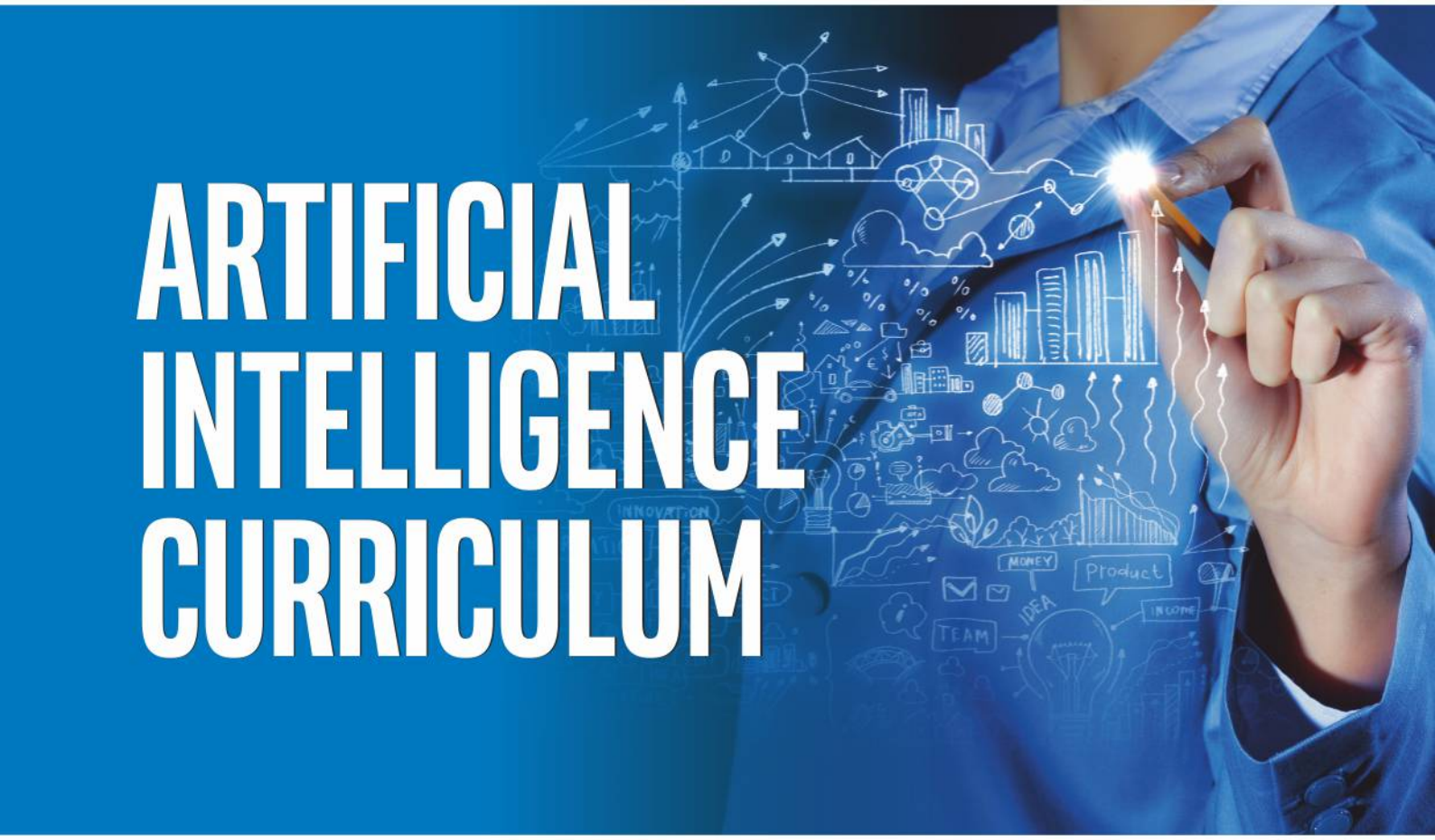
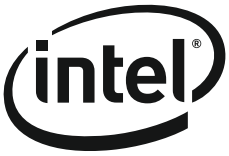


ARTIFICIAL INTELLIGENCE CURRICULUM

Class 9

Facilitator Handbook



ARTIFICIAL INTELLIGENCE CURRICULUM

Curated with support from Intel®

Acknowledgement

Patrons:

- Sh. Ramesh Pokhriyal 'Nishank', Minister of Human Resource Development, Government of India
- Sh. Dhotre Sanjay Shamrao, Minister of State for Human Resource Development, Government of India
- Ms. Rina Ray, IAS, Secretary, Department of School Education and Literacy, Ministry Human Resource Development, Government of India

Advisory, Editorial and Creative Inputs:

- Ms. Anita Karwal, IAS, Chairperson, Central Board of Secondary Education
- Ms. Shweta Khurana, Director, Corporate Affairs Intel India

Guidance and Support:

- Sh. Anurag Tripathi, IRPS, Secretary, Central Board of Secondary Education
- Dr. Joseph Emmanuel, Director (Academics), Central Board of Secondary Education
- Dr. Biswajit Saha, Director (Skill Education & Training), Central Board of Secondary Education

Value adder, Curator and Co-ordinator:

- Sh. Ravinder Pal Singh, Joint Secretary, Department of Skill Education, Central Board of Secondary Education

Content Curation Team:

- Ms. Sharon E. Kumar, Innovation and Education Consultant, Intel AI4Youth Program.
- Ms. Ambika Saxena, AI Coach, Intel AI4Youth Program
- Ms. Shyda Rana, Senior Faculty, Army Welfare Education Society

About the Book

Artificial Intelligence (AI) is being widely recognized to be the power that will fuel the future global digital economy. AI in the past few years has gained geo-strategic importance and a large number of countries are striving hard to stay ahead with their policy initiatives to get their country ready.

India's own AI Strategy identifies AI as an opportunity and solution provider for inclusive economic growth and social development. The report also identifies the importance of skills-based education (as opposed to knowledge intensive education), and the value of project related work in order to “effectively harness the potential of AI in a sustainable manner” and to make India's next generation 'AI ready'.

As a beginning in this direction, CBSE has introduced Artificial Intelligence as an optional subject at Class IX from the Session 2019-2020 onwards. To enhance the multidisciplinary approach in teaching learning and also to sensitize the new generation, it was decided that Schools may start AI “Inspire module” of 12 hours at Class VIII itself.

CBSE is already offering various Skill subjects at Secondary and Senior Secondary level to upgrade the skills and proficiency of the young generation and also to provide them awareness to explore various career options. At Secondary Level, a Skill subject may be offered as additional sixth subject along with the existing five compulsory subjects.

CBSE acknowledges the initiative by Intel India in curating this Facilitator Manual, the AI training video and managing the subsequent trainings of trainers on the Artificial Intelligence Curriculum.

The aim is to strive together to make our students future ready and help them work on incorporating Artificial Intelligence to improve their learning experience.

Contents

Conceptual Framework

Introduction to Artificial Intelligence

Artificial Intelligence has always been a term which intrigues people all over the world. Various organisations have coined their own versions of defining Artificial Intelligence. Some of them are mentioned below:

Niti Aayog: National Strategy for Artificial Intelligence

AI refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making. Initially conceived as a technology that could mimic human intelligence, AI has evolved in ways that far exceed its original conception. With incredible advances made in data collection, processing and computation power, intelligent systems can now be deployed to take over a variety of tasks, enable connectivity and enhance productivity.

World Economic Forum

Artificial intelligence (AI) is the software engine that drives the Fourth Industrial Revolution. Its impact can already be seen in homes, businesses and political processes. In its embodied form of robots, it will soon be driving cars, stocking warehouses and caring for the young and elderly. It holds the promise of solving some of the most pressing issues facing society, but also presents challenges such as inscrutable "black box" algorithms, unethical use of data and potential job displacement. As rapid advances in machine learning (ML) increase the scope and scale of AI's deployment across all aspects of daily life, and as the technology itself can learn and change on its own, multi-stakeholder collaboration is required to optimize accountability, transparency, privacy and impartiality to create trust.

European Artificial Intelligence (AI) leadership, the path for an integrated vision

AI is not a well-defined technology and no universally agreed definition exists. It is rather a cover term for techniques associated with data analysis and pattern recognition. AI is not a new technology, having existed since the 1950s. While some markets, sectors and individual businesses are more advanced than others, AI is still at a relatively early stage of development, so that the range of potential applications, and the quality of most existing applications, have ample margins left for further development and improvement.

Encyclopaedia Britannica

Artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience.

In other words, AI may be defined as:

AI is a form of intelligence; a type of technology and a field of study. AI theory and development of computer systems (both machines and software) are able to perform tasks that normally require human intelligence. Artificial Intelligence covers a broad range of domains and applications and is expected to impact every field in the future. Overall, its core idea is building machines and algorithms which are capable of performing computational tasks that would otherwise require human like brain functions.

Rationale

Schools have an important and responsible role to provide learning opportunities for the students and guide them on the path to success. There is need to channelize learning towards applying innovative skills and application that will contribute towards a robust future in a sustainable world.

A school is recognized because of the capability of its teachers to bring out the best in the students. Students are the ones who will shape the future of the country – they are the ones who need to pave the way to sustainable development and to preserve the planet.

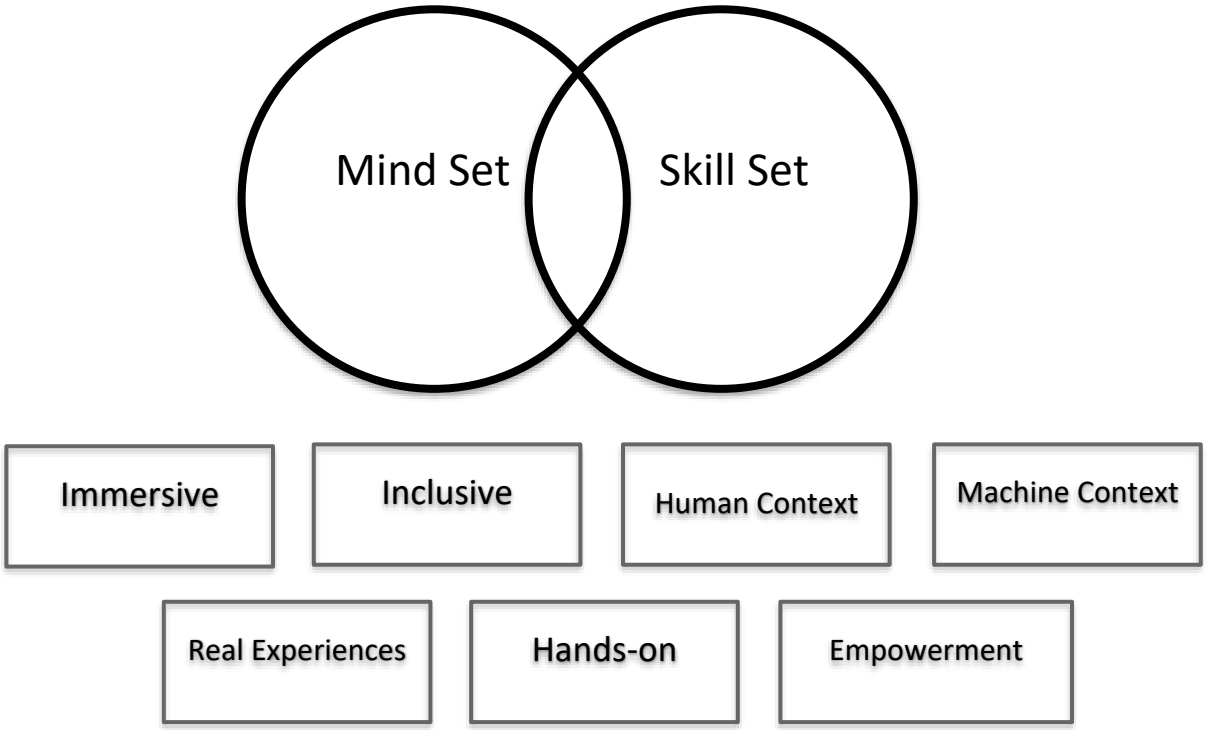
Much aligned to this are the sustainable development goals (SDG) that focus on the well-being of the planet and teachers have the role of introducing these SDGs to the students.

Students also need to be guided on recognizing the pros and cons of Artificial Intelligence and on being able to differentiate between what is right and acceptable and what is not.

The Purpose

Artificial intelligence is gaining the spotlight across applications in our personal and professional lives. We need to take charge of preparing ourselves and our students for the future. Hence, Central Board of Secondary Education (CBSE) has decided to introduce artificial intelligence as an elective subject.

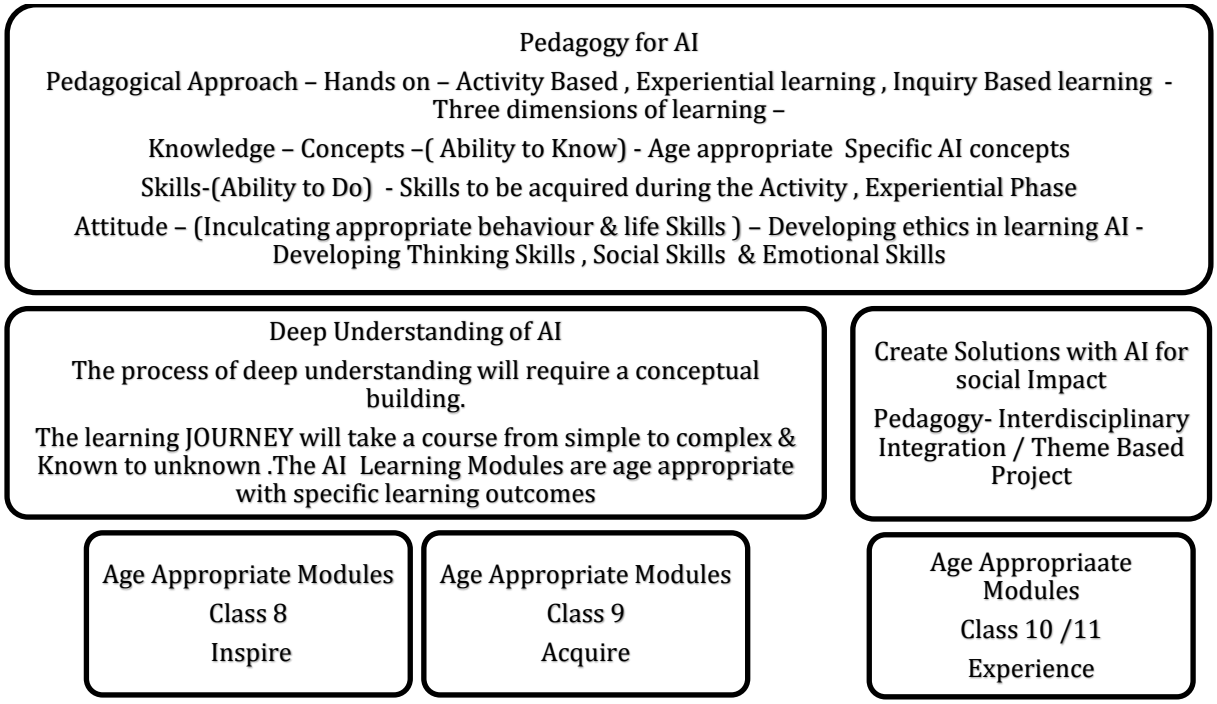
Uniqueness of the Program



Overview of the AI Curriculum

Artificial Intelligence Curriculum aims at developing the learner's mind set and skills set towards artificial intelligence and how it is understood and applied. The important principle that artificial intelligence embraces is holistic inclusive and progressive development in immersive ways by problem solving, creative thinking, and critically analysing data.

Overview and Learning Objectives of the AI Program



Essential Learning Experience form AI

The core essential learning experiences from the AI course are

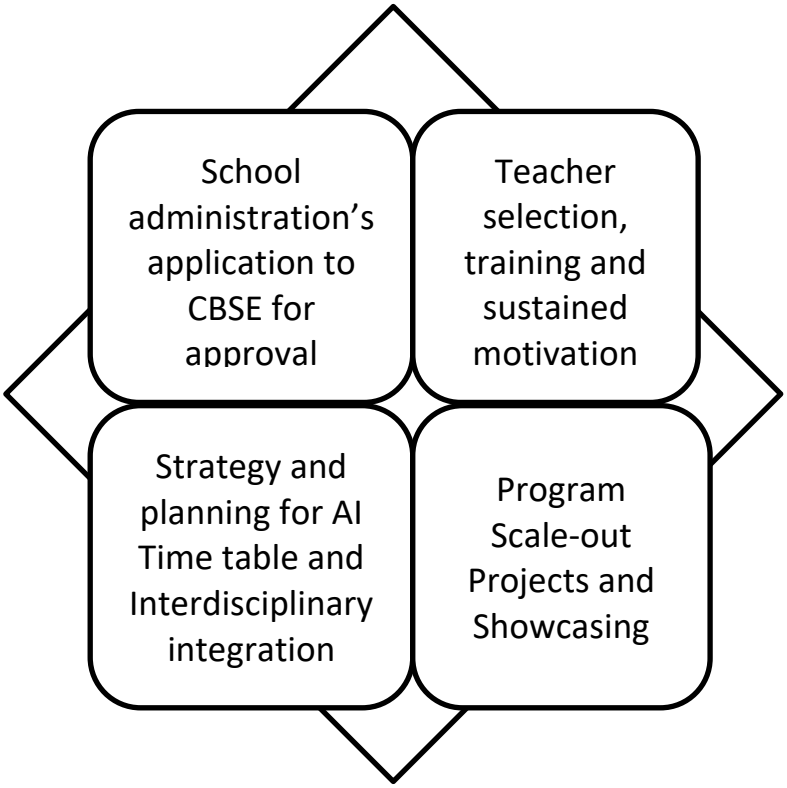
- Experiences of creating by Identifying Problem solving
- Experiences of Informed decision making
- Experiences of demonstrating responsible citizenship
- Experiences of self-reflection, values and ethics.
- Experiences for exploring future career opportunities

Developing Key Competencies for Lifelong Learning

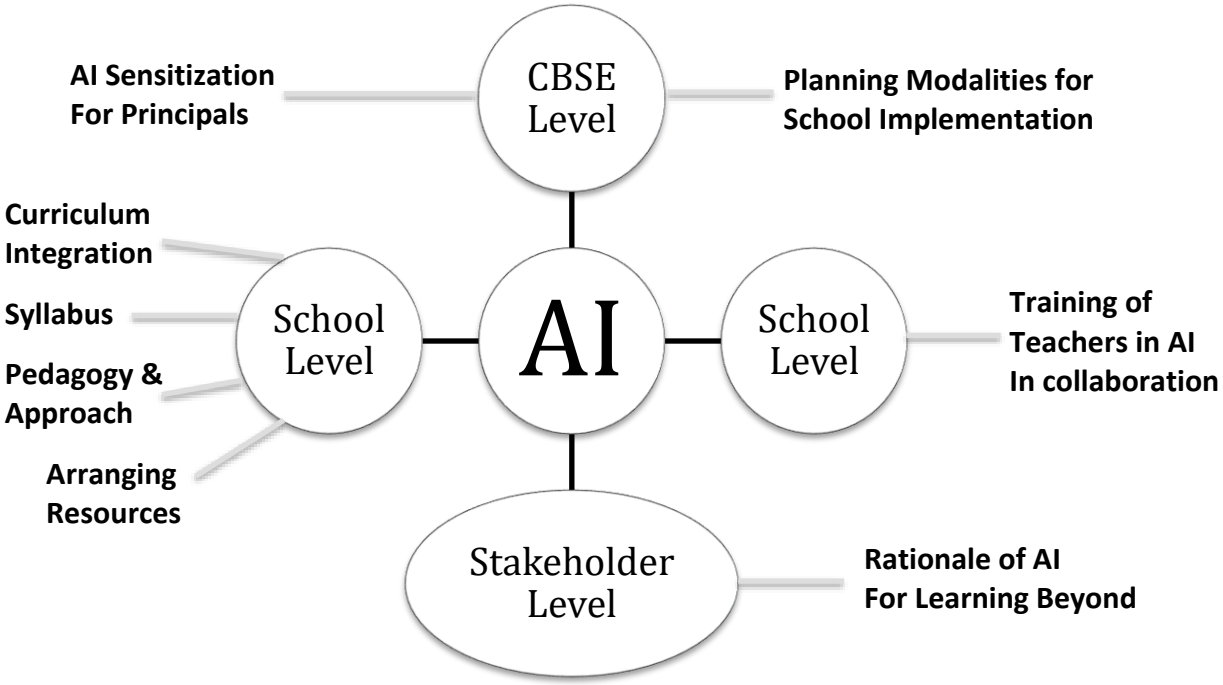
- Learning and problem solving
- Developing interaction and cooperation
- Innovativeness and initiative
- Application across key disciplines
- Social responsibilities and applications
- Vocational ethics
- Communication skills

The AI Curriculum

School Procedures for AI Implementation



AI Implementation Procedures



AI Syllabus

UNITWISE DISTRIBUTION

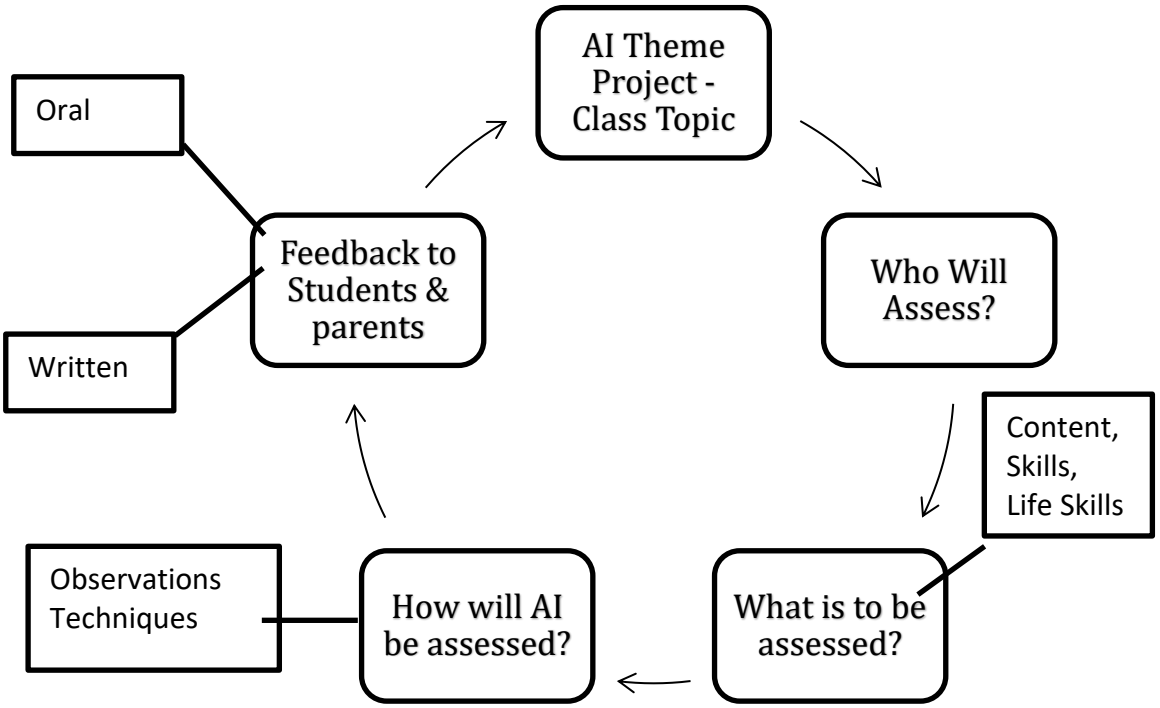
No.	UNIT	SUB-UNIT	DURATION	MARKS	
				THEORY	PRACTICAL
1	Introduction to AI	Excite	2.4 Hours (4 Periods)	10	10
		Relate	02 Hours (3 Periods)		
		Purpose	02 Hours (3 Periods)		
		Possibilities	02 Hours (3 Periods)		
		AI Ethics	3.6 Hours (6 Periods)		
2	AI Project Cycle	Problem Scoping	14 Hours (21 Periods)	10	10
		Data Acquisition	02 Hours (3 Periods)		
		Data Exploration	04 Hours (6 Periods)		
		Modelling	06 Hours (9 Periods)		
3	Neural Network		04 Hours (6 Periods)	10	10
4	Introduction to Python		70 Hours (105 Periods)	20	10
5	Co-curricular Skills				10
TOTAL			**112 Hours (168 Periods)**	**50**	**50**

ASSESSMENT

After completion of each unit, the students can be evaluated on the basis of the following skills:

Conceptual Skills	Technical Skills	Life Skills
Conceptual understanding of AI AI applications and three domains of AI Knowledge Enhancement in 3 AI Domains: Data, Computer Vision & Natural Language Processing Mind mapping Problem Identification Data Acquisition Data Exploration Graphical Representation Neural Network	Ability to use AI Powered Tools Troubleshooting Skill Basic programming skills Basic Python	Thinking Skills Problem Solving Creative thinking Critical Thinking Decision Making Skills Social Skills - Teamwork Team Building Skills Leadership Self-Awareness Empathy Effective Communication Skills Oral & Written Presentation

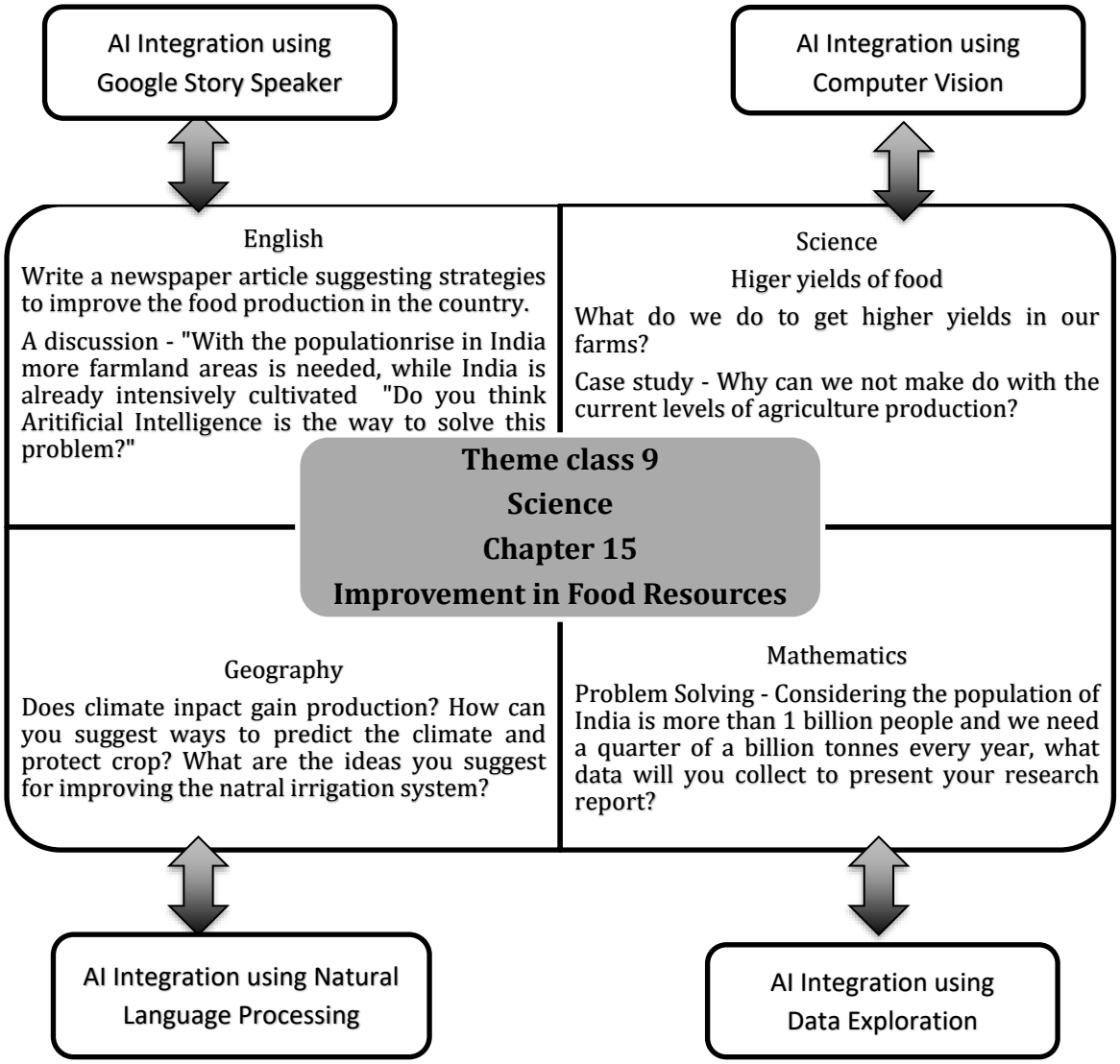
Suggestive Assessment Approaches for AI



AI Curriculum Mapping

AI integration in the curriculum can be done in the following ways: Interdisciplinary approach across Subjects based on a selected theme.

