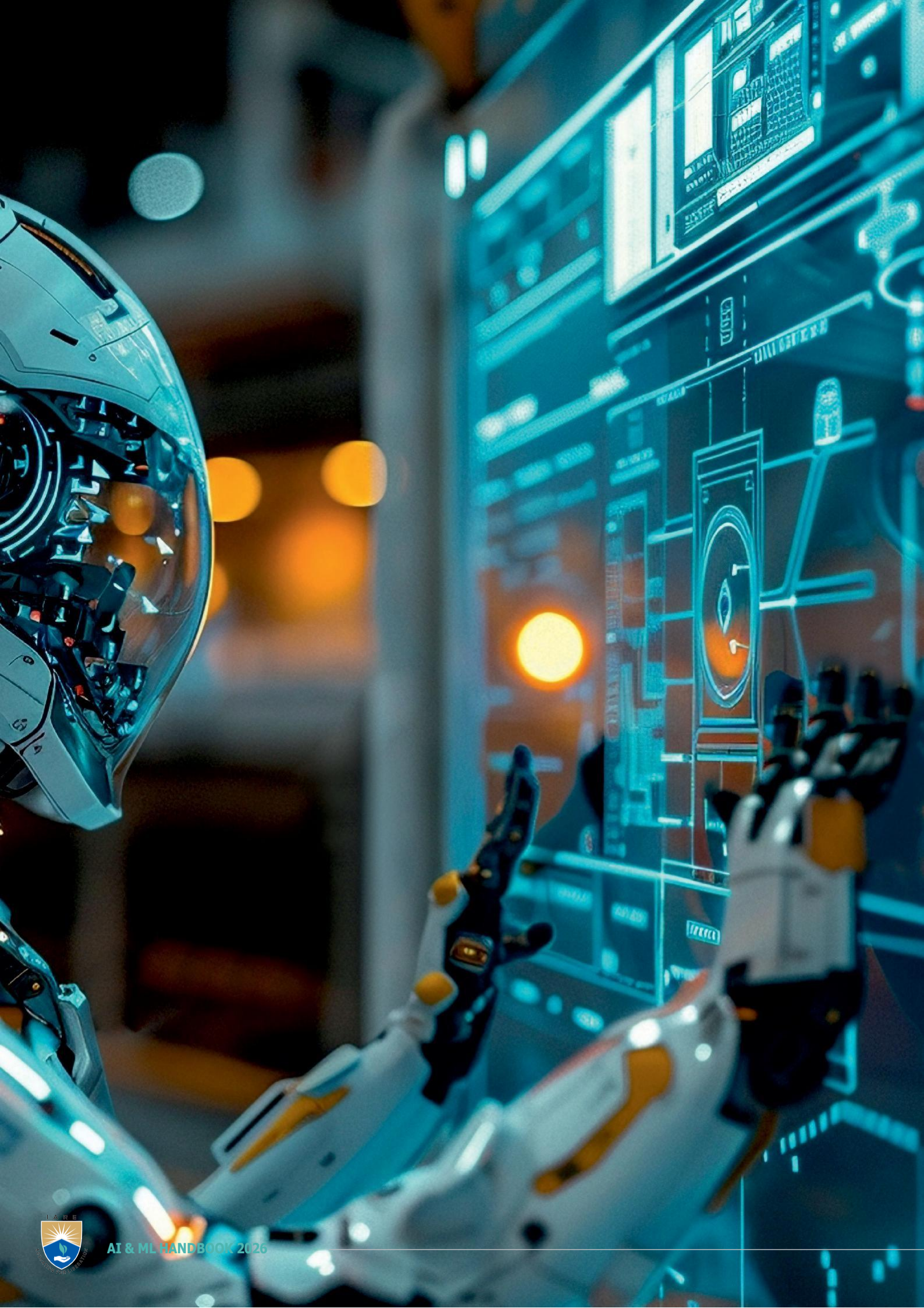
Apply advanced analytical and problem-solving skills for the application of AI in solving organizational challenges and new value creation.

PSO-II

Analyze big contextual data sets to improve AI applications.

PSO-III

Assess ethical, societal and legal considerations related to AI technologies.



ABOUT **ARTIFICIAL INTELLIGENCE**

Artificial intelligence is the science of making machines that can think like humans. It can do things that are considered "smart." The goal for AI is to be able to do things such as recognize patterns, make decisions, and judge like humans.

Why study here **CSE(AI&ML) @ IARE**

- TOP 2 highest demand Bachelor program
- Well trained experts in areas of Computing, Artificial Intelligence, Machine Learning, Natural Language Processing, Deep Learning, Data Analytics and Data Science.
- Well-equipped Laboratory facilities and conducive environment for students.
- International Exposure for students via mobility program and student exchange.
- Industry supported

- AI-based technology has been applied in various critical sectors such as healthcare, business, agriculture, manufacturing and others.
- AI in the program will expose students to AI specific subjects such as Practical in AI, Computer Intelligence, Machine Learning, Deep Learning, Natural Language Processing and several other elective subjects to choose from.
- Students will be exposed to theoretical and practical theory in AI-based courses, focusing more on hands-on skills and experience so that students are fully equipped as future and industry-ready graduates.
- Latest techniques and practices in AI will be taught and delivered to the students, along with the latest issues and developments in industry through exposure of offered courses

Expertise and focus:

We are committed to quality and excellence in research, engaging in both fundamental and applied research that focus on real world problems or issues.

We emphasize on creating new knowledge and innovative products that make impact to the society, academia, government, industry and environment.

Other relevant high demands of research focus also may be not limited to:

Artificial Intelligence & Deep Learning

Machine Learning

Natural Language Processing

Augmented Reality/Virtual Reality

Cloud Application Development

Computer Vision

Internet of Things (IoT)

DEPARTMENT SPECIFIC LABORATORIES

Artificial Intelligence & Deep Learning Centre

CSE(Artificial Intelligence & Machine Learning) has an MoU with Intel and established a center named as Intel® Unnati – data centric Initiatives for emerging technology ("Program") under which EdGate Technologies Pvt. Ltd, an Intel approved vendor, may deploy Intel recommended hardware and software infrastructure but however Institute can decide on the final infrastructure required for Intel® Unnati Lab, related training curriculum on Intel® architecture (IA) and set up state of the art Intel® Unnati Lab based on Intel® architecture, at Institute of Aeronautical Engineering.

Intel® Unnati Catalyst is designed to support Institute in organizing events like conferences, workshops, Internships and contests to help faculty and students enhance their knowledge and understanding of new and emerging technologies, as well as to bring out the innovation skills of the students.

Intel Unnati Industrial Training program provides a unique opportunity for Indian college students to work for one month on industry relevant problems using emerging technologies under guidance of industry mentors. This is exclusive to colleges with Intel® Unnati Labs, and is aligned to AICTE-recommended industry exposure requirements for engineering and technology colleges.

Benefits of Intel® Unnati Program:

- Aligned with industrial training of engineering and technology colleges.
- Expert mentorship
- Hands-on experience
- Exposure to the working system of the digital industry.
- Intel® Unnati course certificate at the end of the program.



Augmented Reality / Virtual Reality Center:

CSE (Artificial Intelligence & Machine Learning) has Augment Reality/Virtual Reality center which provides students with hands-on experience in using cutting-edge technologies to visualize complex concepts, conduct experiments, and develop solutions to real-world problems. AR & VR labs can also foster creativity, collaboration, and critical thinking skills, which are essential for success in their careers. The center will engage in research, teaching and services for developing advanced methods and algorithms for near-real 3D user interfaces and exploratory data analysis in virtual environments.

Objectives Augmented Reality/Virtual Reality Center:

1. Give impetus to research, technology development, product development, technology incubation and entrepreneurship in Virtual & Augmented Reality and allied fields.
2. To create a core group of researchers in the area of AR/VR.
3. Applications of AR-VR in education including virtual labs (could be primary, secondary, collegiate and higher education)
4. Application of AR-VR in skilling and skilling system development.
5. Application of AR-VR in Biomedicine/Bio-engineering & health care applications.



Augmented Reality (AR)

A view of the real-world environment with computer-generated HD images & Videos thus changing the perception of reality is the AR.

Virtual Reality (VR)

The place specialized equipment for researchers to explore the world of VR or to practice and create their own projects.



Cloud Application Development Centre:

CSE (Artificial Intelligence & Machine Learning) has a MoU with Manjra Soft Solution Pty Ltd. to establish an industry support Cloud Application Development Centre. The center is focused on the creation of innovative software technologies for simplifying the development and deployment of applications on private or public Clouds. Aneka platform plays the role of Application Platform as a Service for Cloud Computing. Aneka supports various programming models involving Task Programming, Thread Programming and MapReduce Programming and tools for rapid creation of applications and their seamless deployment on private or public Clouds to distribute applications.

Aneka technology primarily consists of two key components:

1. SDK (Software Development Kit) containing application programming interfaces (APIs) and tools essential for rapid development of applications. Aneka APIs supports three popular Cloud programming models: Task, Thread, and MapReduce.
2. A Runtime Engine and Platform for managing deployment and execution of applications on private or public Clouds.

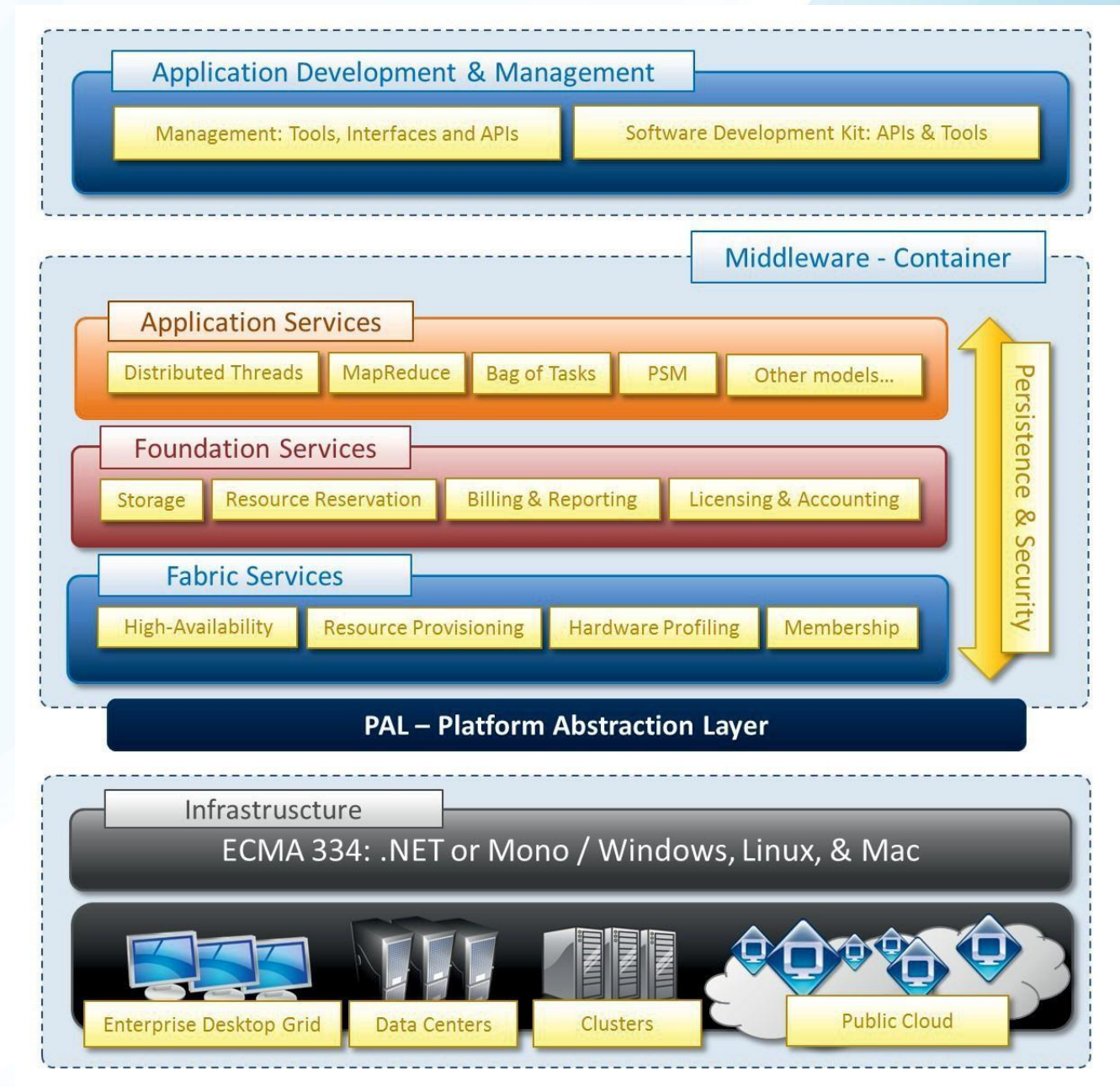
CSE (Artificial Intelligence & Machine Learning) has Augment Reality/Virtual Reality center which provides students with hands-on experience in using cutting-edge technologies to visualize complex concepts, conduct experiments, and develop solutions to real-world problems. AR & VR labs can also foster creativity, collaboration, and critical thinking skills, which are essential for success in their careers. The center will engage in research, teaching and services for developing advanced methods and algorithms for near-real 3D user interfaces and exploratory data analysis in virtual environments.

