

UNIT-I

Data Handling Using Pandas And Data Visualization

CHAPTER-1

DATA HANDLING USING PANDAS-I



TOPIC-1

Introduction To Python Libraries

Revision Notes

➤ **Pandas**

The Pandas is a high-performance open source library for data analysis in Python, developed by Wes McKinney in 2008. Over the years, it has become the de-facto standard library for data analysis using Python.

There are 3 well-established python libraries namely NumPy, Pandas and Matplotlib specially for scientific and analytical use.

These libraries allow us to manipulate, transform and visualise data easily and efficiently.

Using the Pandas, we can accomplish five typical steps in the processing and analysis of data, regardless of the origin of data. These steps are- load, prepare, manipulate, model and analyse.

Some key features of Pandas include the following :

- (i) It can process a variety of data sets in different formats : time series, tabular heterogeneous arrays and matrix data.
- (ii) It facilitates loading and importing data from varied sources such as CSV and DB/SQL.
- (iii) It can handle a myriad of operations on data sets : sub-setting, slicing, filtering, merging, grouping, re-ordering, and re-shaping.
- (iv) It can deal with missing data according to rules defined by the user and developer.
- (v) It can be used for parsing and managing (conversion) of data as well as modeling and statistical analysis.
- (vi) It integrates well with other Python libraries such as SciPy.
- (vii) It delivers fast performance and can be speeded up even more by making use of Cython (C extensions to Python).

➤ **Benefits of Pandas**

The benefits of pandas over using the languages are

- **Data representation** : It can easily represent data in a form naturally suited for data analysis through its DataFrame and Series data structures in a concise manner. Doing the equivalent in C/C++ or Java would require many lines of custom code, as these languages were not built for data analysis but rather networking and kernel development.
- **Clear code** : The clear API of the Pandas allows you to focus on the core part of the code. So, it provides clear code.

➤ **Matplotlib**

It is an amazing visualization library in Python that used for 2D plots of arrays. It is a multi-platform data visualization library which build NumPy arrays. Matplotlib produces publication-quality figures in a variety of hardcopy formats and interactive environments across platforms. Matplotlib can be used in Python scripts, the Python and IPython shell, web application servers and various graphical user interface toolkits.

To get matplotlib up and running in our environment, we need to import it.

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

➤ Data structures in Pandas

Data structure is defined as the storage and management of the data for its efficient and easy access in the future where the data is collected, modified and the various types of operations are performed on the data respectively. Pandas provides two data structures for processing the data, which are explained below :

- (1) **Series** : It is one dimensional object similar to an array, list or column in a table. It will assign a labelled index to each item in the series. By default, each item will receive an index label from 0 to N, where N is the length of the series minus one.
- (2) **Data Frame** : It is a tabular data structure comprised of rows and columns. DataFrame is defined as a standard way to store data which has two different indexes *i.e.*, row index and column index.

➤ Series

Pandas series is one-dimensional array that is capable of holding various data types such as integer, string, float, object etc. with the the help of series () method, we can easily change the list, dictionary into series. A series does not contain multiple columns and rows. Labels of series are called index.

Syntax

`pandas.series (data, index, dtype, copy)`

Here, data can be list, tuple etc

index value should be unique and hashable

dtype defines data type of series

copy copies the data

➤ Creating a series

- (i) Create an empty series

Empty series means it will not have any value.

Syntax

`series_Object = pandas.Series ()`

- (ii) Create a series using Inputs

We can create series by using various inputs as array.

- **Creating series from array** : To create a series from array, we have to import the numpy module and then use array () method. If data is an ndarray, then passed index must be of same length. If there is no index passed as an argument, then index will be range (*n*) by default, where *n* is array length.
- **Creating series from dict** : A dict can be passed as an input. If there is no index specified, then the dictionary's keys are taken in a sorted order. If index is passed, then corresponding values to a particular label in the index will be extracted from the dictionary.
- **Creating series from scalar** : If data is a scalar value, an index must be provided. The value will be repeated to match the length of index.

Source : https://www.tutorialspoint.com/python_pandas_series.htm

➤ Mathematical operations

We can perform mathematical operation on series like addition, subtraction, multiplication, division etc.