Interdisciplinary Integration with Artificial Intelligence - Class 9



AI Learning Indicators

Areas	Class 8	Class 9
Knowledge Understanding AI	What is AI? Why? Pedagogy- Brainstorming/Concept maps, Venn Diagrams	Why AI /Why not AI ? What other possibilities? Pedagogy- Discussion/Debate Questioning, NLR- Comparison Matrix
Skills **Prerequisite skills** **Skills to be acquired/developed**	Inquiry / Questioning Skills Generating Ideas – Critical & Computer skills	Inquiry / Questioning Skills Communicating Creative thinking Critical Thinking
Technical Competencies for Artificial Intelligence (AI) **Data** **Computer Vision(CV)** **Natural Language Processing (NLP)**	Through Creative games /Skills based problem solving challenges /Designing Introduction to all three domains Data CV NLP Using all three domains in different challenging games to identify AI in different context	Through Creative games /Skills based problem solving challenges /Designing Building conceptual understanding and skill development in one domain of AI - Data CV NLP- Gaining competency in NLP. Learning basics of Python
Attitude	Initiative Positive Thinking	Initiative Success Vs failure Positive Thinking
Life Skills to be developed	Thinking Skills Social Skills	Thinking Skills /Social Skills Emotional Skills
Program course to be covered	In one academic session	In one academic session
Mentoring and feedback **Suggestive Activities**	Face to face Online Online Newsletter for all levels on the work in AI all across participating schools	Face to face Online Online Newsletter for all levels on the work in AI all across participating schools

AI Learning Outcomes

Areas	Class 8	Class 9
Unit 1.1: Excite **Introduction to Artificial Intelligence** **Three domains of AI**	After completion of the unit, learners will be able to describe: The relation and application of AI in their daily life Identify the 3 domains of AI	After completion of the unit, learners will be able to describe: The relation and application of AI in their daily life Identify the 3 domains of AI
Unit 1.2: Relate **Smart home and Cities** **Interactive story writing**	Learners will be able to relate to the relevance and application of AI in the context of their homes Learners will be able to extend learning and apply it to interactive story writing	Learners will be able to relate to the relevance and application of AI in the context of their homes Learners will be able to extend learning and apply it to interactive story writing
Unit 1.3: Purpose **Introduction to 17 sustainable development goals**	Learners will be able to identify and develop awareness for SDGs using AI solutions	Learners will be able to identify and develop awareness for SDGs using AI solutions
Unit 1.4: Possibilities **Applications of AI in various fields**	Learners will be able to describe and explore the application of AI in different fields and various industries	Learners will be able to describe and explore the application of AI in different fields and various industries
Unit 1.5: Ethics **Introduction to Ethics** **Awareness to Ethics**	Learners will be able to describe some ethical concerns of AI with respect to inclusion, bias, and privacy	Learners will be able to describe some ethical concerns of AI with respect to inclusion, bias, and privacy
Unit 2: AI project cycle **Introduction to AI Project Cycle** **Problem Scoping** **Data Acquisition** **Data Exploration** **Modelling: AI, ML, DL** **Evaluation**		After completion of the AI project cycle learners will be able to: Describe, explain and apply the different stages in project cycle Enquire about and state the problem for the project cycle and create a system map Understand different ways for data acquisition and interpretation through graphs and visuals Model and evaluate the problem for the project cycle Recognise different type of graphs and explore various patterns and trends out of the data explored
Unit 3: Neural Networks **Introduction to the concepts of Neural Networks**		Learners will be able to develop an understanding of Neural Networks Learners will be able to describe the working of Neural Networks

Translating AI on Ground

Creating the Mindset

The aim is to familiarize students into understanding the AI Program. The foundation on which AI is built upon is Patterning; Data interpretation; Sorting; Comparing; Classifying; Identifying. The AI Applications that surround us are proof of innovation using technology. We need to prepare ourselves to unlearn, learn and relearn!

Preparatory Groundwork

Reading and gathering all information one can get about what is AI and what is not - is imperative for a better understanding of the subject. Be prepared to connect to new learning on the basis of your previous knowledge. – Read, Research, inquire, ask questions, watch videos, talk for and against AI, walk through Malls, airports, hospitals and try to figure out what is AI and what is not.

Facilitating and Feedback

Learning to Facilitate is learning to know the difference between when to guide/suggest and when to allow students to figure out and understand for themselves, question, hypothesize and take the challenge.
Being a Facilitator is mostly about how to motivate, encourage and simplify.
Learning to use appropriate vocabulary while giving feedback is the skill set most required by a Facilitator. Give feedback in a positive manner to inspire students to explore and persevere in their learning.

Mentoring and Monitoring

Ensure that continuity is maintained in mentorship and monitoring to facilitate students' learning. Online feedback, Interactive discussions on problems and challenges are some of the ways to assist this.

Facilitator Instructions for each activity can be found in such Boxes throughout the manual.

Unit 1

1.1 Excite

Facilitator Guide

Title: Excite	**Approach:** Game
Summary: Students will play a few games that involve AI technology and computer applications. Consequently, they will learn about the 3 Domains of AI and do a quiz and reflection about this session.	
Objectives: 1. Students get their first taste of what problems Artificial Intelligence can solve and become excited about learning the technology behind it. 2. Gain the habit of solving problems by practicing critical thinking and self-directed learning. 3. To discover more about themselves and their friends.	
Learning Outcomes: 1. Describe application of AI in their daily lives. 2. Identify the 3 domains of AI.	
Pre-requisites: Basic computer literacy	
Key-concepts: 3 Domains of Artificial Intelligence	

Introduction to AI

Purpose: Introduce the program to students.
Say: *"The Artificial Intelligence Curriculum hopes to inspire AI-Readiness in you. At the end of this program, we hope you will get a deep understanding of AI, access to AI-powered tools and the ability to create solutions with AI."*

Ask the students to answer the questions that follow. Let them write their own views without any guidelines or instructions. After filling the questionnaire, discuss the answers with the whole class so that you get to know what their expectations are regarding the AI curriculum.

Welcome to an Introduction to Artificial Intelligence!

What do you think Artificial Intelligence is?

_____
_____
_____

What do you want to learn about AI?

_____
_____

How do you think we should go about it?

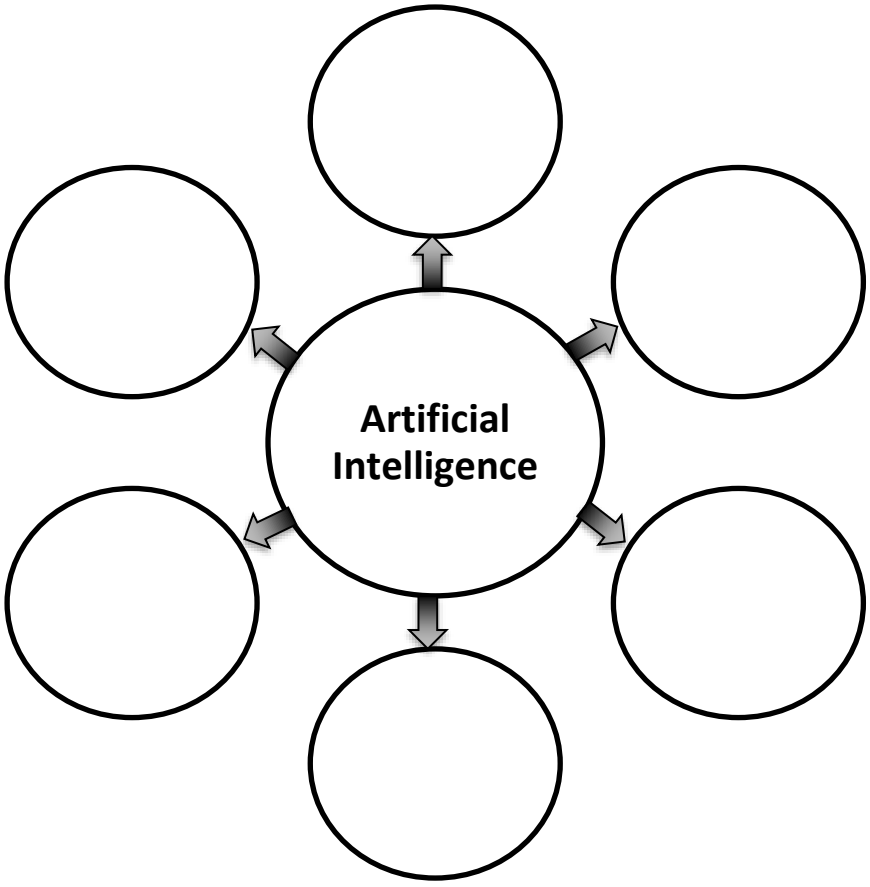
_____
_____
_____

What will you learn?

_____
_____
_____

AI is a form of intelligence; a type of technology and a field of study.
AI theory and development of computer systems (both machines and software) are able to perform tasks that normally require human intelligence.
Artificial Intelligence covers a broad range of domains and applications and is expected to impact every field in the future.
Overall, its core idea is building machines and algorithms which are capable of performing computational tasks that would otherwise require human like brain functions.

How do you think Artificial Intelligence can help you as you go about your daily life? Fill in your ideas below:



Dream Smart Home

Session Preparation

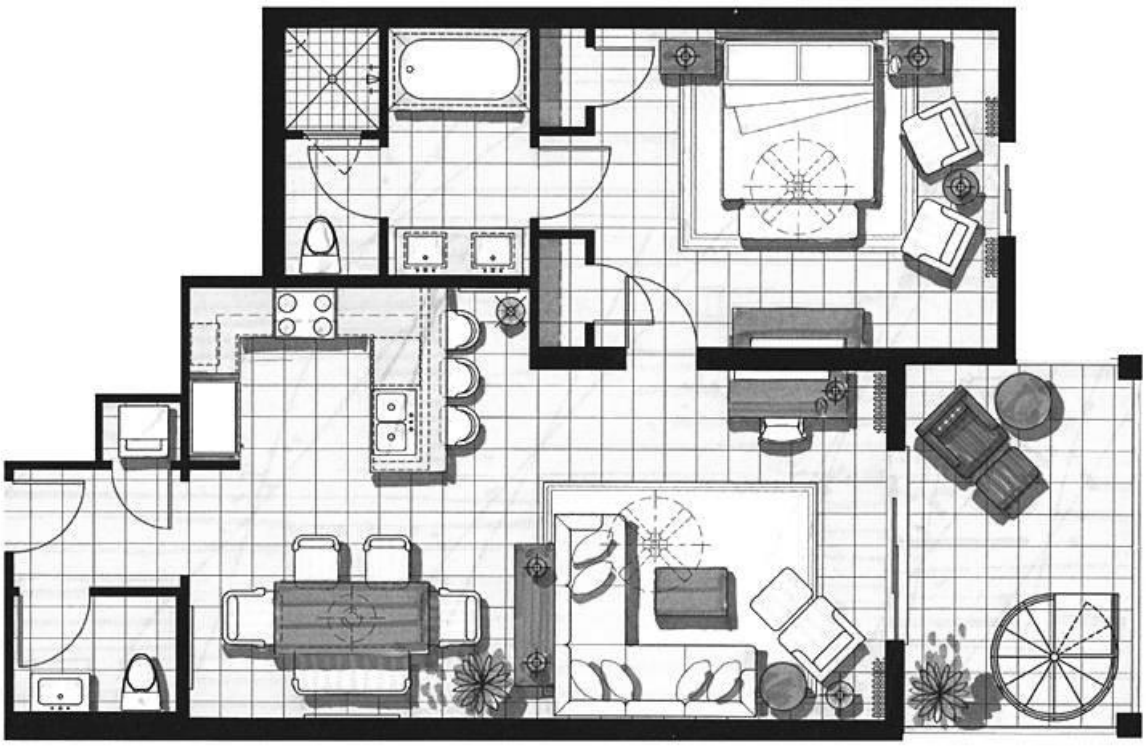
Logistics: For a class of 40 Students. [Individual Activity]
Materials Required:

ITEM	QUANTITY
A4 Sheets	40
Sketch-pens	40

Purpose: Icebreaker activity to get the students excited towards the AI curriculum.

Say: *"We want to get to know you better. Home is where your heart is. Your home will always be the place for which you feel the deepest affection, no matter where you are. Draw a floorplan of your dream home. Does it have a swimming pool… or does it have a place for you to indulge in your favourite hobby... Or if you like gardening... Do you have a garden indoors or outdoors? Imagine you can look down from above at all the spaces in your dream home. What does it look like? Draw it out!"*

Congratulations! You have just won the opportunity to design your Dream Home!



If you could design your home, what would your ideal home look like? Would it have some unique features other than the existing Drawing Room Kitchen Bedrooms etc.? Would it have a swimming pool? A garden - indoors or outdoors? A hobby corner? What if your home could follow all your commands? What are the luxuries that you can include?

Design a layout of a floor plan of your dream smart home.

Include any gadgets or devices that you think will make it unique or “smart”.

Floor Plan of My Dream Smart Home

Activity – Game Time

Session Preparation

Logistics: For a class of 40 Students [Pair Activity]

Materials Required:

ITEM	QUANTITY
AI Game Clues	20
Computers	20
Headphones (With Microphone)	20
Webcams	20

Resources:

Link for Game 1 (Rock, Paper and Scissors): https://www.afiniti.com/corporate/rock-paper-scissors

Link for Game 2 (Mystery Animal): https://experiments.withgoogle.com/mystery-animal

Link for Game 3 (Emoji Scavenger Hunt): https://emojiscavengerhunt.withgoogle.com/

Games are an integral part of our culture. People across the world participate in different kinds of games as a form of social interaction, competition and enjoyment.

The basic principle of every game is rule setting and following the rules.

Write down three rules in the given spaces you would set before playing any games?

Rule 1

Rule 2

Rule 3

Purpose: The purpose of this section is to expose students to the 3 domains of AI (Natural Language Processing, Computer Vision and Data for AI).

Brief: [Pair Activity] Students will go through three AI games in the form of a challenge. The link for each challenge will be printed on small slips and given to the students one after the other. They have to finish all the three challenges within an hour.

Game Descriptions:

Rock, Paper & Scissors: A game based on Data for AI where the machine tries to predict the next move of the participant. It is a replica of basic rock, paper and scissors game where the machine tries to win ahead by learning from the participant's previous moves.

Mystery Animal: A game based on Natural Language Processing where the participant has to guess the animal by asking maximum 20 questions to AI. The animal randomly gets selected for each game by AI and the machine replies in either yes or no.

Emoji Scavenger Hunt: A game based on Computer Vision where the machine initiates the game by showing an emoji. The participant is expected to show a similar object in-front of the camera while the machine keeps on guessing what is being shown to it.

When to intervene?

Rock, Paper & Scissors: Ask the students to see how does the machine react if they 1. Make moves in a specific pattern, 2. Make moves randomly.

Mystery Animal: Ask students to figure out basic characteristics of the animal by asking questions like "Can you swim?", "Are you a carnivore?", "Are you a mammal", etc.

Emoji Scavenger Hunt: Ask them to try new things like drawing the emoji on paper and showing it to the machine.

Say: *"We are going to get serious now! You are challenged by an eccentric data scientist, to solve 3 challenges he designed. You have 60 mins before he inserts a virus in every electronic device in the world! We will work in groups of 4-5 < group Students now >. Whether you are ready or not, the countdown is going to start now! Grab a seat in front of the computer and start your challenge. [Pass every group a mission card]"*

The AI Game Challenge –

Guess what……?

- Here are some visuals that will help you guess the games you are going to play, You have 10 seconds to guess and write the name of the games below:

Guess the game.

_____

Have you tried it before?

_____

Guess the game.

_____

Have you tried it before?

_____

Guess the game.

_____

Have you tried it before?

_____

Pair Activity:

Team up with a partner and let the challenge begin!

- **Game 1: Rock, Paper and Scissors** (*based on Data*)

Write three things you learnt from the game?

_____

_____

_____

List the different sources from where you can collect data?

- **Game 2: Mystery Animal**

  (*based on Natural Language Processing - NLP*)

Mention three things you understood about the game?

_____

_____

_____

What is Natural Language Processing?

- **Game 3: Emoji Scavenger Hunt**

  (*based on Computer Vision – CV*)

Did you face any difficulty while playing this game? How did you overcome this?

_____

_____

_____

What is Computer Vision?

Let's Discuss

Why should these three games be relevant for AI awareness?

Group Activity: Reflect and Analyse:

Session Preparation

Logistics: For a class of 40 Students [Individual Activity]

Materials Required:

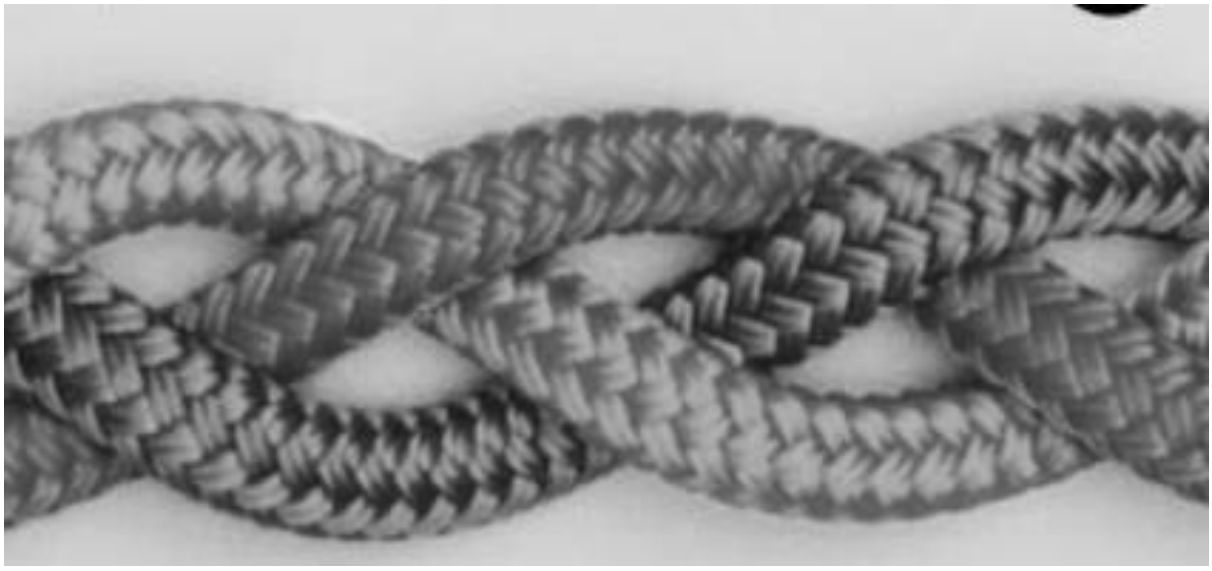
ITEM	QUANTITY
Three Different Coloured Stands of Thread (50 cm each)	40 each colour

Purpose: To understand how three AI domains are inter-related to each other.

Students will get to know that even if these three domains of AI – Natural Language Processing, Computer Vision and Data for AI are quite distinct from each other, they together constitute the concept of Artificial Intelligence.

Take three different colour strands and work them into a braid. See how long your braid can become within 30 seconds!! Ready? Go!!!

Let's understand: To understand AI we draw an analogy from the three strands in a braid. One is the Data strand, the second is the Natural Language Processing strand and the third strand is the Computer Vision. They all together constitute the concept called Artificial Intelligence.



Quiz Time: AI Quiz

Session Preparation

Logistics: For a class of 40 Students [Pair Activity]

Materials Required:

ITEM	QUANTITY
Computers	20

Brief:

The following are questions for the quiz. You can either go for a Pen/Paper Quiz or you can visit any open-sourced, free, online portal; one of which is Kahoot, and create your quiz there.

For Kahoot: Got to https://kahoot.com/ and create your login ID on it. Then, add your own kahoot in it simply by adding all the given questions into it. Once created, you can initiate the quiz from your ID and students can participate in it by putting in the Game pin.

Quiz Questions:

1. Which one of the following is an application of AI?
    a. Remote controlled Drone
    b. Self-Driving Car
    c. Self-Service Kiosk
    d. Self-Watering Plant System
2. This language is easy to learn and is one of the most popular language for AI today:
    a. C++
    b. Python
    c. Ruby
    d. Java
3. Which of the following is not a stage in the AI Project Cycle:
    a. Problem Scoping
    b. Data Acquisition
    c. Data Exploration
    d. Prototyping
4. This field is enabling computers to identify and process images like humans do:
    a. Face Recognition
    b. Model-view-controller
    c. Computer Vision
    d. Eye-in-Hand System
5. What does NLP stand for in AI?
    a. Neutral Learning Projection
    b. Neuro-Linguistic Programming
    c. Natural Language Processing
    d. Neural Logic Presentation

6. This is a program that allows the computer to simulate conversation with a human being:
    a. Speech Application Program Interface
    b. Chatbot
    c. Voice Recognition
    d. Speech Recognition
7. This is a system of Programs and Data-Structures that mimics the operation of the human brain:
    a. Intelligent Network
    b. Decision Support System
    c. Neural Network
    d. Genetic Programming
8. Where is Decision tree used?
    a. Classification Problem
    b. Regression Problem
    c. Clustering Problem
    d. Dimensionality Reduction
9. What does model. Add (dense(32, input_shape=(784))) do?
    a. It adds an input layer
    b. It adds a hidden layer
    c. It adds an output layer
    d. It adds a dense layer
10. How excited are you about this AI curriculum?
    a. Very Excited!
    b. A bit excited
    c. Same as always
    d. Not excited at all

AI Quiz (Paper Pen/Online Quiz)
Quiz to be conducted by the facilitator/teacher.

Activity: Letter to Future Self

Session Preparation

Logistics: For a class of 40 students [Individual Activity]
Materials Required:

ITEM	QUANTITY
A4 Sheets	40

Purpose: To capture students current mood and thoughts about their future with AI

Say: *"I would like you to put on your reflective cap and write a letter to your future self. What do you want to tell yourself or remind yourself?"*

Imagine the world in 2030 and write a letter to your future self. Be sure to mention things that you think your future self would probably be doing and experiencing in daily life.

Place _____

Date _____

Dear _____,

It feels a little strange to be writing a letter to my future self, but it's also rather exciting!

At present I am very interested in _____and am sure this is a hobby that has proved beneficial and I am now a skilled _____.

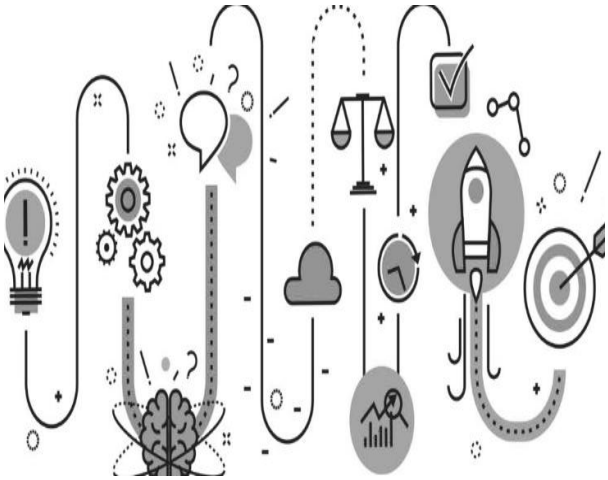
So tell me have things changed a lot? Do we still have a lot of _____ _____?

Has Artificial Intelligence proved to be _____ _____?

You must be so used to _____ _____ while we struggle to _____.

Is our Pet _____ doing well or have you replaced it with _____?

Ha! Ha! It's so much easier, right?!



How is your preparation for the new job? Must be really nice to be _____ _____ _____.

Have you changed the _____ _____ _____?

Am sure things have turned out well for you in 2030. Great _____ _____ _____ _____ !

It's been nice writing to you _____ _____.

Hope this letter brings back old memories…

Sincerely,

……..

1.2 Relate

Facilitator Guide

Title: Relate	**Approach:** Activity
Learning Objectives: 1. Students gain an awareness of where Artificial Intelligence is relevant in their lives. 2. Practice storytelling using an open source AI tool.	
Pre-requisites: Basic computer literacy	
Learning Outcomes: 1. Gain an awareness of where Artificial Intelligence is relevant in their own lives 2. Practice storytelling using an open source AI tool.	
Key-concepts: 1. Smart Homes and Cities 2. Interactive Story Writing	

Share your ideas about Smart Home and write them down in the box?

Floorplan Activity :

Session Preparation
Logistics: For a class of 40 Students

Materials Required:

ITEM	QUANTITY
Computer	1
Projector + Screen	1

Resources:
Link for Smart cities video: https://www.youtube.com/watch?v=eRMiKt81nAE
Link for Smart Home video: https://www.youtube.com/watch?v=1CajaUoI3vU

Purpose: To recap what was done previously so that the students can see a transition in the content. It also helps them relate to AI, starting from their own lives.

