



**A report on**

**Faculty Development Program on  
AI ML with Python and 21<sup>st</sup> century skills**

**Supported by**

**Commonwealth Educational Media Centre for Asia - CEMCA**

**New Delhi**

**Implemented by**

**Andhra Pradesh Information Technology Academy-APITA,  
Vijayawada**

**Venue :**

**VIGNA's Institute of Information Technology, Vizag.**

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# **1.ACKNOWLEDGEMENT**

We earnestly acknowledge the immense contribution of Dr. Madhu Parhar, Director of Commonwealth Educational Media Centre for Asia (CEMCA), and Mr. Saurabh Mishra, Programme Officer (Skills) of Commonwealth Educational Media Centre for Asia (CEMCA), for conceptualizing and floating the highly need-based and demand-driven workshops for upgrading the capacity of the FDP and sensitization program in association with Mr. Sunil Reddy(IFS), CEO of Andhra Pradesh Information Technology Academy (APITA) and Mr. Vishwanath, Director of Andhra Pradesh Information Technology Academy (APITA) for higher education faculties (engineering colleges) in VIIT, Duvvada, Vizag, Andhra Pradesh.

The excellent endeavour of CEMCA is expected to have a profound impact on the qualitative enhancement of the Professors, Lecturers, and HODs & Trainers of all the Engineering Colleges of AP with the different methodology of “AI ML with Python and 21<sup>st</sup> century skills” with the Latest & Traditional, Easy for good, not good & mediocre participant’s perspective of both content & methodology.

It was a privilege for us to get the opportunity to contribute significantly to this value- driven and impact-oriented mission of CEMCA.

## **2.BACKGROUND**

IT is possibly the fastest developing sector in the last few decades. Computers (in all shapes and sizes) and the Internet have acquired a very important role in most domains of our everyday life. In the same way, education is not imaginable anymore without a strong presence of teaching methodologies. Faculties have had to adapt teaching methodologies throughout curriculum delivery to perform the dual task of providing formal, subject-based education and of encouraging pupils' personal development in a wider social and cultural context.

On one hand, formal education involves understanding concepts and processes. It aims at acquiring knowledge and skills to be able to apply what has been learned within each subject area and across subjects. On the other hand, pupils need to learn to describe, analyze, interpret, have a critical view, and apply their acquired knowledge and skills creatively and originally in a wide range of social, scientific, and cultural contexts.

Since the world of the AI ML is changing so rapidly, an important goal is to provide hands-on experience to faculty to equip pupils with the basic knowledge and fundamental skills on one hand, and, on the other hand, to empower them to become independent and autonomous learners too. In this sense, faculty should acquire a range of skills that will allow them to continue learning and teaching with an improved Teaching-Learning Process.

## **3.MOTIVATION**

### **21<sup>st</sup> Century Skills**

21<sup>st</sup> century skills are often cited as a prerequisite for success – particularly for young people and students, but also for adults already in the workforce. But what exactly are 21<sup>st</sup> century skills and why are they so important?

The world of work and communication is changing rapidly. As teachers we need to prepare our secondary learners with the 21<sup>st</sup> century skills they need to thrive in today’s digital and globalized society.

### **AI ML with Python**

Machine Learning is making the computer learn from studying data and statistics. Machine Learning is a step into the direction of artificial intelligence (AI). Machine Learning is a program that analyses data and learns to predict the outcome. In this concern python programming is playing vital role to develop AI ML Applications.

## **4.INTRODUCTION**

### **21<sup>st</sup> Century Skills**

The Glossary of Education Reform defines 21<sup>st</sup> century skills as “a broad set of knowledge, skills, work habits, and character traits that are believed to be critically important to success in today’s world, particularly in collegiate programs and contemporary careers and workplaces.”

Traditionally, these skills have been summed up as the “4 Cs”: communication, collaboration, critical thinking, and creativity. These capabilities originally identified almost 20 years ago by the Partnership for 21st Century Skills, may not be new, but they continue to offer a structure for thinking about modern education. The 4 Cs of 21<sup>st</sup> century learning emphasize the crucial nature of problem solving, analytic thinking, working together, and thinking outside the proverbial box. They serve as inspiration and guidance for educators looking to expand beyond traditional classroom methodologies.

### **AI ML with Python**

Artificial intelligence is considered to be the trending technology of the future. Already there are a number of applications made on it. Due to this, many companies and researchers are taking interest in it. But the main question that arises here is that in which programming language can these AI applications be developed? There are various programming languages like Lisp, Prolog, C++, Java and Python, which can be used for developing applications of AI. Among them, Python programming language gains a huge popularity.

Learning means the acquisition of knowledge or skills through study or experience. Based on this, we can define machine learning (ML) as follows – It may be defined as the field of computer science, more specifically an application of artificial intelligence, which provides computer systems the ability to learn with data and improve from experience without being explicitly programmed.

Basically, the main focus of machine learning is to allow the computers learn automatically without human intervention. Now the question arises that how such learning can be started and done? It can be started with the observations of data. The data can be some examples, instruction or some direct experiences too. Then

on the basis of this input, machine makes better decision by looking for some patterns in data.

## **5.LEARNING OBJECTIVE**

Upon completion of the training program, the faculty will be able to:

### **21<sup>st</sup> Century Skills**

The objective of this learning series is to support a 'breadth of skills' holistic approach to teaching and learning through the integration of 21st Century skills in education systems and increasing participants' knowledge on key concepts related to teaching and assessing 21st Century skills, fostering exchange between the participants in order to build collaborative capacity in the integration of 21st Century skills in education systems, and showcasing within their systems.

Upon completion of the training program, the faculty will be able to:

- Understand what is meant by 21st Century skills.
- Be familiar with the different models of 21st Century skills used by international organizations and national jurisdictions.
- Gain an overview of what their adoption within an education system entails.

### **AI ML with Python**

Machine learning is a type of artificial intelligence (AI) that provides computers with the ability to learn without being explicitly programmed. Machine learning focuses on the development of Computer Programs that can change when exposed to new data. In this workshop, we'll see basics of Machine Learning, and implementation of machine learning algorithm using python.

Upon completion of the training program, the faculty will be able to:

- Understand why python for AI ML
- Be familiar with the different AI ML algorithms – Supervised and Unsupervised
- Gain an overview on building applications using python for AI ML

## **6.DATE & TIME**

<b>S. No.</b>	<b>Course</b>	<b>Date</b>	<b>Time</b>	<b>Participants</b>	<b>Count</b>
1	21 <sup>st</sup> Century Skills	07 <sup>th</sup> June and 08 <sup>th</sup> June 2022	09:30 AM to 05:00 PM	Higher Education Faculties from Andhra Pradesh	49
2	AI ML with Python	09 <sup>th</sup> June to 11 <sup>th</sup> June 2022			

## **7.PARTICIPANTS**

48 faculties attended the program out of which 30 are Female and 19 are Male participants. Out of which 2 are Professors, 3 are Associate Professors, 42 are Assistant Professors, 1 Principal and 1 Rector attended the workshop conducted between 07<sup>th</sup> June to 11<sup>th</sup> June 2022 at Vignan's institute of information technology (A), Visakhapatnam, Andhra Pradesh.

A Detailed List of Participants for workshops is attached in ***Annexure – A***



## 8. TRAINING - 21<sup>st</sup> Century Skills and AI ML with Python

The Training was conducted in the college Auditorium/Lab. The methodology used was a live demonstration on 21<sup>st</sup> century skills and AI-ML with Python followed by hands -on practice by participants using the assignment questions provided by the resource person. The organizing team shared a WhatsApp group to interact, share information, answer queries, and submit feedback.

S. No.	Event	Time	Participants
1	Demonstration Sessions (Every day)	09:30 AM to 05:00 PM	Classroom based
2	Interaction with Queries and Feedback	05:00 PM to 08:00 PM	Online, WhatsApp