For this, various methods are used, as follows :

- **add()** : This function is used to add series and others, element wise.
Syntax `Series.add (other, fill-value=Name, axis=0)`
 Here Other is series or scalar value
 fill-value is None or float value but its default value is None
- **sub()** : This function is used to get subtraction of series and others, element wise.
Syntax `Series.sub (other, fill value=None, axis=0)`
- **mul()** : This function is used to get multiplication of series and others, element-wise.
Syntax `Series.mul (other, fill value=None, axis=0)`
- **div()** : This function is used to get floating division of series and others, element-wise.
Syntax `Series.div (other, fill value=Name, axis=0)`
- **pow()** : This function is used to get exponential power of series and others, element-wise.
Syntax `Series.pow (other, fill value=None, axis=0)`

e.g.

```
import numpy as np
import pandas as pd
x = pd.Series([2, 1, 2, np.nan], index=['p', 'q', 'r', 's'])
y = pd.Series([1, np.nan, 2, 1], index=['p', 'q', 's', 't'])
print("---Addition---")
print(x.add(y, fill_value=0))
print("---Subtraction---")
print(x.sub(y, fill_value=0))
print("---Multiplication---")
print(x.mul(y, fill_value=0))
print("---Division---")
print(x.div(y, fill_value=0))
print("---Power---")
print(x.pow(y, fill_value=0))
```

Output :

	Addition	Subtraction	Multiplication	Division	Power
p	3.0	1.0	2.0	2.0	2.0
q	1.0	1.0	0.0	inf	1.0
r	2.0	2.0	0.0	inf	1.0
s	2.0	-2.0	0.0	0.0	0.0
t	1.0	1.0	0.0	0.0	0.0

dtype: float 64

➤ Head and Tail functions

- head() function is used to get the first n rows.

Syntax Series.head($n=5$)

Here, n is the selected number of rows. It is int type and has default value 5.

- tail() function returns last n rows from the object based on position. It is useful for quickly verifying data. for example, after sorting

Syntax Series.tail($n = 5$)

Here, n is the selected number of rows whose default value is 5.

➤ Selection

In series, Series.select() function is used for selection. This function returns data corresponding to axis labels matching criteria. We pass the name of the function as an argument to this function which is applied on all the index tables. The index labels satisfying the criteria are selected.

Syntax Series.select (crit, axis=0)

Here,

crit = called on each label

axis = int value

➤ Indexing

The object supports both integers and label based indexing and provides a host of methods for performing operation involving the index.

In Python Pandas, Series.index attribute is used to get or set the index labels of the given series object.

Syntax Series.index

Pandas supports three types of multi-axes indexing, which are as follows :

- .loc[]** : This attribute is used to access a group of rows and columns by label(s) or a boolean array in the given series object.

Syntax Series.loc

- .iloc[]** : This attribute enables purely integer location based indexing for selection by position over the given series object

(iii) `.ix[]` : This attribute is primarily label location based indexer, with integer position fallback. It takes the label as input and returns the value corresponding to that label.

Syntax Series.ix

➤ Slicing

Slicing is a powerful approach to retrieve subsets of data from a Pandas object. A slice Object is built using a syntax of `start : end : step`, the segments representing the first item, last item and the increment between each item that you would like as the step.

Know the Terms

- **Pandas** : The Pandas is a high-performance open source library for data analysis in Python.
- **Matplotlib** : It is a visualization library in Python that used for 2D plots of arrays.
- **Series** : It is a one-dimensional array containing a sequence of values. Each value has a data label associated with it also called its index.
- **Selection** : This function returns data corresponding to axis labels matching criteria.
- **Indexing** : This function is used to get or set the index labels of the given series object.
- **Slicing** : Slicing is a powerful approach to retrieve subsets of data from a Pandas object.



TOPIC-2

Data Frames & Operation on Rows and Columns

Revision Notes

➤ Data Frames

- Data Frame is a two dimensional data structure *i.e.*, data is aligned in a tabular form as rows and columns. Data frame consists of various properties as iteration, indexing etc.
- In data frame, columns can be heterogeneous types like integer, boolean etc.
- It can be seen as a dictionary of series where rows and columns both are indexed.

Data can be created using following syntax :

`pandas.DataFrame (data, index, columns, dtype, copy)`

Here **data** contains different forms like ndarray, series, map, constants etc.

index is used for the row label

columns is used for column label

dtype refers to the data type of each column

copy used for copying data

➤ Create DataFrame

We can create DataFrame using various inputs which are discussed below

- **Creating an empty DataFrame** : It is basic DataFrame that can be created by `import pandas as pd`
`object_Name = pd.DataFrame()`
- **Creating a DataFrame From dict of series** : Dictionary of series can be passed to form a DataFrame. The resultant index is the union of all the series indexes passed.

e.g.

```
import pandas as pd
data={'First' : pd.Series(['abc', 'xyz', 'pqr'], index = [11, 12, 13]),
      'second' : pd.Series(['The', 'That', 'This', 'abc'],
                          index=[11, 12, 13, 14])}
value=pd.DataFrame(data)
print(value)
```

Output

	First	Second
11	abc	The
12	xyz	That
13	pqr	This
14	NaN	abc

- **Creating a DataFrame From list of dictionary** : List of dictionary can be passed to form a DataFrame. Keys of dictionary are taken as column names by default.

e.g. import pandas as pd

```
data = [{'abc' : 10, 'xyz' : 20, 'pqr' : 30},
        {'The' : 10, 'pqr' : 20, 'xyz' : 30, 'abc' : 40}]
```

```
value = pd.DataFrame (data)
```

```
print(value)
```

Output

	The	abc	pqr	xyz
0	NaN	10	30	20
1	10.0	40	20	30

➤ Iterating in Pandas DataFrame

Iteration is a general term for taking each item of something one after another.