Say: [Video 1] *"Today we are going to explore smart city and smart homes! Do you think our city is smart? Why and why not? Do you think it is going to become smarter? Why and why not? You can play a part in building this smart city you call home! I am going to show you two videos. The first one is about smart cities."*

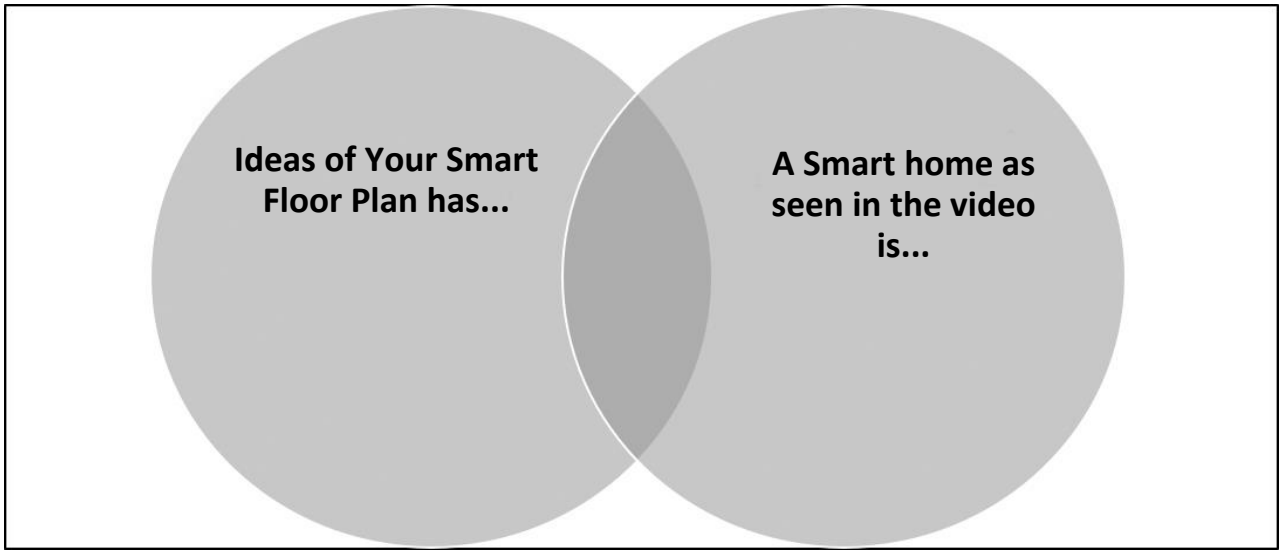
[Video 2]*"Now, I am going to show you another video. This is a home tour of a smart home. Observe what are the smart elements when you watch the video. [Watch Video] What did you see? What do you like? Is this what your house would look like? What more do you wish it had ? What would your house need? (more country-culture-need specific)"*

Let the students look at the concepts of Smart Cities and Homes and ask them to make considerable changes in the floor plans they made in the Excite Session. Let them add some new features or functionalities to it which could be related to the idea of a Smart Home.

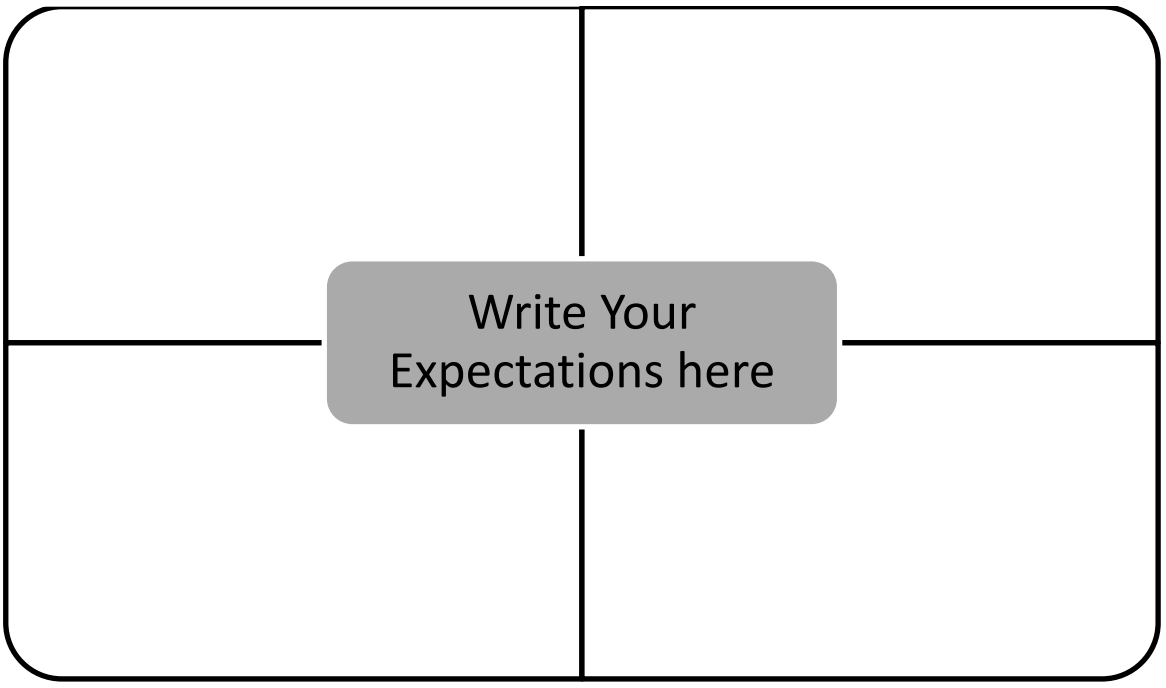
Revisit the Floor plan you created for your smart home in UNIT 1- Excite.

Watch the videos showing the concept of a Smart City and a Smart Home.

Link for Smart cities video: https://www.youtube.com/watch?v=eRMiKt81nAE
Link for Smart Home video: https://www.youtube.com/watch?v=1CajaUoI3vU After watching these videos, compare them with the smart Floorplan you created and fill up the Venn diagram.

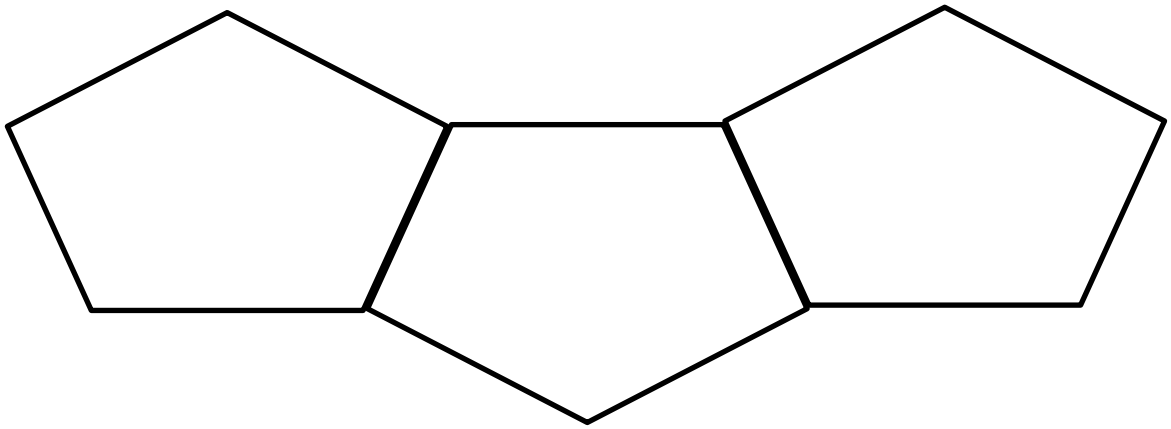


Redesigning:
Take a relook at your floor plan and redesign it to make it an effectively Smart home. You may like to list your expectations of a Smart home before you start redesigning.



Redraw your new Smart Floor Plan here:

Identify what new things you have added to make your dream home “smart”?



Creating a Story: Are you a good Storyteller?

Session Preparation
Logistics: For a class of 40 students [Pair Activity]

Materials Required:

ITEM	QUANTITY
Computers	20
Headphones (With Microphone) [optional]	20

Resources:

Link to install Story Speaker extension for Story Speaker:
https://chrome.google.com/webstore/detail/story-speaker/ohfibfhhfbhknfdkipjdopbnegkbkjpj

Introduction to Story Speaker:
https://www.youtube.com/watch?v=wsrzvYYvhH8&feature=youtu.be

Link to read more about Story Speaker:
https://docs.google.com/document/d/1hFrBtsBbF2LoZ1FFpXEH7L6fWH1lj24W1-itXnKSXK8/edit

Basic Template of Story Speaker: https://docs.google.com/document/d/1rXPSayQVVQ-T5cWlhxPbOCc2UJEZTbVWkxqOnC_RnDE/edit?usp=sharing

Purpose: To capture students current mood and thoughts about their future with AI

Say: *“What we are going to do now, is to work together to build an interactive story which you can play with your classmates later.”*

“This is the video about Story Speaker. [Watch Introduction to Story Speaker Video] [Reiterate main points] First, you have to log in to google docs. Then, have to download the Story Speaker add-on to your google document. You can use the basic template to create the story. Write a story to explain your dream house to your classmates.”

Story Speaker Brief:

The Story Speaker extension can be accessed with docs.google.com. After signing in on Google, and opening google docs, go to Add-Ons and choose Story Speaker. A dialog will open. Ask the students to click on Basic Template and work on the same after understanding how it works.

When to intervene?

Ask the students to play Basic Template once and see what is happening.
Ask them to keep checking the story while they write. It helps in writing an error-free story.

Troubleshooting Tips:

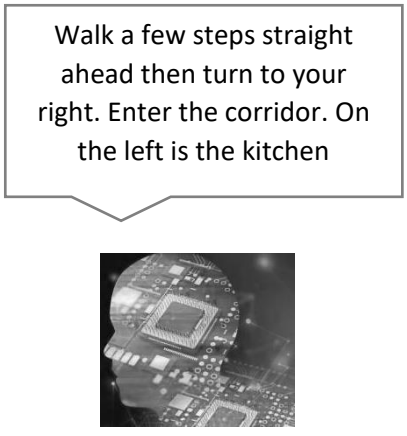
Issue	Possible Reason	Solution
Story Speaker displays error when Students tries to test run.	Indentations are either not done or are inappropriate.	Check through the story and ensure that there is proper indentation for each of the text section.
	Statement with no further forking miss [[END]]	Add [[END]] to the statement where you wish the story to end.
	Fallback missing	In the end of Story, put a Fallback section (Read the instructions)

Do you like listening to stories? How about being a creative writer?

Using your floor Plan as a base for your story, use the **Story Speaker** extension in Google docs and write a story. Ensure that you give/write specific instructions in your story that enables the story speaker to respond back with an answer.

Here is an example:

Asking a Question



Responding to answer

Title: Conversing with Story Speaker

Now it's your turn to create a story using the Google Extension of Story Speaker for Google Docs.

START HERE
Link for the basic template of Story Speaker:
https://docs.google.com/document/d/1rXPSayQVVQ-T5cWlhxPbOCc2UJEZTbVWkxqOnC_RnDE/edit?usp=sharing

Reflection Time:

How was the activity? You can write in the space and tick the given bubbles to describe the activity:

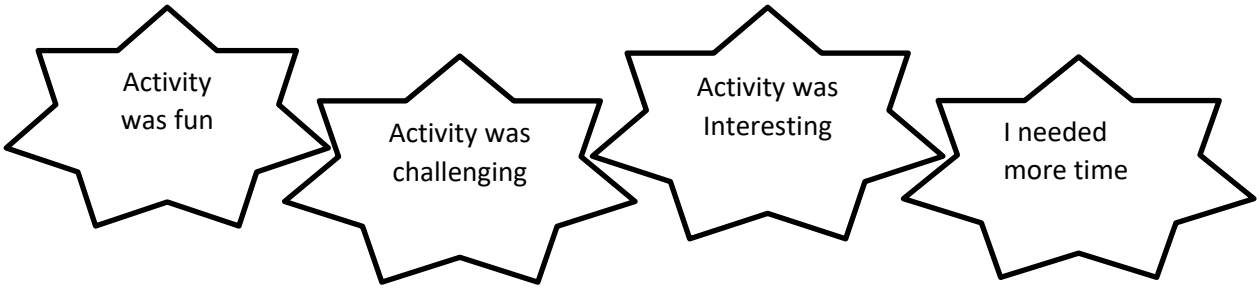
The activity was
……

I learnt that
……

I would
……

The easy part was
……

The difficult part was
……



My Analysis Check:

What did you understand about the way devices /machines respond to your questions?

……

What kind of information do machines understand?

……

Did you notice that the following things matter in writing the interactive story?

- Appropriate choice of words while giving an instruction
- Clarity in thinking
- Sequence of events to be given
- Simple use of language
- Ability to recognise patterns in an instruction

Here is a thought provoking question for you:

- What was responding to your Interactive story guidelines? How?

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1.3 Purpose

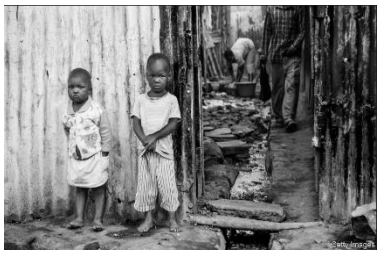
SUSTAINABLE DEVELOPMENT GOALS

Facilitator Guide

Title: Purpose	**Approach:** Interactive Session + Game
Summary: Students will gain an awareness about the 17 Sustainable Development Goals and will be able to relate to them in order to think of solving them.	
Learning Objectives: 1. Appreciate the complexity of social issues 2. Be able to determine where AI solutions would be appropriate	
Learning Outcomes: Identify leverage points which are appropriate for achieving SDGs using AI solutions.	
Pre-requisites: Basic computer literacy	
Key-concepts: Sustainable Development Goals	

Warm up Activity:

Take a look at the pictures and try to give the theme of each picture: you have 5 minutes.

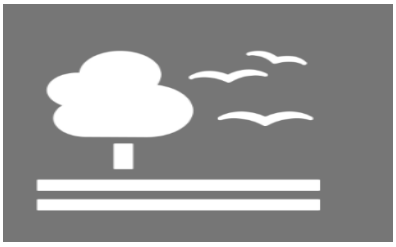


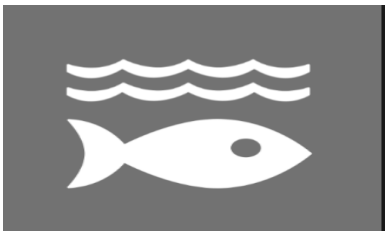
1 …… 2 …… 3 ……

4 …… 5 …… 6 ……

7 …… **8** …… **9** ……

10 …… **11** …… **12** ……





13 …… **14** …… **15** ……

16 …… **17** ……

These themes will help you to reflect on the following questions:

Are you committed to work for making the world a better place?

……
……
……

Can you play a role in helping or supporting work in the following areas and other areas that contribute to well-being of the planet and people? (Tick the appropriate box)

Removing poverty ☐

Clean Water ☐

Clean Energy ☐

Good Health care ☐

Preventing Hunger ☐

Equality of Gender ☐

☐

Others (Please Mention)

_____
_____
_____
_____
_____
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_____

Take a look at these pictures and answer :

Do you think that you are also responsible in making this world a better place or are you satisfied with the things happening around you?

What thoughts and actions of yours will help to make the world a better place?

_____
_____
_____
_____
_____

Write your thoughts here

Write the actions you will take...

This world is the home for life of people, plants and animals. The materials and resources that the planet provides helps us to sustain life.In order to build a better world for everyone it is important that we take care to conserve, preserve and protect our Shelter and the life of those in this world. The Member States of the United Nations have agreed to achieve 17 Sustainable Development Goals (SDGs) by 2030.

Go Goals:

Session Preparation
Logistics: For a class of 40 Students [Group activity – Group of 5 max]

Materials Required:

ITEM	QUANTITY
Go-Goals Game Board	8
Go-Goals Instruction Manual	8
Go-Goals DIY Dice & Token Kit	8
Go-Goals Question Cards set	8
Glue	8
Scissors	8
Sketch-pens	80

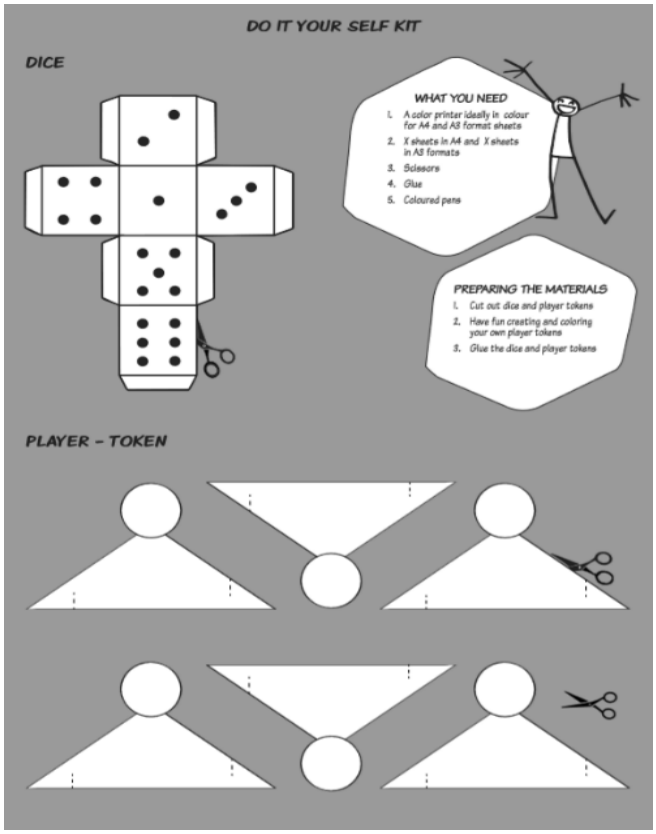
Resources:

Link to Download Go-Goals Game Material: https://go-goals.org/downloadable-material/

Purpose: To gain an understanding of social issues through a board game about the Sustainable Development Goals (SDGs).

Say: *"I want you to think: Who is your favourite superhero? Why? We are going to design a game token that represents your favourite super hero!"*

Token & Dice DIY:



Let your imagination flow and make your own tokens for the Go-Goals Game! Think of your favourite Superhero or your favourite Cartoon character and draw it on your token. Cut it out, shape it, and win the Game!

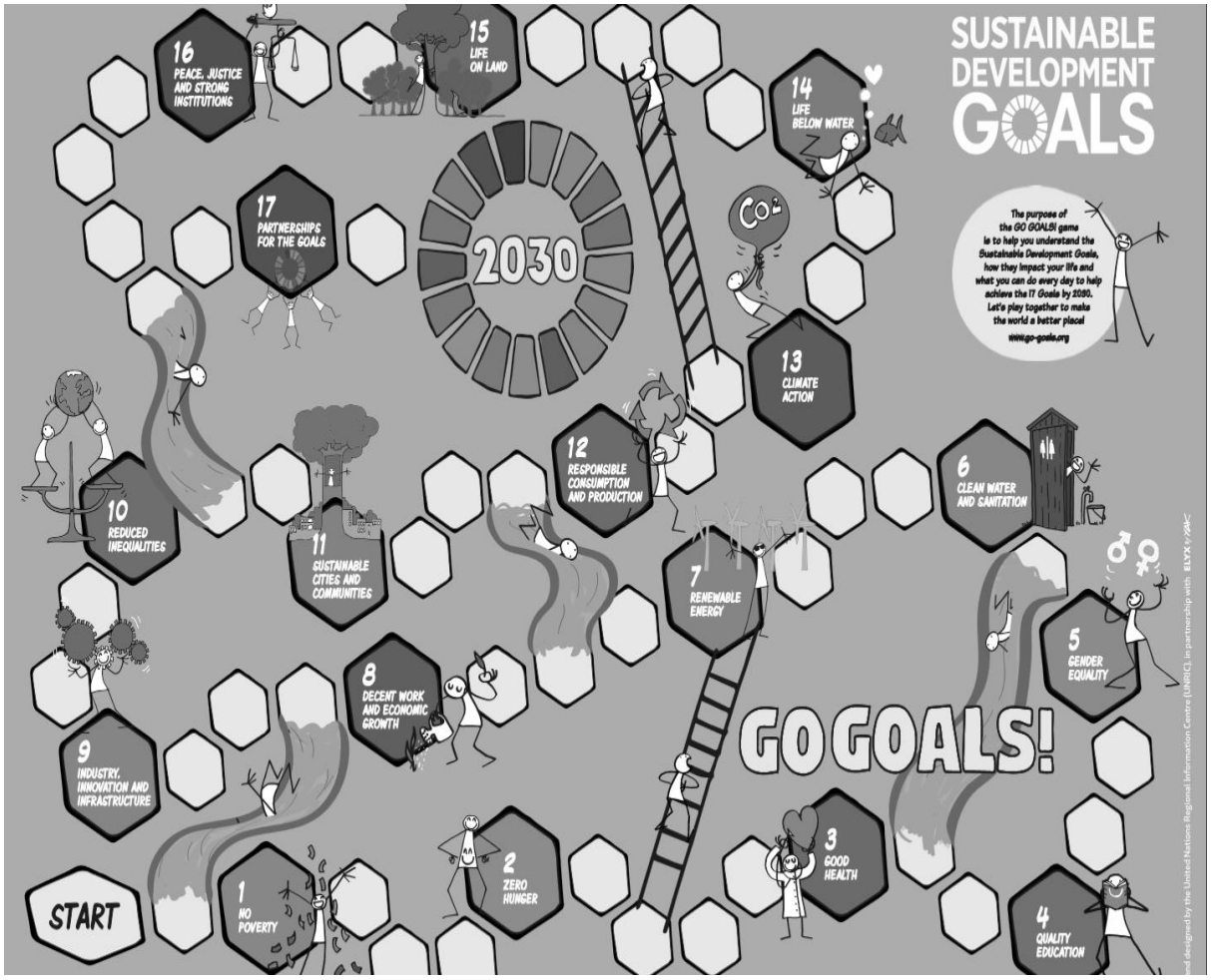
You can also make your own dice using the DIY kit! Just cut it out, fold it and paste it!

Great! You are all set to begin!

Go-Goals Board Game

Purpose: To gain an understanding of social issues through a board game about the Sustainable Development Goals (SDGs).

Say: *"We are ready to play a game called Go-Goals! We will learn more about Sustainable Development Goals and how people are using AI to solve some of the world's problems. This is what your game board looks like. We are going to play in groups of 5. Have you played Snakes and Ladders before? This game is very similar to Snakes and Ladders. Players advance the number of spaces by rolling a single dice. If a player lands at the bottom of a ladder, they can immediately climb to the top. If a player lands at the top of the slide, they immediately move to the bottom of the slide. If a player lands on SDG goal field (1-17), they will draw a card corresponding to the goal number. Another player will read the card question. A correct answer from the card drawer will allow the player to roll the dice again. The first player to arrive on '2030' is the winner. Let's Play!"*



1.4 Possibilities

Facilitator Guide

Title: Possibilities	**Approach:** Self-paced Workshops
Summary: Students will explore the emergence of Artificial Intelligence (AI) jobs in various fields such as healthcare, security, education, agriculture, entertainment, service and transport. They will then make a Job Advertisement of the Future to present their findings.	
Learning Objectives: 1. To showcase local case studies of people using AI for good or working in the AI field 2. To gain awareness on the skill sets needed for jobs in the AI field	
Learning Outcomes: 1. Describe how AI has been affecting jobs in various industries 2. Identify skill sets needed for jobs in the AI field	

Pre-requisites: Nil
Key-concepts: 1. AI for social impact 2. Skills required for AI-related jobs

Group Activity:

Session Preparation
Logistics: For a class of 40 students [Group Activity – Group of 4]

Materials Required:

ITEM	QUANTITY
Computers	10

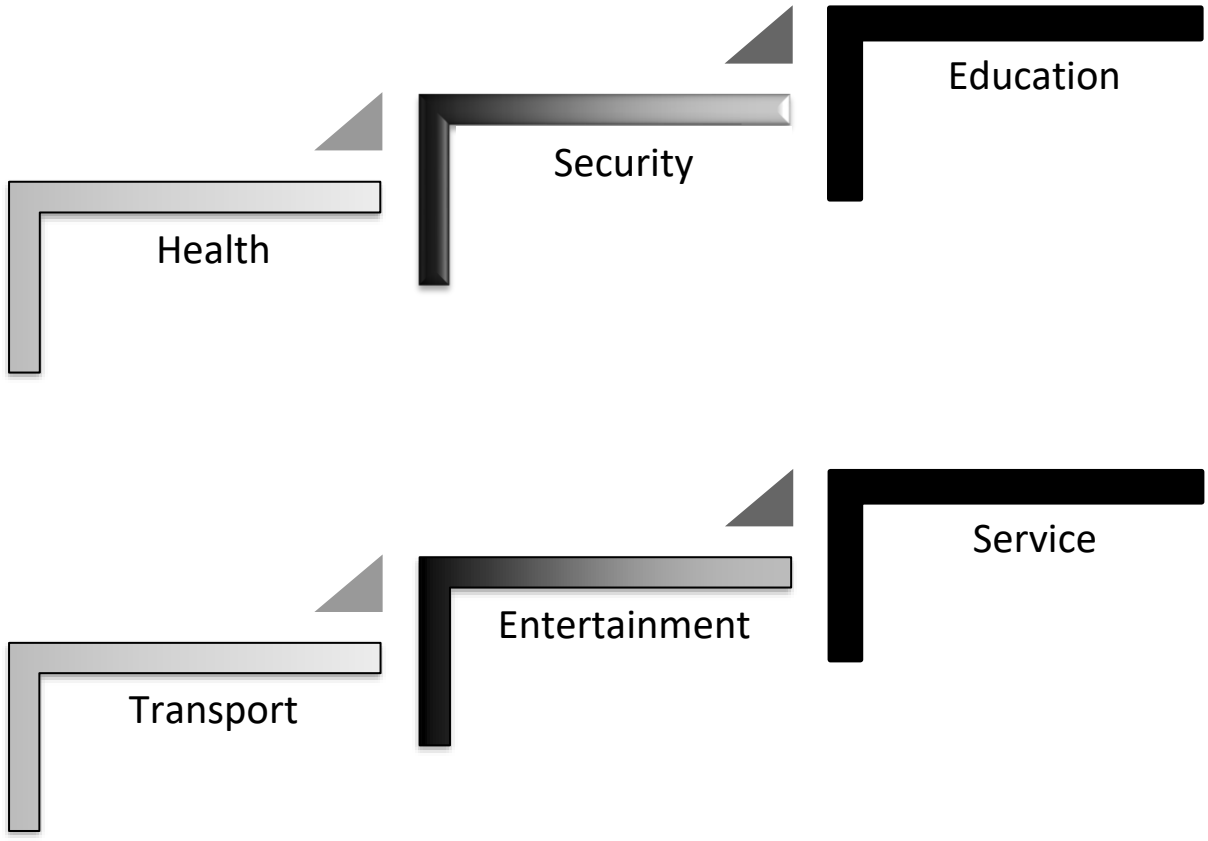
Resources:
Research Template – Provided in Student Handbook.