Highlights of Aneka Center:

1. Support of multiple programming and application environments
2. Simultaneous support of multiple run-time environments
3. Rapid deployment tools and framework
4. Simplicity in developing applications on Cloud
5. Dynamic Scalability
6. Ability to harness multiple virtual and/or physical machines for accelerating application result
7. Provisioning based on QoS/SLA

Aneka Architecture:

Aneka is a platform and a framework for developing distributed applications on the Cloud. Aneka provides developers with a rich set of APIs for transparently exploiting such resources and expressing the business logic of applications by using the preferred programming abstractions. The Aneka based computing cloud is a collection of physical and virtualized resources connected through a network, which are either the Internet or a private intranet.



Data Science Laboratory:

Data Science Lab is configured which not only facilitates students to practice basic programming in C, C++, Python and JAVA; but also learn advanced technologies of computer science such as Machine Learning, Artificial Intelligence, Deep Learning and Data Mining. The Lab facilitates database designing and management through dedicated tools such as Oracle, and MySQL and related computing paradigm and frameworks.

It also provides computing platform for novel languages like Python, R, and OpenCV and other necessary for building coherent set of ideas, fundamental of Machine Learning, Artificial Intelligence and Deep Learning models and algorithms. Each lab sessions is aimed to translate the theory lectures into practical implementation through programming paradigms and tools, platforms provided in the data science lab. Data Science Lab welcomes students, researchers, interns, faculties and everyone from a broad range of disciplines who are fascinated with the possibilities of turning big and complex data to knowledge.

Members of the data science lab seeks cutting edge problem-based solutions to data mining, computer vision and machine learning problems arising in numerous application areas involving data analytics.

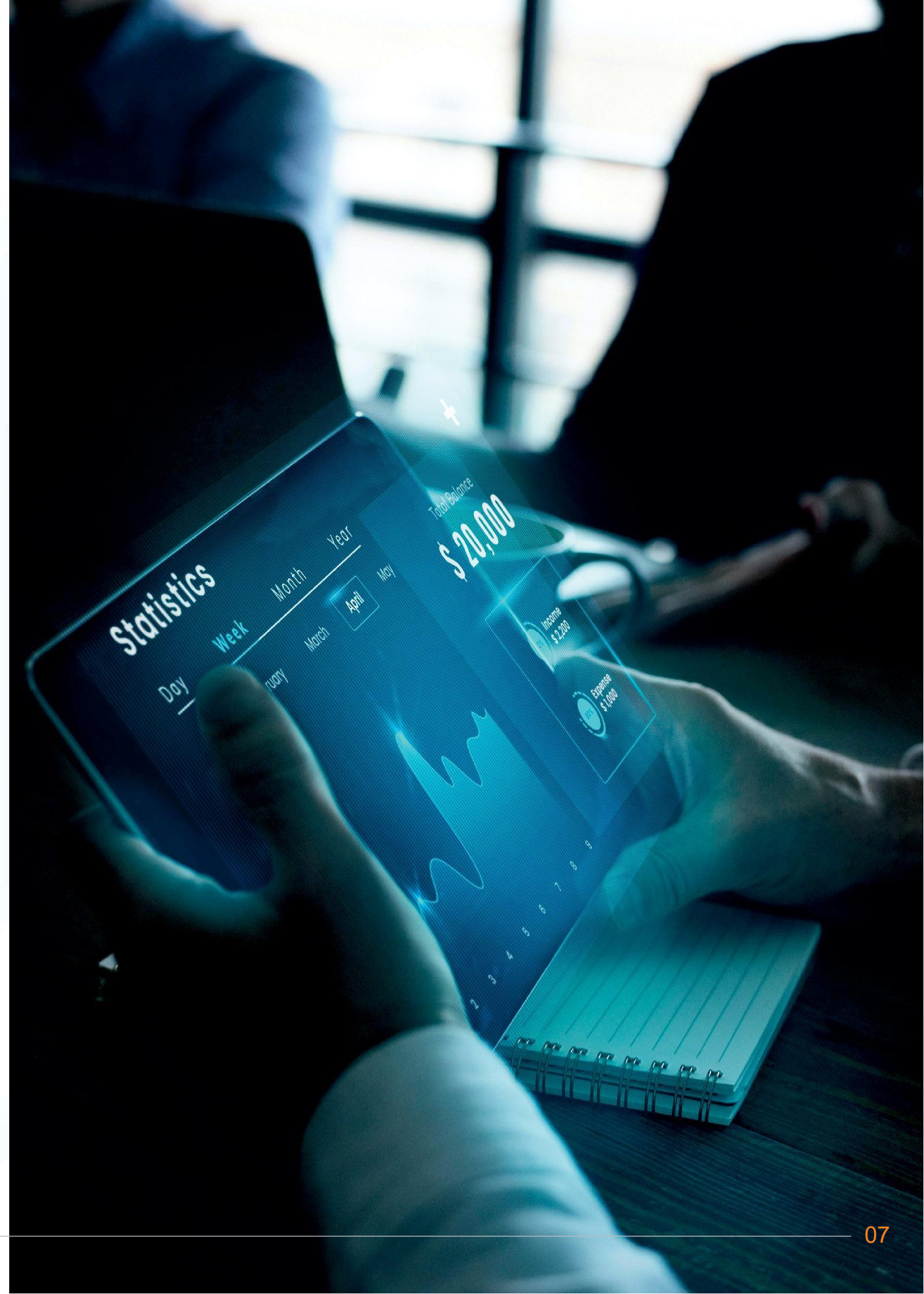
Objectives:

The long-term research agenda of the Data Science Lab is to develop new algorithms and software tools for data management and mining, and to use them for social good.

The Data Science Lab focuses on applying machine learning, data mining, and network analysis to real-world problems in society and industry.

Exploring the creation of novel statistical and computational methods for scalable data mining, machine learning, optimization as well as statistical modelling with complex data sets

We are especially interested in machine learning, data mining and information retrieval. In all of these areas, the combination of well-informed theoretical models empowered by large-scale resources allows for exciting insights and applications.



Laboratory Details

1 Artificial Intelligence & Deep Learning Laboratory

Artificial Intelligence & Deep Learning laboratory provides cutting edge problem-based solutions to data mining, computer vision and machine learning problems arising in numerous application areas involving data analytics. It also provides computing platform for novel languages like Python, R, and OpenCV and other necessary for building coherent set of ideas related to Machine Learning, Artificial Intelligence and Deep Learning algorithms.

Major Equipment

Computing Server:
Make: Intel
Model: M50FCP1UR204
Processor: 6430 32 Core 2.1 Ghz 270W
Memory: 32GB RDIMM 1 RANK 4800MHz
Hard disk: 480GB 2280 SATA 1DW 5300 Pro
Dual Hyper Hybrid Controller:
M.2 Card RT3EX020E w/HW RAID
Operating system: Ubuntu 18.04
Core: 32

Storage Server:
Make: Intel
Model: M50FCP1UR204
Processor: 4410Y 12 Core 2 Ghz 150W
Memory: 32GB RDIMM 1 RANK 4800MHz
Hard disk: 480GB 2280 SATA 1DW 5300 Pro
Dual Hyper Hybrid Controller:
M.2 Card RT3EX020E w/ HW RAID
Operating system: Ubuntu 18.04
Core: 12

Desktop Computer Systems - 36 Nos

Make: Lenovo
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse

2

Augmented Reality / Virtual Reality Laboratory

Augmented Reality and Virtual Reality (AR / VR) are two of the emerging technologies which are transforming the way that training, entertainment, marketing is being done. In AR / VR Laboratory users can superimpose digital information onto real-world objects to create a 3D experience that allows users to interact with both the physical and digital worlds.

Major Equipment (Powered by Unity Technologies)

Unity Education Licenses: Unit (30 Users)
Oculus Quest2, 256GB : 8 Nos
Oculus Link Cable : 8 Nos
Samsung Galaxy Tab S7 : 4 Nos
Apple 2021 iPad Mini : 4 Nos

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Configuration: 12th Gen Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse

3

Machine Learning Algorithms Laboratory

Machine Learning Algorithms Laboratory provides the application aspects of machine learning in the domains of artificial intelligence, machine learning, deep learning, numerical optimization, and natural language processing. Also to develop applications in the area of computational biology, object detection in images, video segmentation and summarization, detection of rare topics in text documents and statistical modelling of computer systems.

Major Equipment

Desktop Computer Systems – 36 Nos
Make: Intel
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Required: Jupiter Notebook, PyCharm, Google Colab, Spyder and PyTorch.

4

Natural Language Processing Laboratory

Natural Language Processing (NLP) is an interdisciplinary field dealing with human-computer interaction and computer aided processing of human language. NLP laboratory provides text classification, sentiment analysis, information extraction, machine translation, language modelling, syntax and parsing and multilingual NLP. Also develop novel algorithms and models for resource-constrained languages, making strides in building practical NLP solutions.

Major Equipment

Desktop Computer Systems – 36 Nos
Make: Intel
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Required: Jupiter Notebook, PyCharm, Google Colab, Spyder and PyTorch.

5

Reinforcement Learning Laboratory

The objectives of the Reinforcement Learning Laboratory are to create new methods for reinforcement learning that remove some of the limitations and to develop reinforcement learning as a model of intelligence that could approach human abilities. Users can develop novel methods to approximate solutions to optimal-control problems that are too large or too ill-defined for classical solution methods such as dynamic programming.

Major Equipment

Desktop Computer Systems – 36 Nos
Make: Lenovo
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Required: Jupiter Notebook, PyCharm, Google Colab, Spyder and PyTorch.

6

Data Structures Laboratory

The Data Structure lab intends to provide the students a practical knowledge of data structures so that the abstractions discussed in lecture classes are made concrete. The lab demonstrates familiarity with major algorithms and data structures and analyzes performance of algorithms. It is used to choose the appropriate data structure and algorithm design method for a specified application and determine which algorithm or data structure to use in different scenarios.

Major Equipment

Desktop Computer Systems – 36 Nos
Make: Intel
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Required: Python, Google Colab and Spyder.

7

Database Management Systems Laboratory

A database management system (DBMS) is a collection of programs that enables users to create and maintain databases and control all access to them. Database Management Systems Laboratory provides working on existing database systems, designing of database, creating relational database, analysis of table design. The lab course also provides practical knowledge to understand advanced database concepts such as Data mining and Big Data Analysis.

Major Equipment

Desktop Computer Systems – 36 Nos
Make: Lenovo
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Required: MySQL and Oracle

8

Mobile and Web Application Development Laboratory

Web application development design allows web-based projects to behave and perform like mobile apps. Web applications engage users by focusing on responsive interactions, while accessed over the internet. Web apps come in a variety of shapes and sizes. Web application development provides the process of designing, building, testing and deploying web-based applications that will be installed on remote servers and delivered to users or customers via the internet.