Fig: Live interaction on 21<sup>st</sup> century skills by Mr. S. Dinakar Reddy

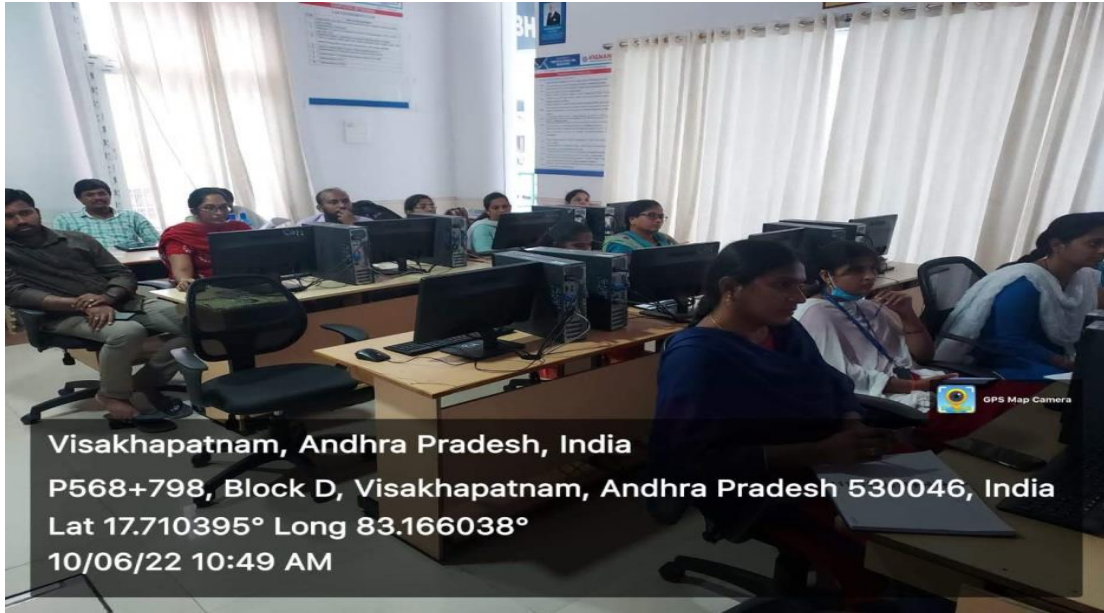


Fig: Live Demonstration on AI ML - Python by Mr. Banoth Prasad

## 9. COURSE CONTENT & STRUCTURE

Day	Title	Session Objective	Session Outcome
1	<ul style="list-style-type: none"> <li>• Ice breaking</li> <li>• Introduction to 21 century skills</li> <li>• Communication skills</li> <li>• Introduction to 3Ls Learning skills Literacy skills Life skills</li> <li>• Discussion on 4C's</li> </ul>	<ul style="list-style-type: none"> <li>• To teach 21st Century skills in education systems</li> <li>• To increase participants' knowledge on key concepts related to teaching and assessing 21st Century skills</li> </ul>	<ul style="list-style-type: none"> <li>• Understand what is meant by 21st Century skills.</li> </ul>
2	<ul style="list-style-type: none"> <li>• Characteristics of 21st century teacher</li> <li>• Critical thinking and problem solving</li> <li>• Communication and collaboration</li> <li>• Creativity and Innovation</li> <li>• Cultural awareness</li> <li>• Digital literacy</li> <li>• Life and career skills</li> <li>• Learning and Innovation skill</li> <li>• Information Media and Technology skills</li> <li>• Flexibility and adaptability</li> <li>• Productivity and accountability</li> <li>• Leadership and responsibility</li> </ul>	<ul style="list-style-type: none"> <li>• To foster the exchange between the participants in order to build collaborative capacity in the integration of 21st Century skills in education systems,</li> <li>• To showcasing within their systems.</li> </ul>	<ul style="list-style-type: none"> <li>• Be familiar with the different models of 21st Century skills used by international organizations and national jurisdictions.</li> <li>• Gain an overview of what their adoption within an education system entails</li> </ul>
3	<ul style="list-style-type: none"> <li>• Python Introduction</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to Python – Indentation, Python Variables, Python Data Types – Numbers, String</li> <li>• Lists, Tuples, Sets and Dictionaries</li> <li>• Python File Handling, Python String Formatting</li> <li>• Working with Jupiter Notebook</li> </ul>	<ul style="list-style-type: none"> <li>• Python Introduction</li> <li>• Python IDLE Installation</li> <li>• Python Built in data types</li> <li>• Working with Jupyter</li> </ul>
	<ul style="list-style-type: none"> <li>• Python Packages – TK Inter</li> <li>• Hands on Exercise</li> </ul>	<ul style="list-style-type: none"> <li>• Python tkinter - Widgets, Standard attributes, Geometry Management</li> <li>• Python tkinter – Widgets - Labels, Buttons, Entry Field, Test Field, Check Buttons, List Box, Radio</li> </ul>	<ul style="list-style-type: none"> <li>• Python Packages</li> <li>• TK inter Exercise</li> </ul>

		<p>Buttons, Menu</p> <ul style="list-style-type: none"> <li>• <b>Exercise :</b> <ul style="list-style-type: none"> <li>• Random Password Generator in Python</li> <li>• Convert Text to Speech in Python</li> </ul> </li> </ul>	
	<ul style="list-style-type: none"> <li>• Python Packages –Pandas, Numpy</li> </ul>	<ul style="list-style-type: none"> <li>• Working with data pre-processing and data visualization using Python - Pandas</li> <li>• Working with data pre-processing and data visualization using Python - Numpy</li> <li>• Working with data pre-processing and data visualization using Python - Matplotlib</li> </ul>	<ul style="list-style-type: none"> <li>• Python Packages</li> </ul>
4	<ul style="list-style-type: none"> <li>• Introduction to AI ML</li> <li>• Tools for AI ML</li> <li>• AI ML Algorithms</li> </ul>	<ul style="list-style-type: none"> <li>• Tools for AI ML – Detection of Covid-19 Project</li> <li>• Supervised learning - Classification &amp; Regression Tree</li> <li>• Supervised learning - Naïve Baye’s.</li> <li>• Unsupervised learning - K-Means Clustering</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to AI ML</li> <li>• Tools for AI ML</li> <li>• AI ML Algorithms</li> </ul>
5	<ul style="list-style-type: none"> <li>• Exploratory Data Analysis &amp; NLTK</li> <li>• Project - Project Detect COVID-19 from Chest X-Rays by building a Simple Convolution Neural Network.</li> </ul>	<ul style="list-style-type: none"> <li>• Exploratory Data Analysis &amp; NLTK</li> <li>• Project Detect COVID-19 from Chest X-Rays by building a Simple Convolution Neural Network.</li> <li>• NLTK – Sentiment Analysis – Movie Review</li> </ul>	<ul style="list-style-type: none"> <li>• Exploratory Data Analysis &amp; NLTK</li> </ul>

## 10. WORKSHOP PROCEEDINGS

**Day – 1: 7<sup>th</sup> June 2022: Inaugural Session and Introduction on 21 century skills**

### **Inaugural Session:**

The Training Programme began with the inaugural session. The inaugural session was graced by Dr. B Arundhati Principal – VIITs, Dr. Shekar HOD - CSE Dept, VIITs, S Dinakar Reddy Corporate Trainer and falicitator, Rector Dr B Madhusudan Rao, Mr Sridhar Co-ordinator, APITA. Dr. B Arundhati in his inaugural address highlighted the importance of FDP for newly appointed faculties about the advanced teaching Methodologies in 21<sup>st</sup> century and made a note about the importance of AI-ML with Python.



Fig: Inaugural Session on day 1

టీచింగ్ మెథడాలజీలో 21వ శతాబ్దపు నైపుణ్యాలపై

# ఫ్యాకల్టీ డెవలప్ మెంట్ ప్రోగ్రామ్

దువ్వూడ, జూన్ 8, మనం న్యూస్: విజ్ఞాన్ ఇన్స్టిట్యూట్ ఆఫ్ ఇన్ఫర్మేషన్ టెక్నాలజీ, కంప్యూటర్ సైన్స్ విభాగం ఆధ్వర్యంలో 21వ శతాబ్దపు బోధనా పద్ధతులపై రెండు రోజుల వర్కాప్ నిర్వహించింది. ఆంధ్రప్రదేశ్ ఇన్ఫర్మేషన్ టెక్నాలజీ అకాడమీ కామన్ వెల్త్ ఎడ్యుకేషనల్ మీడియా సెంటర్ ఫర్ ఆసియా తో కలిసి నిర్వహించబడింది. దినకర్ రెడ్డి, కార్పొరేట్ మాస్టర్ ట్రైనర్ ఫెసిలిటీటర్, ఇన్నోవేషన్ ఎంటర్ప్రెనూరియల్ మెం టార్ ఇన్స్ట్రక్షనల్ డిజైనర్ కూడా రిసోర్స్ పర్సన్లుగా వ్యవహరించారు. అతను బ్లామ్స్ వర్గీకరణ, అభ్యాస నైపుణ్యాలు, బోధన గురువు యొక్క నిజమైన అర్థం గురించి చర్చించాడు. అతను పుస్తకాన్ని శాస్త్రం



ఇంజనీరింగ్ యొక్క ఆధునిక విషయాలను బోధించడానికి పంచతంత్రంపై చిన్న కథల ప్రభావవంతమైన ఉపయోగంతో జ్ఞానోదయం చేశాడు. విద్యార్థులకు బోధించడానికి రియల్ టైమ్ గణాంకాలను ఉపయోగించడం వల్ల ఉపన్యాసం వినడానికి మరింత ఉత్సాహం పెరుగుతుందని ఆయన అన్నారు. భారతదేశంలో మనం అనుసరిస్తున్న అన్ని సాంప్రదాయ పద్ధతుల వెనుక ఉన్న వివిధ శాస్త్రీయ

కారణాలపై ఆయన మరింత చర్చించారు. ఇన్స్టిట్యూట్లోని ఫ్యాకల్టీ అంతా ఎఫ్ఐపిలో పాల్గొన్నారు. సంస్థ రెక్టర్ డాక్టర్ వి.మధుసూధన్ రావు, ప్రెసిడెంట్ డా.బి.అరుంధతి, వైస్ చాన్సలర్ డాక్టర్ కె.మధుసూధన్ రావు, సీబ్బింది అందరూ కలిసి రిసోర్స్ పర్సన్లను ఘనంగా సత్కరించారు. సంస్థ రెక్టర్ డాక్టర్ వి.మధుసూధన్ రావు, ప్రెసిడెంట్ డాక్టర్ బి.అరుంధతి, వైస్ చాన్సలర్ డాక్టర్ కె.మధుసూధన్ రావు తదితరులు పాల్గొన్నారు. ఎఫ్ఐపి ప్రశ్నోత్తరాల సెషన్లో ముగిసింది, ఇక్కడ అన్ని ప్రాంతాలకు సంబంధించిన వివిధ సందేహాలను స్వీకర్ పరిష్కరించారు. ఏపీఐటీవీ కోఆర్డినేటర్ శ్రీధర్ సమన్వయకర్తగా వ్యవహరించారు.

Fig: Article published in newspaper - about the FDP

## Day 1: Session 1 and 2 – 21<sup>st</sup> century skills

- The first day session 1 started with Ice breaking  
The following topics were delivered as part of the session 1:
- Introduction to 21 century skills

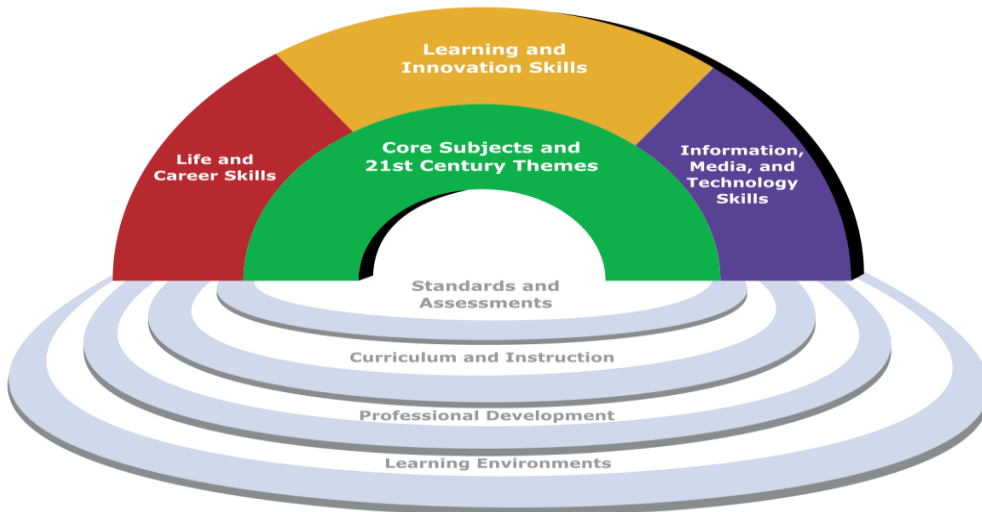
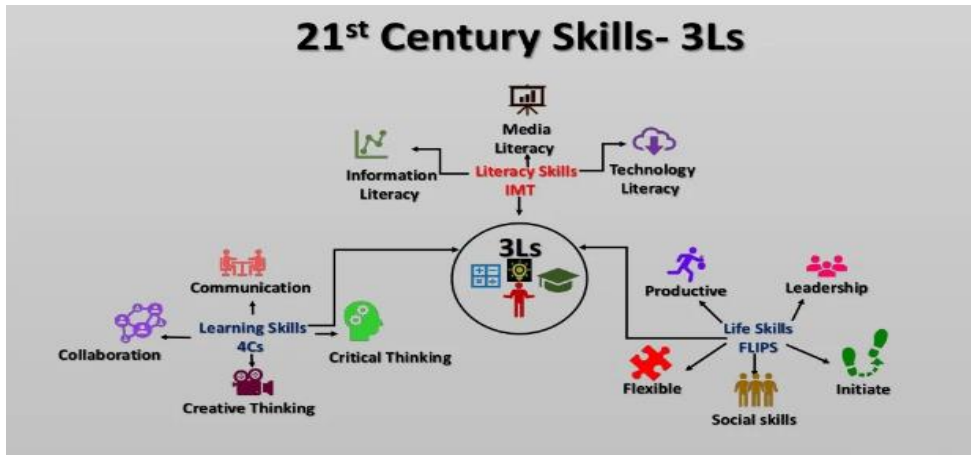