Purpose: To inspire students by local examples of AI application in their community, to create a summary of their findings in a form of a future Job Advertisement and share it with other teams.

Say: *"Today's goal is to uncover what are the future skills and jobs that all of us will be involved in as AI advances. This research can be used to help us decide what we want to learn to be ready for these jobs. As there are numerous jobs that will be created due to AI, we will conduct this research in teams! Each team will be given a theme, some guiding resources and laptop to research on AI-related jobs. The themes include* ***Health, Security, Education, Entertainment, Service, Transport.*** *You will search for current and emerging trends in employment and fill in the Research Template given in the handbook. The company can even be a start-up, big organisation or community project."*

Make even number of teams and divide give one theme to two teams. For example, if you have 10 teams, divide any 5 themes giving same theme to two teams. This will help in the activities of next modules.

Put your Research Skills in action:
Here are a set of themes – you will be getting one theme out of these to work on in a group of 4. Research on the given theme and find out various organisations incorporating AI in your theme sector. Also, look at the skill-sets required for such jobs today. With this, try to analyse what skill-sets would be required 10 years down the line?



Use the space below to fill in whatever you have found out regards the theme given to your group:

Industry Vertical/Theme

What are the names of the organisations in our country working around this theme?	Write briefly what they do.
1.	1.
What kind of skill sets (Look at both soft skills and technical skills) are they interested in their new hires possessing? Consider: Would the skills sets required still be the same after 10 years?	

Soft Skills	Technical Skills
Soft Skills (10 years later)	Technical Skills (10 years)

What are the ethical concerns revolving around the theme? (Keywords: AI ethics, AI bias, AI Access, AI privacy)	
Topic	Examples
Sources: Provide Website Links	
Title of Article	Website Link

Poster Making – Job Advertisement for 2029!

Session Preparation
Logistics: For a class of 40 Students [Group Activity – Groups of 4]

Materials Required:

ITEM	QUANTITY
A3 Sheets	10
Sketch-pens	40
Old Newspapers	20
Magazines	20
Scissors	10
Glue	10

Purpose: To inspire students by local examples of AI application in their community, to create a summary of their findings in the form of a future Job Advertisement and share it with other teams.

Say: *"Now, on the basis of the research you have made, make a 'Future Job Ad' (think 2029 - ten years later). Your Job Ad should include information about the company that is hiring and what kind of skills that they are looking for in their employees. Share the reasons why you chose this job or jobs. Be creative about the Job Ad that you are creating. Remember it is something from the future. What jobs will be relevant 10 years from now? I am excited to see what you will come up with! Let's begin."*

Ask students to make a Poster for a Future Job Advertisement in which they need to mention what job are they recruiting for and what skill-sets do they expect in the candidate. Ask them to make the poster as creative as possible. It should be futuristic and should talk about the period 10 years in the future.

Here's what you have to do:

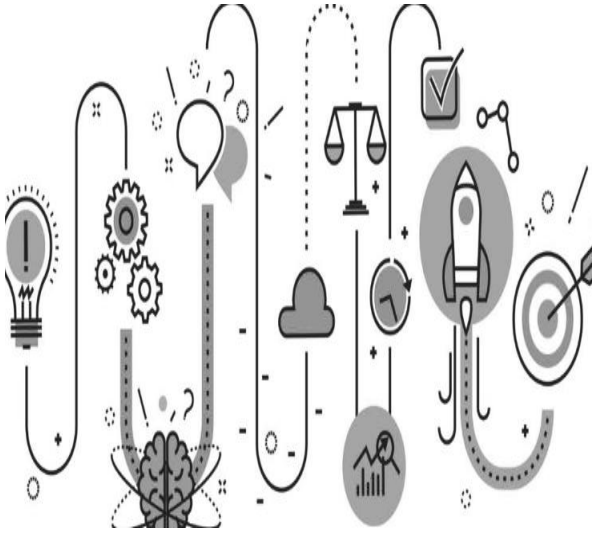
- Search for current and emerging trends in employment to make a Future Job Advertisement.
- The job description is for a job which will exist ten years from now, i.e. the current date.
- To help you , the job advertisement must include the following information.

Information about the hiring company

Required Skills - Vital, Essential And Desirable Skills	Is the company a start up?
Is the company a big organisation?	Is this a community Project?
Share the reason why you chose this job or jobs?	

Analysis:

List the kinds of futuristic job opportunities that would be available for you?



Write the skills you will require to do these jobs?

Make a Job Advertisement for the Future here:

Now be ready to share your ideas!

1.5 AI Ethics

Facilitator Guide

Title: AI Ethics	**Approach:** Discussion & Debate
Summary: Students will participate in a debate to gain awareness of the ethical concerns regarding Artificial Intelligence (AI).	
Learning Objectives: 1. Gain awareness of ethical concerns about AI 2. Critically think about the cost and benefits of AI technology	
Learning Outcomes: 1. Describe some ethical concerns of AI with respect to inclusion, bias and privacy 2. Be able to evaluate the cost and benefits of AI technology	
Pre-requisites: Nil	
Key-concepts: AI Ethics	

Activity: Recapitulation

Complete the following sentence:

The three things we did in the previous module are:

1 ……

2 ……

3 ……

Activity – Watch the video AI for Good.

Purpose: To introduce Students to the topic of AI Ethics.

Say: *"Let's watch the AI for Good Video to introduce the big questions around AI Ethics"*

Session Preparation:
Logistics: For a class of 40 students

Materials Required:

ITEM	QUANTITY
Computer	1
Projector + Screen	1

Link for Video: https://www.youtube.com/watch?v=vgUWKXVvO9Q

Now, answer these questions:

What have you understood from the video? **What are your learnings from it ?**

To get a clue of the theme of the discussion; unscramble the word given below:

S T I E H C

……

What in your understanding does this mean?

……

……

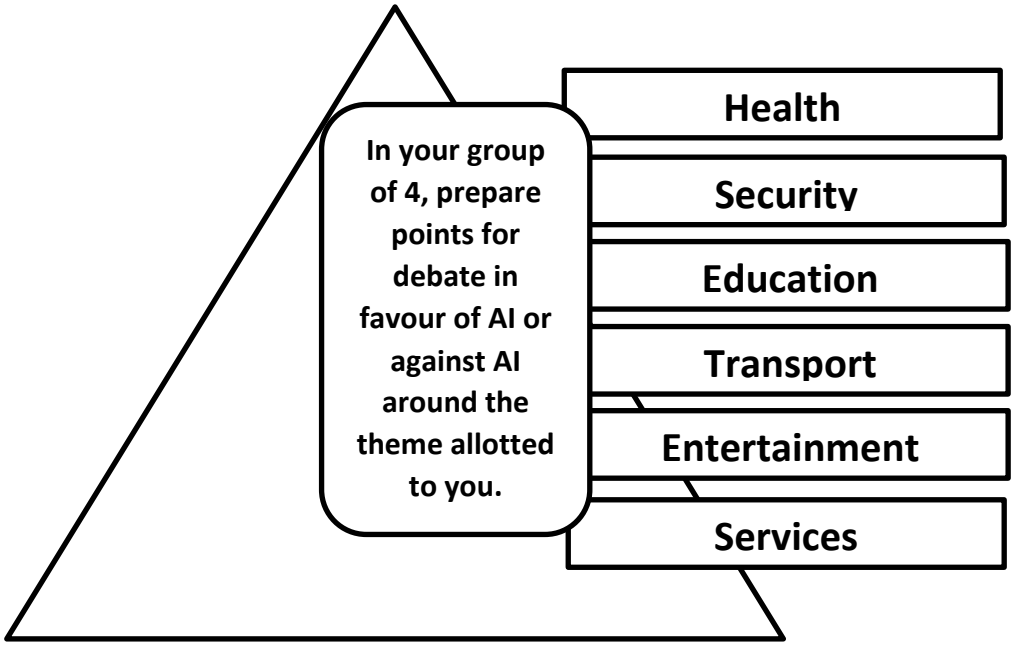
BALLOON DEBATE:

Session Preparation:
Logistics: For a class of 40 students [group activity – groups of 4]

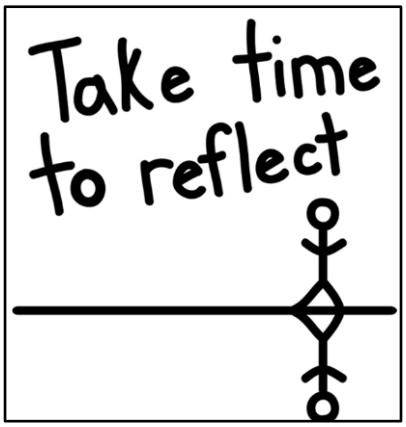
Purpose: To introduce the concept of ethics (bias, access, privacy) in AI and its complexity.
Say: "*We are going to debate about the boon and bane of various AI applications in the different industries you researched about. This will be a 4 v 4 debate. As you know, each theme has been given to two different teams. Now one team out of these two with be in affirmation with AI applications in their theme while the other one will be against AI applications in the same theme. The debate will go theme by theme wherein each member of the team will get a minute to speak. The first speaker of the affirmative team will start the debate after which the first speaker of the rebuttal team will put their points. In this manner, each speaker will get a minute to speak and finally one team will be chosen to be thrown out of the balloon debate depending upon how convincing their points were. The speaker who speaks more than a minute will get his team disqualified. You will get 15 minutes to prepare your points. And your time starts now!"*

Imagine there are two families of four people out for a ride in a hot air balloon. Suddenly the balloon starts to move towards the earth instead of staying airborne. To stabilize it, one family needs to take the parachute and go out of the balloon or else it will come crashing down.

Who should be thrown out of the hot air balloon?



Reflect and Discuss:



- With the increase in AI applications leading to replacing human workforce, do you consider it ethical to incorporate the use of AI for various jobs?
- How do you think income would be shared if Ai is used in place of Human Workforce?
- AI will probably bring with it many Health benefits. How will these Health benefits be made accessible and available to all the people in society?
- AI is a powerful tool in various fields, however depending on how it is used, it can either be a boon or a bane. Discuss.
- How can learning opportunities for AI be extended to all?
- How will human beings ensure that they stay ahead of Artificial Intelligence?

Discuss this with your peers and write your views:

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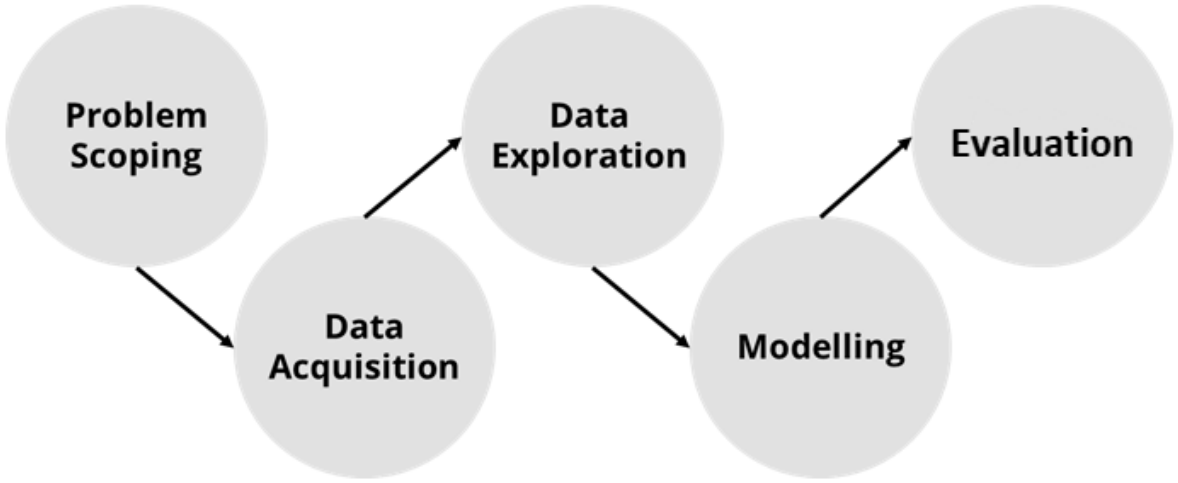
"The important thing to remember is the consequences of your actions while applying AI"

Unit 2

AI Project Cycle

Lesson Title: AI Project Cycle	**Approach:** Interactive Session
Summary: Students will learn about the AI Project Cycle and get familiar with it.	
Learning Objectives: Students will know how they can get started on an AI project.	
Learning Outcomes: Describe the stages in the AI project cycle.	
Pre-requisites: Basic computer literacy	
Key-concepts: AI project cycle	



Let us think!

- Problem Scoping means

_____

_____.

- Data Acquisition means

_____

_____

- Data Exploration means

_____

_____.

- Modelling means

_____

_____.

- Evaluate means

_____

_____.

Let us understand…

Let us go through the AI project cycle with the help of an example.

Imagine!
The world's largest diamond, is in danger as Mr. X has threatened to steal it. No one is able to track Mr. X and so the situation is critical. You have been appointed as the Chief Security Officer and your job is to enhance the security of the diamond to make the area impossible for Mr X to break into and steal the diamond. Now that you are aware of AI concepts, plan to use them in accomplishing your task.

Start with listing down all the factors which you need to consider while framing a security system.

The aim of this system is to (fill in the blank)

_____
_____
_____
_____

*While finalising the aim of this system, you scope the problem which you wish to solve with the help of your project. This is **Problem Scoping**.*

Now, as you interact with the authorities, you get to know that some people are allowed to enter the area where the diamond is kept. Some of them being - the maintenance people; officials; VIPs, etc. Now, your challenge is to make sure that no unauthorised person enters the premises. For this, you: (choose one)

a. Get photographs of all the authorised people.
b. Get photographs of all the unauthorised people.
c. Get photographs of the premises in which the diamond has been kept.
d. Get photographs of all the visitors.

As you start collecting the photographs, you actually acquire data in a visual form. This data now becomes the base of your security system. Note that the data needs to be accurate and reliable as it ensures the efficiency of your system. This is known as ***Data Acquisition.***

After acquiring the required data, you realise that it is not uniform. Some images are small in size while the others are big, some images are missing while you have multiple copies of others. Thus, you think of putting all the information collected in a simplified format for which you: (choose one)

a. Create a table and put the names of people whose photographs you have.
b. Put all the photographs in a graph and try to interpret a pattern out of it.
c. Make a database to store the image data.
d. Remember all the faces you see in the images.

At this stage, you try to interpret some useful information out of the data you have acquired. For this, you explore the data and try to put it uniformly for a better understanding. This is known as ***Data Exploration****.*

After exploring the data, now you know that you need to develop a system which detects the face of a person entering the vault and to match it with the existing image data you have in your system. For this, you put all your data into the AI-enabled model and train it in such a way that it alerts the officials if an unknown person tries to enter the vault. To implement this, you need: (list down the components of your system)

1.
2.
3.
4.
5.

To implement your idea, you now look at different AI-enabled algorithms which work on Computer Vision (since you are working on visual data). You go through several models and select the ones which match your requirements. After choosing the model, you implement it. This is known as the ***Modelling*** *stage.*

Your surveillance system is now complete! You test it by sending a mix of known and unknown faces to the vault. You notice that the results were 70% correct. After evaluating this model, you work on other shortlisted AI algorithms and work on them.

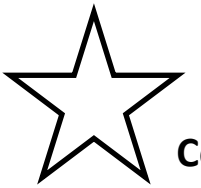
You test the algorithms to

_____

_____

*As you move towards deploying your model in the real-world, you test it in as many ways as possible. The stage of testing the models is known as **Evaluation**. In this stage, we evaluate each and every model tried and choose the model which gives the most efficient and reliable results.*

After proper testing, you deploy your surveillance system in the premises. Mr. X, who is unaware of the surveillance system, tries to break through the vault and gets caught in your system. You have saved the diamond!



Congratulations! Mission Accomplished!

AI Project Cycle – Defined!

What you did just now was an example of AI Project Cycle. Starting with Problem Scoping, you set the goal for your AI project by stating the problem which you wish to solve with it.

To proceed,

- You need to acquire data which will become the base of your project as it will help you in understanding what the parameters that are related to the problem are scoping.
- You go for data acquisition by collecting data from various reliable and authentic sources. Since the data you collect would be in large quantities, you can try to give it a visual image of different types of representations like graphs, databases, flow charts, maps, etc. This makes it easier for you to interpret the patterns in which your acquired data follows.
- After exploring the patterns, you can decide upon the type of model you would build to achieve the goal. For this, you can research online and select various models which give a suitable output.
- You can test the selected models and figure out which is the most efficient one.
- The most efficient model is now the base of your AI project and you can develop your algorithm around it.
- Once the modelling is complete, you now need to test your model on some newly fetched data. The results will help you in evaluating your model and hence improving it.
- Finally, after evaluation, the project cycle is now complete and what you get is your AI project.

Let us summarize

Now, it's your turn to describe what you have learnt. Explain the concept of AI project cycle with the help of a suitable example.

2.1 Problem Scoping

Let us start with the first step of AI Project cycle – Problem Scoping.

Let us Recap

What according you does Problem Scoping mean? Write in your words below:

_____
_____
_____
_____
_____
_____
_____.

It is a fact that we are surrounded by problems. They could be small or big, sometimes ignored or sometimes even critical. Many times we become so used to a problem that it becomes a part of our life. Identifying such a problem and having a vision to solve it, is what Problem Scoping is about.

Getting Started

Facilitator Guide

Title: Problem Scoping	**Approach:** Instructor-led Interactive Session
Summary: Students will be introduced to the 4Ws problem Canvas and Problem Statement template. They will be able to set goal for their AI projects to solve problems around them.	
Learning Objectives: 1. Students will know how they can get started on an AI project. 2. To problem scope with the help of template/worksheet.	
Learning Outcomes: 1. Apply the problem scoping framework. 2. Frame a Goal for the project.	
Pre-requisites: Basic computer literacy	
Key-concepts: Problem scoping	

Session Preparation

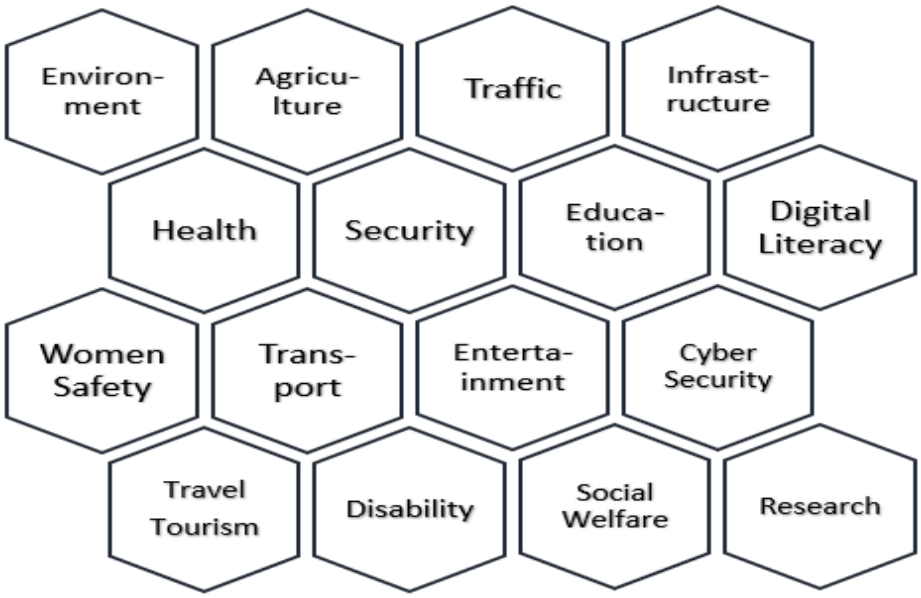
Logistics: For a class of 40 Students [Group activity – Groups of 4]

Purpose: Understanding how to narrow down to a problem statement from a broad theme.

Say: "*Let us now start with the first stage of AI Project Cycle that is – Problem Scoping! As we have understood, Problem Scoping means selecting a problem which we night want to solve using our AI knowledge.***"**

Brief: *Students will be selecting a theme either out of those mentioned in the handbook or from anywhere outside. They will then look inside the theme and find out topics where problems exist. They need to understand the vastness of a theme because of which one needs to go deeper. After listing down the topics, they will then find out various problems which exist under them. These problems will now be very specific as they have been narrowed down from a broader perspective. Ask the students to select any one problem out of the ones they scoped and write it as the goal of their project. Doing this, gives them a clear vision as to what exactly are they looking forward to solve using their AI knowledge.*

Let us now start scoping a problem. Look around you and select a theme which interests you the most. Suggested themes are:



You can either select any one out of these or you can think of one on your own. For more options, you can also refer to the 17 Sustainable Development Goals we discussed in the Purpose module.

Your selected theme is:

_____

Why did you select this theme?

_____
_____
_____
_____
_____.

As we know, a theme is a broad term which covers all the aspects of relevance under it.

For example:
In Agriculture, there are pest issues, yield rates, sowing and harvesting patterns, etc. all being very different from each other but still a part of the Agriculture theme. Thus, to effectively understand the problem and elaborate it, we need to select one topic under the theme.

Some examples are:

Theme: Digital Literacy **Topics:** Online learning platforms, digital awareness, e-books, etc.
Theme: Health **Topics:** Medicinal Aid, Mobile Medications, Spreading of diseases, etc.
Theme: Entertainment **Topics:** Media, Virtual Gaming, Interactive AVs, Promotions etc.

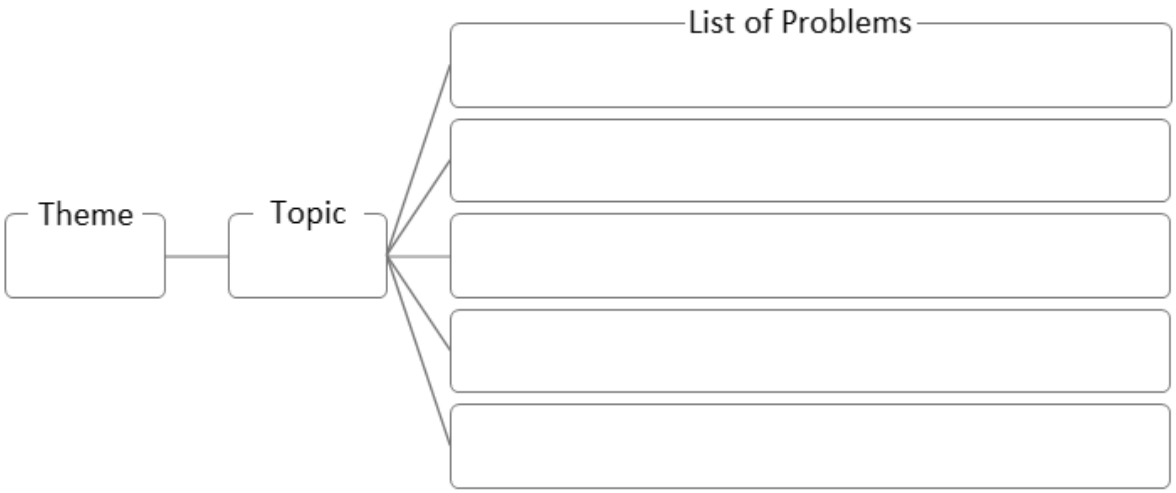
Our Sun is here to throw more light on this! Go back to your selected **Theme**, select various **Topics** related to your theme and fill them up in the rays of this sun

Choose one **Topic** out of the ones mentioned in the rays of the Sun above, and fill it in below:

_____.

Let us now list down the problems which come under our **Topic.** You can recall daily life scenarios where you may have witnessed problems related to the Topic of your choice. Also, you can go online and research around your chosen topic.

Fill up the problems that you find under your topic below.



Great! We now know that there exist lot of problems to be solved around us! Thus, to set up the **GOAL** of your project, select **one problem** out of the ones listed above which you want to solve using your AI knowledge. This **Problem** now becomes the target of your AI project and helps you getting a clear vision of what is to be achieved.

Let us now frame the selected problem as a goal. For example, a goal can be stated as *How might we help farmers determine the best times for seeding and for sowing their crops?*

It's your turn now! Write the **Goal** of your project below:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Since you have now determined the **Goal** of your project, let's start working around it.

4Ws Problem Canvas

Purpose: To understand step by step how problem scoping is done using the 4Ws framework.
Say: *"We are now going to go through the 4Ws Problem Canvas. This canvas helps us in identifying 4 crucial parameters we need to know for solving a problem. So what are the 4Ws? It refers to Who, What, When and Why."*

"Let's start with who. In this stage, we are looking at the person who is having the problem, they are also known as the stakeholders of the problem."

"Next we have what. In this stage, you consider the nature of the problem. What is the problem and how do you know that it is a problem? Is there evidence to support that it is a problem?"

"Next we will ask Where does the problem arise? In this we describe the context of the problem."

The 4Ws Problem canvas helps you in identifying the key elements related to the problem. Let us go through each of the blocks one by one.

Who?
The "Who" block helps you in analysing the people getting affected directly or indirectly due to it. Under this, you find out who the 'Stakeholders' to this problem are and what you know about them. Stakeholders are the people who face this problem and would be benefitted with the solution.

Let us fill the "Who" canvas!

Who?

- Who are the Stakeholders?

_____
_____
_____

- What do you know about them?

_____
_____
_____

What?

Under the "What" block, you need to look into what you have on hand. At this stage, you need to determine the nature of the problem. What is the problem and how do you know that it is a problem? Under this block, you also gather evidence to prove that the problem you have selected actually exists. Newspaper articles, Media, announcements, etc are some examples.

Let us fill the "What" canvas!

What?

- What is the problem?

_____
_____
_____

- How do you know that it is a problem? (Is there any evidence?)

_____
_____

Where?

Now that you know who is associated with the problem and what the problem actually is; you need to focus on the context/situation/location of the problem. This block will help you look into the situation in which the problem arises, the context of it, and the locations where it is prominent.

Let us fill the "Where" canvas!

Where?

- What is the context/ situation the stakeholders experience the problem?

_____
_____
_____

- Where is the problem located?

_____
_____
_____

Why?

You have finally listed down all the major elements that affect the problem directly. Now it is convenient to understand who the people that would be benefitted by the solution are; what is to be solved; and where will the solution be deployed. These three canvases now become the base of why you want to solve this problem. Thus in the "Why" canvas, think about the benefits which the stakeholders would get from the solution and how would it benefit them as well as the society.

Let us fill the "Why" canvas!

Why?

- Why will this solution be of value to the stakeholders?

_____
_____
_____

- How will the solution improve their situation?

_____
_____
_____

Problem Statement Template

Purpose: To understand how to phrase a problem statement using the Problem Statement Template.

Say: "*This is a problem statement template. It is used to frame the 4ws into a paragraph to describe your problem, the stakeholders involved and how solving the problem would benefit them.*"

Ask the students to fill the problem statement template on the basis of how they have filled the 4Ws Problem canvas. In the end, they should be able to get a statement describing the problem which they wish to solve considering the stakeholders, context of the problem and benefit of its solution.