Major Equipment

Desktop Computer Systems – 36 Nos
Make: Lenovo
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Required: XAMPP Server and WAMP,

9

Image and Speech Processing Laboratory

Image and Speech Processing laboratory introduces the basic concepts of speech coding related to signal and image processing modules. The laboratory enhances the student's knowledge through multimedia signal processing, learning through speech and audio coding. Speech processing tasks include speech recognition, speech synthesis, speaker diarization, speech enhancement, speaker recognition,

Major Equipment

Desktop Computer Systems – 36 Nos
Make: Lenovo
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Required: Python, Anaconda, PyCharm, Google Colab, Spyder.

10

Object Oriented Analysis and Design Laboratory

Unified Modelling Language (UML) is appropriate for modelling systems, ranging from enterprise information system to distributed web based application and even to real time embedded system. The UML language is used for specifying, constructing, visualizing, and documenting the software system and its components. Lab introduces object-oriented analysis and design, including: use cases, CRC cards, and class design; UML; inheritance and polymorphism; methods for verifying, validating, and testing software; concurrency; distributed systems; relational databases; continued development of design and programming skills using UML through weekly laboratories.

Major Equipment

Desktop Computer Systems 36 Nos
Make: Lenovo
Model: Think Center Neo 50s
Configuration: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 512 GB SSD HDD, Bluetooth, WiFi, 22" Monitor, Keyboard, Mouse
Software Required: StarUML, AgroUML and Visual Paradigm

FACULTY INFORMATION



Dr M Nagaraju

Associate Professor and Head of the Department

Ph.D (2022), Doctoral Degree, LPU, Punjab.

M.Tech (2012), JNTU, Hyderabad.

B.Tech (2004), Osmania University, Telangana.

AREA OF SPECIALIZATION

Artificial Intelligence, Machine Learning, Deep Learning, and Fuzzy Logic



Dr P Nagalakshmi Devi

Assistant Professor and Deputy HOD

Ph.D (2023) Doctoral Degree, VIT, AP.

M.Tech (2013), JNTU, Hyderabad.

B.Tech (2004), ANU, Guntur, AP.

AREA OF SPECIALIZATION

Computer Engineering, Cloud Computing, and Statistical Foundations of Data Science.



Dr. P Ashok Babu

Professor

Ph.D (2017), Doctoral Degree, JNTU Hyderabad

M.E (2005), CBIT Hyderabad, TS

B.Tech (2001), CR Reddy Engineering College, Eluru, AP.

AREA OF SPECIALIZATION

Computer Vision and Image Processing, Pattern Recognition and Machine Learning.



Dr. B Polaiah

Professor

Ph.D (2011), Doctoral Degree, JNTU, Anantapur, AP

M.Tech (2005), Annamalai University, TN

B.Tech(2002), JNTU, Hyderabad, AP

AREA OF SPECIALIZATION

Image Processing



Dr. V Padmanabha Reddy

Professor

Ph.D (2014), Doctoral Degree, SVU, Tirupathi, AP.

M.Tech (2002), JNTU, Anantapur, AP

B.Tech (1993), Kakatiya University, Warangal, TS.

AREA OF SPECIALIZATION

Signal and Image Processing



Dr. B Padmaja

Associate Professor

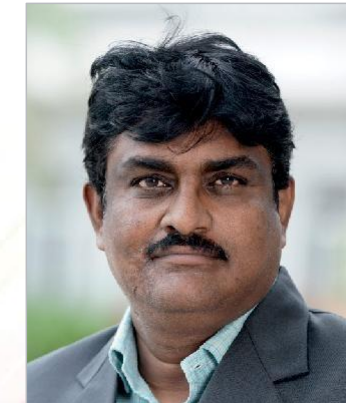
Ph.D (2021), Doctoral Degree, JNTU, Hyderabad.

M.Tech (2010), JNTU, Hyderabad, TS

B.Tech (2001), North Eastern Regional Institute of Science & Technology, Nirjuli, Arunachal Pradesh.

AREA OF SPECIALIZATION

Machine Learning, Deep Learning



Dr. Shaik Jakeer Hussain

Professor

Ph.D (2021), Doctoral Degree, Krishna University, Machilipatnam, AP

M.Tech (2011), AN University, Guntur AP.

B.Tech (2002), Gulbaraga University, Karnataka.

AREA OF SPECIALIZATION

Machine Learning and Deep Learning



Dr. D Khalandar Basha

Associate Professor

Ph.D (2022), Doctoral Degree, Sri Venkateswara University, Tirupathi, AP

M.Tech (2008), JNTU, Hyderabad, TS

B.Tech(2001), SV University, Tirupathi, AP

AREA OF SPECIALIZATION

Digital Image Processing,

Very Large-Scale Integration

Associate and Assistant Professors

Associate Professors:

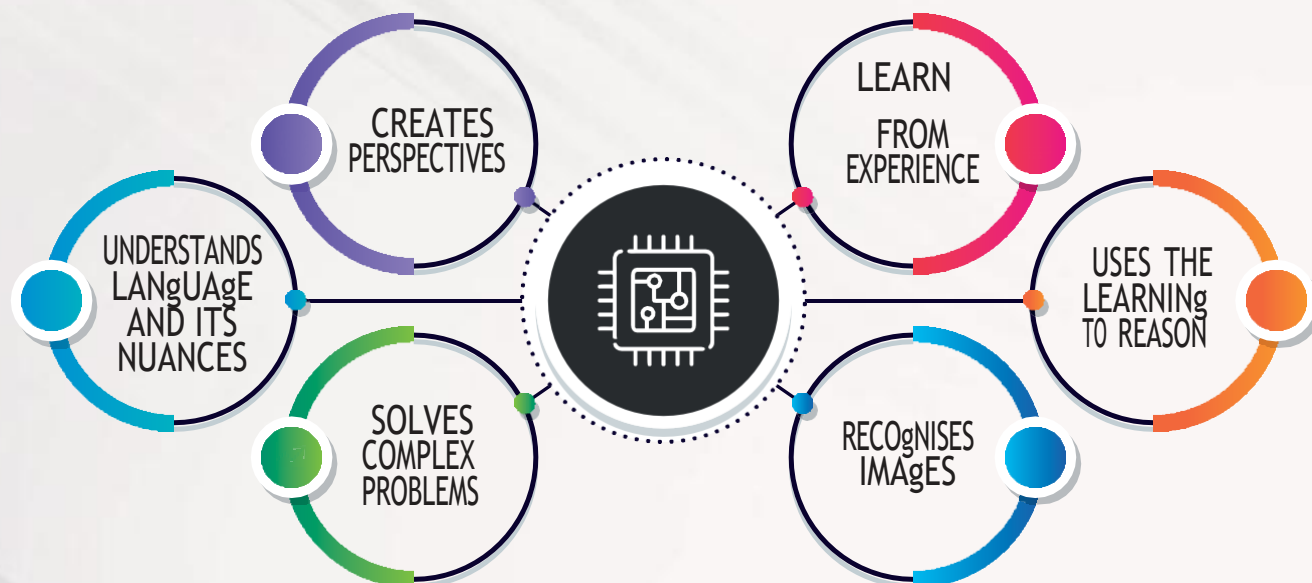
Dr. B Venkateshwara Rao
Dr. P Ramadevi

Assistant Professors:

Dr. Mallepogu SivaLakshmi
Dr. Shaik Ruksana Begam
Mr. S. Aswini
Ms. D Koumudi Prasanna
Mr. Bhukya Mohan
Mr. Somla
Ms. Bidyutlata Sahoo
Mr. Ch. Sai Kiran Reddy
Mr. M Seshanna
Ms. K Subba Shankar
Ms. P Sumathi
Mr. V Vidya Sagar
Ms. B Shirisha
Mr. M Rajashekar
Ms. Reshma
Ms. J Lakshmi
Ms. Y Bhanushya
Mr. G Sreekanth
Ms. Shilpa
Ms. V Sandhya
Ms. L Babitha
Ms. G Indu
Ms. Neelam

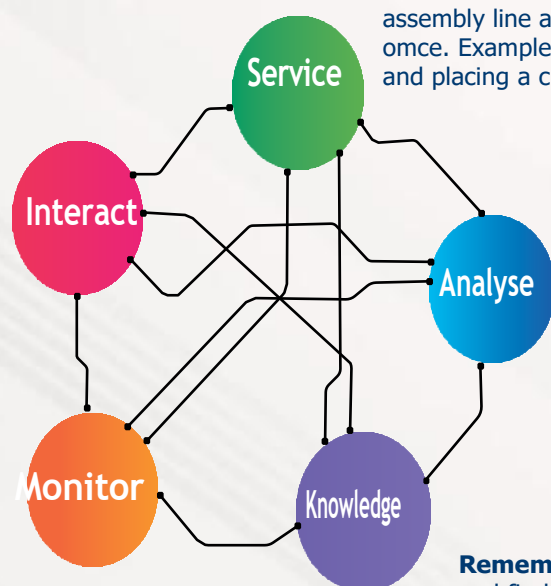
ARTIFICIAL INTELLIGENCE SYSTEM

Artificial Intelligence (AI), Sometimes called **Machine Intelligence**, is Intelligence demonstrated by machines, in contrast to the **natural intelligence** displayed by humans and other animals, through "learning" and "problem solving"



FIVE SKILLS OF AI

Listen / Talk: The ability to listen, read, talk, write and respond to AI solution. The aim here is for technology to ensure that the interaction feels intuitive and the customer is happy. Examples in this space include Chatbots and Voicebots.



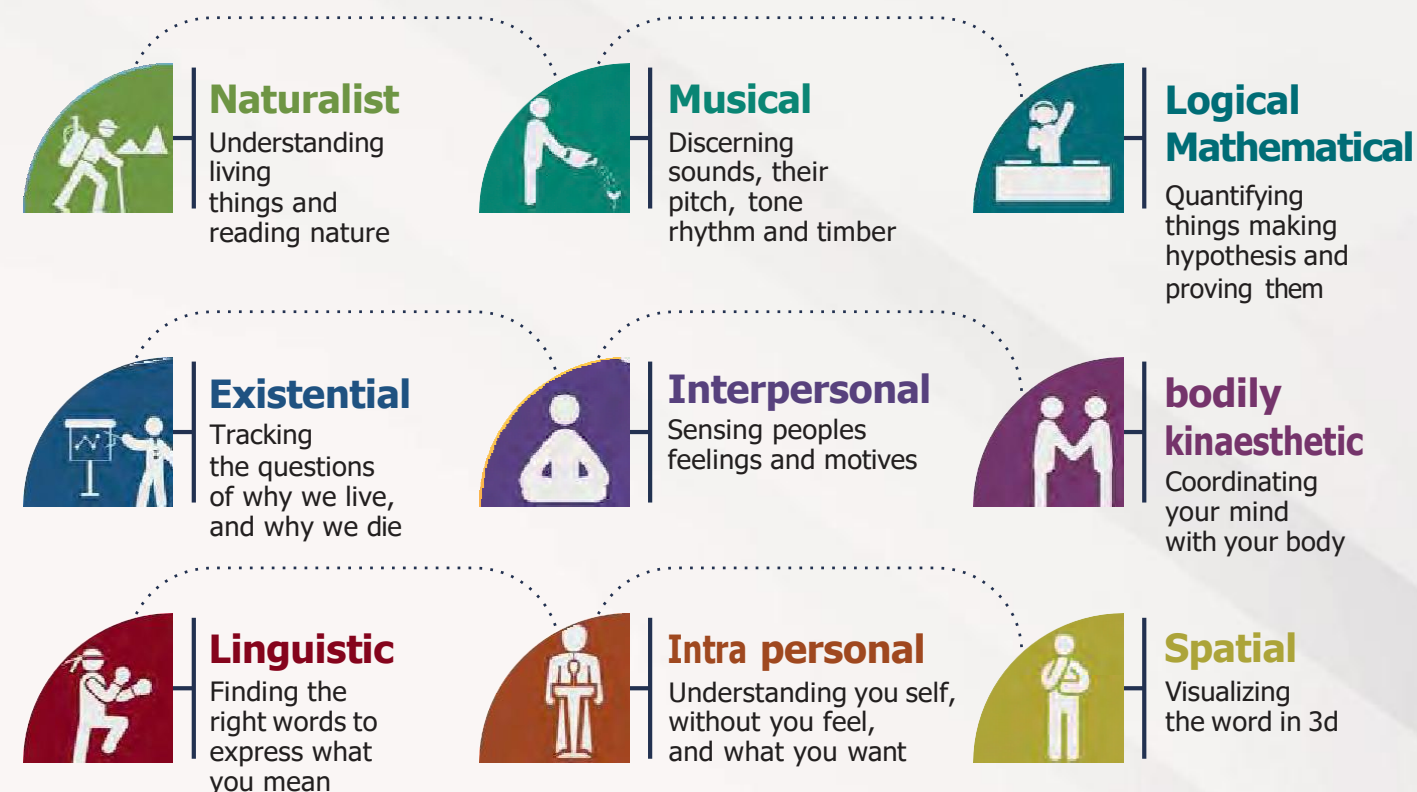
Act: This area uses technology to take action. We are used to the concept of Robots working on an assembly line and now they are moving into the omce. Examples include resetting a password and placing a customer order.