Figure 1 - P21 Framework for 21st Century Learning

- Communication skills

- Introduction to 3Ls



Learning skills

Literacy skills

Life skills

Discussion on 4C's





- Be Participants Understood what is meant by 21st Century skills
- Got familiar with the different models of 21st Century skills used by international organizations and national jurisdictions.
- Gain an overview of what their adoption within an education system entails



## **Day – 2: 8<sup>th</sup> June 2022: 21<sup>st</sup> century skills**

The session 2 started with lots of old and new innovations, discoveries and inventions.

The vocabulary building, latest and old statistics, data examples and stories.

The following content were delivered as part of the session:

- Characteristics of 21st century teacher

### **1. Critical Thinking**

One of the most important 21st century skills to teach our learners is how to think critically. With so much information available online, it's crucial that young people analyze, question and challenge what they are being told. They should remain open-minded, evaluate situations and think outside the box when approaching tasks.

Encourage critical thinking in class by having students predict what is going to happen in a reading or listening activity, giving them challenging problems to solve, using a variety of games and puzzles and asking questions with multiple answers.

You could also try class debates where learners have to examine the advantages and disadvantages of the different scenarios before starting.

These opportunities will make learning more exciting, help create a classroom culture where asking questions is positive and also arouse students' curiosity.

### **2. Communication**

Communication is the skill many students find challenging to acquire, especially in a second language, so it's essential you give them plenty of practice.

Good communicators will not only speak English more clearly and confidently,

they'll also excel outside of the class when it comes to studying, working or traveling.

Learners need to be able to express their opinions on a range of subjects, make themselves understood to others and work well in groups.

At the start of a course, try making a set of 'communication rules', which all the students should agree to follow. Include things like, only speaking in English or listening to others when they are talking.

Ensure that your students listen carefully to their partners by having them face each other when working in pairs, provide them with speaking frames to help them formulate their ideas, and use authentic audio and video materials as much as possible.

### **3. Collaboration**

This skill links nicely with communication, as good collaborators work effectively with others to achieve a common goal. Learning how to take turns, respecting other people's opinions and being a good team player is vital for the success of your class.

Teamwork skills will also help students when they leave school and find jobs, as many of them will have to work with people from different backgrounds or cultures.

Include pair work, group work and collaborative projects frequently in your lessons, making sure to vary who students work with so that they can collaborate with different types of people.

Also try assigning different roles to students when working in groups, so that everyone gets a chance to be the leader and doesn't feel left out.

Doing team building activities at the beginning of a course, will also help break down barriers and make students feel more comfortable with their new classmates.

#### **4. Creativity**

Everyone has a creative side – they just might not know it yet! It's your role as a teacher to help students explore their creativity and stimulate their imaginations.

Similar to critical thinking, students should be encouraged to think of new and innovative ways to solve problems. As well helping them in their other subjects at school, it will also benefit them when entering higher education or the workplace.

Traditional arts and crafts are a good place to start, but there are many other things you can do in class to boost creativity.

One idea is to give students some random objects from around your house (or around the school) and get them to come up with weird and wonderful new uses for them. You can also spend time in class listening to music, singing songs and reading poetry. You can also include drama in your lessons and put on a class show once a term.

Whatever you do, you should praise students for the things they do well and draw attention to positive behavior and actions in class. By taking the focus of negative things in class, you'll create an environment where errors are acceptable and your students won't be afraid of making mistakes.

#### **5. Cultural Awareness**

More than ever, we are living and working in multicultural environments. Learners need to be able to understand differences between themselves and people from other countries that have different cultures or traditions.

Developing respect and understanding for others will help students find common ground with anyone they meet, whether it's at school or later when they are studying, working or traveling.

You can create cultural awareness among your students by using authentic materials whenever possible. One way to do this is to watch videos that show

life in other countries or regions and always try to expose students to different cultures around the world; including their music, clothes, food, traditions and beliefs.

You could do this bringing in speakers from other countries to speak to the class, having a class charity which helps people from abroad or even simply having students research a country and then give a presentation to the rest of the class about what they discovered.

## **6. Digital Literacy**

Although it's getting to the point where our teenage learners have a better understanding of the digital world than we do, it's important to use technology in our classes so that our students are engaged and motivated to learn.

We need to remember that many of the younger generations do not know a life without Google, social media or smartphones. It's therefore important that the way we teach reflects this.

Incorporate smartphones into your classes to research projects, check definitions of words or play interactive quizzes like Kahoot. Use interactive whiteboard or projectors to show authentic videos or have students make their own.

If you are worried about your students chatting to friends or getting distracted by this technology during your class, you can try giving them a 30 second technology break in the middle of the lesson where they can check their notifications.

It's also crucial that we encourage learners to use technology safely, educate them on the potential dangers they face online and teach them about what information or websites they can trust.

## **7. Autonomy**

Many young people study English because it's part of the school curriculum, or it might be that their parents have signed them up for extracurricular classes.

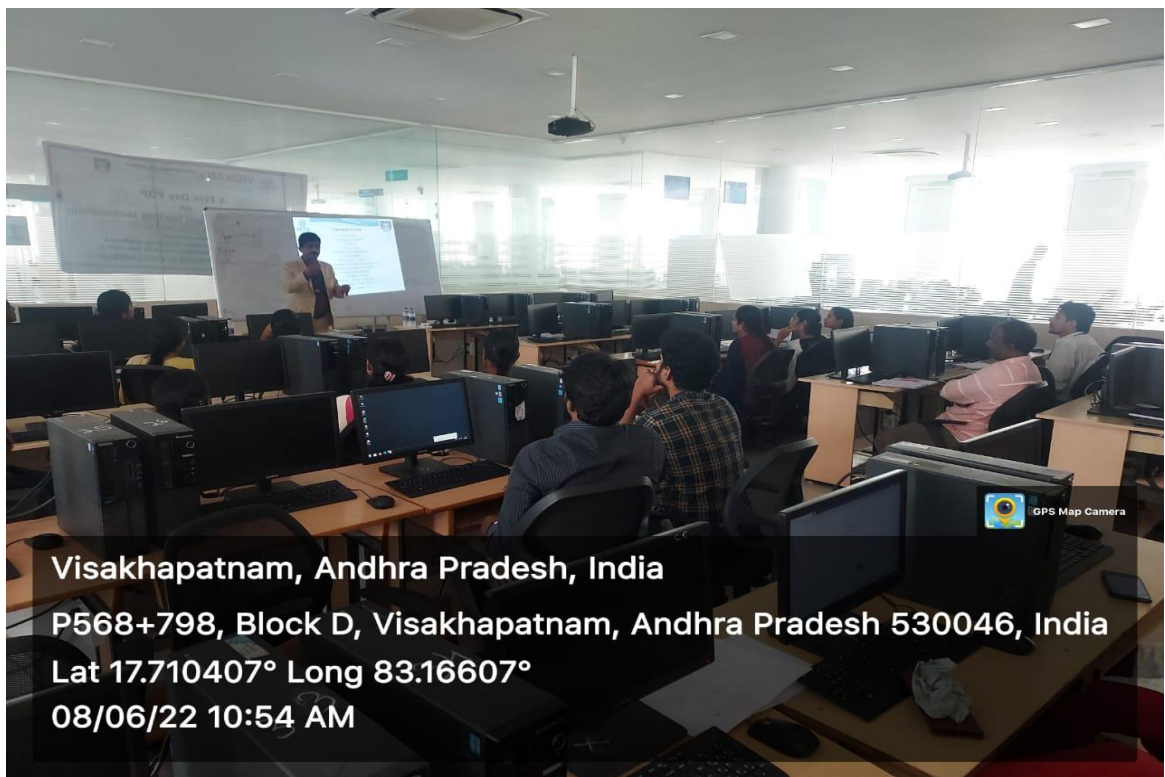
Unfortunately, this often causes a lack of motivation among teenagers.

It's therefore important to personalize your classes. Speak to your teenage students about the benefits of learning English and how it will help them in the future when studying, traveling or looking for a job.

You should also give students a choice in class. Like adults, teenagers like to be trusted and given the responsibility to make their own decisions. Let them decide between homework tasks or even the type of activity they are going to do next.

Also have them come up with the class rules and even get them to include one or two for you. You will soon see that the more independent learners they become, the more ownership they'll take for their learning.

Dedicate time to self-reflection and peer feedback and personalize the lessons when possible.



## **Day – 3: 9<sup>th</sup> June 2022: Python Basics & Packages**

### **Day – 3: Session 1: Python Basics**

The third day session 1 started with

- Introduction to Python, Indentation, Python Variables, Python Data Types – Numbers, String, Lists, Tuples, Sets and Dictionaries

#### **What is Python?**

Python is a popular programming language. It was created by Guido van Rossum, and released in 1991.

It is used for:

- web development (server-side),
- software development,
- mathematics,
- system scripting.

#### **What can Python do?**

- Python can be used on a server to create web applications.
- Python can be used alongside software to create workflows.
- Python can connect to database systems. It can also read and modify files.
- Python can be used to handle big data and perform complex mathematics.
- Python can be used for rapid prototyping, or for production-ready software development.