In Pandas DataFrame, we can iterate an element in two ways :

(i) **Iterating over rows** : There are three function to iterate over rows as follows :

- **iterrows()** : It returns the iterator yielding each index value along with a series containing the data in each row.
- **iteritems()** : It iterates over each column as key, value pair with label as key and column value as series object.
- **itertuples()** : In DataFrame, it returns a tuple for each row. The first element of the tuple will be the row's corresponding index value, while the remaining value are the rows values.

(ii) **Iterating over columns**

In order to iterate over columns, we need to create a list of dataframe columns and then iterating through that list to pull out the dataframe columns.

➤ Operations on rows and columns

As we known, DataFrame is a two dimensional data structure means data is arranged in a tabular format like rows and columns, some basic operations can be perform like adding, deleting, selecting and renaming. These operations are as follows :

(i) **Addition**

- To add a column in Pandas Dataframe, a new list as a column can be declared and add to an existing DataFrame.
- To add a row in Pandas DataFrame, we can concat the old dataframe with new one.

(ii) **Selection**

- To select a column in Pandas DataFrame, we can either access the columns by calling them by their column names.
- To retrieve rows from a DataFrame, a special method is used named DataFrame.loc[]. Rows can also be selected by passing integer location to iloc[] method.

(iii) **Deletion**

- To delete a column from Pandas DataFrame, drop() method is used. Columns are deleted by dropping columns with column names.
- To delete a row from Pandas DataFrame, drop() method is used. Rows are deleted by dropping rows by index label.

➤ Head and Tail functions

head() and tail() methods or functions are used to view a small sample of a DataFrame object. These functions are described below

(i) **head()** : This function returns the first *n* rows for the object based on position. It is useful for quick testing if your object has the right type of data in it.

Syntax DataFrame.head (*n*=5)

Parameters : n is an integer value, number of rows to be returned where default value is 5. Return DataFrame with top n rows

- (ii) **tail()** : This function returns last n rows from the object based on position. It is useful for quickly verifying data. *e.g.* after sorting

Syntax : DataFrame.tail ($n=5$)

➤ Indexing using Labels

Indexing in Pandas means simply selecting particular rows and columns of a DataFrame. Indexing can also be known as subset selection.

It is common operation to pick out one of the DataFrame's columns to work on. To select a column by its label, we use the .loc[] function.

Pandas DataFrame.loc attribute access a group of rows and columns by label(s) or a boolean array in the given DataFrame.

Syntax : DataFrame.loc

loc takes two single/list/range operator separated by '!'. The first one indicates the row and the second one indicates columns.

➤ Boolean Indexing :

It helps us to select the data from the DataFrames using a boolean vector. We need a DataFrame with a boolean index to use the boolean indexing.

In boolean indexing, we can filter a data in four ways

- Accessing a DataFrame with a boolean index
- Applying a boolean mask to a DataFrame
- Masking data based on column value
- Masking data based on index value

e.g., import pandas as pd

```
dict={'Name': ["Rahul", "Kiyaan", "Shreya", "Riya"],
      "Salary": ["28000", "38000", "34000", "3600"]}
info=pd.DataFrame(dict, index=[True, False, False, True])
print (info)
```

Output

	Name	Salary
True	Rahul	28000
False	Kiyaan	38000
False	Shreya	34000
True	Riya	36000

➤ CSV File

CSV files are the comma separated values. This type of file can be view as an excel file and separated by commas. CSV file is nothing more than a simple text file. However, it is the most common, simple and easiest method to store tabular data. This particular format arranges tables by a specific structure divided into rows and columns.

Once we have the DataFrame, we can persist it in CSV on the local disk. Let's first create CSV file using data that is currently present in the DataFrame, we can store the data of this DataFrame in CSV format using API called to_csv (...) of Pandas

➤ Importing/Exporting Data between CSV files and DataFrames

- Pandas **read_csv()** function is used to import a CSV file to DataFrame format.