Think: This is the ability to detect patterns and recognise trends. It applies algorithms to knowledge to determine appropriate action or predict future consequences.

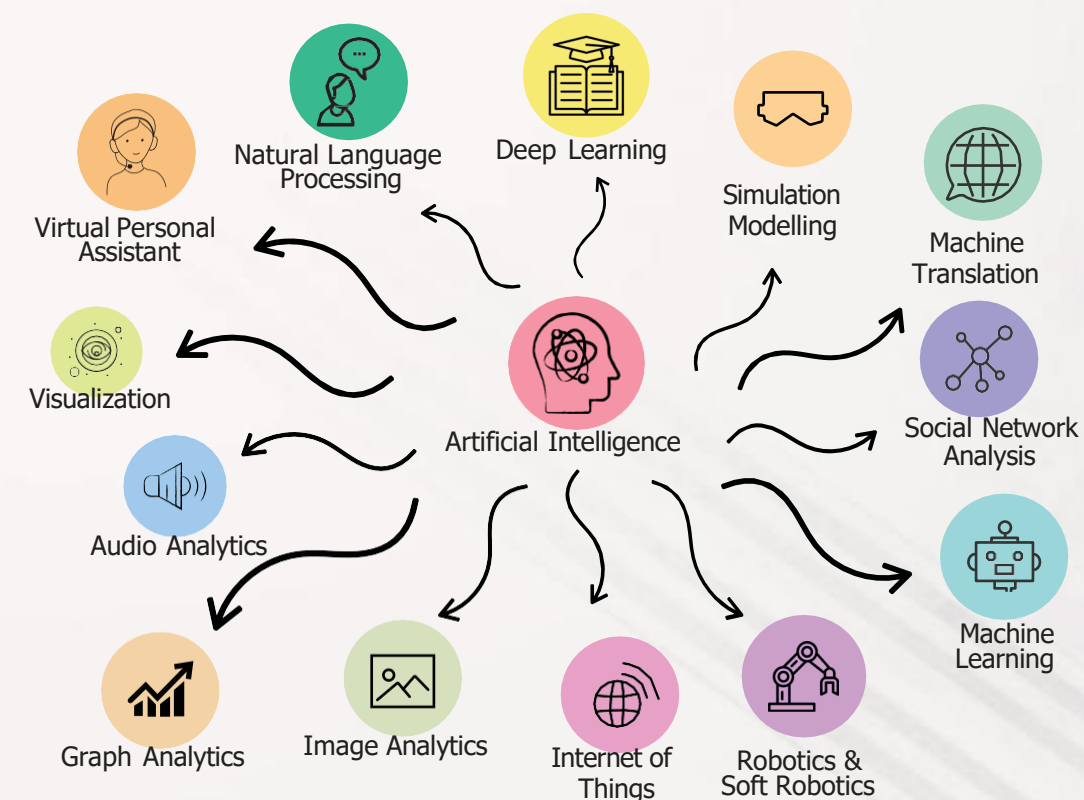
Watch: Here technology is used to watch and record key business data. It is used to create knowledge. This would include CCTV and IoT sensors.

Remember: This is about being able to store and find information effectively using components like databases and search engines. This is probably the least developed area within corporations, but examples include Wikipedia and employee's hard drives.

TYPES OF INTELLIGENCE

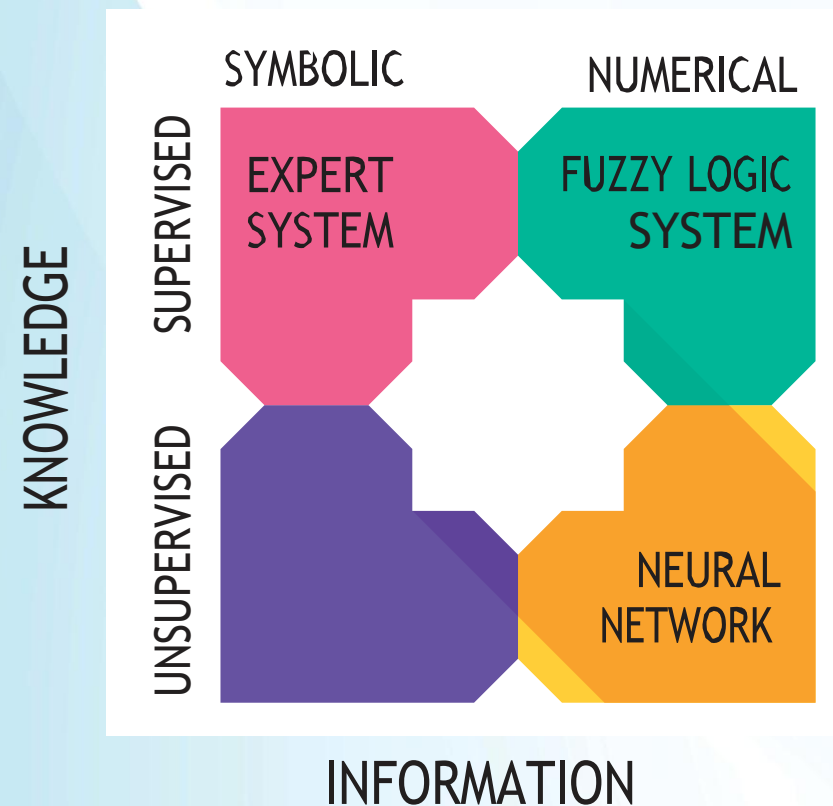


POSSIBLE APPLICATIONS FOR ARTIFICIAL INTELLIGENCE



ARTIFICIAL INTELLIGENCE **FRAMEWORK**

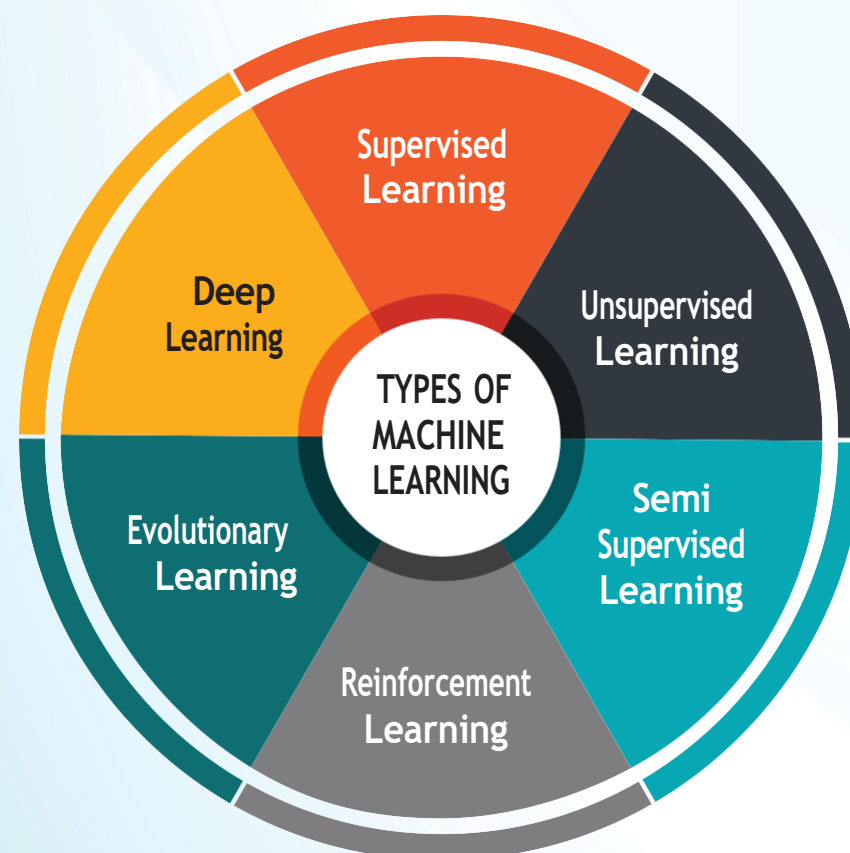
AI model frameworks provide a foundation for developing, training, and deploying machine learning models. The AI model is as follows.



MACHINE LEARNING AND ITS TYPE

Machine learning (ML) is a field of study in artificial intelligence concerned with the development and study of statistical algorithms that can learn from data and generalize to unseen data, and thus perform tasks without explicit instructions.

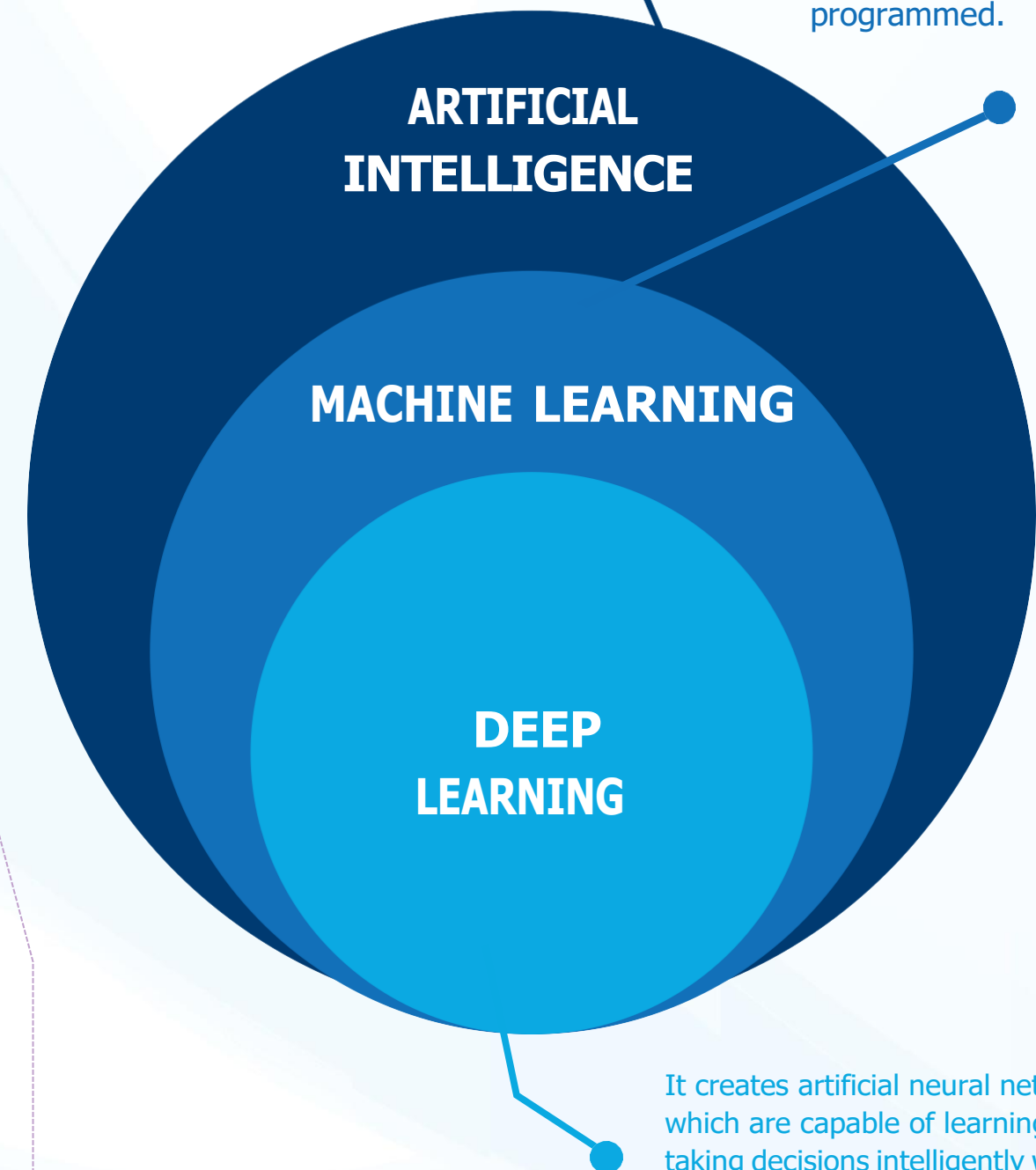
Machine learning is a “Field of study that gives computers the capability to learn without being explicitly programmed”.