## Why Python?

- Python works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc).
- Python has a simple syntax similar to the English language.
- Python has syntax that allows developers to write programs with fewer lines than some other programming languages.
- Python runs on an interpreter system, meaning that code can be executed as soon as it is written. This means that prototyping can be very quick.
- Python can be treated in a procedural way, an object-orientated way or a functional way.

## Python Indentation

- Indentation refers to the spaces at the beginning of a code line.
- Where in other programming languages the indentation in code is for readability only, the indentation in Python is very important.
- Python uses indentation to indicate a block of code.

### Example

```
if 5 > 2:  
    print("Five is greater than two!")
```

Python will give you an error if you skip the indentation:

## Comments

- Python has commenting capability for the purpose of in-code documentation.
- Comments start with a #, and Python will render the rest of the line as a comment:

### Example

Comments in Python:

```
#This is a comment.  
print("Hello, World!")
```

### Python Variables

- In Python variables are created the moment you assign a value to it:

### Example

Variables in Python:

```
x = 5  
y = "Hello, World!"
```

Python has no command for declaring a variable.

### Variable Names

A variable can have a short name (like x and y) or a more descriptive name (age, carname, total\_volume). Rules for Python variables:

- A variable name must start with a letter or the underscore character
- A variable name cannot start with a number
- A variable name can only contain alpha-numeric characters and underscores (A-z, 0-9, and \_)
- Variable names are case-sensitive (age, Age and AGE are three different variables)

### Python Collections (Arrays)

There are four collection data types in the Python programming language:

- **List** is a collection which is ordered and changeable. Allows duplicate members.
- **Tuple** is a collection which is ordered and unchangeable. Allows duplicate members.



- **Set** is a collection which is unordered and unindexed. No duplicate members.
- **Dictionary** is a collection which is unordered, changeable and indexed. No duplicate members.

When choosing a collection type, it is useful to understand the properties of that type. Choosing the right type for a particular data set could mean retention of meaning, and, it could mean an increase in efficiency or security.

### **List**

- Lists are used to store multiple items in a single variable.
- Lists are one of 4 built-in data types in Python used to store collections of data, the other 3 are Tuple, Set, and Dictionary, all with different qualities and usage.
- Lists are created using square brackets:

### **Example**

Create a List:

```
thislist = ["apple", "banana", "cherry"]  
print(thislist)
```

### **Tuple**

- Tuples are used to store multiple items in a single variable.
- Tuple is one of 4 built-in data types in Python used to store collections of data, the other 3 are List, Set, and Dictionary, all with different qualities and usage.
- A tuple is a collection which is ordered and unchangeable.
- Tuples are written with round brackets.

## Example

Create a Tuple:

```
thistuple = ("apple", "banana", "cherry")
print(thistuple)
```

## Set

- Sets are used to store multiple items in a single variable.
- Set is one of 4 built-in data types in Python used to store collections of data, the other 3 are List, Tuple, and Dictionary, all with different qualities and usage.
- A set is a collection which is *unordered*, *unchangeable\**, and *unindexed*.
- **Note:** Set *items* are unchangeable, but you can remove items and add new items.
- Sets are written with curly brackets.

## Example

Create a Set:

```
thisset = {"apple", "banana", "cherry"}
print(thisset)
```

## Dictionary

- Dictionaries are used to store data values in key:value pairs.
- A dictionary is a collection which is ordered\*, changeable and do not allow duplicates.
- As of Python version 3.7, dictionaries are *ordered*. In Python 3.6 and earlier, dictionaries are *unordered*.
- Dictionaries are written with curly brackets, and have keys and values:

## Example

Create and print a dictionary:

```
thisdict = {
    "brand": "Ford",
    "model": "Mustang",
    "year": 1964
```

```
}  
print(thisdict)
```

### **Day – 3: Session 2: Python Packages**

The third day session 2 started with

- Introduction to Python packages – Pandas and NumPy

#### **Fundamental Python Libraries**

- The Python community is one of the most active programming communities with a huge number of developed toolboxes.
- The most popular Python toolboxes for any data scientist are NumPy, SciPy, Pandas, and Scikit-Learn.

#### **What is Pandas?**

- Pandas is a Python library used for working with data sets.
- It has functions for analyzing, cleaning, exploring, and manipulating data.
- The name "Pandas" has a reference to both "Panel Data", and "Python Data Analysis" and was created by Wes McKinney in 2008.

#### **Why Use Pandas?**

- Pandas allows us to analyze big data and make conclusions based on statistical theories.
- Pandas can clean messy data sets, and make them readable and relevant.
- Relevant data is very important in data science.

## Installation of Pandas

If you have Python and PIP already installed on a system, then installation of Pandas is very easy.

**Install it using this command:**

***C:\Users\Your Name>pip install pandas***

## Example: Create DataFrame from List of Lists with Column Names & Index

```
import pandas as pd

#list of lists

data = [['a1', 'b1', 'c1'],
        ['a2', 'b2', 'c2'],
        ['a3', 'b3', 'c3']]

columns = ['C1', 'C2', 'C3']
index = ['R1', 'R2', 'R3']

df = pd.DataFrame(data, index, columns)
print(df)
```

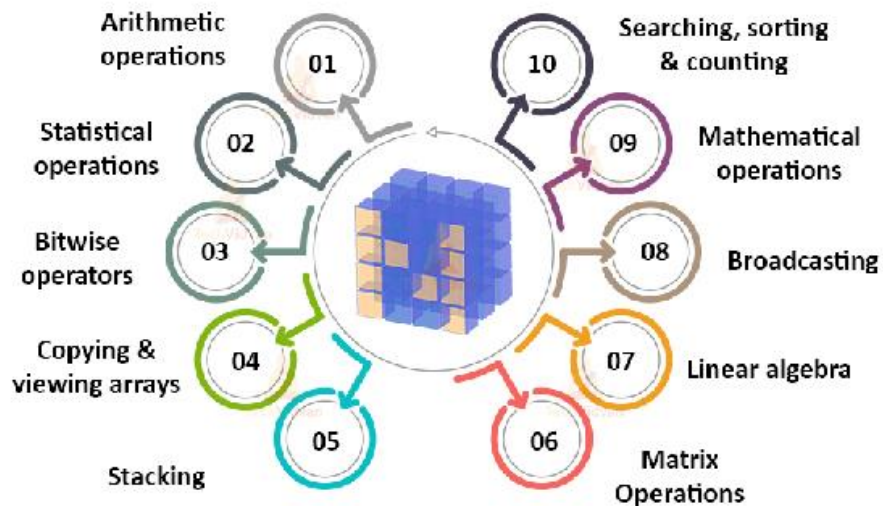
### OUTPUT :

```
C1 C2 C3
R1 a1 b1 c1
R2 a2 b2 c2
R3 a3 b3 c3
```

## What is NumPy?

- NumPy stands for Numerical Python.
- NumPy is a Python library used for working with arrays.
- It also has functions for working in domain of linear algebra, fourier transform, and matrices.
- NumPy was created in 2005 by Travis Oliphant. It is an open source project and we can use it freely.

## Uses of NumPy



## Installation of NumPy

If you have Python and PIP already installed on a system, then installation of NumPy is very easy.

Install it using this command:

```
C:\Users\Your Name>pip install numpy
```

If this command fails, then use a python distribution that already has NumPy installed like, Anaconda, Spyder etc.

### Example :

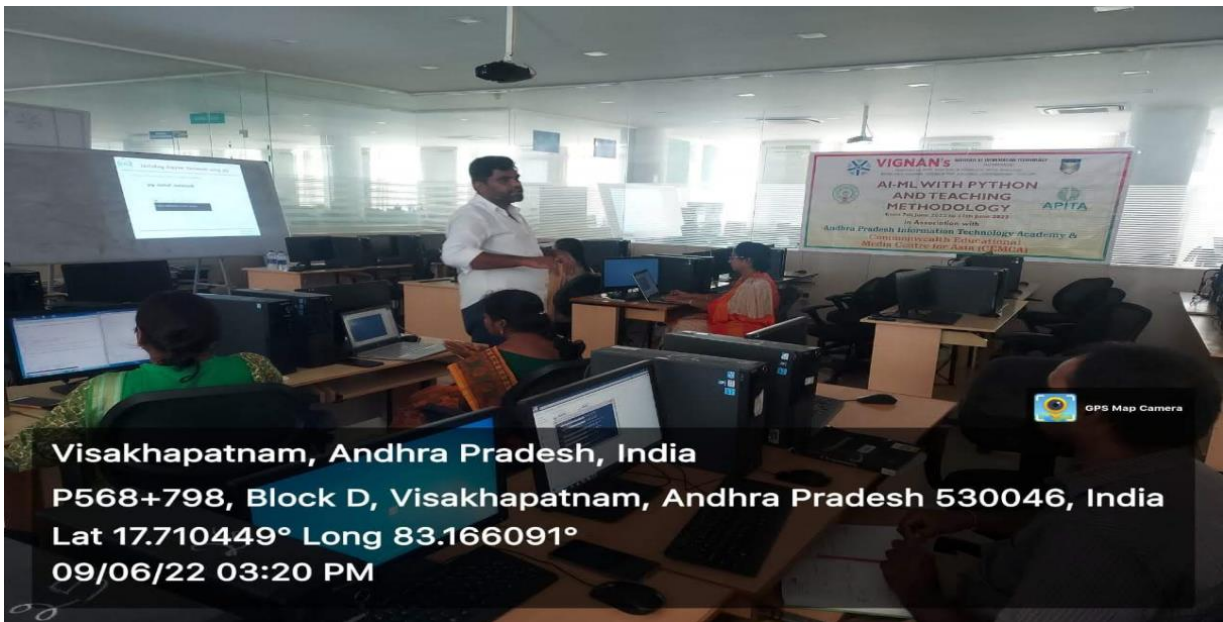
Use a List to create a NumPy array:

```
import numpy  
arr = numpy.array([1, 2, 3, 4, 5])  
print(arr)
```

```
[1 2 3 4 5]
```

### Day 3 – Objectives

- Participants gained knowledge on
  - Understanding concepts of python
  - Understanding concepts of python –Built in data types
  - Understanding concepts of python packages – Pandas and Numpy