Syntax df.read_csv('file_name.CSV', header=None)

Here,

Header allows you to specify which row will be used as column names for your DataFrame. Expected int value or a list of int values. If your file does not have a header, then simply set header=None

- To export a Pandas DataFrame to a CSV file, use **to_csv** function. This saves a DataFrame as a CSV file.

Syntax to_csv(parameters)

CHAPTER-2

DATA VISUALIZATION

Revision Notes

➤ Data visualization is the presentation of data in graphical format. It helps people understand the significance of data by summarizing and presenting a huge amount of data in a simple and easy to understand format and helps communicate information clearly and effectively.

➤ **Plotting using Matplotlib**

- The Matplotlib Python library developed by John Hunter and many other contributors, is used to create high quality graphs, charts and figures.
- Matplotlib produces publication quality figures in a variety of hardcopy format and interactive environments across platforms. It can be used in Python scripts, the Python and IPython shell, web application servers and various graphical user interface toolkits.

- For installation of matplotlib in various operating system such as windows, Linux, MacOS, etc., use following command at command prompt :

```
Python -m pip install -U matplotlib
```

- Importing matplotlib

```
from matplotlib import pyplot as plt
```

OR

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

- Plotting using matplotlib provides a brief introduction to plotting in Pandas using matplotlib. The matplotlib API is imported using the standard convention.

- pyplot is a module in the matplotlib package. This module provides an interface that allows you to implicitly and automatically create figures and axes to achieve the desired plot.

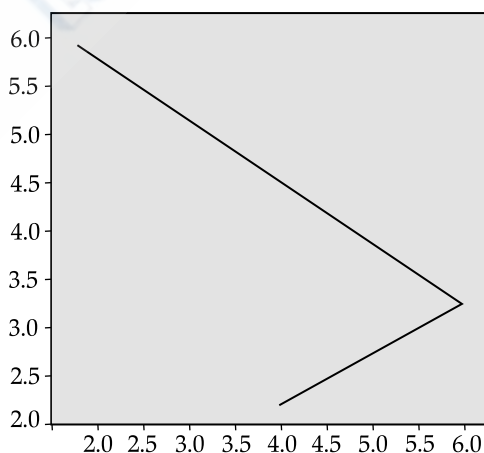
e.g.,

```
from matplotlib import pyplot as plt
```

```
plt.plot ([4, 6, 2], [2, 3, 6])
```

```
plt.show()
```

Output



➤ **Line Plot**

For all matplotlib plots, we start by creating a figure and an axes.

The figure (an instance of the class plt. figure) can be thought of as a single container that contains all the objects represented axes, graphics, text and labels.

The axes (an instance of the class `plt. axes`) is a bounding box with ticks and labels, which will eventually contain the plot elements that make up our visualization. If we want to create a single figure with multiple lines, we can simply call the plot function multiple times :

e.g. `import matplotlib.pyplot as plt`

`import numpy as np`

`fig = plt.figure()`

`ax = plt.axes()`

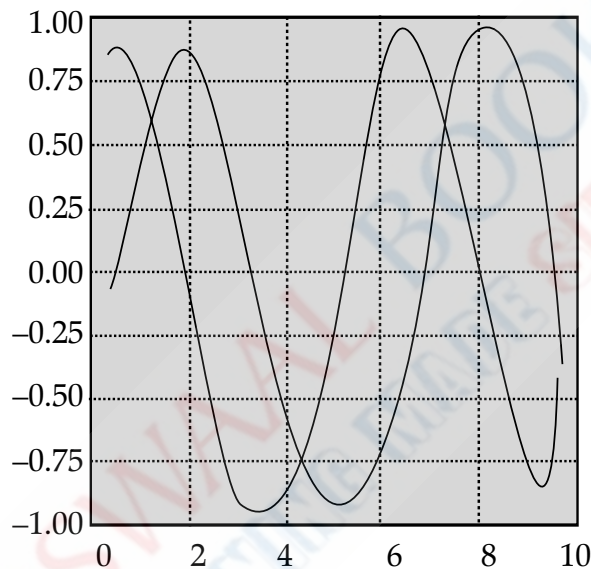
`x = np.linspace(0, 10,1000)`

`ax.plot(x, np.sin(x))`

`plt.plot(x, np.sin(x))`

`plt.plot(x, np.cos(x))`

Output



➤ Plotting Bar Graph

Categorical data can be represented in rectangular blocks with different heights or lengths proportional to the values. Such a type or representation is called a bar chart. The bar chart can be plotted vertically or horizontally.