DIFFERENCE BETWEEN MACHINE LEARNING AND DEEP LEARNING

The ability of machines to simulate human behaviour and take decisions intelligently like a human.

The ability of machines to automatically learn without being explicitly programmed.

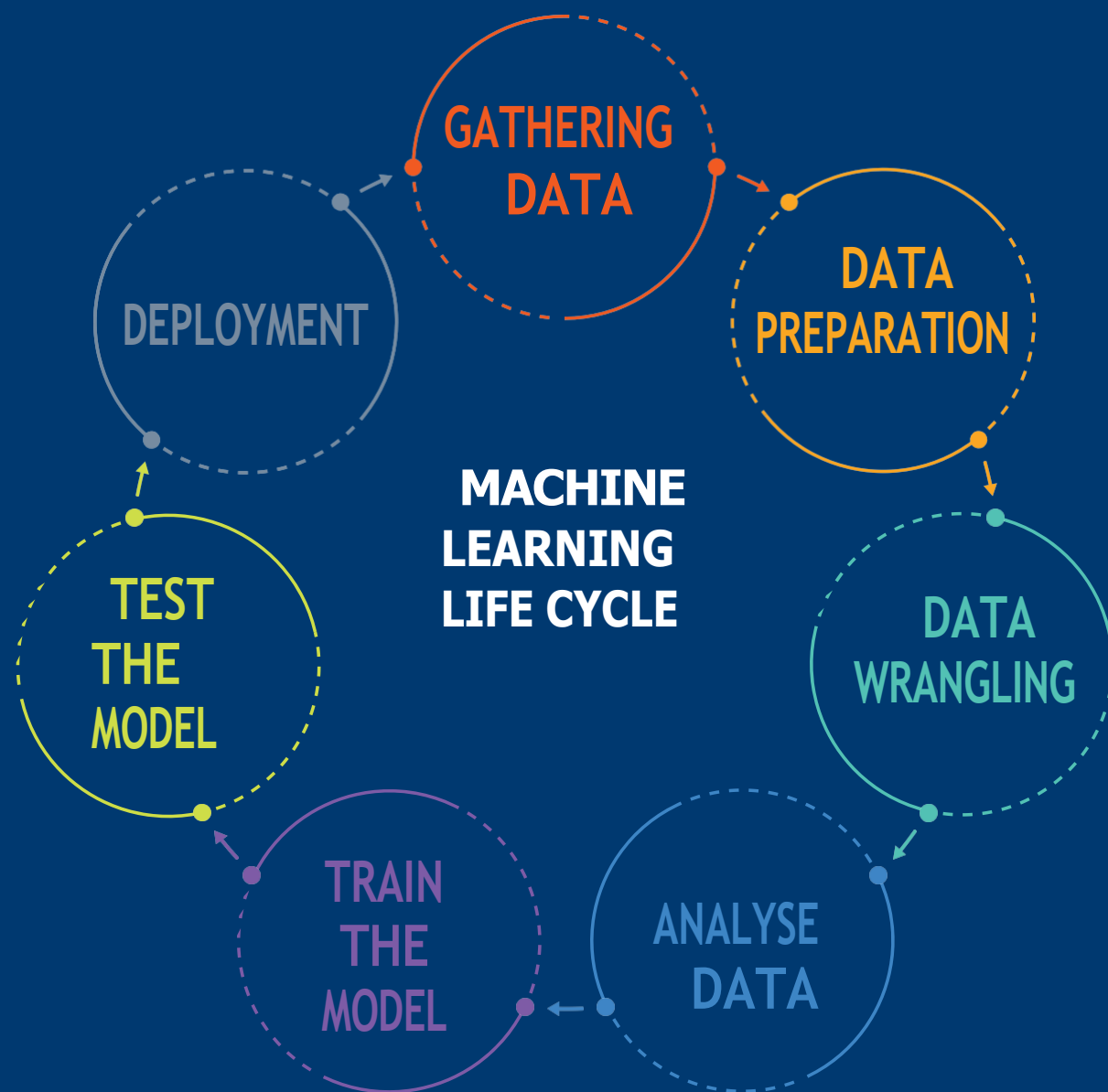


It creates artificial neural networks, which are capable of learning and taking decisions intelligently with the help of algorithms.

MACHINE LEARNING FRAMEWORK

The most important thing in the complete process is to understand the problem and to know the purpose of the problem. Therefore, before starting the life cycle, we need to understand the problem because the good result depends on the better understanding of the problem.

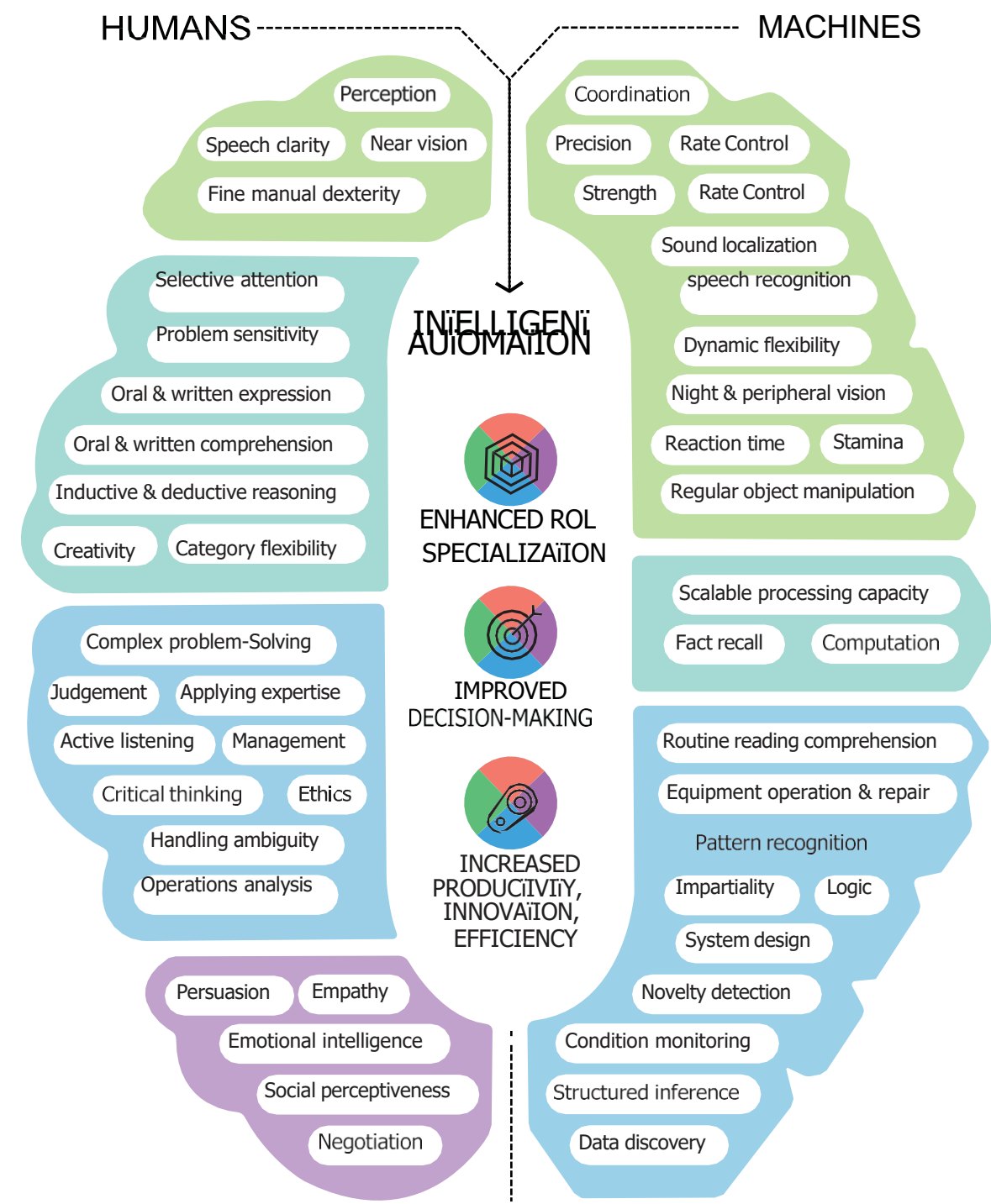
In the complete life cycle process, to solve a problem, we create a machine learning system called "model", and this model is created by providing "training". But to train a model, we need data, hence, life cycle starts by collecting data.



A NEW MIND-SET FOR THE NO-COLLAR WORKFORCE

Humans and machines can develop a symbiotic relationship, each with specialized skills and abilities, in a unified workforce that delivers multifaceted benefits to the business.

Abilities ● Psychomotor, sensory, physical ● Cognitive **skills** ● Content, Process, system ● Social



COURSE MENU

Curriculum is designed based on professional modules from Microsoft, Alibaba, Huawei, CTS, IEEE, ACM, and AICTE Model Curriculum in several subjects and so that students have opportunity to obtain professional certificates from the companies upon graduation.



I SEMESTER			
Course Code	Course Name	Credits	Prerequisite
THEORY			
AHSE01	Matrices and Calculus	4	Basic Principles of Algebra and Calculus
AHSE02	Engineering Physics	3	Basic Principles of Physics
AHSE04	Professional Communication	3	---
ACSE02	Essentials of Problem Solving	3	---
ACSE01	Object Oriented Programming	3	---
PRACTICAL			
AHSE07	English Language and Communication Skills Laboratory	1	Professional Communication
ACSE03	Object Oriented Programming Laboratory	1	---
AHSE05	Engineering Physics Laboratory	1	---
ACSE04	Front-End Web Development Laboratory	1	---
TOTAL CREDITS		20	
CUMULATIVE CREDITS		20	

II SEMESTER			
Course Code	Course Name	Credits	Prerequisite
THEORY			
AHSE03	Engineering Chemistry	3	Basic Principles of Chemistry
AHSE08	Ordinary Differential Equations and Vector Calculus	3	Basic Principles of Matrices and Calculus
ACSE06	AI Foundations	3	Python Programming
ACSE05	Data Structures	3	---
AEEE01	Basic Electrical and Electronics Engineering	3	---
PRACTICAL			
AHSE03	Engineering Chemistry Laboratory	1	Engineering Chemistry
ACSE07	Programming for Problem Solving Laboratory	1	Python Programming
ACSE08	Data Structures Laboratory	1	---
AMEE03	Computer Aided Engineering Graphics	2	---
TOTAL CREDITS		21	
CUMULATIVE CREDITS		41	

III SEMESTER			
Course Code	Course Name	Credits	Prerequisite
THEORY			
ACSE10	Design and Analysis of Algorithms	3	Mathematics
AITE01	Computer Systems and Architecture	3	---
AITE02	Database Management System	3	Data Structures
ACAE01	Intelligent Systems	3	AI Foundations
AHSE09	Probability and Statistical Methods	3	---
PRACTICAL			
ACSE12	Design and Analysis of Algorithms of Algorithms	1	Data Structures
AITE03	Database Management Systems Laboratory	1	---
ACAE02	Intelligent Systems Laboratory	1	---
ACSE14	Mobile Applications Development	1	---
SKILL ENHANCEMENT PROJECT			
AITE04	Programming with Objects	1	---
MANDATORY COURSE			
AMCE01	Environmental and Sustainable Development	0	
TOTAL CREDITS		21	
CUMULATIVE CREDITS		62	

IV SEMESTER			
Course Code	Course Name	Credits	Prerequisite
THEORY			
ACSE15	Internet Programming	3	Object Oriented Programming
AITE05	Computer Networks	3	---
AITE06	Software Engineering	3	---
ACSE16	Knowledge Discovery and Data Mining	3	Python Programming
ACSE11	Operating Systems	2	Python Programming
PRACTICAL			
ACSE18	Internet Programming Laboratory	1	Intelligent Systems
AITE07	Software Engineering and Computer Networks Laboratory	1	---
ACSE20	Java Full Stack Development	1	Object Oriented Programming
SKILL ENHANCEMENT PROJECT			
ASDE01	Prototype and Design Building	1	---
EXPERIENTIAL ENGINEERING EDUCATION (ExEED)			
ASDE02	Engineering Entrepreneurship and Skill Development	1	---
Internship - Field Practicum			
TOTAL CREDITS		20	
CUMULATIVE CREDITS		82	

#The course would consist of talks by working professionals from industry, government, academia & research organizations.