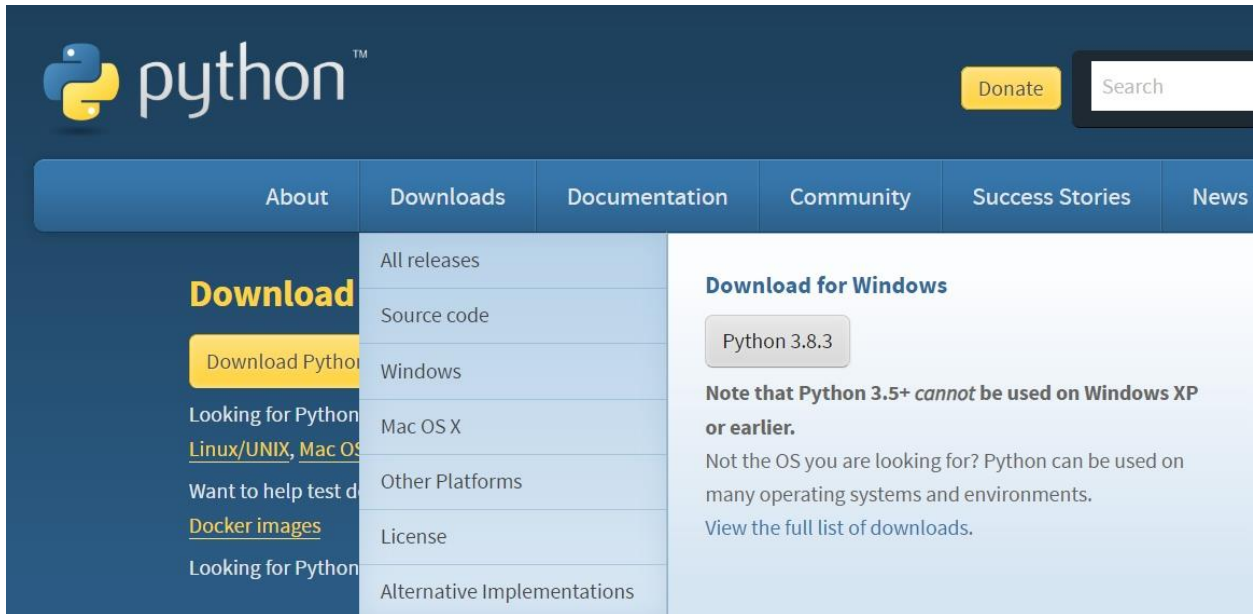
### Day – 4: 10<sup>th</sup> June 2022: Tools for AI ML & AI ML Algorithms

#### Day – 4: Session 1: Tools for AI ML – Detection of Covid-19 Project

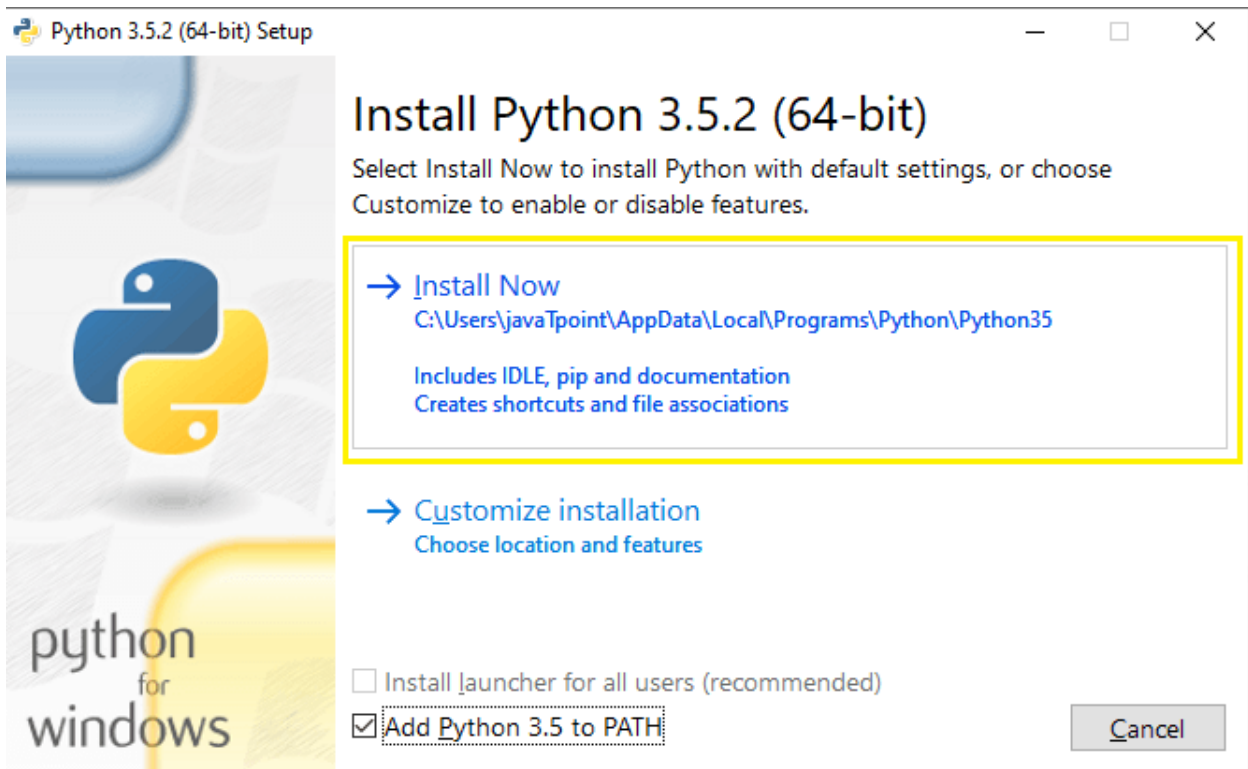
The fourth day session 1 started with

- Bringing tools Python, PIP, Jupyter Notebook, Microsoft VC++, Tensorflow, CUDA and CUDA Tool kit

## Installation of Python:



The screenshot shows the Python.org website. The top navigation bar includes 'About', 'Downloads', 'Documentation', 'Community', 'Success Stories', and 'News'. A 'Download' button is highlighted in the 'Downloads' menu. The 'Download for Windows' page is visible, showing the current version as Python 3.8.3. A note states: 'Note that Python 3.5+ cannot be used on Windows XP or earlier.' Below this, it says: 'Not the OS you are looking for? Python can be used on many operating systems and environments. View the full list of downloads.'



The screenshot shows the 'Python 3.5.2 (64-bit) Setup' window. The title bar reads 'Python 3.5.2 (64-bit) Setup'. The main heading is 'Install Python 3.5.2 (64-bit)'. Below the heading, it says: 'Select Install Now to install Python with default settings, or choose Customize to enable or disable features.' There are two main options: 'Install Now' and 'Customize installation'. The 'Install Now' option is highlighted with a yellow box and includes the following details: 'C:\Users\javaTpoint\AppData\Local\Programs\Python\Python35', 'Includes IDLE, pip and documentation', and 'Creates shortcuts and file associations'. The 'Customize installation' option includes the instruction 'Choose location and features'. At the bottom, there are two checkboxes: 'Install launcher for all users (recommended)' (unchecked) and 'Add Python 3.5 to PATH' (checked). A 'Cancel' button is located in the bottom right corner.

## What is PIP?

PIP is a package manager for Python packages, or modules if you like.

```
C:\Users\UDDISH> pip --version
```

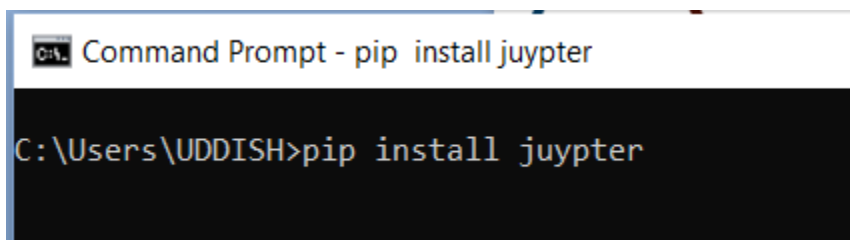
```
C:\Users\UDDISH>pip --version  
pip 20.0.2 from C:\Users\UDDISH\anaconda3\lib\site-packages\pip (python 3.7)
```

```
C:\Users\UDDISH> python -m pip install --upgrade pip --user
```

```
C:\Users\UDDISH>python -m pip install --upgrade pip --user  
Collecting pip  
  Using cached https://files.pythonhosted.org/packages/fe/ef/60d7ba03b5c44230  
3/pip-21.0.1-py3-none-any.whl  
Installing collected packages: pip  
Successfully installed pip-21.0.1
```

```
python.exe -m pip install --upgrade pip
```

## Installing and Working of Jupyter Notebook using pip:



```
Command Prompt - pip install jupyter  
C:\Users\UDDISH>pip install jupyter
```

```
E:\jupyter>jupyter notebook
```



```

E:\jupyter>jupyter notebook
'jupyter' is not recognized as an internal or external command,
operable program or batch file.

E:\jupyter>jupyter notebook
[I 07:00:56.411 NotebookApp] The port 8888 is already in use, trying another port.
[I 07:00:56.412 NotebookApp] The port 8889 is already in use, trying another port.
[I 07:00:56.413 NotebookApp] The port 8890 is already in use, trying another port.
[I 07:00:56.413 NotebookApp] The port 8891 is already in use, trying another port.
[I 07:00:56.476 NotebookApp] JupyterLab extension loaded from C:\Users\UDDISH\anaconda3\lib\site-pack
[I 07:00:56.476 NotebookApp] JupyterLab application directory is C:\Users\UDDISH\anaconda3\share\jupy
[I 07:00:56.491 NotebookApp] Serving notebooks from local directory: E:\jupyter
[I 07:00:56.491 NotebookApp] The Jupyter Notebook is running at:
[I 07:00:56.491 NotebookApp] http://localhost:8892/?token=cbb24bfd0215c8c4db4d889cc8ff57e55d7ca5da02b
[I 07:00:56.492 NotebookApp] or http://127.0.0.1:8892/?token=cbb24bfd0215c8c4db4d889cc8ff57e55d7ca5d
[I 07:00:56.492 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to st
[C 07:00:56.557 NotebookApp]

```

To access the notebook, open this file in a browser:  
 file:///C:/Users/UDDISH/AppData/Roaming/jupyter/runtime/nbserver-4432-open.html  
 Or copy and paste one of these URLs:  
 http://localhost:8892/?token=cbb24bfd0215c8c4db4d889cc8ff57e55d7ca5da02b60556  
 or http://127.0.0.1:8892/?token=cbb24bfd0215c8c4db4d889cc8ff57e55d7ca5da02b60556

The screenshot shows a web browser window with the address bar containing 'localhost:8892/tree'. The page header includes the Jupyter logo and 'Quit' and 'Logout' buttons. Below the header, there are tabs for 'Files', 'Running', and 'Clusters'. A message says 'Select items to perform actions on them.' with 'Upload', 'New', and a refresh icon. A table lists files in the current directory:

<input type="checkbox"/>	<input type="checkbox"/>	Name	Last Modified	File size
<input type="checkbox"/>	<input type="checkbox"/>	catdog	4 days ago	
<input type="checkbox"/>	<input type="checkbox"/>	catdog1	4 days ago	
<input type="checkbox"/>	<input type="checkbox"/>	catdog2	3 days ago	
<input type="checkbox"/>	<input type="checkbox"/>	keras-io-master	4 days ago	
<input type="checkbox"/>	<input type="checkbox"/>	x-ray	7 hours ago	

## Installing Microsoft Visual C++ 2015 Software:

Choose the download you want

File Name	Size
<input checked="" type="checkbox"/> vc_redist.x64.exe	14.6 MB
<input type="checkbox"/> vc_redist.x86.exe	13.8 MB


Download Summary:  
KBMBGB

1. vc\_redist.x64.exe

Total Size: 14.6 MB

Next

Microsoft Visual C++ 2015 Redistributable (x64) - 14.0.242...