A bar graph uses bars to compare data among different categories.

e.g.,

`from matplotlib import pyplot as plt`

`import numpy as np`

`plt.bar([0.25, 1.25, 2.25, 3.25, 4.25], [70, 50, 60, 75, 30],`

`label="Kiyaan",width=.5)`

`plt.bar([.75, 1.75,2.75,3.75,4.75],[75, 60, 50, 80, 93],`

`label="Shreya",color='r',width=.5)`

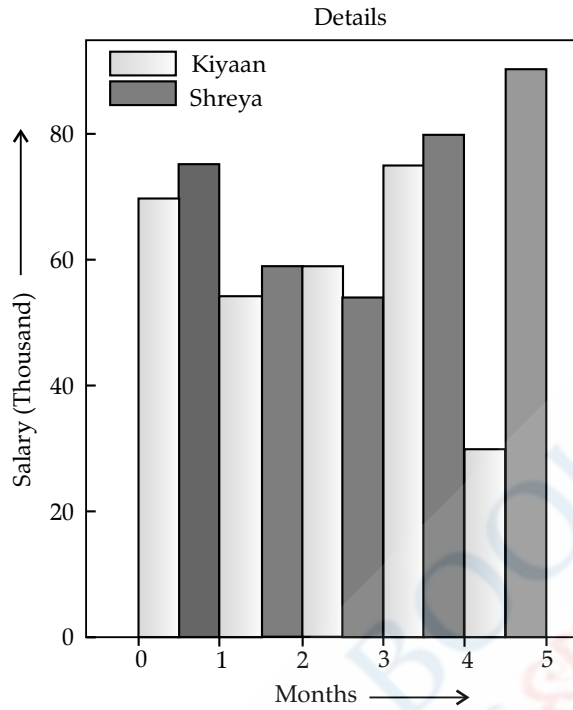
`plt.legend()`

`plt.xlabel('Month')`

`plt.ylabel('Salary (Thousand)')`

`plt.title('Details')`

Output

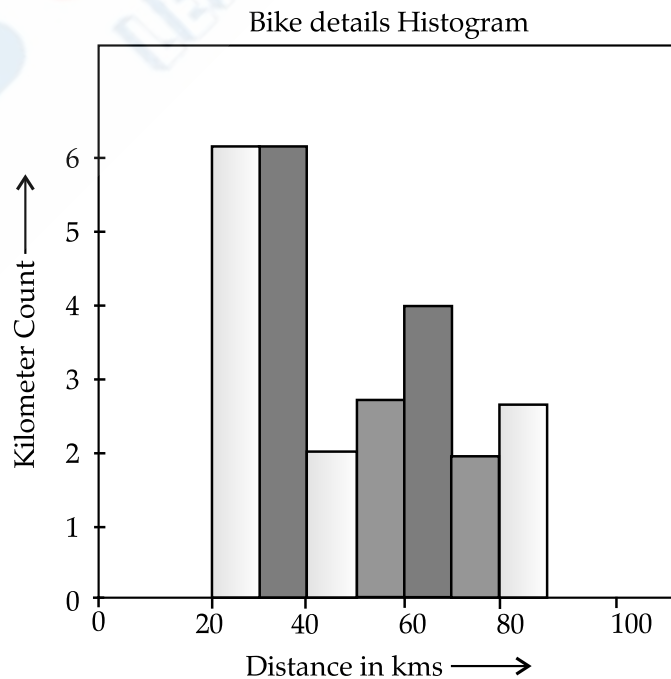


➤ **Plotting Histogram**

A histogram is an accurate representation of the distribution of numerical data. It uses rectangle to represent data. Histograms are used to show a distribution. A probability distribution can be estimated using a histogram plot.

```
import matplotlib.pyplot as plt
days = [50,80,70,80,40,20,20,20,70,20,60,20,80,50,40,50,20,60,60,60]
bins = [0,10,20,40,50,60,70,80,90,100]
plt.hist(days, bins, histtype='stepfilled', rwidth=0.88)
plt.xlabel('Distance in kms')
plt.ylabel('kilometer count')
plt.title('bike details Histogram')
```

Output



➤ Customizing Plots

You can customise the charts or graphs with proper details. The graph or plot should have a proper title, labels, legends etc.

- **Adding a title :** To add a title in chart or graph title () function is used.

Syntax

```
<matplotlib.pyplot>.title(title_string)
```

- **Adding Labels :** To set the labels for X-axis and Y-axis, xlabel() and ylabel() are used respectively.
- **Adding Legends :** When we plot multiple ranges on a single plot, it becomes necessary that legends are specified. To add legend to the plot, legend() function is used.