V SEMESTER			
Course Code	Course Name	Credits	Prerequisite
THEORY			
ACAE03	Computer Vision and Image Processing	3	AI Foundations
AHSE10	Business Economics and Financial Analysis	3	---
ACAE04	Big Data and Advanced Data Mining	3	Knowledge Discovery and Data Mining
	Program Elective - I	3	---
	Open Elective - I	2	---
PRACTICAL			
ACAE09	Computer Vision and Image Processing Laboratory	1	---
ACAE10	Creating Coding Laboratory	1	---
AHSE11	Professional Studies and Skill Development Laboratory	1	---
SKILL ENHANCEMENT PROJECT			
ACSE28	DevOps Engineering	1	---
EXPERIENTIAL ENGINEERING EDUCATION (ExEED)			
ASDE03	Engineering Design Project	1	---
MANDATORY COURSES			
AMCE02	Indian Knowledge System	1	
TOTAL CREDITS		21	
CUMULATIVE CREDITS		103	

#The course would consist of talks by working professionals from industry, government, academia & research organizations.

VI SEMESTER			
Course Code	Course Name	Credits	Prerequisite
THEORY			
AITE08	Theory of Computation	3	Discrete Mathematical Structures
ACAE11	Natural Language Processing	3	AI Foundations
ACAE12	Augmented Reality and Virtual Reality	3	---
	Program Elective - II	3	---
	Open Elective - I	3	---
PRACTICAL			
ACAE18	Natural Language Processing Laboratory	1	---
ACAE19	AI in Software Development Laboratory	1	---
ACAE20	Augmented Reality and Virtual Reality Laboratory	2	---
EXPERIENTIAL ENGINEERING EDUCATION (ExEED)			
ASDE04	Engineering Development Project	1	---
MANDATORY COURSE			
AMCE03	Gender Sensitization	1	---
Internship - Industrial In-Plant Training			
TOTAL CREDITS		20	
CUMULATIVE CREDITS		123	

#The course would consist of talks by working professionals from industry, government, academia & research organizations.

VII SEMESTER			
Course Code	Course Name	Credits	Prerequisite
THEORY			
AHSE12	Management Science and Psychology	3	Business Economics and Financial Analysis
ACAE21	Reinforcement and Robotic Learning	3	Intelligent Systems
	Program Elective - III	3	---
	Program Elective - IV	3	---
	Open Elective - III	2	---
PRACTICAL			
ACAE30	Reinforcement and Robotic Learning Laboratory	1	---
ACAE31	Generative AI Laboratory	1	---
ACAE32	Data Visualization Laboratory	1	---
SKILL ENHANCEMENT PROJECT			
ASDE05	Student Learning Model - Projects / Products	2	---
TOTAL CREDITS		20	
CUMULATIVE CREDITS		143	

VIII SEMESTER			
Course Code	Course Name	Credits	Prerequisite
THEORY			
	Program Elective - V	3	---
	Program Elective - VII	3	---
PROJECT WORK			
ACAE41	Capstone Project Work)	14	---
TOTAL CREDITS		20	
CUMULATIVE CREDITS		163	

ELECTIVE COURSES

PROGRAM ELECTIVES COURSES (PEC)

The below listed courses are Professional electives and the student has to study six courses as professional electives.

Course Code	Name of the Course	Prerequisites	Preferred Semester	Credits
ACAE05	Computer Graphics	Matrices and Calculus	V	3
ACSE23	Real-Time Data Analytics	Data Structures	V	3
ACAE06	Software Testing Methodologies	Object Oriented Programming	V	3
AITE12	Social, Text, and Media Analytics	Probability and Statistics Methods	V	3
AITE13	Blockchain Technologies	Database Management System	V	3
ACSE29	Software Architecture and Design Patterns	Software Engineering	VI	3
ACAE13	Blockchain Technology	Database Management System	VI	3
AITE18	Software Project Management	Software Engineering	VI	3
ACAE14	Mining Massive Datasets	Knowledge Discovery and Data Mining	VI	3
ACAE15	Probabilistic Graphical Model	Probability and Statistical Methods	VI	3
AITE21	Software Quality Assurance and Testing	Software Engineering	VII	3
ACDE18	Cryptography and Network Security	Computer Networks	VII	3
ACDE19	Penetrating Testing and Incident Response	Cryptography and Network Security	VII	3
ACAE22	Expert Systems	Intelligent Systems	VII	3
ACAE23	Cloud Computing	Computer Networks	VII	3
ACAE24	Agile Methodology	Software Engineering	VII	3
ACAE25	Advanced Algorithms	Design and Analysis of Algorithms	VII	3
ACAE26	Quantum Computing	Matrices and Calculus	VII	3
ACAE27	Robotic Process Automation	Programming with Objects	VII	3
ACDE24	Cyber Forensics	Operating System	VII	3
ACAE33	Nature Inspired Computing	Artificial Intelligence Foundations	VIII	3
ACSE41	Explainable AI (XAI)	Machine Learning Algorithms	VIII	3
ACAE34	Game Theory	Probability and Statistics Methods	VIII	3
ACAE35	Knowledge Representation and Reasoning	Intelligent Systems	VIII	3
ACAE36	Applications of AI in Bioinformatics	Machine Learning	VIII	3
ACAE37	High Performance Computing	Computer System and Architecture	VIII	3
ACAE38	Edge Computing	Cloud Computing	VIII	3
ACAE39	Evolutionary Computing	Nature-Inspired Computing	VIII	3
AITE28	Adhoc and Sensor Networks	Computer Networks	VIII	3
ACAE40	Classical Automation Techniques	Control Systems / Engineering Mechanics	VIII	3

OPEN ELECTIVE COURSES (OEC)

The courses listed below are offered by the Department of CSE (AI&ML) for students of other departments.

Course Code	Course Name	Prerequisites	Credits
ACAE07	Fundamentals of AI	-	2
ACAE08	Machine Learning Techniques	-	2
ACAE16	Introduction to Natural Language Processing	-	2
ACAE17	Virtual Reality	-	2
ACAE28	Cluster Computing	-	2
ACAE29	Deep Learning Paradigms for Computer Vision	-	2

VALUE-ADDED COURSES

Objective:

Value added courses are provided to equip the students with knowledge and skills outside of the curriculum or to meet any specific requirements of the industry. The following are the Value- Added Courses provided to students by various departments in our institution.

ANY FOUR FROM THE GIVEN BELOW THROUGH IARE ELRV -AKANKSHA / CERTIFICATE - SWAYAM, e-PG pathshala, NPTEL etc.

1. Data Scalability and Distribution (Amazon Web Services, Microsoft Azure, Google Cloud Platform etc.
2. Software Developer (Restful webservices / Microservices, Rust programming, MEAN, MERN, MEVN)
3. Data Science (Data visualization, Data wrangling, Bigdata Technologies, Business Intelligence etc.)
4. Operating Systems (IBM I, Mac OS, Linux, Haiku etc.)
5. Debugging
6. Testing (Selenium, TestNG)
7. Cyber Security (Network Security, Threat Intelligence and Analysis / Risk Assessment and Management)
8. Software Architect
9. Blockchain Technology



Competency building Courses

- AR/VR Solutions
- Software Engineering testing
- Software Engineering an industry approach
- Sales force
- C# and .Net
- Mobile Application Development
- Pega
- AWS
- Azure
- Machine Learning
- Advanced Robotics
- Block Chain
- Data Analytics
- Cyber Security

Career Development Courses:

- Competitive Programming
- JAVA Full Stack Developer
- DevOps
- Cloud Application Development
- Database Design
- Computer Networks
- Puzzle
- Aptitude and Reasoning
- Professional Communication & Soft Skills

The components of curriculum are divided as follows:

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total number of credits
Basic Sciences	11.87	21	19
Basic Engineering	11.25	23	18
Humanities and Social Sciences	2.5	5	4
Program Core	41.87	79	67
Program Electives	11.25	18	18
Open Electives	5.62	09	09
Project(s)	8.75	28	14
Any other (Skill)	6.87	19	11
Total number of credits			160



I SEMESTER

- Professional Communication
- Matrices and Calculus
- Engineering Physics
- Essentials of Problem Solving
- Object Oriented Programming
- English Language and Communication Skills Laboratory
- Object Oriented Programming Laboratory
- Engineering Physics Laboratory
- Front-End Web Development Laboratory

II SEMESTER

- Engineering Chemistry
- Ordinary Differential Equations and Vector Calculus
- Data Structures
- AI Foundations
- Basic Electrical and Electronics Engineering
- Engineering Chemistry Laboratory
- Programming for Problem Solving Laboratory
- Data Structures Laboratory
- Knowledge Representation and Reasoning Laboratory

AI&ML TRACK

DATA SCIENCE TRACK

III SEMESTER

- Design and Analysis of Algorithms
- Computer System and Architecture
- DatabaseManagementSystems
- Intelligent Systems
- Probability and Statistic Methods
- Data Structures Laboratory
- Design and Analysis of Algorithms Laboratory
- DatabaseManagementSystemsLaboratory
- Intelligent Systems Laboratory
- Mobile Application Development Laboratory

VI SEMESTER

- Theory of Computation
- Natural Language Processing
- Augmented Reality and Virtual Reality
- Program Elective - II
- Open Elective - II
- Natural Language Processing Laboratory
- Augment Reality and Virtual Reality Laboratory
- AI in Software Development Laboratory
- Engineering Development Project

IV SEMESTER

- Internet Programming
- Software Engineering
- Knowledge Discovery and Data Mining
- Operating Systems
- Internet Programming Laboratory
- Software Engineering and Computer Networks Laboratory
- Knowledge Discovery and Data Mining Laboratory
- Java Full Stack Development

VII SEMESTER

- Management Science and Psychology
- Reinforcement and Robotic Learning
- Program Elective - III
- Program Elective - IV
- Open Elective - III
- Reinforcement and Robotic Learning Laboratory
- Generative Learning Laboratory
- Data Visualization Laboratory
- Project Work (Phase - I)

V SEMESTER

- Computer Vision and Image Processing
- Business Economics and Financial Analysis
- Bigdata and Advanced Data Mining
- Program Elective - I
- Open Elective - I
- Computer Vision and Image Processing Laboratory
- Creative Coding Laboratory
- Professional Studies and Skill Development Laboratory
- Engineering Design Project

VIII SEMESTER

- Program Elective - V
- Program Elective - VI
- Capstone Project Work (Phase - II)

III SEMESTER

- Probability and Statistics Methods
- Design and Analysis of Algorithms
- Computer System and Architecture
- Database Management Systems
- Data Handling and Visualization Techniques
- Design and Analysis of Algorithms Laboratory
- Database Management Systems Laboratory
- Data Handling and Visualization Techniques Laboratory
- Mobile Application Development Laboratory