After filling the 4Ws Problem canvas, you now need to summarise all the cards into one template. The Problem Statement Template helps us to summarise all the key points into one single Template so that in future, whenever there is need to look back at the basis of the problem, we can take a look at the Problem Statement Template and understand the key elements of it.

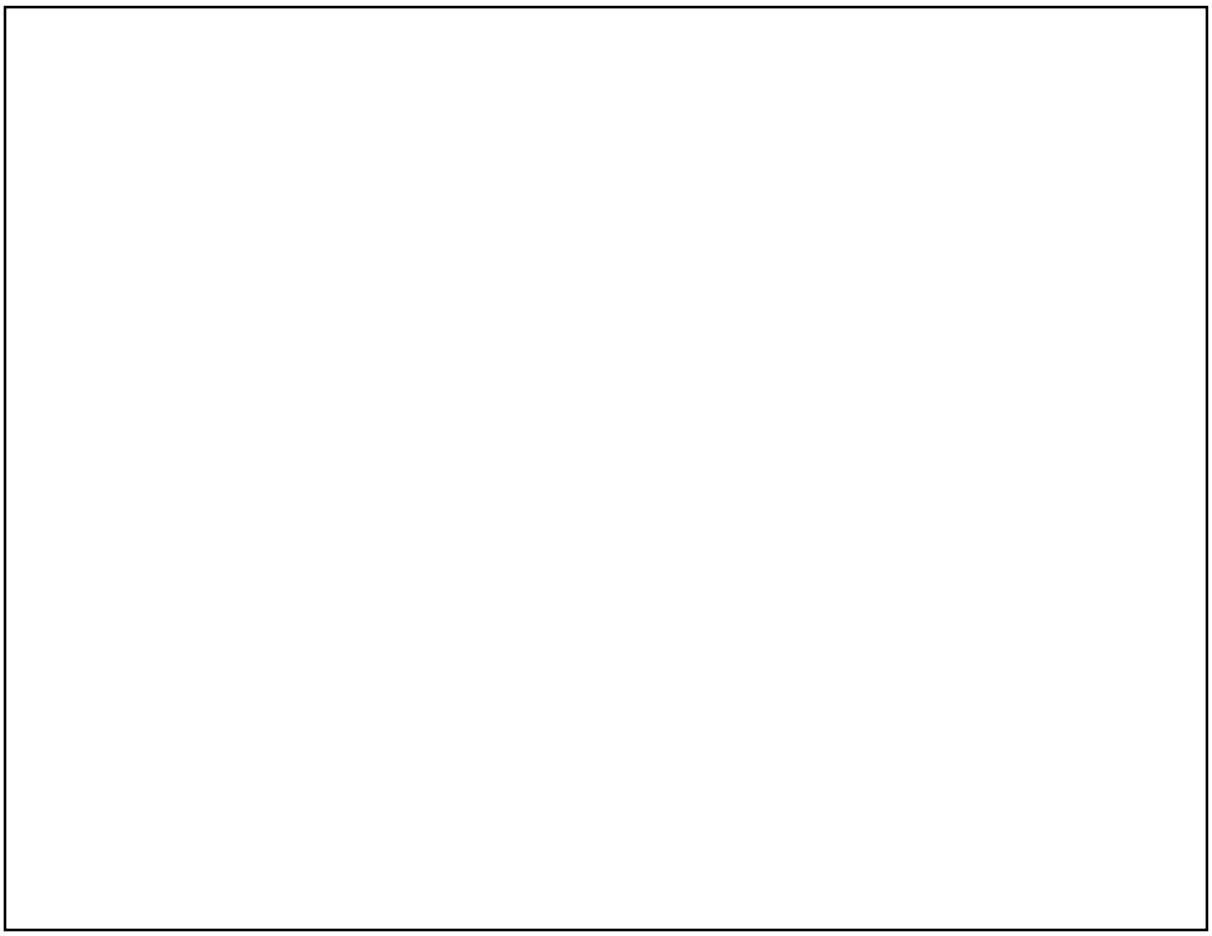
Problem Statement Template with space to fill details according to your Goal:

Our	[stakeholder(s)] _____ _____ _____ _____	Who
has /have a problem that	[issue, problem, need] _____ _____ _____ _____	What
when / while	[context, situation] _____ _____ _____ _____	Where
An ideal solution would	[benefit of solution for them] _____ _____ _____ _____	Why

2.2 Data Acquisition

Let us Recap

Redraw the AI Project Cycle here:



In the previous module, we learnt how to scope a problem and set a Goal for the project. After setting the goal, we listed down all the necessary elements which are directly/indirectly related to our problem. This was done using the 4Ws problem canvas. 4Ws were:

1. Who?
    a. Who are the stakeholders?
    b. What do we know about them?
2. What?
    a. What is the problem?
    b. How do you that it is a problem? (is there an evidence?)
3. Where?
    a. What is the context/situation the stakeholders experience this problem?
    b. Where is the problem located?
4. Why?
    a. What would hold value for the stakeholders?
    b. How will the solution improve their situation?

To summarise, we then go for the problem statement template where we put in all the details together at one place.

Our _____[Stakeholders]_____ has/have a problem that _____[issue, problem, need]_____ when/while _____[context, situation]. An ideal situation would be_____[benefit of solution for them]_____.

What is Data Acquisition?

Facilitator Guide

Lesson Title: Data Acquisition	**Approach:** Interactive Session + System Maps
Summary: Students will learn how to acquire data from reliable and authentic sources and will understand how to analyse the data features which affect their problem scoped. Also, they will learn the concept of System Maps	
Learning Objectives: 1. Students will learn various ways to acquire data. 2. Students will learn about data features. 3. Students will learn about System Maps.	
Learning Outcomes: 1. Identify data required regards a given problem. 2. Draw System Maps.	
Pre-requisites: Basic computer literacy	
Key-concepts: 1. Develop an understanding of reliable and authentic data sources. 2. System Mapping	

As we move ahead in the AI Project Cycle, we come across the second element which is: **Data Acquisition**. As the term clearly mentions, this stage is about acquiring data for the project. Let us first understand what is data. Data can be a piece of information or facts and statistics collected together for reference or analysis. Whenever we want an AI project to be able to predict an output, we need to train it first using data.

For example, If you want to make an Artificially Intelligent system which can predict the salary of any employee based on his previous salaries, you would feed the data of his previous salaries into the machine. This is the data with which the machine can be trained. Now, once it is ready, it will predict his next salary efficiently. The previous salary data here is known as **Training Data** while the next salary prediction data set is known as the **Testing Data**.

For better efficiency of an AI project, the Training data needs to be relevant and authentic. In the previous example, if the training data was not of the previous salaries but of his expenses, the machine would not have predicted his next salary correctly since the whole training went wrong. Similarly, if the previous salary data was not authentic, that is, it was not correct, then too the prediction could have gone wrong. Hence….

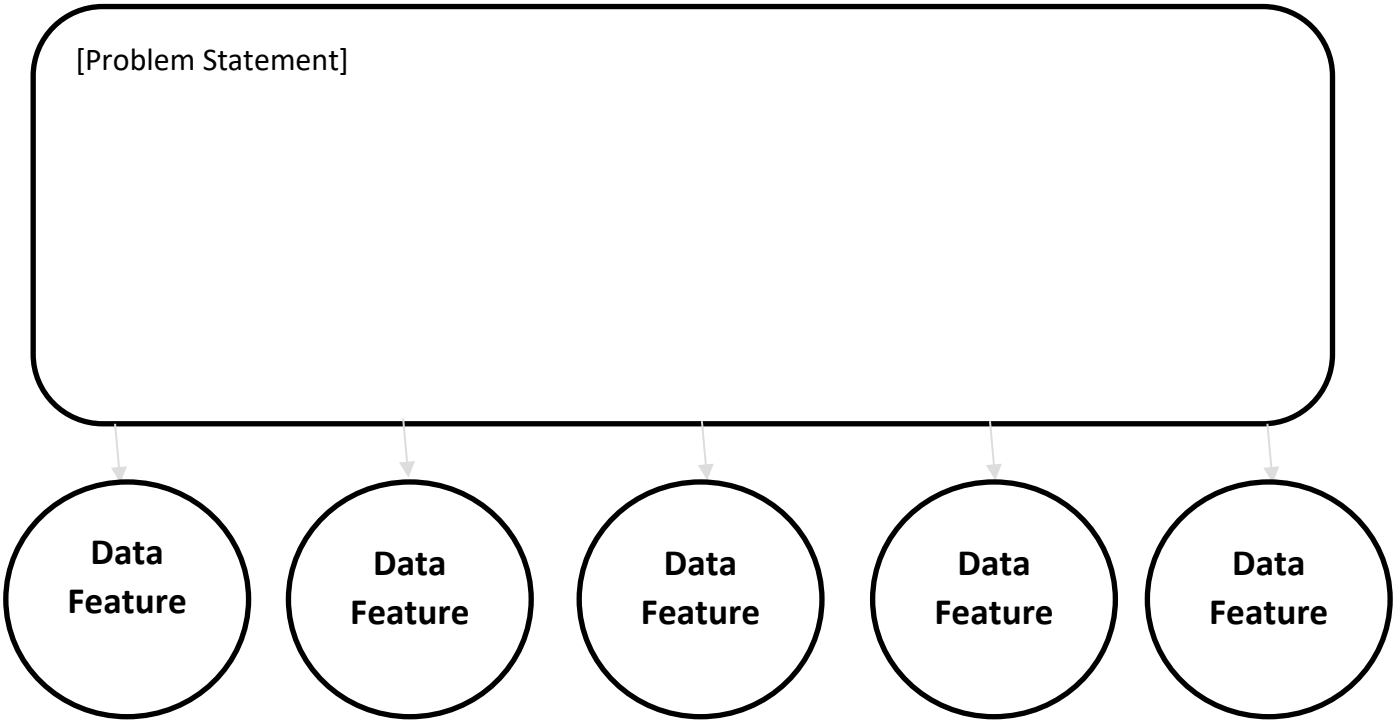
For any AI project to be efficient, the training data should be authentic and relevant to the problem statement scoped.

Data Features

Purpose: The purpose of this section is to learn what data features are and how to find them for the problem scoped.
Say: *"We've come to the stage of data acquisition, how do we know what data to get based on the problem statement? We need to visualise the factors which affect the problem statement. For this, we need to extract the Data Features for the problem scoped. Now try to find out what are the parameters which affect your problem statement directly or indirectly and list them down below."*

Look at your problem statement once again and try to find the data features required to address to this issue. **Data features refer to the type of data you want to collect**. In our previous example, data features would be salary amount, increment percentage, increment period, bonus, etc.

Try to identify the data features required for your problem statement:

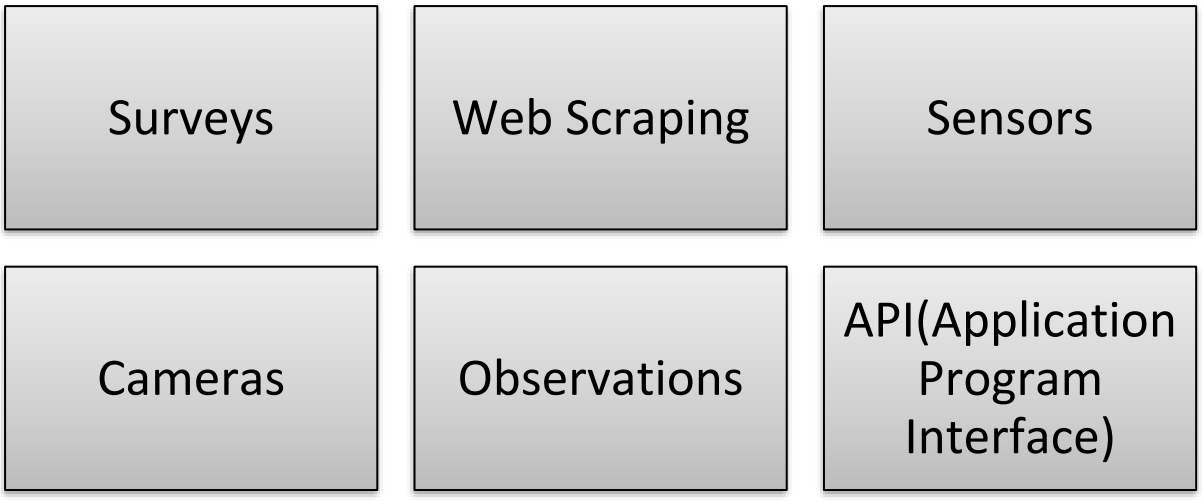


Acquiring Data from reliable sources

Purpose: The purpose of this section is to identify reliable and authentic data sources for its acquisition.

Say: *"After finding out the Data Features, we now need to acquire the same. There exists various sources from which the data can be acquired. Do all the sources have authentic data? What if we do not get appropriate data? Data plays an important part of the AI project as it creates the base on which the AI project is built. Therefore, the data acquired should be authentic, reliable and correct. Also, the acquisition methods shall be authentic so that our project does not create any sort of conflicts with anyone."*

After mentioning the Data features, you get to know what sort of data is to be collected. Now, the question arises- From where can we get this data? There can be various ways in which you can collect data. Some of them are:



Sometimes, you use the internet and try to acquire data for your project from some random websites. Such data might not be authentic as its accuracy cannot be proved. Due to this, it becomes necessary to find a reliable source of data from where some authentic information can be taken. At the same time, we should keep in mind that the data which we collect is open-sourced and not someone's property. Extracting private data can be an offence. One of the most reliable and authentic sources of information, are the open-sourced websites hosted by the government. These government portals have general information collected in suitable format which can be downloaded and used wisely.

Some of the open-sourced Govt. portals are: *data.gov.in, india.gov.in*
List down ways of acquiring data for a project below:

1.
2.
3.
4.
5.

System Maps

Session Preparation
Logistics: For a class of 40 students [Group Activity – Groups of 4]

Materials Required:

ITEM	QUANTITY
Computers	10
Chart Paper	10
Sketch-Pens	40

Resources:

Link to make System maps Online using an Animated tool: https://ncase.me/loopy/

Purpose: The purpose of this section is introduce the concepts System Maps and its elements, relationships and feedback loops.

Say: "*Now that we have listed all the Data features, let us look at the concept of System Maps. System Maps help us to find relationships between different elements of the problem which we have scoped. It helps us in strategizing the solution for achieving the goal of our project. Here is an example of a System very familiar to you – Water Cycle. The major elements of this system are mentioned here. Take a look at these elements and try to understand the System Map for this system. Also take a look at the relations between all the elements. After this, make your own system map for the data features which you have listed. You can also use the online animated tool for creating your System Maps.*"

Brief:

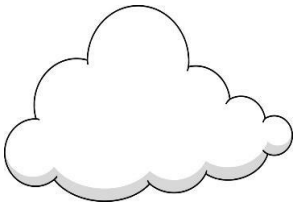
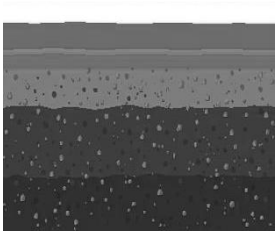
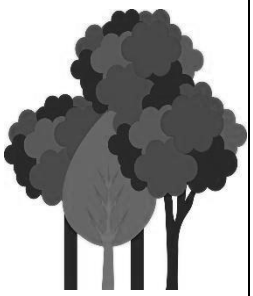
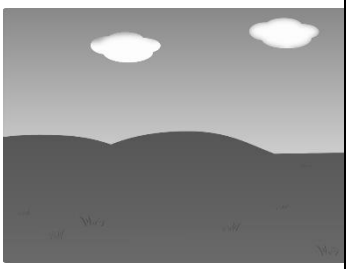
We use system maps to understand complex issues with multiple factors that affect each other. In a system, every element is interconnected. In a system map, we try to represent that relationship through the use of arrows. Within a system map, we will identify loops. These loops are important because they represent a specific chain of causes and effects. A system typically has several chains of causes and effects. You may notice that some arrows are longer than others. A longer arrow represents a longer time for a change to happen. We also call this a time delay. To change the outcome of a system, as a change maker, we have two options - change the elements in a system or change the relationships between elements. It is usually more effective to change the relationship between elements in a system. You may also notice the use of '+' signs and '-' signs. These are an indicator of the nature of the relationship between elements. What we did was a very basic introduction to systems thinking, you can use Google to find more detailed information on how to make systems maps.

A system map shows the components and boundaries of a system and the components of the environment at a specific point in time. With the help of System Maps, one can easily define a relationship amongst different elements which come under a system. Relating this concept to our module, the Goal of our project becomes a system whose elements are the data features mentioned above. Any change in these elements changes the system outcome too. For example, if a person received 200% increment in a month, then this change in his salary would affect the prediction of his future salary. The more the increment presently, the more salary in future is what the system would predict. Here is a sample System Map:

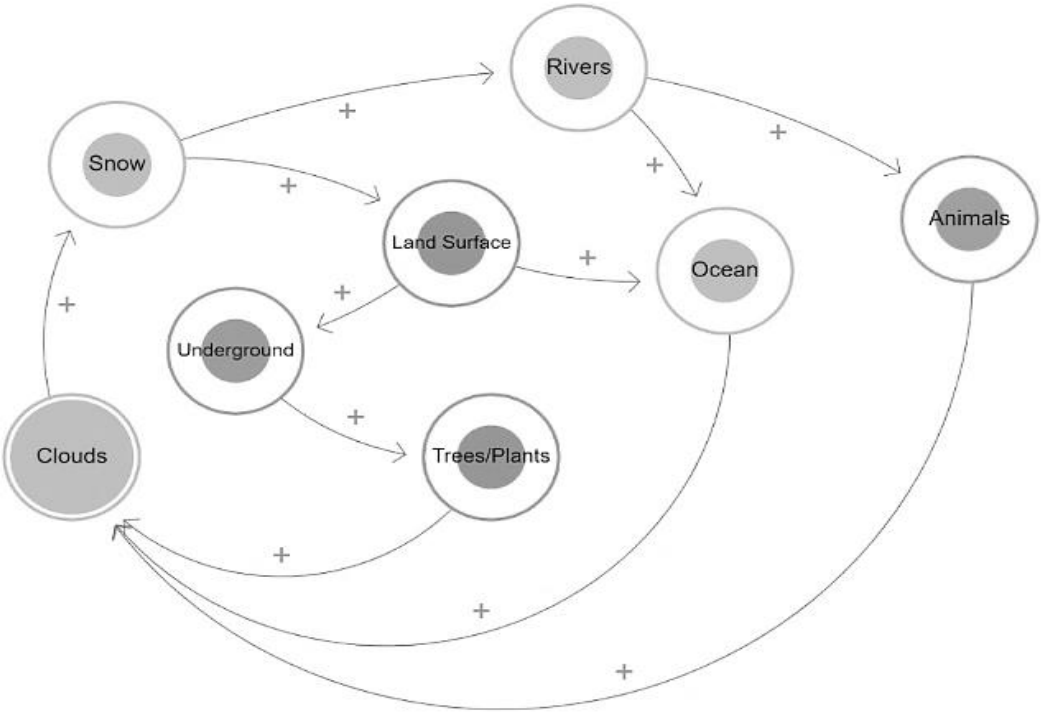
The Water Cycle

The concept of Water cycle is very simple to understand and is known to all. It explains how water completes its cycle transforming from one form to another. It also adds other elements which affect the water cycle in some way.

The elements which define the Water cycle system are:

			
Clouds	**Snow**	**Underground Soil**	**Rivers**
			
Oceans	**Trees**	**Land**	**Animals**

Let us draw the System Map for the Water Cycle now.



In this System Map, all the elements of the Water cycle are put in circles. The map here shows cause & effect relationship of elements with each other with the help of arrows. The arrow-head depicts the direction of the effect and the sign (+ or -) shows their relationship. If the arrow goes from X to Y with a + sign, it means that both are directly related to each other. That is, If X increases, Y also increases and vice versa. On the other hand, If the arrow goes from X to Y with a – sign, it means that both the elements are inversely related to each other which means if X increases, Y would decrease and vice versa.

Now, it's your turn to build your own System Map!

Considering the data features for your problem, draw a system map in the box provided.

(Hint: You can also use this animated tool for drawing and understanding system maps: https://ncase.me/loopy/)

2.3 Data Exploration

Facilitator Guide

Title: Data Exploration	**Approach:** Activity
Summary: Students will explore different types of graphs used in data visualization and will be able to find trends and patterns out of it.	
Learning Objectives: 1. Students will explore various types of graphical representations. 2. Students will learn how to visualize the data they have.	
Learning Outcomes: 1. Recognize different types of graphs used in data visualization. 2. Exploring various patterns and trends out of the data explored.	
Pre-requisites: Basic computer literacy	
Key-concepts: Data Visualization	

Let us Recap!

Quiz Time!

1. Which one of the following is the second stage of AI project cycle?
    a. Data Exploration
    b. Data Acquisition
    c. Modelling
    d. Problem Scoping
2. Which of the following comes under Problem Scoping?
    a. System Mapping
    b. 4Ws Canvas
    c. Data Features
    d. Web scraping
3. Which of the following is not valid for Data Acquisition?
    a. Web scraping
    b. Surveys
    c. Sensors
    d. Announcements
4. If an arrow goes from X to Y with a – (minus) sign, it means that
    a. If X increases, Y decreases
    b. The direction of relation is opposite
    c. If X increases, Y increases
    d. It is a bi-directional relationship

5. Which of the following is not a part of the 4Ws Problem Canvas?
    a. Who?
    b. Why?
    c. What?
    d. Which?

Let us explore:

Session Preparation
Logistics: For a class of 40 Students. [Group Activity – Groups of 4]

Materials Required:

ITEM	QUANTITY
Computers	10

Resources:

Link to visualisation website: https://datavizcatalogue.com/

Purpose: To understand why we do data exploration before jumping straight into training an AI Model.

Say: "*Why do you think we need to explore and visualize data before jumping into the AI model? When we pick up a library book, we tend to look at the book cover, read the back cover and skim through the content of the book prior to choosing it as it helps us understand if this book is appropriate for our needs and interests. Similarly, when we get a set of data in our hands, spending time to explore it will help get a sense of the trends, relationships and patterns present in the data. It will also help us better decide on which model/models to use in the subsequent AI Project Cycle stage. We use visualization as a method because it is much easier to comprehend information quickly and communicate the story to others.*"

Brief:

In this session, we will be exploring various types of Graphs using an online open-sourced website. Students will learn about various new ways to visualise the data.

When to intervene?

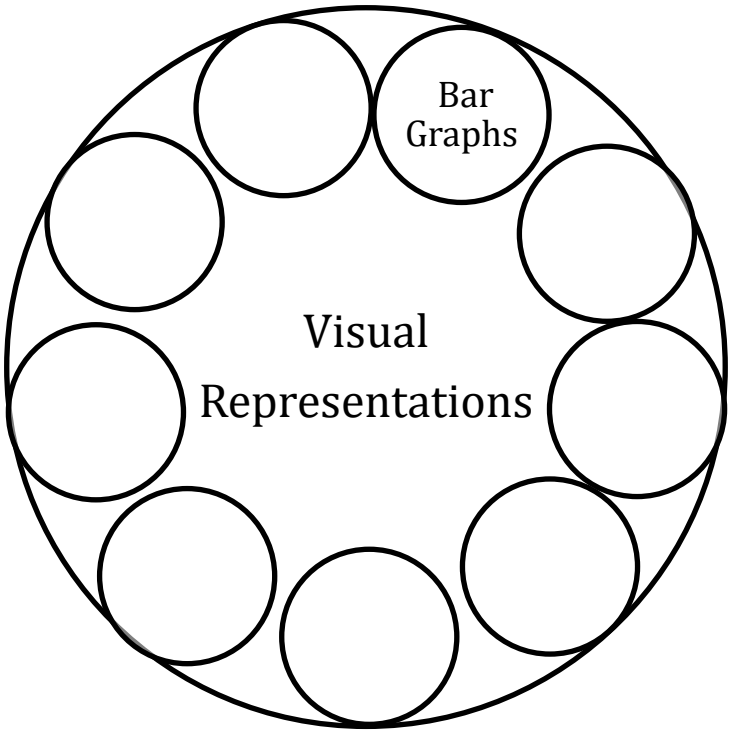
Ask the students to figure out which types of graphs would be suitable for the data features that they have listed for their problem. Let them take their time in going through each graph and its description and decide which one suits their needs the best.

In the previous modules, you have set the goal of your project and have also found ways to acquire data. While acquiring data, you must have noticed that the data is a complex entity – it is full of numbers and if anyone wants to make some sense out of it, they have to work some patterns out of it. For example, if you go to the library and pick up a random book, you first try to go through its content quickly by turning pages and by reading the description before borrowing it for yourself, because it helps you in understanding if the book is appropriate to your needs and interests or not.

Thus, to analyse the data, you need to visualise it in some user-friendly format so that you can:

- Quickly get a sense of the trends, relationships and patterns contained within the data.
- Define strategy for which model to use at a later stage.
- Communicate the same to others effectively. To visualise data, we can use various types of visual representations.

Are you aware of visual representations of data? Fill them below:



As of now, we have a limited knowledge of data visualisation techniques. To explore various data visualisation techniques, visit this link: https://datavizcatalogue.com/

On this website, you will find various types of graphical representations, flowcharts, hierarchies, process descriptors, etc. Go through the page and look at various new ways and identify the ones which interest you the most.

List down 5 new data visualisation techniques which you learnt from https://datavizcatalogue.com/

Data Visualisation Technique 1	
Name of the Representation	
One-line Description	
How to draw it	
Suitable for which data type?	

Data Visualisation Technique 2	
Name of the Representation	
One-line Description	
How to draw it	
Suitable for which data type?	

Data Visualisation Technique 3	
Name of the Representation	
One-line Description	
How to draw it	
Suitable for which data type?	

Data Visualisation Technique 4	
Name of the Representation	
One-line Description	
How to draw it	
Suitable for which data type?	

Data Visualisation Technique 5	
Name of the Representation	
One-line Description	
How to draw it	
Suitable for which data type?	

Sketchy Graphs

Session Preparation
Logistics: For a class of 40 Students. [Group Activity – Groups of 4]

Materials Required:

ITEM	QUANTITY
Chart Paper	10
Sketch-pens	10
Ruler	10
Basic Stationary	10 Sets

Purpose: To know the different visualization techniques and to use the right graph to display the data.

Say: *"In this activity, we are going to sketch graphs! Now that you have explored various types of graphs and have already chosen the best ones to plot your data features, let us start drawing them out! Select any two data features and plot their graphs on the chart paper provided. Make sure that you are able to relate this graph to the goal of your project. At the end of this activity, you would have to present your representations to all of us and describe what trends or patterns have you witnessed in it. Your time starts now!"*

Let us now look at the scoped Problem statement and the data features identified for achieving the goal of your project. Try looking for the data required for your project from reliable and authentic resources. If you are not able to find data online, try using other methods of acquiring the data (as discussed in the Data Acquisition stage).

Once you have acquired the data, you need to visualise it. Under the sketchy graphs activity, you will visualise your collected data in a graphical format for better understanding.