 Microsoft Visual C++ 2015 Redistributable (x64) - 14.0.24212

**MICROSOFT SOFTWARE LICENSE TERMS**

**MICROSOFT VISUAL STUDIO 2015 EXTENSIONS, VISUAL STUDIO SHELLS and C++ REDISTRIBUTABLE**

These license terms are an agreement between Microsoft Corporation (or based on where you live, one of its affiliates) and you. They apply to the

I agree to the license terms and conditions

Install Close

## Installing and working of TensorFlow:

```
C:\Windows\system32>pip install tensorflow
```

```
C:\Windows\system32>import tensorflow
'import' is not recognized as an internal or external command,
operable program or batch file.

C:\Windows\system32>import tensorflow as tf
'import' is not recognized as an internal or external command,
operable program or batch file.

C:\Windows\system32>python
Python 3.7.0 (default, Jan 8 2020, 20:23:39) [MSC v.1916 64 bit (AMD64)] :: Anaconda, Inc. on win32

Warning:
This Python interpreter is in a conda environment, but the environment has
not been activated. Libraries may fail to load. To activate this environment
please see https://conda.io/activation

Type "help", "copyright", "credits" or "license" for more information.
>>> import tensorflow
2020-06-10 08:16:03.352617: I tensorflow/stream_executor/platform/default/dso_loader.cc:44] Successfully opened dy
>>>
>>> import tensorflow as tf
>>> msg = tf.constant('Hello, TensorFlow!')
2020-06-10 08:20:08.065738: W tensorflow/stream_executor/platform/default/dso_loader.cc:55] Could not load dynamic
2020-06-10 08:20:08.126256: E tensorflow/stream_executor/cuda/cuda_driver.cc:313] failed call to cuInit: UNKNOWN E
2020-06-10 08:20:08.728462: I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:169] retrieving CUDA diagnostic
2020-06-10 08:20:08.732358: I tensorflow/stream_executor/cuda/cuda_diagnostics.cc:176] hostname: LAPTOP-8NMODJGK
2020-06-10 08:20:09.271133: I tensorflow/core/platform/cpu_feature_guard.cc:143] Your CPU supports instructions th
2020-06-10 08:20:10.734499: I tensorflow/compiler/xla/service/service.cc:168] XLA service 0x22d83e35580 initialize
2020-06-10 08:20:10.740576: I tensorflow/compiler/xla/service/service.cc:176] StreamExecutor device (0): Host, D
>>> tf.print(msg)
Hello, TensorFlow!
>>>
```

## Installing CUDA:

**DOWNLOAD DRIVERS**

NVIDIA > DRIVERS > GEFORCE GAME READY DRIVER

**RELATED PAGES**

- GeForce
- NVIDIA 3D Vision
- PhysX
- CUDA
- Games and Apps

**16: THE NEW**

**GEFORCE GAME READY DRIVER**

**Version:** 446.14 WHQL  
**Release Date:** 2020.5.27  
**Operating System:** Windows 10 64-bit  
**Language:** English (India)  
**File Size:** 534.95 MB

**DOWNLOAD**

## CUDA® Toolkit —TensorFlow supports CUDA 10.1:

### CUDA Toolkit 10.2 Download

**Select Target Platform**

Click on the green buttons that describe your target platform. Only supported platforms will be shown.

Operating System	<b>Windows</b>	Linux	Mac OSX			
Architecture	<b>x86_64</b>					
Version	<b>10</b>	8.1	7	Server 2019	Server 2016	Server 2012 R2
Installer Type	exe (network)	<b>exe (local)</b>				

#### Edit environment variable

<b>C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v10.2\bin</b>	New
C:\Program Files\NVIDIA GPU Computing Toolkit\CUDA\v10.2\libnvvp	Edit
C:\Windows\system32	Browse...
C:\Windows	Delete
C:\Windows\System32\Wbem	Move Up
C:\Windows\System32\WindowsPowerShell\v1.0\	Move Down
C:\Windows\System32\OpenSSH\	Edit text...
C:\Program Files\MATLAB\R2017b\runtime\win64	
C:\Program Files\MATLAB\R2017b\bin	
C:\Program Files\NVIDIA Corporation\Nsight Compute 2019.5.0\	
C:\Program Files (x86)\NVIDIA Corporation\PhysX\Common	

## **Day – 4: Session 2: AI ML Algorithms**

The fourth day session 1 started with

- Introduction to Python, Indentation, Python Variables, Python Data Types – Numbers, String, Lists, Tuples, Sets and Dictionaries

### **Artificial Intelligence (AI)**

According to the father of Artificial Intelligence, John McCarthy, it is “The science and engineering of making intelligent machines, especially intelligent computer programs”.

Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think. AI is accomplished by studying how human brain thinks and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

While exploiting the power of the computer systems, the curiosity of human, lead him to wonder, “Can a machine think and behave like humans do?”

Thus, the development of AI started with the intention of creating similar intelligence in machines that we find and regard high in humans.

### ***The Necessity of Learning AI***

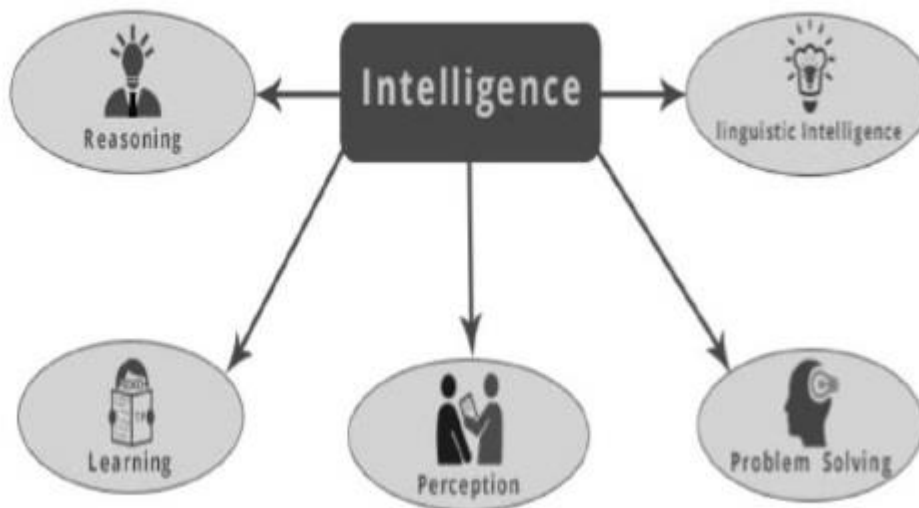
As we know that AI pursues creating the machines as intelligent as human beings. There are numerous reasons for us to study AI. The reasons are as follows –

- AI can learn through data
- AI can teach itself
- AI can respond in real time
- AI achieves accuracy
- AI can organize data to get most out of it
- Understanding Intelligence

### **What is Intelligence Composed Of?**

The intelligence is intangible. It is composed of –

- Reasoning
- Learning
- Problem Solving
- Perception
- Linguistic Intelligence



### **What's Involved in AI**

Artificial intelligence is a vast area of study. This field of study helps in finding solutions to real world problems.

Let us now see the different fields of study within AI –

- Machine Learning
- Logic
- Searching
- Artificial neural networks
- Genetic Algorithm
- Knowledge Representation

### **Application of AI**

In this section, we will see the different fields supported by AI –

- Gaming
- Natural Language Processing
- Expert Systems
- Speech Recognition
- Handwriting Recognition
- Intelligent Robots

## **Machine Learning**

Learning means the acquisition of knowledge or skills through study or experience. Based on this, we can define machine learning (ML) as follows –

It may be defined as the field of computer science, more specifically an application of artificial intelligence, which provides computer systems the ability to learn with data and improve from experience without being explicitly programmed.

Basically, the main focus of machine learning is to allow the computers learn automatically without human intervention. Now the question arises that how such

learning can be started and done? It can be started with the observations of data. The data can be some examples, instruction or some direct experiences too. Then on the basis of this input, machine makes better decision by looking for some patterns in data.

## **Types of Machine Learning (ML)**

Machine Learning Algorithms helps computer system learn without being explicitly programmed. These algorithms are categorized into supervised or unsupervised. Let us now see a few algorithms –

### **Supervised machine learning algorithms**

Mainly supervised learning problems can be divided into the following two kinds of problems –

- **Classification** – A problem is called classification problem when we have the categorized output such as “black”, “teaching”, “non-teaching”, etc.
- **Regression** – A problem is called regression problem when we have the real value output such as “distance”, “kilogram”, etc.

Decision tree, random forest, knn, logistic regression are the examples of supervised machine learning algorithms

### **Unsupervised machine learning algorithms**

Unsupervised learning problems can be divided into the following two kinds of problem –

- **Clustering** – In clustering problems, we need to discover the inherent groupings in the data. For example, grouping customers by their purchasing behavior.



- **Association** – A problem is called association problem because such kinds of problem require discovering the rules that describe large portions of our data. For example, finding the customers who buy both **x** and **y**.

K-means for clustering, Apriori algorithm for association are the examples of unsupervised machine learning algorithms.

### **Most Common Machine Learning Algorithms**

In this section, we will learn about the most common machine learning algorithms.