VI SEMESTER

- Machine Learning Algorithms
- Theory of Computation
- Cloud Computing
- Program Elective - II
- Open Elective - II
- Machine Learning Algorithms Laboratory
- Computer Networks Laboratory
- Professional Studies and Skill Development Laboratory
- Engineering Development Project

IV SEMESTER

- Software Engineering
- Operating System
- Computer Networks
- Internet Programming
- Knowledge Discovery and Data Mining
- Software Engineering and Computer Networks Laboratory
- Internet Programming Laboratory
- Knowledge Discovery and Data Mining Laboratory
- Java Full Stack Development

VII SEMESTER

- Management Science and Psychology
- Entrepreneur Thinking and Digital Models
- Program Elective - III
- Program Elective - IV
- Open Elective - III
- Data Stream Mining Laboratory
- Web and Social Media Analytics Laboratory
- Generative AI Laboratory
- Project Work (Phase - I)

V SEMESTER

- Applied Artificial Intelligence
- Business Economics and Financial Analysis
- Big Data and Advance Data Mining
- Program Elective - I
- Open Elective - I
- Applied Artificial Intelligence Laboratory
- Big Data and Advance Data Mining Laboratory
- Creative Coding Laboratory
- DevOps Engineering

VIII SEMESTER

- Program Elective - V
- Program Elective - VI
- Capstone Project Work (Phase - II)

COURSE SYNOPSIS



CORE COURSES

Essentials of Problem Solving

Essentials of Problem Solving introduces students to the fundamental concepts of computational thinking, logical reasoning, and structured problem-solving. The course emphasizes algorithmic thinking, flowchart design, pseudocode development, and basic programming constructs required to solve real-world problems. It helps students build a strong foundation for programming and analytical thinking, which are essential for advanced courses in computer science, artificial intelligence, and machine learning.

Object Oriented Programming

Object Oriented Programming provides students with a systematic understanding of programming using objects, classes, inheritance, polymorphism, abstraction, and encapsulation. The course enables students to design modular, reusable, and maintainable software applications. It focuses on developing practical programming skills and prepares students to solve complex problems using object-oriented design principles.

AI Foundation

AI Foundations introduces the basic principles, techniques, and applications of Artificial Intelligence. The course covers intelligent agents, search strategies, knowledge representation, reasoning, machine learning basics, and AI-based problem-solving approaches. It helps students understand how intelligent systems are designed and applied in areas such as automation, decision-making, robotics, healthcare, and smart applications.



Data Structures

Data Structures focuses on the organization, storage, and efficient processing of data. The course covers arrays, linked lists, stacks, queues, trees, graphs, hashing, and searching and sorting techniques. It enables students to select appropriate data structures for solving computational problems efficiently and forms the foundation for algorithm design, database systems, operating systems, and AI applications.

Design and Analysis of Algorithms

Design and Analysis of Algorithms deal with the systematic design, evaluation, and optimization of algorithms. The course covers algorithmic paradigms such as divide and conquer, greedy methods, dynamic programming, backtracking, branch and bound, and graph algorithms. It helps students analyze time and space complexity and develop efficient solutions for computationally challenging problems.

Computer System and Architecture

Computer System and Architecture introduce students to the internal organization and working principles of computer systems. The course covers digital logic, processor organization, memory hierarchy, input-output systems, instruction sets, pipelining, and performance evaluation. It helps students understand how hardware and software interact to execute programs efficiently.

Database Management System

Database Management Systems provides students with knowledge of database design, data modeling, query processing, transaction management, and database security. The course covers relational database concepts, ER modeling, normalization, SQL, indexing, and concurrency control. It enables students to design and manage efficient database systems for real-world applications.

Intelligent Systems

Intelligent Systems focuses on the design and development of systems capable of reasoning, learning, decision-making, and adapting to dynamic environments. The course covers knowledge-based systems, expert systems, fuzzy logic, uncertainty handling, machine learning, evolutionary computation, and intelligent agents. It prepares students to develop AI-driven solutions for complex and uncertain real-world problems.

Internet Programming

Internet Programming introduces students to the concepts, technologies, and tools required for developing web-based applications. The course covers client-side and server-side scripting, HTML, CSS, JavaScript, web frameworks, database connectivity, and web application deployment. It enables students to design interactive, dynamic, and responsive web applications.

Computer Networks

Computer Networks provides a comprehensive understanding of data communication and networking concepts. The course covers network models, transmission media, routing, switching, IP addressing, transport protocols, network security, and internet technologies. It helps students understand how devices communicate and how reliable, secure, and efficient networks are designed and managed.

Software Engineering

Software Engineering introduces students to the principles, methods, and tools used for systematic software development. The course covers software development life cycle models, requirement analysis, system design, coding standards, testing, maintenance, project management, and quality assurance. It enables students to develop reliable, scalable, and maintainable software systems.

Knowledge Discovery and Data Mining

Knowledge Discovery and Data Mining focus on extracting useful patterns, trends, and knowledge from large datasets. The course covers data preprocessing, association rule mining, classification, clustering, regression, anomaly detection, and evaluation techniques. It prepares students to apply data mining methods in business intelligence, healthcare, social media analytics, and AI-based decision-making systems.

Operating System

Operating Systems provides students with an understanding of the core concepts and functions of modern operating systems. The course covers process management, memory management, file systems, input-output management, scheduling, synchronization, deadlocks, and system security. It helps students understand how operating systems manage hardware resources and provide services for application programs.

Computer Vision and Image Processing

Computer Vision and Image Processing introduce students to techniques for acquiring, processing, analyzing, and interpreting digital images and visual data. The course covers image enhancement, filtering, segmentation, feature extraction, object detection, pattern recognition, and deep learning-based vision models. It prepares students for applications in medical imaging, surveillance, autonomous systems, agriculture, and industrial automation.

Big Data and Advanced Data Mining

Big Data and Advanced Data Mining focus on handling, processing, and analyzing massive and complex datasets. The course covers big data characteristics, distributed storage, parallel processing, Hadoop, Spark, advanced mining techniques, scalable machine learning, and real-time analytics. It enables students to develop intelligent data-driven solutions for large-scale industrial and research applications.

Theory of Computation

Theory of Computation provides the mathematical foundation for understanding the capabilities and limitations of computation. The course covers finite automata, regular languages, context-free grammars, pushdown automata, Turing machines, decidability, and computational complexity. It helps students develop formal reasoning skills required for compiler design, algorithm analysis, and theoretical computer science.

Natural Language Processing

Natural Language Processing introduces students to computational techniques for processing and understanding human language. The course covers text preprocessing, language modeling, syntactic and semantic analysis, sentiment analysis, information extraction, machine translation, and deep learning-based language models. It prepares students to develop applications such as chatbots, question-answering systems, text analytics tools, and intelligent language interfaces.

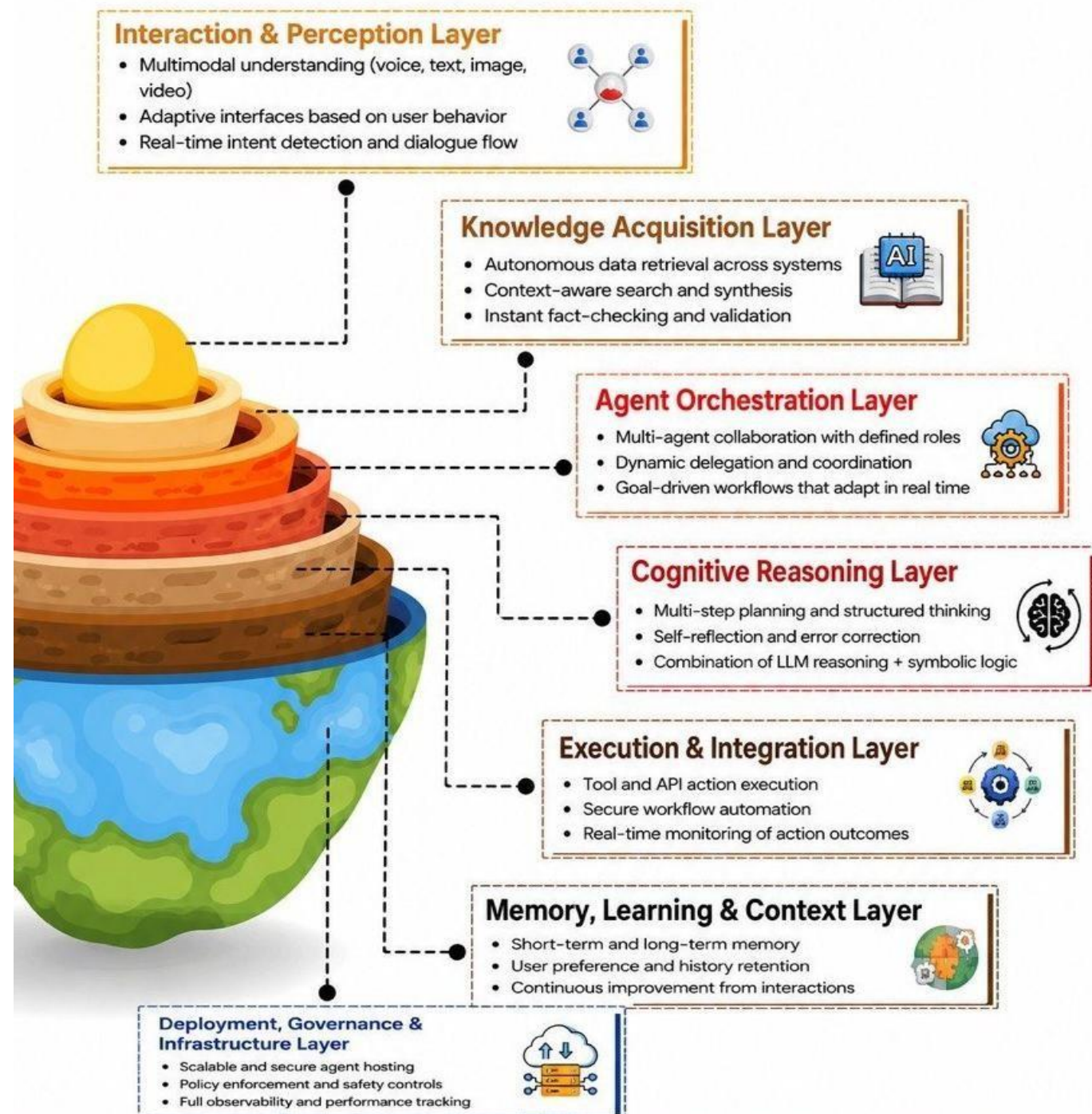
Augmented Reality and Virtual Reality

Augmented Reality and Virtual Reality introduces students to immersive technologies that blend digital content with real or simulated environments. The course covers AR/VR concepts, 3D modeling, tracking, rendering, interaction techniques, sensors, and application development. It enables students to design immersive applications for education, healthcare, gaming, training, simulation, and industrial visualization.

Reinforcement and Robotic Learning

Reinforcement and Robotic Learning focus on learning-based decision-making methods for autonomous systems and robots. The course covers reinforcement learning principles, Markov decision processes, reward modeling, policy learning, exploration-exploitation strategies, robotic perception, planning, and control. It prepares students to design intelligent agents and robotic systems capable of learning from interaction with their environment.

7 LAYERS OF AGENTIC AI



PROFESSIONAL ELECTIVES

Computer Graphics

Computer Graphics introduces students to the principles, techniques, and algorithms used to create, manipulate, and display visual content using computers. The course covers graphics primitives, 2D and 3D transformations, viewing, projection, clipping, shading, rendering, and animation concepts. It enables students to develop interactive graphical applications and provides a foundation for advanced areas such as visualization, gaming, virtual reality, augmented reality, and computer-aided design.

Software Testing Methodologies

Software Testing Methodologies provides students with a systematic understanding of software verification and validation techniques. The course covers test planning, test case design, black-box testing, white-box testing, unit testing, integration testing, system testing, regression testing, automation testing, and defect management. It helps students ensure software quality, reliability, performance, and maintainability in real-world software development environments.