For this, select one of representation from the link or choose the ones which you already know. The basis of your selection should be the data feature which you want you visualise in that particular representation. Do this for all the data features you have for the problem you have scoped. Let us answer the following questions for a better understanding:

1. Which data feature are you going to represent?

_____
_____
_____
_____
_____
_____

2. Which representation are you going to use for this data feature? Why?

_____
_____
_____
_____
_____
_____

Now, let's start drawing visual representations for all the Data features extracted, and try to find a pattern or a trend from it.

For example, if the problem statement is: *How can we predict whether a song makes it to the billboard top 10?*

We would require data features like: *Current trends of music, genre of music, tempo of music, duration of song, popularity of a singer, etc.*

Now to analyse a pattern, we can say that the popularity of the singer would directly have an effect on the output of the system. Thus, we would plot a graph showing the popularity of various singers and the one who is most popular has the maximum chance of getting to the billboard. In this way, the graphical representation helps us understanding the trends and patterns out of the data collected and to design a strategy around them for achieving the goal of the project.

Do it yourself:

Take a chart paper and start representing your data features in various types of graphs. After completing this exercise, present your work to your friends and explain to them the trends and patterns you have observed in it.

List down the trends you might have observed in your representations below:

1. _____

_____

_____

2. _____

_____

_____

3. _____

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4. _____

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5. _____

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6. _____

_____

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2.4 Modelling

Facilitator Guide

Title: Modelling	**Approach:** Session + Activity
Summary: Students will be introduced to rule based and AI models and undertake activities to appreciate the distinction between each. They will receive an overview of the various types of regression, classification and clustering models.	
Learning Objectives: 1. Students are introduced to common regression, classification and clustering models 2. Students are introduced to the decision tree algorithm as an example of rule-based models 3. Students are introduced to image classification model.	
Learning Outcomes: 1. List common regression, classification and clustering models 2. Explain how decision trees work 3. Describe the process involved in image classification	
Pre-requisites: Nil	
Key-concepts: 1. Learning AI process 2. Rule based vs AI model 3. Decision Trees 4. Image Classification	

Let us Recap!

List down any 5 concepts which you have learnt so far:

No.	Concept	Description	Importance

In the previous module of Data Exploration, you explored the data you had acquired at the Data Acquisition stage for the problem you scoped in the Problem Scoping stage. Now, you have visualised some trends and patterns out of the data which would help you develop a strategy for your project. To build an AI based project, we need to work around Artificially Intelligent models or algorithms. This could be done either by designing your own model or by using the pre-existing AI models. Before jumping into modelling let us clarify the definitions of Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL).

AI, ML & DL

Purpose: To differentiate between Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL).

Say: *"As we enter the world of modelling, it is a good time to clarify something many of you may be having doubts about. You may have heard the terms AI, ML and DL when research content online and during this course. They are of course related, but how?*

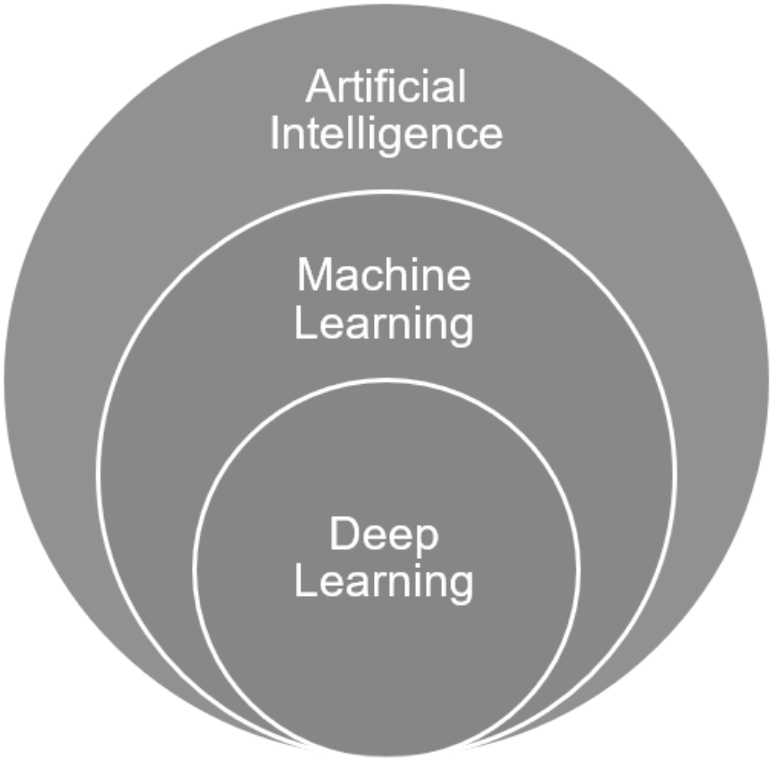
Artificial Intelligence, or AI for short, refers to any technique that enables computers to mimic human intelligence. An artificially intelligent machine works on algorithms and data fed to it and gives the desired output.

Machine Learning, or ML for short, enables machines to improve at tasks with experience. The machine here learns from the new data fed to it while testing and uses it for the next iteration. It also takes into account the times when it went wrong and considers the exceptions too.

Deep Learning, or DL for short, enables software to train itself to perform tasks with vast amounts of data. Since the system has got huge set of data, it is able to train itself with the help of multiple machine learning algorithms working altogether to perform a specific task.

Artificial Intelligence is the umbrella term which holds both Deep Learning as well as Machine Learning. Deep Learning, on the other hand, is the very specific learning approach which is a subset of Machine Learning as it comprises of multiple Machine Learning algorithms."

As you have been progressing towards building AI readiness, you must have come across a very common dilemma between AI and ML. Many of the times, these terms are used interchangeably but are they the same? Is there no difference in Machine Learning and Artificial Intelligence? Is Deep Learning also Artificial Intelligence? What exactly is Deep Learning? Let us see…



As you can see in the Venn Diagram, Artificial Intelligence is the umbrella terminology which covers machine and deep learning under it and Deep Learning comes under Machine Learning. It is a funnel type approach where there are a lot of applications of AI out of which few are those which come under ML out of which very few go into DL.

Defining the terms:

1. **Artificial Intelligence**, or AI, refers to any technique that enables computers to mimic human intelligence. The AI-enabled machines think algorithmically and execute what they have been asked for intelligently.

2. **Machine Learning**, or ML, enables machines to improve at tasks with experience. The machine learns from its mistakes and takes them into consideration in the next execution. It improvises itself using its own experiences.

3. **Deep Learning**, or DL, enables software to train itself to perform tasks with vast amounts of data. In deep learning, the machine is trained with huge amounts of data which helps it into training itself around the data. Such machines are intelligent enough to develop algorithms for themselves.

Deep Learning is the most advanced form of Artificial Intelligence out of these three. Then comes Machine Learning which is intermediately intelligent and Artificial Intelligence covers all the concepts and algorithms which, in some way or the other mimic human intelligence.

Modelling

Purpose: Classification of Models into Rule-based approach and Learning approach.

Say: *"In general, there are two approaches taken by researchers when building AI models. They either take a rule based approach or learning approach. A Rule based approach is generally based on the data and rules fed to the machine, where the machine reacts accordingly to deliver the desired output. Under learning approach, the machine is fed with data and the desired output to which the machine designs its own algorithm (or set of rules) to match the data to the desired output fed into the machine"*

AI Modelling refers to developing algorithms, also called models which can be trained to get intelligent outputs. That is, writing codes to make a machine artificially intelligent.

Let us ponder

Use your knowledge and thinking ability and answer the following questions:

1. What makes a machine intelligent?

_____
_____
_____
_____
_____

2. How can a machine be Artificially Intelligent?

_____
_____
_____
_____
_____

3. Can Artificial Intelligence be a threat to Human Intelligence? How?

_____
_____
_____
_____
_____
_____
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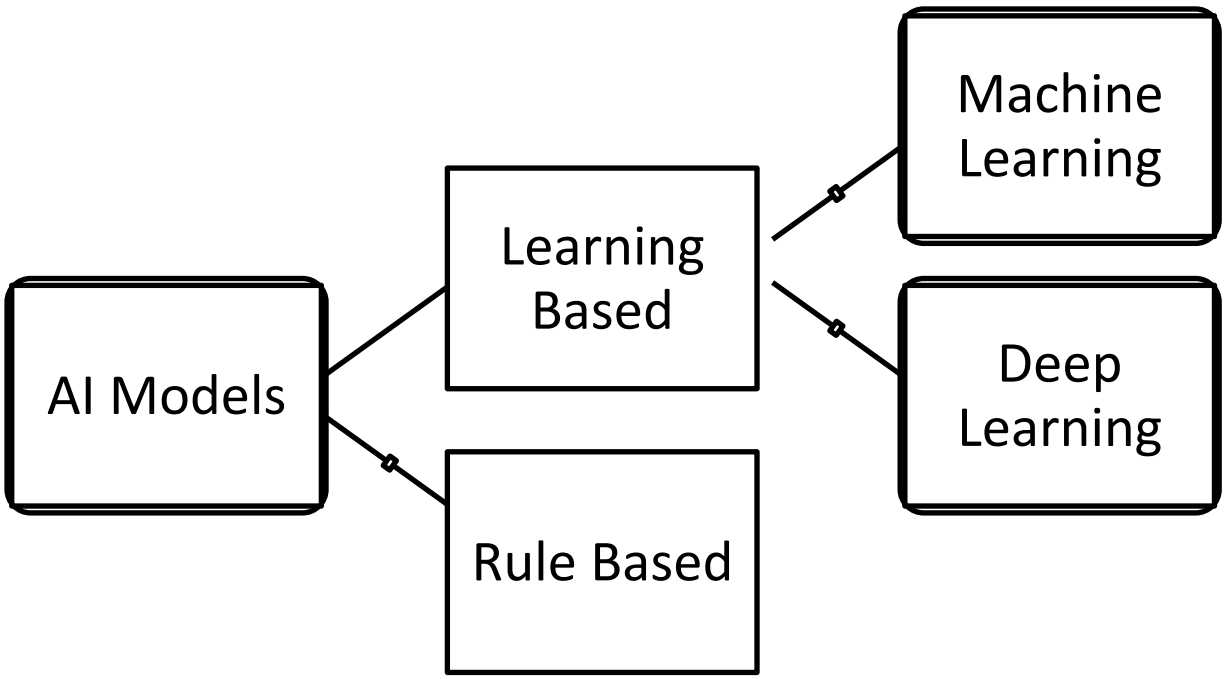
_____

In the previous module of Data exploration, we have seen various types of graphical representations which can be used for representing different parameters of data. The graphical representation makes the data understandable for humans as we can discover trends and patterns out of it. But when it comes to machine accessing and analysing data, it needs the data in the most basic form of numbers (which is binary – 0s and 1s) and when it comes to discovering patterns and trends in data, the machine goes for mathematical representations of the same. The ability to mathematically describe the relationship between parameters is the heart of every AI model. Thus, whenever we talk about developing AI models, it is the mathematical approach towards analysing data which we refer to.

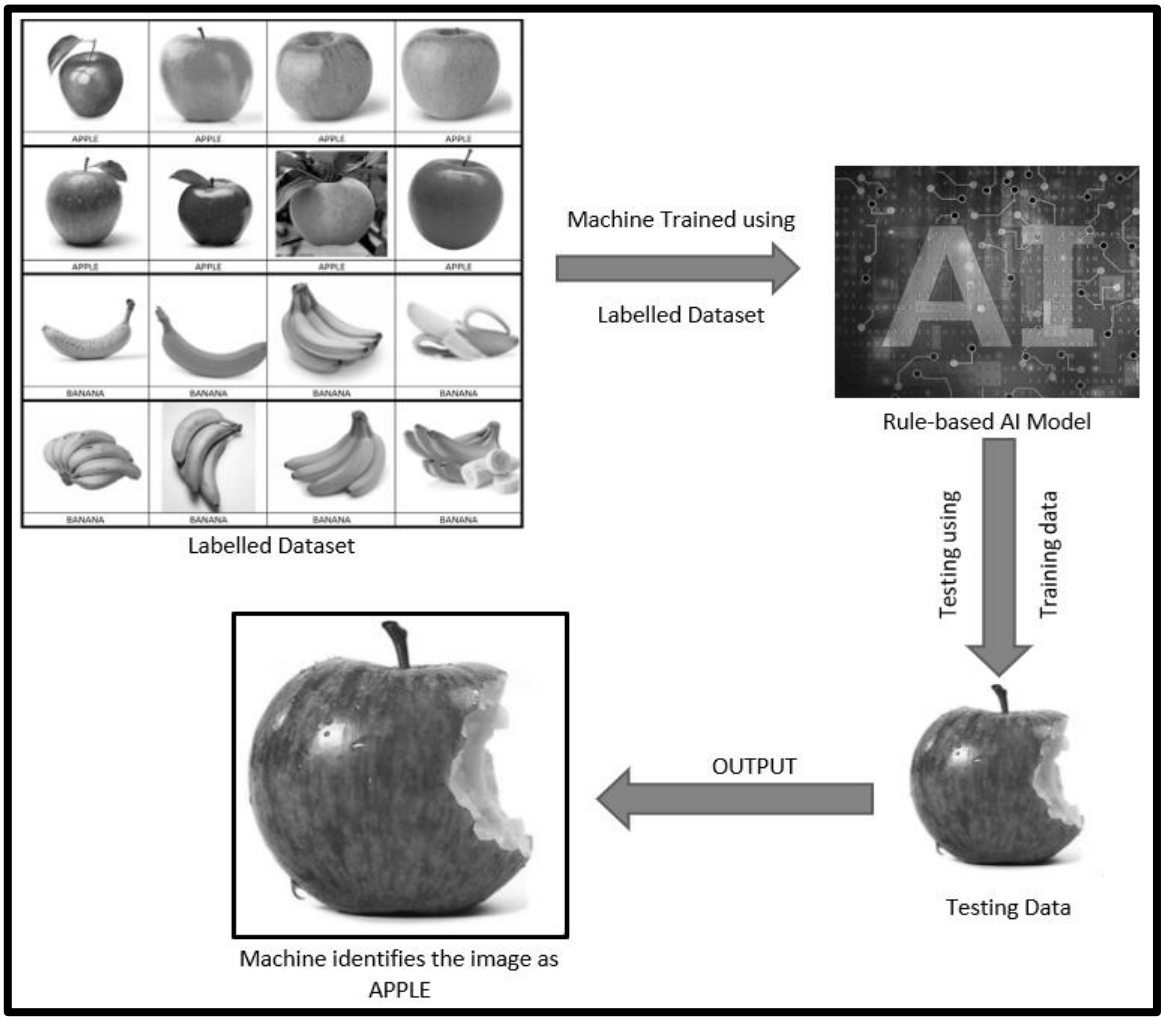
Generally, AI models can be classified as follows:



Rule Based Approach

Rule Based Approach Refers to the AI modelling where the relationship or patterns in data are defined by the developer. The machine follows the rules or instructions mentioned by the developer, and performs its task accordingly. For example, suppose you have a dataset comprising of 100 images of apples and 100 images of bananas. To train your machine, you feed this data into the machine and label each image as either apple or banana. Now if you test the machine with the image of an apple, it will compare the image with the trained data and according to the labels of trained images, it will identify the test image as an apple. This is known as Rule based approach. The rules given to the machine in this example are the labels given to the machine for each image in the training dataset.

Rule Based AI Model

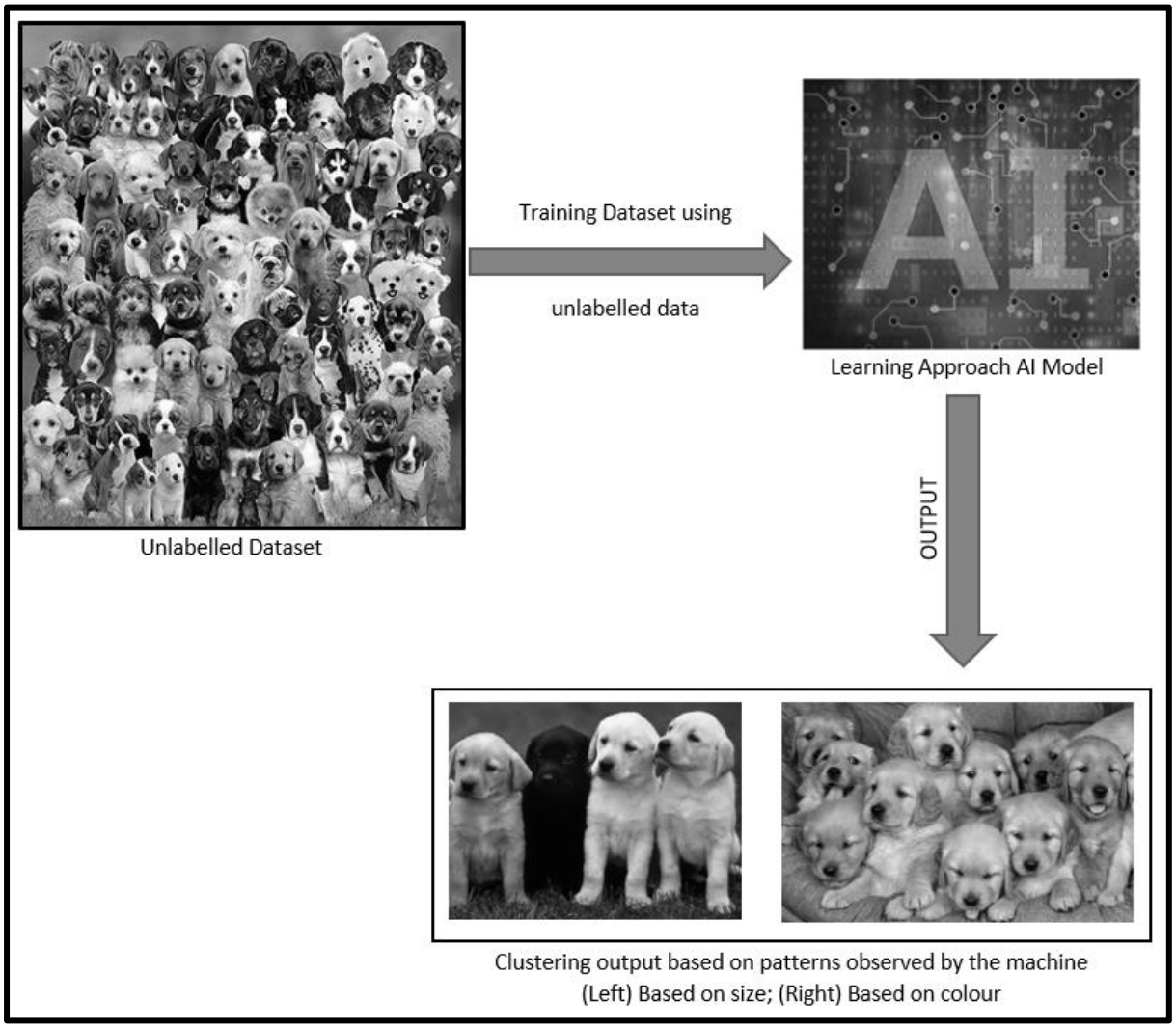


Learning Based Approach

Refers to the AI modelling where the relationship or patterns in data are not defined by the developer. In this approach, random data is fed to the machine and it is left on the machine to figure out patterns and trends out of it. Generally this approach is followed when the data is unlabelled and too random for a human to make sense out of it. Thus, the machine looks at the data, tries to extract similar features out of it and clusters same datasets together. In the end as output, the machine tells us about the trends which it observed in the training data.

For example, suppose you have a dataset of 1000 images of random stray dogs of your area. Now you do not have any clue as to what trend is being followed in this dataset as you don't know their breed, or colour or any other feature. Thus, you would put this into a learning approach based AI machine and the machine would come up with various patterns it has observed in the features of these 1000 images. It might cluster the data on the basis of colour, size, fur style, etc. It might also come up with some very unusual clustering algorithm which you might not have even thought of!

Learning Based AI Model



Decision Tree

Purpose: To know one of the most common and basic models in data science – Decision Tree.

Say: *"Do you remember the story speaker activity we did in Relate module? We had set up certain conditions and outcomes to guide our friends around our smart home. Decision trees are similar to that. They are an example of a rule based approach. The basic structure of a Decision Tree starts from the root which the point where the decision tree starts. From there, the tree diverges into multiple directions with the help of arrows called branches. These branches depict the condition because of which the tree diverges. In the end, the final decision is where the tree ends. These decisions are termed as the leaves of the tree. You would realize that this looks like an upside-down tree."*

When to intervene?

While making the Decision Tree, ask the students to take a look at the data carefully before drawing the decision tree. Ask them to figure out which out of the whole data would be the root and the leaves. After this, they should analyse the data and find out if there is some redundant data which might not be necessary while making the tree.

In the Relate module, you developed an interactive story using the Google Docs extension called *Story Speaker*. In that activity, you wrote a story which changed according to the user inputs. Here is one excerpt from an Interactive story:

Intro
You have entered the Palace and you are standing in-front of the main staircase. Would you like to take the staircase or would you go to the kitchen which is at your right?

If you say "right" or "go right" or "kitchen"

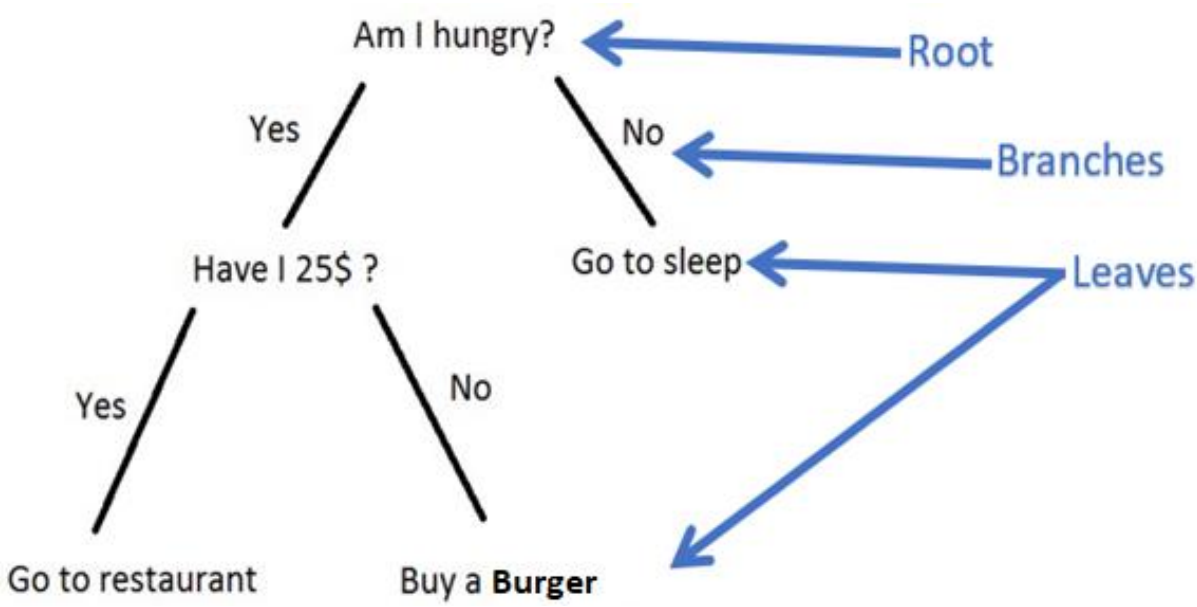
_____

_ You have entered the kitchen now. The master chef is preparing dinner here. He does not like visitors at his workplace so you have to leave. [[END]]

If you say "go up" or "go straight" or "staircase"

You are now on the first floor where the queen lives. Guards have identified you as an intruder. They catch hold of you and move you out of the palace. [[END]]

Decision Trees are similar to the concept of Story Speaker. It is a rule-based AI model which helps the machine in predicting what an element is with the help of various decisions (or rules) fed to it. A basic structure of decision tree is shown below:



Here, the Decision tree starts from the question *Am I Hungry?* The beginning point of any Decision Tree is known as its Root. It then forks into two different ways or conditions: Yes or No. The forks or diversions are known as Branches of the tree. The branches either lead to another question, or they lead to a decision like *Go to Sleep* which is known as the leaf. If you look closely at the image above, you would notice that it looks like an inverted tree with root above and the leaves below. Hence the name Decision Tree!

Now, answer the following questions to test your understanding on the basis of the example above:

1. How many branches does the tree shown above have?

2. How many leaves does the tree shown above have?

Decision Trees are made on the basis of the dataset we have and change according to the parameters which we take into consideration for modelling. Many times, the dataset might have redundant data, that is, some data might not hold importance while developing the decision tree. For this, one needs to visualise the relation amongst all the parameters given in the data and then formulate the model.

Points to Remember

- While making Decision Trees, one should take a good look at the dataset given to them and try to figure out what pattern does the output leaf follow. Try selecting any one output and on its basis, find out the common links which all the similar outputs have.

- Many times, the dataset might contain redundant data which does not hold any value while creating a decision tree. Hence, it is necessary that you note down which are the parameters that affect the output directly and should use only those while creating a decision tree.

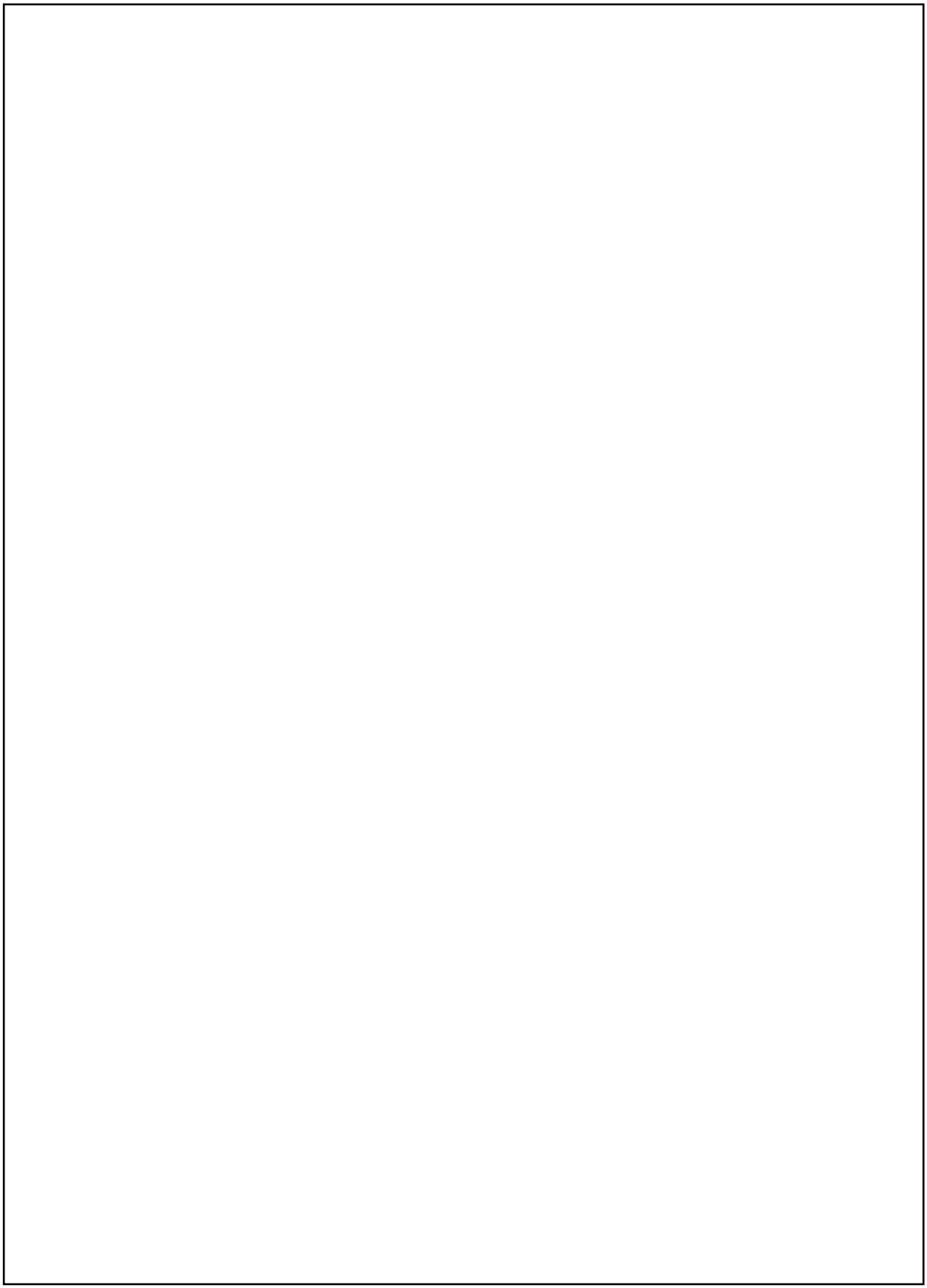
- There might be multiple decision trees which lead to correct prediction for a single dataset. The one which is the simplest should be chosen as the best.