The algorithms are described below –

- Linear Regression
  - Simple linear regression .
  - Multiple linear regression
- Logistic Regression
- Decision Tree
- Support Vector Machine (SVM)
- Naïve Bayes
- K-Nearest Neighbors (KNN)
- K-Means Clustering
- Random Forest

### **Day 4 – Objectives**

- Participants gained knowledge on
  - Understanding role of different tools used for AI ML
  - Understanding concepts of AI Algorithms
  - Understanding concepts of ML Algorithms



## **Day – 5: 11<sup>th</sup> June 2022: Exploratory Data Analysis & NLTK**

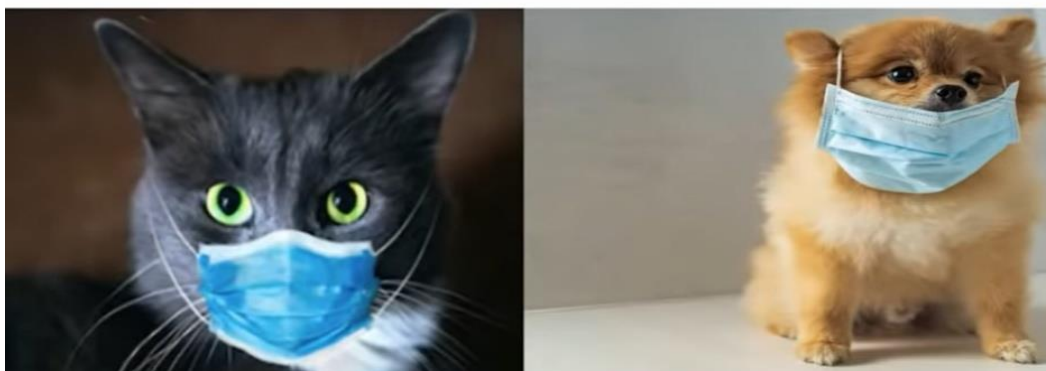
### **Day – 5: Session 1: Exploratory Data Analysis – Detection of Covid-19 Project**

The fourth day session 1 started with

- Introduction to Exploratory Data Analysis – Detection of Covid-19 Project

### **Project Detect COVID-19 from Chest X-Rays by building a Simple Convolution Neural Network.**

How do you distinguish “Cat” from a “Dog”?



We will discuss how we can make your own **machine learning to successfully detect COVID-19 from Chest X-Rays by building a Simple Convolution Neural Network.**

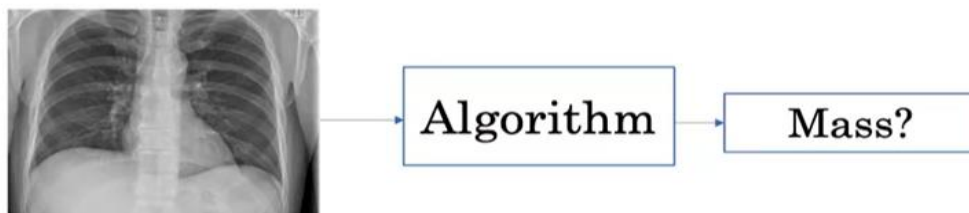
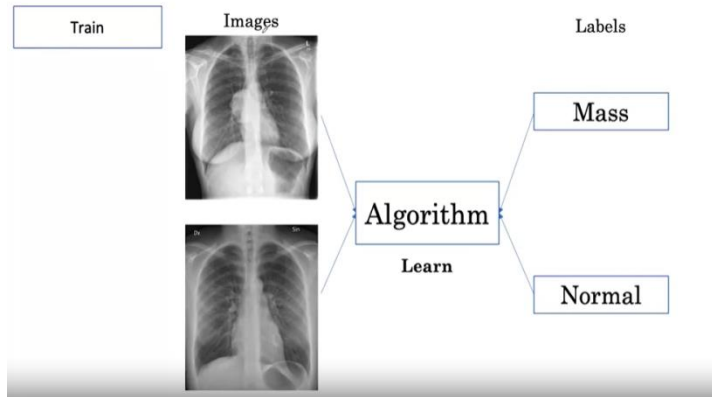
- Dataset Preparation
- Understanding the Dataset
- Building a CNN
- Model Training

Dataset Details ----- We will sample our dataset from the following.  
Covid X-Ray Image Dataset <https://github.com/ieee8023/covid-chestxray-dataset>  
for **positive cases.**

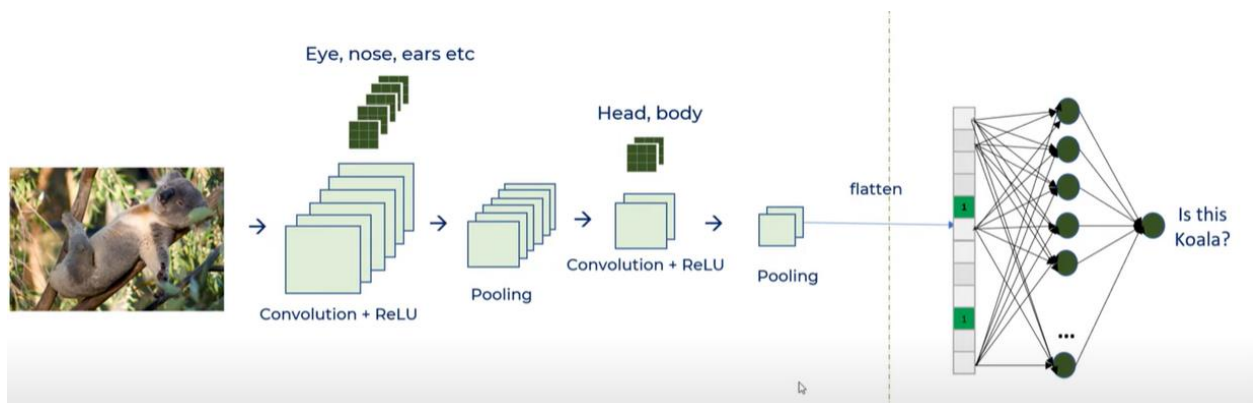
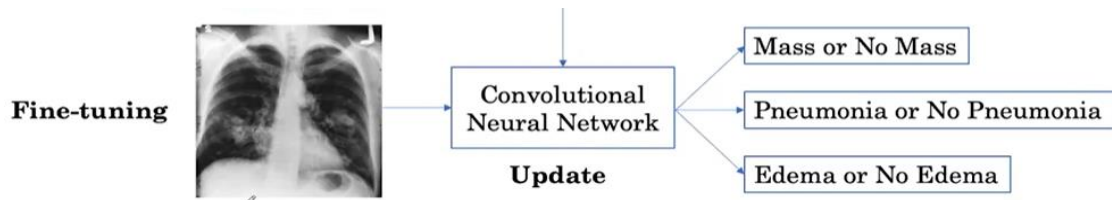
Kaggle X-Ray Chest Images - <https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia> for **negative cases.**

Critical for detection  
Of pneumonia, lung  
cancer etc





deep learning algorithm  
model  
neural network  
convolutional neural network



## Day – 5: Session 2: NLTK – Sentiment Analysis – Movie Review

The fifth day session 2 started with

- Introduction to NLTK, Text Classification and Example discussed on Movie Review analysis using BOW Algorithm, TF Algorithm and Navie base Algorithm

### NLTK Sentiment Analysis

- **NLTK = natural language toolkit**
- **pip install nltk**
- In today's area of internet and online services, data is generating at incredible speed and amount.
- Generally, Data analyst, engineer, and scientists are handling relational or tabular data.
- These tabular data columns have either numerical or categorical data.
- Generated data has a variety of structures such as text, image, audio, and

video.

- Online activities such as articles, website text, blog posts, social media posts are generating unstructured textual data.
- Corporate and business need to analyze textual data to understand customer activities, opinion, and feedback to successfully derive their business.
- To compete with big textual data, text analytics is evolving at a faster rate than ever before.

### **Text Analytics has lots of applications in today's online world.**

- By analyzing tweets on **Twitter**, we can find trending news and peoples reaction on a particular event.
- **Amazon** can understand user feedback or review on the specific product.
- **BookMyShow** can discover people's opinion about the movie.
- **Youtube** can also analyze and understand peoples viewpoints on a video.

### **Text Analytics and NLP:**

#### **Text Analytics:**

- Text communication is one of the most popular forms of day to day conversation.
- We chat, message, tweet, share status, email, write blogs, share opinion and feedback in our daily routine.
- All of these activities are generating text in a significant amount, which is unstructured in nature.
- In this area of the online marketplace and social media, It is essential to analyze vast quantities of data, to understand peoples opinion.

#### **NLP :**

- NLP enables the computer to interact with humans in a natural manner.
- It helps the computer to understand the human language and derive meaning from it.

- NLP is applicable in several problematic from speech recognition, language translation, classifying documents to information extraction.
- Analyzing movie review is one of the classic examples to demonstrate a simple NLP Bag-of-words model, on movie reviews.

### **Tokenization:**

- Tokenization is the first step in text analytics.
- The process of breaking down a text paragraph into smaller chunks such as words or sentence is called Tokenization.
- Token is a single entity that is building blocks for sentence or paragraph.

### **Sentence Tokenization:**

Sentence tokenizer breaks text paragraph into sentences.

```
text="""Hello Mr. UDDISH, how are you doing today? The weather is great, and
city is awesome.
The sky is pinkish-blue. You shouldn't eat cardboard"""

print(text)
```

Hello Mr. UDDISH, how are you doing today? The weather is great, and city is awesome.  
The sky is pinkish-blue. You shouldn't eat cardboard

```
#from nltk.tokenize import sent_tokenize

text="""Hello Mr. UDDISH, how are you doing today? The weather is great, and
city is awesome.
The sky is pinkish-blue. You shouldn't eat cardboard"""

tokenized_text=sent_tokenize(text)
print(tokenized_text)
```

['Hello Mr. UDDISH, how are you doing today?', 'The weather is great, and city is awesome.', 'The sky is pinkish-blue.', 'You shouldn't eat cardboard']

### **Word Tokenization:**

- Word tokenizer breaks text paragraph into words.

```
#from nltk.tokenize import word_tokenize
```

```
tokenized_word=word_tokenize(text)  
print(tokenized_word)
```

```
['Hello', 'Mr.', 'UDDISH', ',', 'how', 'are', 'you', 'doing', 'today', '?', 'The', 'weather', 'is', 'great',  
, 'and', 'city', 'is', 'awesome', ',', 'The', 'sky', 'is', 'pinkish-blue', ',', 'You', 'should', "n't", 'eat',  
'cardboard']
```

### **Frequency Distribution**

```
#from nltk.probability import FreqDist
```

```
fdist = FreqDist(tokenized_word)  
print(fdist)
```