Block Chain Technologies

Blockchain Technology introduces students to the concepts, architecture, and applications of decentralized and distributed ledger systems. The course covers cryptographic foundations, blocks, hashing, consensus mechanisms, smart contracts, cryptocurrencies, blockchain platforms, and security issues. It enables students to understand how blockchain can be applied in finance, supply chain, healthcare, digital identity, governance, and secure data sharing.

Mining Massive Datasets

Mining Massive Datasets focuses on techniques for extracting useful knowledge from extremely large and complex datasets. The course covers scalable data mining algorithms, distributed computing frameworks, clustering, classification, recommendation systems, frequent pattern mining, graph mining, and stream data analysis. It prepares students to work with large-scale data-driven applications in business analytics, social networks, e-commerce, healthcare, and artificial intelligence.

Probabilistic Graphical Model

Probabilistic Graphical Model introduces students to graphical representations of probabilistic relationships among variables. The course covers Bayesian networks, Markov networks, factor graphs, conditional independence, inference methods, learning algorithms, and decision-making under uncertainty. It helps students model complex real-world systems where uncertainty is present and supports applications in machine learning, computer vision, natural language processing, robotics, and bioinformatics.

Expert Systems

Expert Systems focuses on the design and development of computer-based systems that simulate the decision-making ability of human experts. The course covers knowledge representation, inference engines, rule-based reasoning, knowledge acquisition, explanation facilities, uncertainty handling, and expert system shells. It enables students to build intelligent advisory systems for domains such as medicine, engineering, finance, agriculture, and troubleshooting.

Cloud Computing

Cloud Computing introduces students to the concepts, models, and technologies used to deliver computing resources over the internet. The course covers cloud service models, deployment models, virtualization, storage, networking, scalability, security, cloud platforms, and cloud-based application deployment. It prepares students to design and manage scalable, cost-effective, and reliable cloud-based solutions for modern computing environments.

Agile Methodology

Agile Methodology provides students with an understanding of iterative and incremental approaches to software development. The course covers Agile principles, Scrum, Kanban, sprint planning, user stories, product backlog management, continuous integration, collaboration, and customer feedback. It enables students to participate effectively in modern software development teams and deliver high-quality software with flexibility and faster response to change.

Advanced Algorithms

Advanced Algorithms focuses on sophisticated algorithmic techniques used to solve complex computational problems efficiently. The course covers advanced graph algorithms, randomized algorithms, approximation algorithms, string matching, computational geometry, network flows, and complexity analysis. It strengthens students' ability to design optimized solutions for large-scale problems in artificial intelligence, machine learning, data science, networking, and software systems.

Quantum Computing

Quantum Computing introduces students to the principles of computation based on quantum mechanics. The course covers qubits, quantum gates, superposition, entanglement, quantum circuits, quantum algorithms, quantum measurement, and basic quantum programming concepts. It helps students understand the potential of quantum computing in solving complex problems related to cryptography, optimization, simulation, machine learning, and high-performance computing.

Robotic Process Automation

Robotic Process Automation focuses on the use of software robots to automate repetitive, rule-based, and business-oriented tasks. The course covers RPA concepts, process identification, workflow design, bot development, automation tools, exception handling, monitoring, and integration with enterprise applications. It enables students to design automation solutions that improve productivity, accuracy, efficiency, and operational performance in organizations.

Nature Inspired Computing

Nature Inspired Computing introduces students to computational techniques inspired by natural processes and biological systems. The course covers genetic algorithms, swarm intelligence, ant colony optimization, particle swarm optimization, artificial immune systems, neural-inspired models, and other bio-inspired methods. It helps students solve complex optimization, search, scheduling, classification, and decision-making problems using intelligent and adaptive approaches.

Game Theory

Game Theory provides students with a mathematical framework for analyzing strategic decision-making among rational agents. The course covers games, strategies, payoff matrices, Nash equilibrium, cooperative and non-cooperative games, zero-sum games, repeated games, and decision-making under competition. It prepares students to apply game-theoretic concepts in artificial intelligence, economics, cybersecurity, networking, resource allocation, and multi-agent systems.

Applications of AI in Bioinformatics

Applications of AI in Bioinformatics introduces students to the use of artificial intelligence and machine learning techniques for solving biological and biomedical problems. The course covers biological data analysis, sequence classification, gene prediction, protein structure prediction, disease diagnosis, drug discovery, genomics, and personalized medicine. It enables students to apply AI methods to extract meaningful insights from complex biological datasets.

High Performance Computing

High Performance Computing focuses on the use of advanced computing architectures and parallel processing techniques to solve computationally intensive problems. The course covers parallel programming, multicore processors, GPUs, clusters, distributed computing, performance optimization, and scalable algorithms. It prepares students to develop efficient solutions for scientific computing, artificial intelligence, big data analytics, simulations, and engineering applications.

Edge Computing

Edge Computing introduces students to computing models that process data closer to the source of generation rather than relying only on centralized cloud systems. The course covers edge architecture, Internet of Things integration, latency reduction, edge analytics, resource management, security, and real-time application deployment. It enables students to design intelligent, low-latency, and efficient systems for smart cities, healthcare, industry, agriculture, and autonomous applications.

Evolutionary Computing

Evolutionary Computing focuses on optimization and problem-solving techniques inspired by the process of natural evolution. The course covers genetic algorithms, genetic programming, evolutionary strategies, selection, crossover, mutation, fitness evaluation, and multi-objective optimization. It helps students solve complex search and optimization problems in artificial intelligence, machine learning, engineering design, scheduling, and decision-support systems.

Classical Automation Techniques

Classical Automation Techniques introduces students to traditional methods used for automating industrial and computational processes. The course covers control systems, sensors, actuators, programmable logic controllers, feedback mechanisms, process control, and rule-based automation. It provides a foundation for understanding modern automation systems and prepares students for advanced topics such as robotics, industrial automation, intelligent control, and cyber-physical systems.

Fundamentals of AI

Fundamentals of AI introduces students to the basic concepts, principles, and applications of artificial intelligence. The course covers intelligent agents, problem-solving methods, search techniques, knowledge representation, reasoning, learning approaches, and AI applications. It helps students understand how machines can be designed to perform tasks that require intelligence, such as decision-making, planning, perception, and language understanding.

Machine Learning Techniques

Machine Learning Techniques provides students with knowledge of algorithms and models that enable computers to learn from data. The course covers supervised learning, unsupervised learning, regression, classification, clustering, dimensionality reduction, model evaluation, and basic deep learning concepts. It enables students to develop predictive and intelligent systems for applications in healthcare, finance, agriculture, business analytics, computer vision, and natural language processing.

Introduction to Natural Language Processing

Introduction to Natural Language Processing focuses on computational methods for analyzing, understanding, and generating human language. The course covers text preprocessing, tokenization, stemming, lemmatization, language modeling, part-of-speech tagging, sentiment analysis, text classification, information retrieval, and basic neural language models. It prepares students to develop intelligent language-based applications such as chatbots, search engines, summarization systems, and conversational agents.

Virtual Reality

Virtual Reality introduces students to immersive computing technologies that create simulated digital environments for user interaction. The course covers VR concepts, 3D environments, visualization, tracking, rendering, interaction devices, user experience design, and VR application development. It enables students to design immersive applications for education, training, healthcare, gaming, simulation, engineering, and industrial visualization.

Big Data Mining

Big Data is huge, large or voluminous data, information or the relevant statistics acquired by the large organizations and ventures. Many software and data storage created and prepared as it is difficult to compute the big data manually. It is used to discover patterns and trends and make decisions related to human behavior and interaction technology. Data Mining is a technique to extract important and vital information and knowledge from a huge set/libraries of data. It derives insight by carefully extracting, reviewing, and processing the huge data to find out pattern and co-relations which can be important for the business. It is analogous to the gold mining where golds are extracted from rocks and sands.

Randomized Algorithms

A randomized algorithm is a technique that uses a source of randomness as part of its logic. It is typically used to reduce either the running time, or time complexity; or the memory used, or space complexity, in a standard algorithm. These algorithms introduce randomness to improve efficiency or simplify the algorithm design. By incorporating random choices into their processes, randomized algorithms can often provide faster solutions or better approximations compared to deterministic algorithms. They are particularly useful in situations where exact solutions are difficult to find or when a probabilistic approach is acceptable.

Augmented Reality & Virtual Reality

AR uses a real-world setting while VR is completely virtual. AR users can control their presence in the real world; VR users are controlled by the system. VR requires a headset device, but AR can be accessed with a smartphone. AR enhances both the virtual and real world while VR only enhances a fictional reality. virtual reality (VR), the use of computer modeling and simulation that enables a person to interact with an artificial three-dimensional (3-D) visual or other sensory environment.

Federated Machine Learning

Federated learning (FL) is a decentralized approach to training machine learning models that gives advantages of privacy protection, data security, and access to heterogeneous data over the usual centralized machine learning approaches. Federated learning is a way to train AI models without anyone seeing or touching your data, offering a way to unlock information to feed new AI applications. Federated learning works by training a central model across decentralized devices or servers. Instead of moving all data to a central location, the model is trained locally on each device, and only the model updates are shared. This maintains privacy and allows collaborative learning without sharing raw data.

Machine Translation

Machine translation of languages refers to the use of artificial intelligence (AI) and machine learning algorithms to automatically translate text or speech from one language to another. This technology has been developed over the years and has become increasingly sophisticated, with the ability to produce accurate translations across a wide range of languages. Machine translation is the process of using artificial intelligence to automatically translate text from one language to another without human involvement.

Sequence Models in NLP

Sequence Models in Natural Language Processing (NLP) refer to a set of techniques and models that are specifically designed to process and analyze sequential data, such as text, speech, and time series data. Sequence models are a class of machine learning models designed for tasks that involve sequential data, where the order of elements in the input is important. Sequential data includes textual data, time series data, audio signals, video streams or any other ordered data. Sequence models are the machine learning models that input or output sequences of data. Sequential data includes text streams, audio clips, video clips, time-series data and etc. Recurrent Neural Networks (RNNs) is a popular algorithm used in sequence models.

Applied Natural Language Processing

Natural Language Processing (NLP) is an important area of Artificial Intelligence concerned with the processing and understanding (NLU) of a human language. The goal of NLP and NLU is to process and harness information from a large corpus of text with very little manual intervention. Natural language processing is a field of computer science and linguistics that deals with the interaction between computers and human languages. NLP enables computers to understand human language and respond in a way that is natural for humans. The ultimate goal of NLP is to help computers understand language as well as we do. It is the driving force behind things like virtual assistants, speech recognition, sentiment analysis, automatic text summarization, machine translation and much more.

Artificial Intelligence in Agriculture

AI is a useful tool for tracking and spotting possible issues with plant health or soil nutrient deficits. Applications are created to examine crop health trends in agriculture with the use of thorough research. These AI-enabled apps are helpful for improving knowledge of plant diseases, pests, soil health, and pests. This system utilizes AI and Machine Learning to detect crop issues, enabling timely intervention for healthier crops. AI based analytics using field photographs for crop health assessment and crop health monitoring using Satellite, weather & soil moisture datasets for rice and wheat crop.

Application of AI in Bioinformatics

AI enables the development of predictive models in bioinformatics. Machine learning algorithms can predict biological outcomes, understand disease patterns, and guide personalized medicine approaches based on individual genetic profiles. Machine learning in bioinformatics can sift through biomedical publications and reports to identify different genes and proteins and search for their functionality. It can also aid in annotating protein databases and complement them with the information it retrieves from the literature.

Machine Intelligence in Medical Image Analysis

AI algorithms can be trained to analyze medical images and detect abnormalities or subtle changes that may be difficult for humans to detect, leading to more accurate and efficient diagnosis and treatment of various conditions. By leveraging machine learning algorithms, AI systems can analyze medical images with speed and precision, aiding in the identification of early-stage diseases that may be difficult to detect through traditional methods. Conventional machine learning approach to CAD in medical imaging used image analysis methods to recognize disease patterns and distinguish different classes of structures on images.



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