Do It Yourself!

The following is a dataset comprising of 4 parameters which lead to the prediction of whether an Elephant would be spotted or not. The parameters which affect the prediction are: Outlook, Temperature, Humidity and Wind. Draw a Decision Tree for this dataset.

Outlook	Temperature	Humidity	Wind	Elephant Spotted?
Sunny	Hot	High	Weak	No
Sunny	Hot	High	Strong	No
Overcast	Hot	High	Weak	Yes
Rain	Mild	High	Weak	Yes
Rain	Cool	Normal	Weak	Yes
Rain	Cool	Normal	Strong	No
Overcast	Cool	Normal	Strong	Yes
Sunny	Mild	High	Weak	No
Sunny	Cool	Normal	Weak	Yes
Rain	Mild	Normal	Weak	Yes
Sunny	Mild	Normal	Strong	Yes
Overcast	Mild	High	Strong	Yes
Overcast	Hot	Normal	Weak	Yes
Rain	Mild	High	Strong	No

Draw Your Decision Tree here:



Let's Discuss

Answer the following questions regarding the previous exercise:

1. Did you manage to draw the Decision Tree without any assistance?

2. Was it challenging for you to draw the decision tree for this dataset? If so, why?

3. Were all the parameters equally important for the Decision Tree? Did you notice any redundant data? If yes, what was it?

4. What if the dataset had more than 1000 data sets? Will decision tree still be a suitable model for it? Why?

Pixel It

Session Preparation

Logistics: For a class of 40 students [Group Activity – Groups of 4]

Materials Required:

ITEM	QUANTITY
Pixel It Activity Sheet (given in Student Handbook)	40
Scissors	10
Glue	10
Sketch-pens	40

Purpose: To know how the computer classifies images as well as how the computer reads them.

Say: *"For the next activity, we will look at how computers process, classify and see images. This is an example of a machine learning approach that is typically used in computer vision applications."*

The steps of this activity are given in the Students Handbook.

After the activity, say: *"In the Decision Tree activity, we tried a rule based approach and in the Pixel It activity we tried the machine learning approach. So how is machine learning different? [Wait for Students response] In machine learning, what you want to accomplish is for the machine to be producing the model for you. What you will provide is the training data, and the machine will undergo a training process and produce the model."*

As we discussed earlier, there are various different kinds of AI models available. We discussed a rule based approach AI model called Decision Trees. Now let's move towards another type of AI modelling.

Let us start with an activity. Follow the instructions step-by-step as mentioned below:

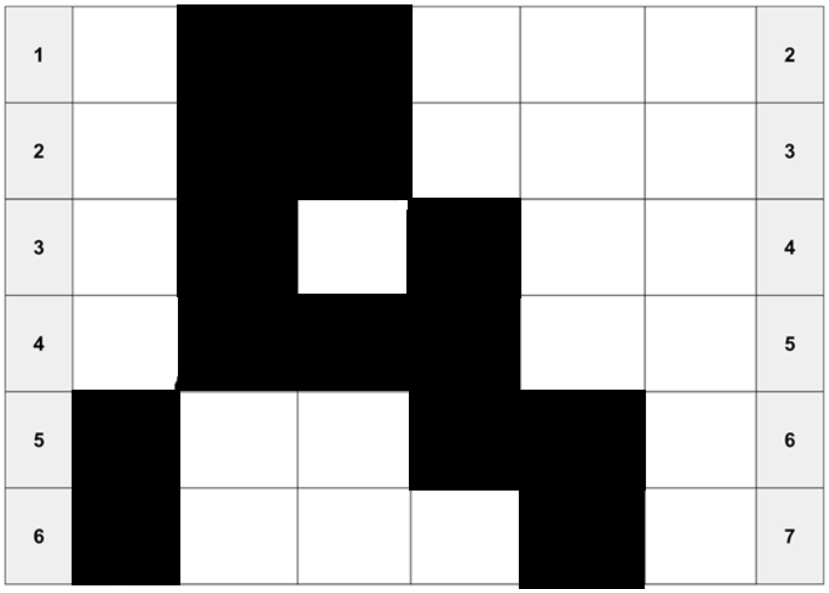
- Cut out the matrix from the page given below or draw the same on a blank page with 6x6 square blocks.
- Write an uppercase alphabet on this matrix. The height of the alphabet should be equal to the height of this matrix. In other words, it should start from the bottom line of the matrix till the top line. You can write any capital alphabet in any handwriting.
- Now, colour the boxes on which the lines of that alphabet have fallen.
- After this, cut out horizontal stripes of the matrix such that it goes from 1-2, 2-3, 3-4, 4-5, 5-6 and 6-7.
- Now, paste all these stripes together to form a single paper string. Make sure that the last block should neither be over the first block of next line nor should there be any gap in between the first and the last blocks.

- Now, find those students in your class who have chosen the same alphabet as you. Put their paper strings under your string and add up all the coloured blocks to get a series of numbers. A block without colour counts as 0 while the coloured ones count as 1. If a column has 3 coloured boxes, the summation turns out to be 3.
- Now, get another student whose letter is different from yours. Put his paper string under your multiple strings (of same alphabet) and see if the pattern of coloured blocks is the same or not.
- Also, go to other groups and check if their summation series of numbers is the same as yours or not.
- Note down your observations in the end.

1							**2**
2							**3**
3							**4**
4							**5**
5							**6**
6							**7**

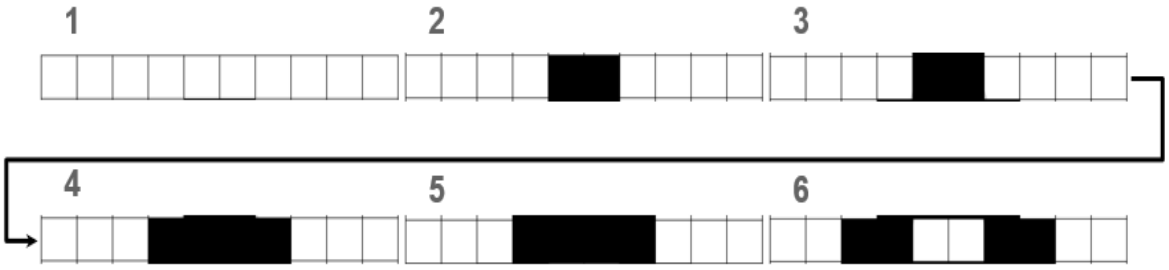
Cut out this matrix

Write an uppercase alphabet on this matrix. The height of the alphabet should be equal to the height of this matrix. In other words, it should start from the bottom line of the matrix till the top line. You can write any capital alphabet in any handwriting.

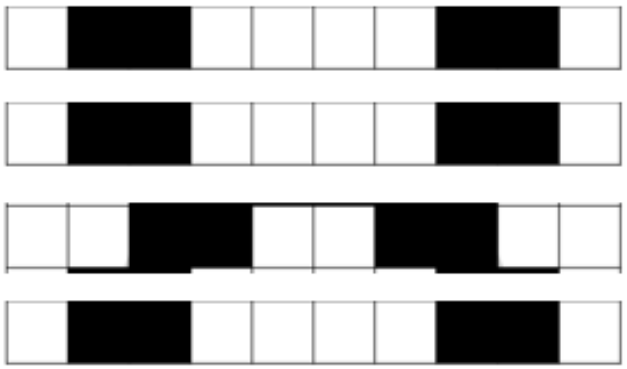


colour the boxes on which the lines of that alphabet has fallen.

cut out horizontal stripes of the matrix such that it goes from 1-2, 2-3, 3-4, 4-5, 5-6 and 6-7.



Paste all these stripes together to form a single paper string. Make sure that the last block should neither be over the first block of next line nor should there be any gap in between the first and the last blocks.



Find those students in your class who have chosen the same alphabet as you. Put their strings under your string and do the addition of all the coloured blocks to get a series of numbers. Blocks without colour count as 0 while the coloured ones count as 1. If a column has 3 coloured boxes, the summation turns out to be 3.

0341001430

Follow the rest of the steps to finish this activity.

What have we learnt?

Pixel It activity is an example of how computers see images, process them and classify them. This kind of Machine Learning approach is commonly used in Computer Vision related applications. Every image which is fed to the computer is divided into pixels (which are the smallest unit of an image). The Computer analyses each pixel and if it has to compare 2 pictures to check if they are similar or not, pixel-wise comparison takes place. If pixels are identical, this means that the images are the same.

In this activity, you created your own intelligent model which can identify if an alphabet is similar to the data trained or not. Here, you divided your alphabet into 36 blocks and then processed it. Also, to train the model, you used datasets of the same alphabet but different handwritings. Now, when you go for testing it, the model would see if the coloured blocks are aligned or not. If majority of the blocks are aligned altogether, there exists maximum probability that the alphabet is the same. Otherwise the alphabet is different.

Unit 3

Neural Networks

Facilitator Guide

Title: Neural Networks	**Approach:** Session + Activity
Summary: Students will be introduced to the concept of a neural network and form a "human" neural network to gain an intuitive understanding of its workings.	
Learning Objectives: Introduce students to the neural network	
Learning Outcome: Describe how a neural network works	
Pre-requisites: Nil	
Key-concepts: Neural Networks	

Let us Recap!

Indicate whether True or False

Artificial Intelligence:

1. Artificial Intelligence refers to any technique that enables computers to mimic human intelligence.
2. AI-enabled machines think algorithmically and execute what they have been asked for intelligently.
3. A machine will automatically mimic human intelligence.

Machine Learning:

1. Machine Learning enables machines to improve at tasks with experience.
2. The machine learns from its mistakes and takes them into consideration. It improvises using its own experiences.
3. If a Machine can improvise it is at par with Human Intelligence.

Deep Learning:

1. Deep Learning enables software to train itself to perform tasks with vast amounts of data.
2. Machines with Deep Learning are intelligent enough to develop algorithms for themselves.
3. In deep learning, the machine is trained with huge amounts of data which helps it to train itself around the data. Such machines are intelligent enough to develop algorithms for themselves.

Most advanced form of Artificial Intelligence is:

1. Deep Learning is the most advanced form of Artificial Intelligence.
2. Artificial Intelligence covers all the concepts and algorithms which, in some way or the other mimic human intelligence.
3. Machine learning is the most advanced form of Artificial Intelligence.

Decision Trees:

1. All data holds importance while developing the Decision Tree.
2. The beginning point of any Decision Tree is known as its Root.
3. Decision Trees is a rule-based AI model which helps the machine in predicting what an element is with the help of various rules.

Getting Started

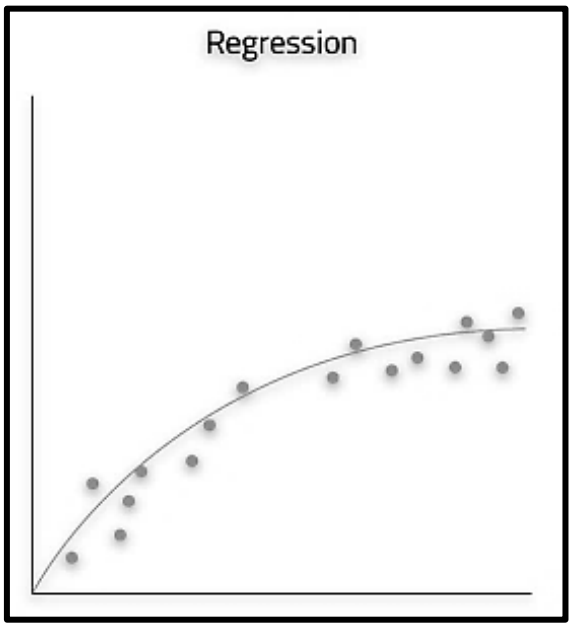
At the Modelling Stage, you learnt about general approaches for developing an AI model. Let us revisit the two approaches.

Under Rule based approach, the developer feeds in data along with some ground rules to the model. The model gets trained with these inputs and gives out answers in the form of predictions. This approach is commonly used when we have a known dataset or labelled dataset.

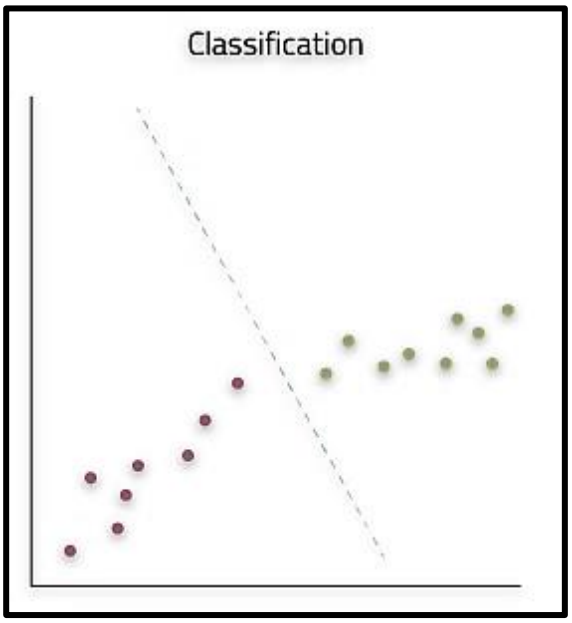
Whereas, under the Machine Learning approach the developer feeds in data along with the answers. The machine then designs its own algorithms and methodologies to match the data with answers and gives out the rules. This approach is commonly used when the data is unknown/random or unlabelled.

Some of the common AI models are given below:

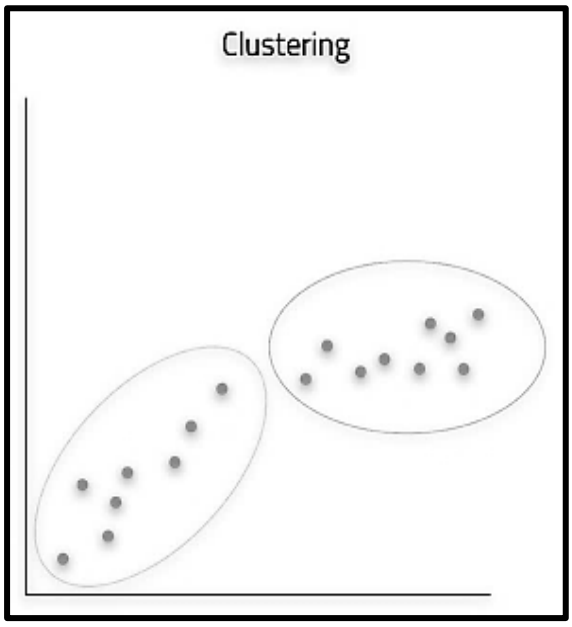
1. **REGRESSION**: This is a type of Rule-based AI model. In regression, the algorithm generates a mapping function from the given data, represented by the solid line. The blue dots shown in the graph are the data values and the solid line here represents the mapping done for them. With the help of this mapping function, we can predict the future data. For example, if we want to predict the salary of an employee, we can use his past salaries as training data and can predict his next salary. Regression works with continuous data.



2. **CLASSIFICATION**: This is another Rule-based AI model. In classification, the algorithm is able to determine which set a given data point belongs to by means of a classification function represented by the dotted line. The model classifies datasets according to the rules given to it. Usually the dataset used for classification are labelled and the data then gets sorted according to their labelling. Testing data is then classified as one of the labels of the training dataset. For example, If we want to train a model to identify if an image is of a guitar or a piano, we need to train it with multiple images of both guitar and piano along with their labels. The machine will then classify images on the basis of the labels and predict the correct label for testing data. Classification works on discrete dataset.



3. **CLUSTERING**: This is a Machine learning approach where the machine generates its own rules or algorithms to differentiate amongst the given dataset to achieve the pre-decided goal. The data fed to such a model is usually unlabelled or random and thus the developer feeds in the data directly into the machine and instructs it to build its own algorithm. The machine then finds out patterns or trends out of the training dataset and clusters the ones which follow the same pattern. The output rules might be very different to what was expected as the machine has its own way of recognising patterns. For example, if you have a random data of stray dogs which live in your locality, since you are unable to find any meaningful pattern amongst them, you would feed their data into the clustering algorithm. The algorithm would then analyse the data and divide them into clusters according to their similarities based on the trends noticed. The clusters are then given as the output. Clustering works on discrete dataset.



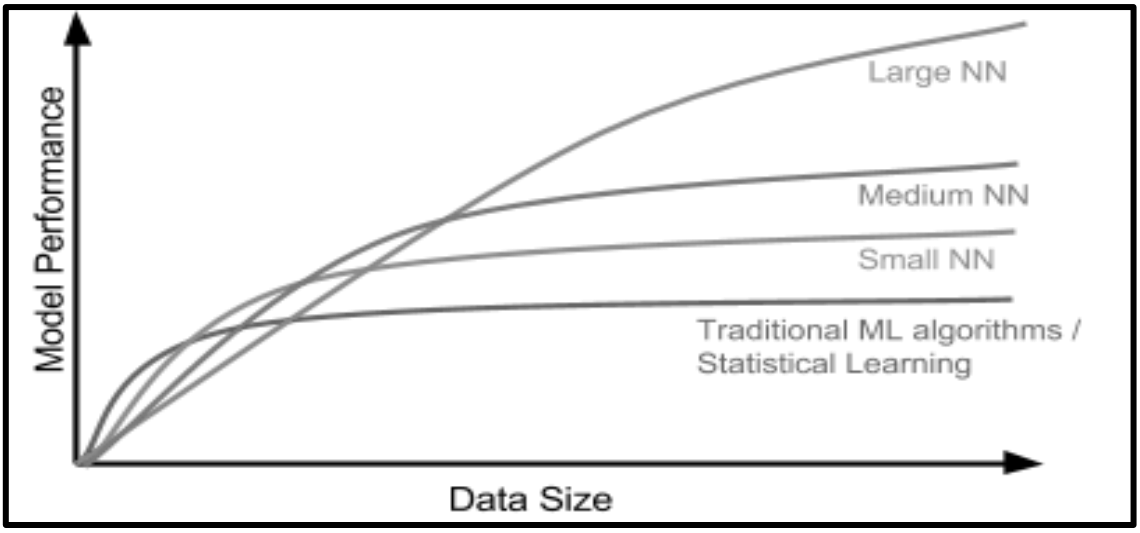
Neural Networks – Defined

Purpose: To understand and experience what a neural network is like.

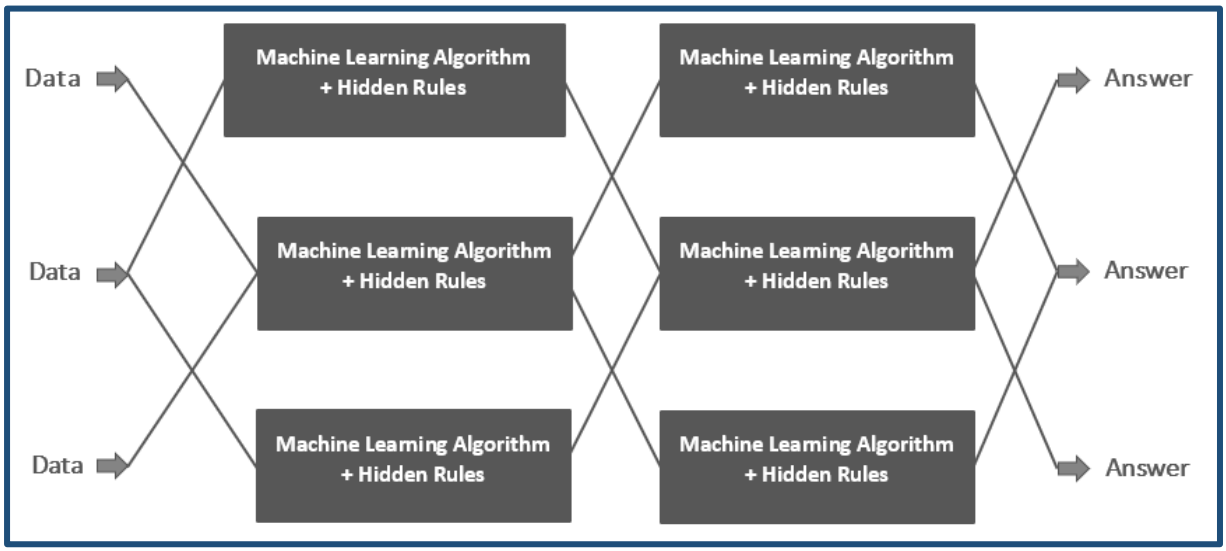
Brief:

Neural networks are loosely modelled after how neurons in the human brain behave. The key advantage of neural networks are that they are able to extract data features automatically without needing the input of the programmer. A neural network is essentially a system of organizing machine learning algorithms to perform certain tasks. It is a fast and efficient way to solve problems for which the dataset is very large, such as in images.

Neural networks are loosely modelled after how neurons in the human brain behave. The key advantage of neural networks, are that they are able to extract data features automatically without needing the input of the programmer. A neural network is essentially a system of organizing machine learning algorithms to perform certain tasks. It is a fast and efficient way to solve problems for which the dataset is very large, such as in images.



As seen in the figure given, the larger Neural Networks tend to perform better with larger amounts of data whereas the traditional machine learning algorithms stop improving after a certain saturation point.

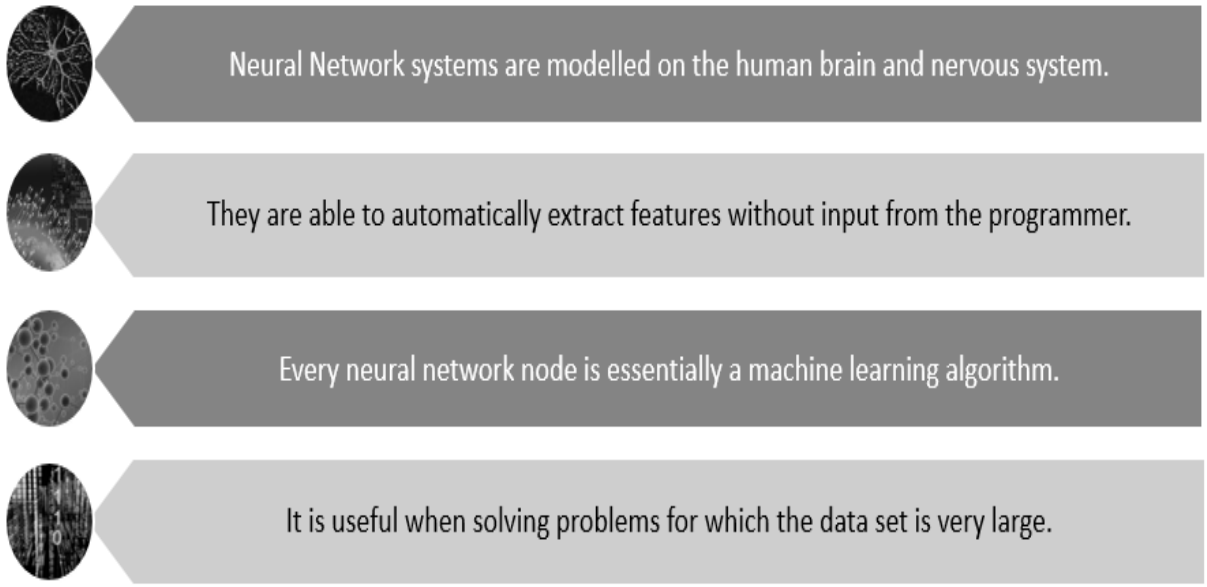


This is a representation of how neural networks work. A Neural Network is divided into multiple layers and each layer is further divided into several blocks called nodes. Each node has its own task to accomplish which is then passed to the next layer. The first layer of a Neural Network is known as the input layer. The job of an input layer is to acquire data and feed it to the Neural Network. No processing occurs at the input layer. Next to it, are the hidden layers. Hidden layers are the layers in which the whole processing occurs. Their name essentially means that these layers are hidden and are not visible to the user.

Each node of these hidden layers has its own machine learning algorithm which it executes on the data received from the input layer. The processed output is then fed to the subsequent hidden layer of the network. There can be multiple hidden layers in a neural network system and their number depends upon the complexity of the function for which the network has been configured. Also, the number of nodes in each layer can vary accordingly. The last hidden layer passes the final processed data to the output layer which then gives it to the user as the

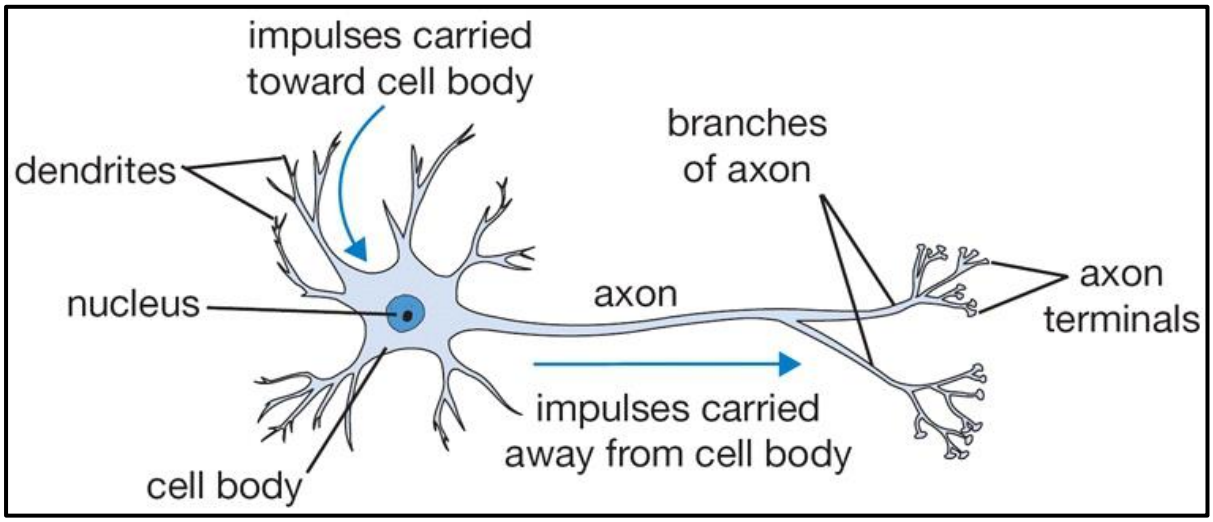
final output. Similar to the input layer, output layer too does not process the data which it acquires. It is meant for user-interface.