Syntax

```
<matplotlib.pyplot>.legend(loc = <string or position no>)
```

Know the Terms

- **Scatter plot :** It is a type of plot that shows the data as a collection of points.
- **Pyplot :** It is a collection of methods within matplotlib library which allows user to construct 2D plots easily and interactively.
- **MATLAB :** It is a high performance language for technical computing. It integrates computation, visualization, and programming in an easy to use environment where problems and solutions are expressed in familiar mathematical notations.
- **Pie-charts :** The chart is shaped in a circular form like a pie and each data point is represented by a certain percentage while taking a part of the pie that is shaped like a slice.
- **Title :** This is the text that appears on the top of the plot. It defines what the chart is about. The legend of a graph reflects the data displayed in the graph's Y-axis, also called the graph series.



UNIT-IV Societal Impacts

CHAPTER-3 SOCIETAL IMPACTS



TOPIC-1 Cyber Safety

Revision Notes

- Cyber safety is the act all about the responsible and safe use of Internet services by dealing with the risk which is associated using the Internet. This behaviour helps us to protect our personal information and minimize the danger online.
- When we use Internet we need to be careful about sharing our personal information. Share your personal information only with the trustworthy sources. If someone succeeds in stealing your personal information it could create great danger.
- **Digital Footprint**
 - Whatever a person be on internet creates his usage or we can say left a shadow behind of that activity and all these activities shadow creates your identity, this identity is called digital footprint. Digital footprint is nothing but the record of what a person do online.

- Digital footprint includes e-mail you sent, information you shared, websites you visited and the activities you took part online.
- Digital footprint is used for several reason for example marketers use your digital footprint to find out what kind of product you have interested and a interviewer what kind of activities the candidates perform online, it gives better idea about the candidate's personality.

Digital footprint is of two types :

1. **Active Digital Footprint** : When a user knowingly share the personal data in order to share information about the user by means of social networking digital platform.
e.g. when user makes a comment or post something on social media.
2. **Passive Digital Footprint** : When the personal data of the user in collected without letting him know or collection of personal data of user without the permission of him is known as passive digital footprint.
e.g. when user visits any website traces his physical location using user's device IP address.

➤ **How can you make your digital footprint positive?**

You can make your digital footprint positive by being little careful when you are surfing. You can do following things:

- Always check the content you post on web. If you are not careful about what you do online then there is the possibility of your negative digital footprint.
- Don't keep the attitude that you can do anything online and no one will come to know. This information can be fetched even without your permission. All the information stored in the form of cookies which can be accessed by the one who wants to get information about your digital footprint.
- You should always know what you exactly want because the confusion can create wrong footprint and can mislead the one who is looking for your digital footprint.

➤ **Advantage of digital footprint :**

Although when we hear the name digital footprint a negative image comes in our mind because it keeps the record of each and every activity of us, we do online. But digital footprint has so many advantages.

- Digital footprint makes our online experience friendly. Digital footprint decreases the complexity of the online world. Without digital footprint, our net surfing may not be easy as it is today.
- Digital footprint helps Google Ad Sense to serve as best. Using our digital footprint, Google Ad Sense provides us appropriate advertisement. If they haven't used our digital footprint this may happen that we are searching for job information and they feeding our search with railway booking information.
- These days most of the devices are GPS enabled which digital footprint, online maps provides you best route possible.

➤ **Net and communication etiquettes (Netiquettes)**

- Netiquette is a way to communicate over Internet. In real world, we use a manner to talk so that the exact meaning could successfully convey to the listener. On Internet, this manner is known as Netiquettes which help the user to get exact idea of what is said.
- Netiquettes makes the communication process successful because without it sender's message can be misinterpreted by the receiver though he will not be able to see the facial expression of the sender.
- Netiquettes makes the communication more effective by adding human emotion to it. By using netiquettes, sender can express what he was feeling while writing the post or message.
- Netiquettes help the user in establishing good relation with the other users because when use netiquettes he can express what he feels or what he wants to say.
- Netiquettes ensure careful word formation and also placing them at right place. These also ensure the correct use of emotions.

- Netiquettes help in making good digital footprint of yours. If you are applying netiquettes while taking to friends or other person then you are making good reputation of yourself.

Rules to follow for good netiquette are :

- Don't send same message again and again, it creates negative effect and irritate other people, no matter how good this message is.
- Always take permission of other person before sharing their personal information, photos etc. If you don't take permission before sharing the information, it is bad netiquette.
- Never make bad comments about anyone on social media, it will degrade your reputation and don't catch into fight on social media even try to avoid such situation.
- Never post abusive content on social media, it will create difficulty for you. Even your account can be terminated.