<FreqDist with 25 samples and 30 outcomes>

```
fdist.most_common(2)
```

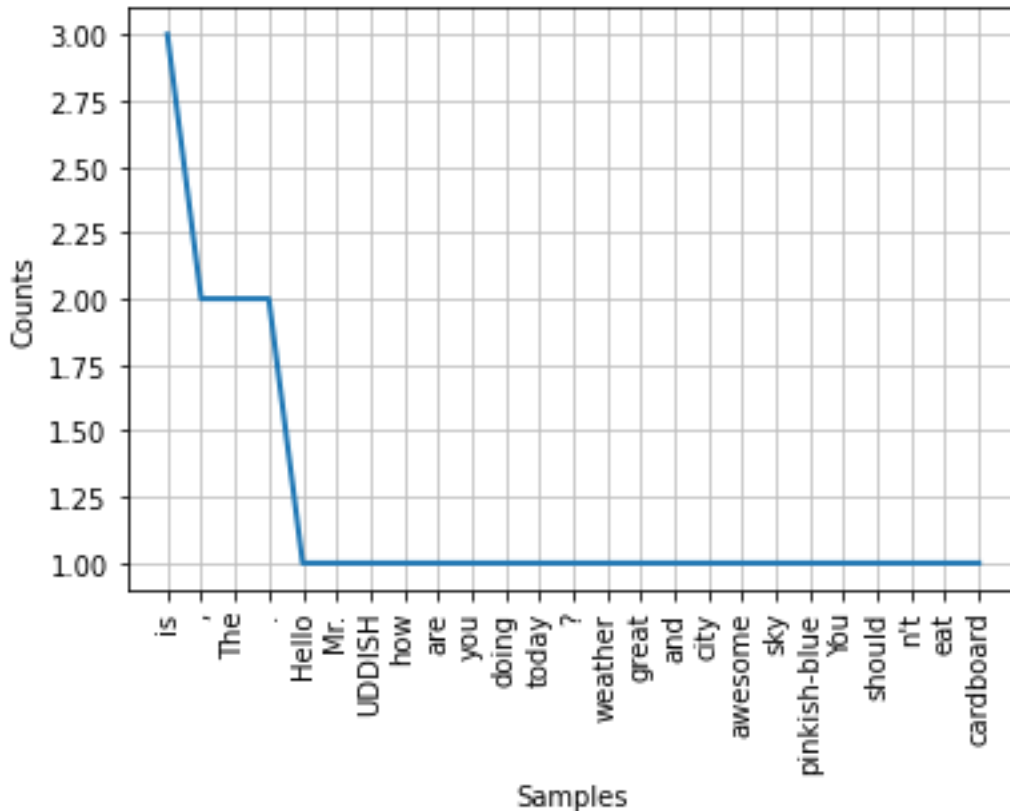
```
[('is', 3), (',', 2)]
```

```
# Frequency Distribution Plot
```

```
# import matplotlib.pyplot as plt
```

```
fdist.plot(30,cumulative=False)  
plt.show()
```





## Sentiment Analysis

### Analysis :

- Nowadays companies want to understand, what went wrong with their latest products?
- What users and the general public think about the latest feature?

You can quantify such information with reasonable accuracy using sentiment analysis.

**Sentiment Analysis : Quantifying users content, idea, belief, and opinion is known as sentiment analysis.**

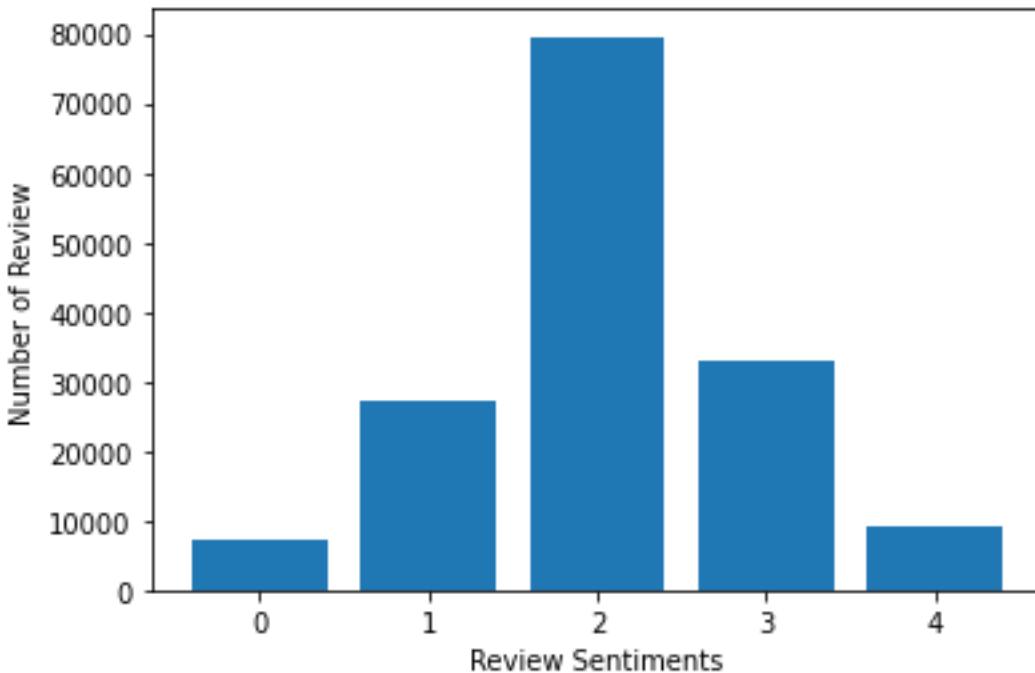
- User's online post, blogs, tweets, feedback of product helps business people to the target audience and innovate in products and services.
- Sentiment analysis helps in understanding people in a better and more accurate way. It is not only limited to marketing, but it can also be utilized in politics, research, and security.
- Human communication just not limited to words, it is more than words.
- Sentiments are combination words, tone, and writing style.

- As a data analyst, It is more important to understand our sentiments, what it really means?

**There are mainly two approaches for performing sentiment analysis.**

**Lexicon-based:** count number of positive and negative words in given text and the larger count will be the sentiment of text.

**Machine learning based approach:** Develop a classification model, which is trained using the pre-labeled dataset of positive, negative, and neutral.



**Feature Generation using Bag of Words:**

- In the Text Classification Problem, we have a set of texts and their respective labels.
- But we directly can't use text for our model.
- We need to **convert these text into some numbers or vectors of numbers.**

**Bag-of-words model(BoW ):**

- Bag-of-words model(BoW ) is the simplest way of extracting features from the text.

- BoW converts text into the **matrix** of occurrence of words within a document.
- This model concerns about whether given words occurred or not in the document.

### **TF-IDF (Term Frequency - Inverse Document Frequency):**

- In Term Frequency(TF), you just count the number of words occurred in each document.
- The main issue with this Term Frequency is that it will give more weight to longer documents.
- Term frequency is basically the output of the BoW model.
- IDF(Inverse Document Frequency) measures the amount of information a given word provides across the document.
- IDF is the logarithmically scaled inverse ratio of the number of documents that contain the word and the total number of documents.

### **Split train and test set**

To understand model performance, dividing the dataset into a training set and a test set is a good strategy.

Let's split dataset by using function **train\_test\_split()**

You need to pass basically 3 parameters features, target, and test\_set size.

Additionally, you can use random\_state to select records randomly.

```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(text_counts,
data['Sentiment'], test_size=0.3, random_state=1)
```

### **Model Building and Evaluation**

Let's build the Text Classification Model

- First, import the MultinomialNB module and create a Multinomial Naive Bayes classifier object using MultinomialNB() function.

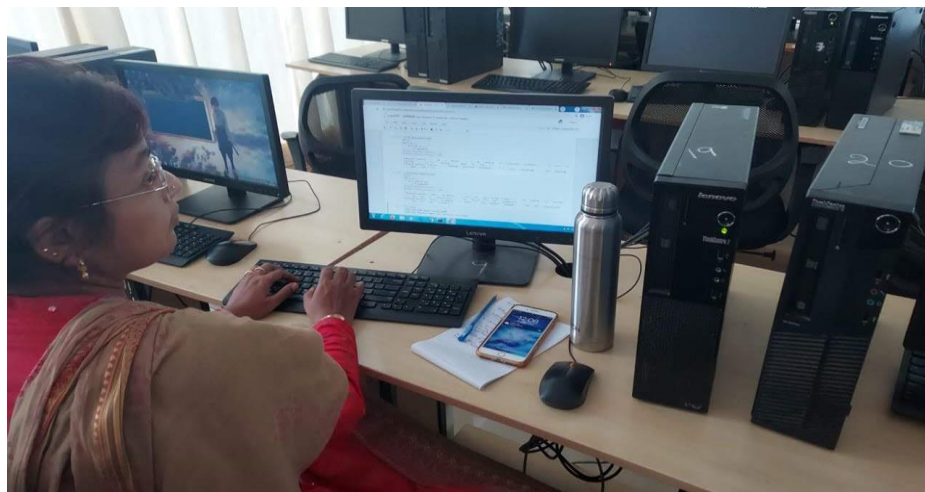
- Then, fit your model on a train set using fit() and perform prediction on the test set using predict().

```
from sklearn.naive_bayes import MultinomialNB
#Import scikit-Learn metrics module for accuracy calculation
from sklearn import metrics
# Model Generation Using Multinomial Naive Bayes
clf = MultinomialNB().fit(X_train, y_train)
predicted= clf.predict(X_test)
print("MultinomialNB Accuracy:",metrics.accuracy_score(y_test, predicted))
```

MultinomialNB Accuracy: 0.6049169122986885

## Day 5 – Objectives

- Participants gained knowledge on
  - Understanding concepts of Exploratory Data Analysis – Detection of Covid-19 Project
  - Understanding concepts of NLTK
  - Understanding concepts of Text Classification and
  - Example discussed on Movie Review analysis using BOW Algorithm, TF Algorithm and Navie base Algorithm



## 11. CLOSING CEREMONY

The Training Programme concluded with the closing ceremony. The closing ceremony was graced by Dr. B Arundhati Principal – VIITs, Dr. Shekar HOD - CSE Dept, VIITs, Rector Dr B Madhusudan Rao, Mr Sridhar Co-ordinator (APITA), Banoth Prasad CEO/CO-Founder - K4U Infotech and participants given feedback on the FDP.



Fig: Group picture of participants on day2 on Closing Ceremony



Fig: Closing Ceremony on Day 5

## 12. Participant's List (Annexure – A)

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Thank you CEMCA