Some of the features of a Neural Network are listed below:

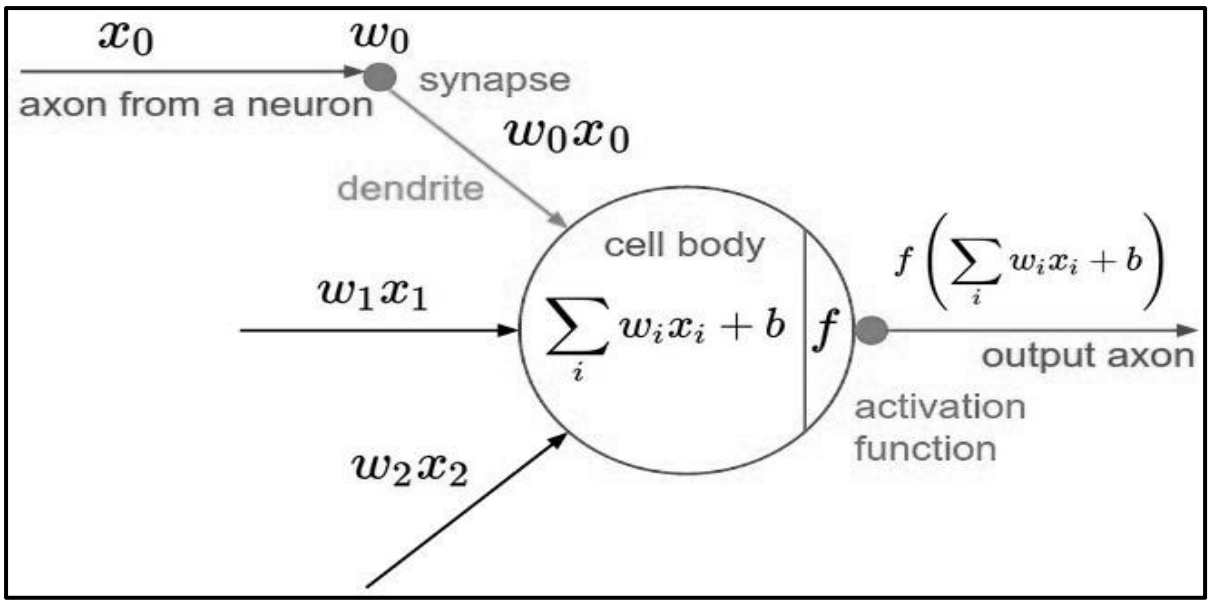


Neural Networks Vs Human Nervous System

Let us recall how Neurons in a Human Body work:



Given are the images of a Human Neuron and its relation with the Neural Network. The axon from a neuron sends an impulse to the synapse of another neuron. The impulse received is then sent to the cell body (nucleus) through dendrites. The cell body performs an activation function on the impulse received and then gives it to the output axon which passes the same to the next neuron in the system. Now as we relate this process with an Artificial Neural Network, we can see that the input layer gets data which is passes on to the nodes in the hidden layer. The nodes perform specific actions on the data and pass the processed information to the next layer. In the end, the final processed data reaches the output of the system.



Now, according to your understanding derive an analogy of the components of an Artificial Neural Network with the Human Nervous System:

Artificial Neural Network	Human Brain and Nervous System
Input Layer	
Nodes	
Output Layer	

Human Neural Network – The Game

Session Preparation

Logistics: For a class of 40 students [Individual Activity]

Materials Required:

ITEM	QUANTITY
Images (To be kept with the facilitator)	2
Post-It Notes	80
Sketch-pens	40

Resources:

Purpose: To understand and experience what a neural network is like.

Brief:

Students will now experience how Neural networks work with the help of an activity. Each of the students will be considered as the node of either Input Layer, 1st Hidden Layer, 2nd Hidden Layer or the Output Layer. The instructions and rules have been mentioned in the Students Handbook.

After arranging the students at their positions and handing them sticky notes to write, show the sample image print-out to the input layer students. Let the students understand and do by themselves after this.

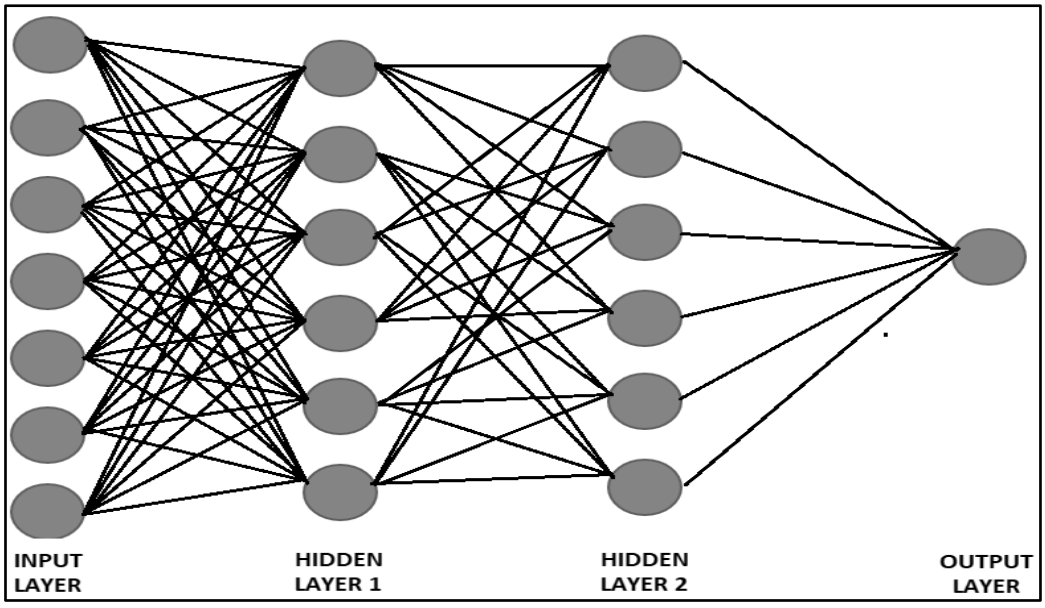
When to intervene?

Ask the students to play the game with honesty. No two nodes can discuss anything. Each one of them has to use their own discretion to understand and play.

Let us develop a better understanding about this concept with the help of a game called ***Human Neural Network.***

Game Structure:

Layers	**Number of Students**	**Number of chits**
Input Layer	7	6
Hidden Layer 1	6	4
Hidden Layer 2	6	2
Output Layer	1	-
TOTAL	**20**	-



Ground Rules:

- No one is allowed to talk or discuss till the game ends. Fun of the game lies in playing it honestly.
- Each layer should sit distant to each other.
- The image should only be shown to the Input layer and no one else.
- The game is supposed to be played silently. This means that one has to write a word on the chit and pass on the chit without speaking out aloud.
- One needs to process the data as fast as possible, hence not take much time can be taken to write and pass on the chits.
- Input layer nodes cannot discuss the image shown with each other. Everyone has to use their own discretion.
- No sentences or multiple words are to be written on the chit. Only one word per chit is allowed.
- Once the task of a layer is finished, that layer needs to go and sit aside and not disturb others till the game ends.

Game Instructions:

- Input Layer:
    - 7 students will be standing as the nodes of an input layer.
    - All of them will be shown an image. After looking at it, they need to write 6 different words on 6 different chits. They have to choose the words which describe the image in the best way possible. They can also repeat the words if needed.
    - After making these chits, they need to pass on one chit to each of the nodes of hidden layer 1. That is, 1 chit will be given to one member.

- Hidden Layer 1:
    - 6 students will be standing as the nodes of hidden layer 1.
    - Each of them will receive 7 chits from 7 different input nodes. Now they have to take a good look at the chits and then write down 4 different words on 4 different chits. For this, they can either use the same words as the input layer did, or they can make their own information (relevant to the context) and write it.
    - Now these 4 chits are to be given randomly to any 4 nodes of Hidden Layer 2. Out of the 6 nodes of 2^{nd} hidden layer, one can choose any 4 and give once chit to each. (For best results, each node of hidden layer 2 should get almost same number of chits thus the division should be done properly)

- Hidden Layer 2:
    - 6 students will be standing as the nodes of hidden layer 2.
    - Each one of them will get some number of chits from the previous layer. Now they have to perform the same task as hidden layer 1 and have to write down 2 different words on 2 different chits and pass it on to the output layer.

- Output Layer:
    - Finally the output layer node will get 12 chits. Now s/he has to understand all the words and has to guess which image was shown to the input layer initially.
    - Output layer will then write a summary out of all the words received to explain his/her deduction. The summary should not be more than 5 lines.

- Finally, the output layer presents this summary in-front of everyone and the real image is finally revealed to all.

- If the summary is accurate enough, the whole network wins else they lose.

Find the words related Artificial Intelligence from the letter in the box below:

N	**Q**	**S**	**M**	**A**	**R**	**T**	**H**	**O**	**M**	**E**	**W**	**E**	**R**	**T**	**J**
D	**E**	**S**	**Y**	**S**	**T**	**E**	**M**	**M**	**A**	**P**	**S**	**O**	**U**	**Y**	**O**
E	**A**	**U**	**W**	**D**	**B**	**R**	**T**	**G**	**N**	**R**	**V**	**B**	**N**	**M**	**B**
C	**A**	**P**	**R**	**C**	**A**	**X**	**V**	**B**	**N**	**O**	**R**	**S**	**D**	**V**	**A**
I	**X**	**E**	**Z**	**A**	**L**	**Q**	**D**	**F**	**G**	**B**	**E**	**V**	**B**	**D**	**D**
S	**A**	**R**	**G**	**R**	**L**	**R**	**T**	**Y**	**K**	**L**	**K**	**B**	**F**	**E**	**V**
I	**C**	**V**	**T**	**T**	**O**	**N**	**V**	**T**	**R**	**E**	**A**	**G**	**H**	**E**	**E**
O	**Q**	**I**	**V**	**I**	**O**	**G**	**E**	**T**	**R**	**M**	**E**	**E**	**W**	**P**	**R**
N	**I**	**S**	**C**	**F**	**N**	**S**	**T**	**T**	**S**	**S**	**P**	**S**	**V**	**L**	**T**
T	**S**	**E**	**M**	**I**	**D**	**H**	**H**	**X**	**W**	**C**	**S**	**D**	**C**	**E**	**I**
R	**I**	**D**	**R**	**C**	**E**	**T**	**I**	**R**	**N**	**O**	**Y**	**F**	**G**	**A**	**S**
E	**T**	**D**	**G**	**I**	**B**	**T**	**C**	**W**	**U**	**P**	**R**	**W**	**W**	**R**	**E**
E	**I**	**C**	**Y**	**A**	**A**	**H**	**S**	**F**	**J**	**I**	**O**	**K**	**E**	**N**	**M**
D	**O**	**G**	**H**	**L**	**T**	**N**	**U**	**R**	**N**	**N**	**T**	**T**	**T**	**I**	**E**
C	**N**	**R**	**N**	**B**	**E**	**J**	**J**	**B**	**G**	**G**	**S**	**D**	**Y**	**N**	**N**
M	**A**	**C**	**H**	**I**	**N**	**E**	**L**	**E**	**A**	**R**	**N**	**I**	**N**	**G**	**T**

ARTIFICIAL, NEURAL NETWORK, SYSTEMMAPS, DECISION TREE, SUPERVISED, PROBLEM SCOPING, JOB ADVERTISEMENT, DEEP LEARNING, MACHINE LEARNING, BALLOON DEBATE, ETHICS, SDG, STORY SPEAKER, SMART HOME, ACQUISITION

Co-Curricular Activities

Following activities from the content can be assessed under Co-Curricular Activities:

1. Unit 1: 1.1 – Excite Module
    - Kahoot Quiz: Conduct an Online Kahoot Quiz. (Alternative: Pen/Paper Quiz)
2. Unit 1: 1.2 – Relate Module
    - Story Speaker activity: To write an interactive story using the Google Doc extension of Story Speaker.
3. Unit 1: 1.4 – Possibilities Module
    - Job Advertisement Poster Making: Create a poster for a Job Advertisement describing the job created and skills required for the same after 10 years.
4. Unit 1: 1.5 – AI Ethics Module
    - Balloon Debate: Conducting a balloon debate wherein the teams talk in favour of AI and against AI relating it to various domains like Agriculture, Transport, Security, etc.
5. Unit 2: 2.1 Problem Scoping
    - Article Writing: Write an article about the problem which you have scoped and how you wish to x solve it using Artificial Intelligence.

A – Analyse
R- Rationalise
T- Think
I – Inquire
F- Focus
I- Interpret
C- Challenge
I – Ideate
A – Acquire
L- Learn

I-Integrate
N- Neural Network
T- Test
E- Ethics
L- Link
L- Login
I-Inspire
G- Gauge
E- Edit
N- Note
C – Channelize
E - Empower

Analyse, rationalise, think, inquire, focus and interpret the challenge to ideate, so as to acquire and learn!

Build Intelligence!

ANNEXURE

ARTIFICIAL INTELLIGENCE CURRICULUM
CLASS 9

OBJECTIVE

The objective of this unit is to develop a readiness for understanding and appreciating Artificial Intelligence and its application in our lives. This unit focuses on:

1. Helping learners understand the world of Artificial Intelligence and its applications through games, activities and multisensorial learning to become AI-Ready.
2. Introducing the learners to three domains of AI in an age appropriate manner.
3. Allowing the learners to construct meaning of AI through interactive participation and engaging hands-on activities.
4. Introducing the learners to AI Project Cycle.
5. Introducing the learners to programming skills - Basic python coding language.

LEARNING OUTCOMES

Learners will be able to:

- Identify and appreciate Artificial Intelligence and describe its applications in daily life.
- Relate, apply and reflect on the Human-Machine Interactions to identify and interact with the three domains of AI: Data, Computer Vision and Natural Language Processing and Undergo assessment for analysing their progress towards acquired AI-Readiness skills.
- Imagine, examine and reflect on the skills required for futuristic job opportunities.
- Unleash their imagination towards smart homes and build an interactive story around it.
- Understand the impact of Artificial Intelligence on Sustainable Development Goals to develop responsible citizenship.
- Gain awareness about AI bias and AI access and describe the potential ethical considerations of AI.
- Develop effective communication and collaborative work skills.
- Get familiar and motivated towards Artificial Intelligence and Identify the AI Project framework. Learn problem scoping and ways to set goals for an AI project and understand the iterative nature of problem scoping in the AI project cycle.
- Brainstorm on the ethical issues involved around the selected problem
- Foresee the kind of data required and the kind of analysis to be done, identify data requirements and find reliable sources to obtain relevant data.
- Use various types of graphs to visualise acquired data.
- Understand, create and implement the concept of Decision Trees.
- Understand and visualise computer's ability to identify alphabets and handwritings.
- Understand and appreciate the concept of Neural Network through gamification and learn basic programing skills
- Acquire introductory Python programming skills in a very user-friendly format.

UNITWISE DISTRIBUTION

No.	UNIT	SUB-UNIT	DURATION	MARKS	
				THEORY	PRACTICAL
1	Introduction to AI	Excite	2.4 Hours (4 Periods)	10	10
		Relate	02 Hours (3 Periods)		
		Purpose	02 Hours (3 Periods)		
		Possibilities	02 Hours (3 Periods)		
		AI Ethics	3.6 Hours (6 Periods)		
2	AI Project Cycle	Problem Scoping	14 Hours (21 Periods)	10	10
		Data Acquisition	02 Hours (3 Periods)		
		Data Exploration	04 Hours (6 Periods)		
		Modelling	06 Hours (9 Periods)		
3	Neural Network		04 Hours (6 Periods)	10	10
4	Introduction to Python		70 Hours (105 Periods)	20	10
5	Co-curricular Skills				10
TOTAL			**112 Hours(168 Periods)**	**50**	**50**

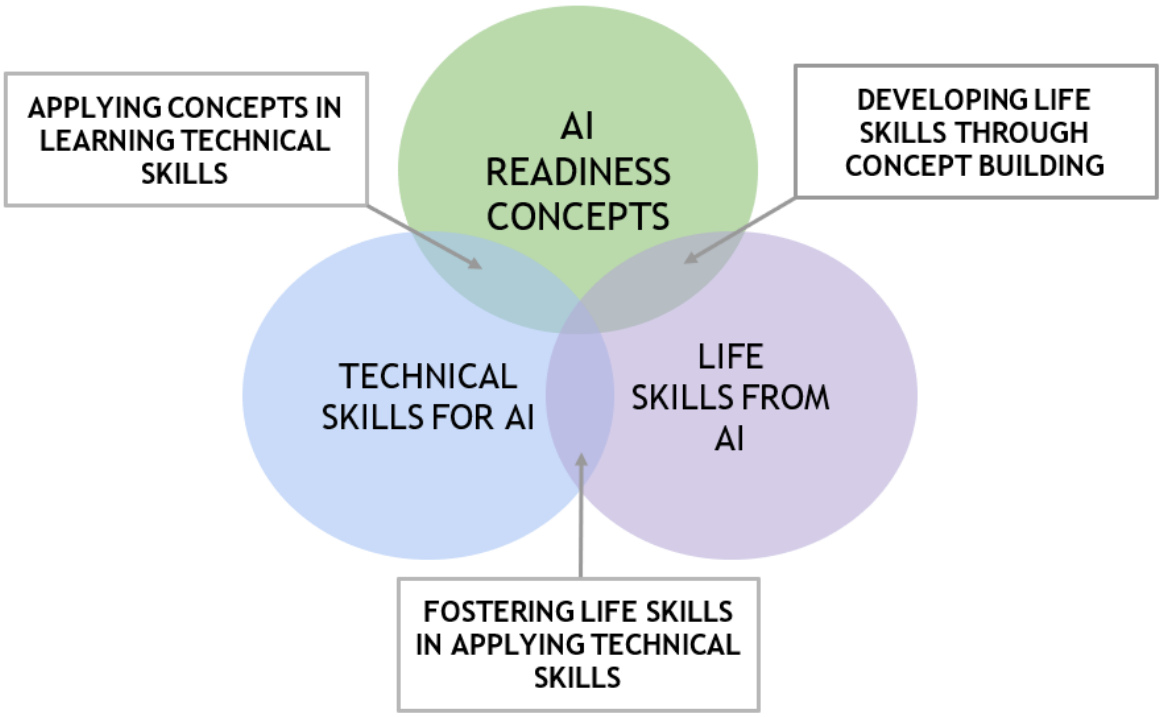
Total: **100** Marks

COURSE OUTLINE

UNIT	SUB-UNIT	SESSION/ACTIVITY/PRACTICAL	LEARNING OUTCOMES
Introduction to AI	Excite	**Session**: Introduction to AI and setting up the context of the curriculum	To identify and appreciate Artificial Intelligence and describe its applications in daily life.
		Ice Breaker Activity: Dream Smart Home idea Learners to design a rough layout of floor plan of their dream smart home.	
		Recommended Activity: The AI Game Learners to participate in three games based on different AI domains. ● **Game 1: Rock, Paper and Scissors** (based on data) ● **Game 2: Mystery Animal** (based on Natural Language Processing - NLP)	To relate, apply and reflect on the Human-Machine Interactions. To identify and interact with the three domains of AI: Data, Computer Vision and Natural Language Processing.

		● **Game 3: Emoji Scavenger Hunt** (based on Computer Vision - CV)	
		Recommended Activity: AI Quiz (Paper Pen/Online Quiz)	To undergo an assessment for analysing progress towards acquired AI-Readiness skills.
		Recommended Activity: To write a letter Writing a Letter to one's future self ● Learners to write a letter to self keeping the future in context. They will describe what they have learnt so far or what they would like to learn someday	To imagine, examine and reflect on the skills required for futuristic job opportunities.
	Relate	**Video Session: To watch a video** **I**ntroducing the concept of Smart Cities, Smart Schools and Smart Homes	Learners to relate to application of Artificial Intelligence in their daily lives.
		Recommended Activity: W**rite an Interactive Story** Learners to draw a floor plan of a Home/School/City and write an interactive story around it using **Story Speaker** extension in Google docs.	To unleash their imagination towards smart homes and build an interactive story around it. To relate, apply and reflect on the Human-Machine Interactions.
	Purpose	**Session:** Introduction to **sustainable development goals**	To understand the impact of Artificial Intelligence on Sustainable Development Goals to develop responsible citizenship.
		Recommended Activity: Go Goals Board Game ● Learners to answer questions on Sustainable Development Goals	
	Possibilities	**Session: Theme-based research and Case Studies** ● Learners will listen to various case-studies of inspiring start-ups, companies or communities where AI has been involved in real-life. ● Learners will be allotted a theme around which they need to search for present AI trends and have to visualise the future of AI in and around their respective theme.	To research and develop awareness of skills required for jobs of the future. To imagine, examine and reflect on the skills required for the futuristic opportunities.
		Recommended Activity: Job Ad Creating activity ● Learners to create a job advertisement for a firm describing the nature of job available and the skill-set required for it 10 years down the line. They need to figure out how AI is going to transform the nature of jobs and create the Ad accordingly.	To develop effective communication and collaborative work skills.

	AI Ethics	**Video Session: Discussing about AI Ethics**	
		Recommended Activity: Ethics Awareness ● Students play the role of major stakeholders and they have to decide what is ethical and what is not for a given scenario.	To understand and reflect on the ethical issues around AI.
		Session: AI Bias and AI Access ● Discussing about the possible bias in data collection ● Discussing about the implications of AI technology	To gain awareness around AI bias and AI access.
		Recommended Activity: Balloon Debate ● Students divide in teams of 3 and 2 teams are given same theme. One team goes in affirmation to AI for their section while the other one goes against it. ● They have to come up with their points as to why AI is beneficial/harmful for the society.	To let the students analyse the advantages and disadvantages of Artificial Intelligence.



AI Project Cycle	Problem Scoping	**Session: Introduction to AI Project Cycle** ● Problem Scoping ● Data Acquisition ● Data Exploration ● Modelling ● Evaluation	Identify the AI Project Cycle framework.
		Activity: Brainstorm around the theme provided and set a goal for the AI project. ● Discuss various topics within the given theme and select one. ● List down/ Draw a mindmap of problems related to the selected topic and choose one problem to be the goal for the project.	Learn problem scoping and ways to set goals for an AI project.
		Activity: To set actions around the goal. ● List down the stakeholders involved in the problem. ● Search on the current actions taken to solve this problem. ● Think around the ethics involved in the goal of your project.	Identify stakeholders involved in the problem scoped. Brainstorm on the ethical issues involved around the problem selected.
		Activity: Data and Analysis ● What are the data features needed? ● Where can you get the data? ● How frequent do you have to collect the data? ● What happens if you don't have enough data? ● What kind of analysis needs to be done? ● How will it be validated? ● How does the analysis inform the action?	Understand the iterative nature of problem scoping for in the AI project cycle. Foresee the kind of data required and the kind of analysis to be done.
		Presentation: Presenting the goal, actions and data.	Share what have the students discussed so far.
	Data Acquisition	**Activity: Introduction to data and its types.** ● Students work around the scenarios given to them and think of ways to acquire data.	Identify data requirements and find reliable sources to obtain relevant data.
	Data Exploration	**Session: Data Visualisation** ● Need of visualising data ● Ways to visualise data using various types of graphical tools.	To understand the purpose of Data Visualisation

		Recommended Activity: Let's use Graphical Tools ● To decide what kind of data is required for a given scenario and acquire the same. ● To select an appropriate graphical format to represent the data acquired. ● Presenting the graph sketched.	Use various types of graphs to visualise acquired data.
	Modelling	**Session: Decision Tree** ● To introduce basic structure of Decision Trees to students.	Understand, create and implement the concept of Decision Trees.
		Recommended Activity: Decision Tree ● To design a Decision Tree based on the data given.	
		Recommended Activity: Pixel It ● To create an "AI Model" to classify handwritten letters. ● Students develop a model to classify handwritten letters by diving the alphabets into pixels. ● Pixels are then joined together to analyse a pattern amongst same alphabets and to differentiate the different ones.	Understand and visualise computer's ability to identify alphabets and handwritings.
Neural Network		**Session: Introduction to neural network** ● Relation between the neural network and nervous system in human body ● Describing the function of neural network.	Understand and appreciate the concept of Neural Network through gamification.
		Recommended Activity: Creating a Human Neural Network ● Students split in four teams each representing input layer (X students), hidden layer 1 (Y students), hidden layer 2 (Z students) and output layer (1 student) respectively. ● Input layer gets data which is passed on to hidden layers after some processing. The output layer finally gets all information and gives meaningful information as output.	

Introduction to Python		**Recommended Activity: Introduction to programming** using Online Gaming portals like Code Combat.	Learn basic programming skills through gamified platforms.
		Session: Introduction to Python language ● Introducing python programming and its applications	Acquire introductory Python programming skills in a very user-friendly format.
		Practical: Python Basics ● Students go through lessons on Python Basics (Variables, Arithmetic Operators, Expressions, Data Types - integer, float, strings, using print() and input() functions) ● Students will try some simple problem solving exercises on Python Compiler.	
		Practical: Python Lists ● Students go through lessons on Python Lists (Simple operations using list) ● Students will try some basic problem solving exercises using lists on Python Compiler.	

ASSESSMENT

After completion of each unit, the students can be evaluated on the basis of following skills:

Conceptual Skills	Technical Skills	Life Skills
Conceptual understanding of AI AI applications and three domains of AI Knowledge Enhancement in 3 AI Domains: Data, Computer Vision & Natural Language Processing Mind mapping Problem Identification Data Acquisition Data Exploration Graphical Representation Neural Network	Ability to use AI Powered Tools Troubleshooting Skill Basic programming skills Basic Python	Thinking Skills Problem Solving Creative thinking Critical Thinking Decision Making Skills Social Skills - Teamwork Team Building Skills Leadership Self-Awareness Empathy Effective Communication Skills Oral & Written Presentation

Notes

Notes