Do's	Don'ts
Keep messages and posts brief.	Post inflammatory/offensive comments.
Reread your posts or emails to make sure they say what you intend.	Write in ALL CAPS. It is considered as SHOUTING on the net.
Remember that you leave a digital footprint. So, be careful what you write.	Respond to internet trolls/personal attacks.
Use discretion.	Post private or embarrassing images/comments.
Include a subject line in an email.	Use sarcasm. It might be misinterpreted.
Protect personal information.	Violate copyright laws, Make sure your work is your own or properly cited.
Obey copyright laws.	Exclude people or talk behind their backs.
Stay focused and stick to the topic.	Spam others by sending large number of unsolicited e-mails.

➤ **e-mail Etiquettes**

- Write a clear, concise subject line that reflects the body of the e-mail. Avoid subject lines with general works like, "Hi", "Hello" and do not leave the subject line blank.
- Always use an appropriate greeting. Begin your e-mail with phrases such as Good Morning, Good Afternoon etc.
- Be aware that funny sayings or colloquialisms may be completely misconstrued by your colleagues in overseas offices.
- Always state if your e-mail needs an action and by when. Open-ended e-mails can be confusing. Having an action or even letting the recipient know that no further action is required is helpful.
- Don't hit reply all. It can be annoying to be copied into every email or to see every response in a chain if it is not relevant to your recipient.
- Never use inappropriate language in an e-mail. The reality is that your e-mail will remain on the server long after you have deleted it.

➤ **Data protection**

- It is the process of safeguarding important information from corruption, compromise or loss. In short, you should be able to decide whether or not you want to share some information, who has access to it, for how long, for what reason and be able to modify some of this information and more.
- A large part of a data protection strategy is ensuring that data can be restored quickly after any corruption or loss. Protecting data from compromise and ensuring data privacy are other key components of data protection. There are two key areas of data management used in data protection as.
 - Data life cycle management** is the process of automating the movement of critical data to online and offline storage.

- (ii) **Information life cycle management** is a comprehensive strategy for valuing, cataloguing and protecting information assets from application and user errors, malware and virus attacks, machine failure or facility outage and disruptions.

Purpose of data protection

Storage technologies that can be used to protect data include a disk or tape backup that copies designated information to a disk based storage array or a tape cartridge device so it can be safely stored. Mirroring can be used to create an exact replica of a website or files so they are available from more than one place. Storage snapshots can automatically generate a set of pictures to information stored on tape or disk, enabling faster data recovery while continuous data protection backs up all the data in an enterprise whenever a change is made.

Know the terms

- Cybersafety addresses the ability to act in a safe and responsible manner on the Internet and other connected environments.
- Digital footprint is data that is left behind when users have been online.
- Digital Tattoos: Digital footprints are also termed as Digital Tattoos.
- Netiquette is the short form of “internet etiquette” or communication etiquettes over the internet



TOPIC-2

Ethical-Issues

Revision Notes

- Intellectual Property
 - When someone owns a house or a motorcycle, we say that the person owns that property. Similarly, if someone comes out with a new idea, this original idea is that person’s intellectual property.
 - Intellectual property refers to the inventions, literary and artistic expressions, designs and symbols, names and logos. The ownership of such concepts lies with the creator or the holder of the intellectual property.
 - This enables the creator or copyright owner to earn recognition or financial benefit by using their creations or inventions.

Intellectual property is legally protected through copyright patents, trademarks etc.

- (i) **Copyright** : It grants legal rights to creators for their original works like writing, photograph, audio recordings, video, sculptures, architectural works, computer software, and other creative works like literary and artistic work.

Copyrights are automatically granted to creators and authors. Copyright law gives the copyright holder a set of rights, that they alone can avail legally. The rights include right to copy (reproduce) a work, right to create derivative works based upon it, right to distribute copies of the work to the public and right to publicly display or perform the work. It prevents others from copying, using or selling the work. For example, any writer holds the copyright to his book. It would be an infringement of the writer’s copyright if someone used parts of his book without permission. To use other’s copyrighted material, one needs to obtain a license from them.

- (ii) **Patent** : It is usually granted for inventions. Unlike copyright, the inventor needs to file for patenting the invention. When a patent is granted, the owner gets an exclusive right to prevent others from using selling or distributing the protected invention.

Patent gives full control to the patentee to decide whether or how the invention can be used by others. Thus it encourages inventors to share their scientific or technological findings with others. A patent protects an invention for 20 years, after which it can be freely used. Recognition and financial benefits right the environment and provide motivation for more creativity and innovation.

- (iii) **Trademark** : It includes any visual symbol, word, name, design, slogan, label etc., that distinguishes the brand or commercial enterprise, from other brands or commercial enterprise.

For example, no company other than ABC can use the ABC brand to sell shoes or clothes. It also prevents others from using a confusingly similar mark, including works or phrases.

➤ **Intellectual Property Rights (IPR)**

Intellectual Property Rights are the exclusive rights given to the person over his/her creation for specific time period. These rights allow the patents or owner to buy, sell, exchange their licensed goods to different people or organisations. Intellectual property rights are largely covered by laws governing to patents. Copyrights, industrial design rights, trademarks, plant variety rights, trade dress, geographical indications, circuit design rights and supplementary protection certificates for pharmaceutical products and database rights, etc.

➤ **Objectives of IPR**

The policy is a comprehensive document that lays down seven objectives which have been elaborated with actionable steps to be undertaken by the identified nodal ministry or department towards achieving objectives.

- (i) **IPR Awareness : Outreach and Promotion** — To create public awareness about the economic, social and cultural benefits of IPRs among all sections of society.
 - (ii) **Generation of IPRs** : To stimulate the generation of IPRs.
 - (iii) **Legal and Legislative Framework** : **To have strong and** effective IPR laws, which balance the interests of owners rights with larger public interest.
 - (iv) **Administration and Management** : To modernize and strengthen service oriented IPR administration.
 - (v) **Commercialization of IPRs** : Get value for IPRs through commercialization.
 - (vi) **Enforcement and Adjudication** : To strengthen the enforcement and adjudicatory mechanisms for combating IPR infringements.
 - (vii) **Human Capital Development** : To strengthen and expand human resources, institutions and capacities for teaching, training, research and skill building in IPRs.
- Intellectual Property laws and enforcement vary widely from jurisdiction to jurisdiction. Term 'open source' governmental efforts to harmonize them through international treaties such as 1994 World Trade Organisation (WTO) Agreement on Trade Related aspects of Intellectual Property Rights (TRIPs), while other treaties may facilitate registration in more than one jurisdiction at a time.
- With companies, institutions and individuals constantly forging ahead in newer fields and geographical territories and with path breaking inventions becoming the norm, the field of Intellectual Property rights has assumed primordial importance, especially in emerging economics like India.
- **Violation of IPR**

Violation of IPR may happen in one of the following ways :

1. **Plagiarism** : With the availability of Internet, we can instantly copy or share text, pictures and videos. Presenting someone else's idea or works as one's own idea or work is called plagiarism. If we copy some contents from Internet, but do not mention the source or the original creator, then it is considered as an act of plagiarism. Further, if someone derives an idea or a product from an already existing idea or product, but instead presents it as a new idea then also it is plagiarism. It is a serious ethical offense and sometimes considered as an act of fraud. Even if we take contents that are open for public use, we should cite the author or sources to avoid plagiarism.

Types of Plagiarism :

- (i) **Direct Plagiarism** is the word to word transcription of a section of someone else work without attribution and without quotation marks.
- (ii) **Self Plagiarism** occurs when a student submits his or her own previous work or mixes parts of previous work without permission from all professors involved.
- (iii) **Mosaic Plagiarism** occurs when a student borrows phrases from a source without using quotation marks.
- (iv) **Accidental Plagiarism** occurs when a person neglects to cite their sources or misquotes their sources.

Apart from these, other categories of plagiarism are as follows :

- **CLONE** : Cloning is the most problematic and common form of plagiarism.
- **Ctrl + C** : In this type of plagiarism, a particular portion of the text is copied from a single source without any alteration.
- **FIND-REPLACE** : Most common keywords of the copied content are changed.
- **REMIX** : Information from various sources are collected and mixed.

2. **Copyright Infringement** : Copyright infringement is when we use other person's work without obtaining their permission to use or we have not paid for it, if it is being sold. Suppose we download an image from the Internet and use it in our project. But if the owner of the copyright of the image does not permit its free usage, then using such image even after giving reference of the image in our project is a violation of copyright. Just because it is on the Internet, does not mean that it is free for use. Hence, check the copyright status of writer's work before using it to avoid plagiarism.
3. **Trademark Infringement** : Trademark infringement means unauthorised use of other's trademark on products and services. An owner of a trademark may commence legal proceedings against someone who infringes its registered trademark.

➤ **Software License**

It is a document that provides legally binding guidelines for the use and distribution of software. Software licenses typically provide end users with the right to one or more copies of the software without violating copyrights.

Types of Software License :

- (i) Proprietary license is a license where the copyright stays with the producer and the user is granted the right to use the software.
- (ii) GNU General Public License (GPL) which are agreements under which open source are usually licensed.
- (iii) End User License Agreement (EULA) indicates the terms under which the end user may use the software.
- (iv) Creative commons (CC) license is a public copyright license that enables free distribution of a copyrighted work.

Apache is the most popular web server software that enables a computer to host one or more websites. It is open source and free to use hence enabling web hosting companies to offer web hosting solutions at minimal costs.

- **Platforms supported by Apache** : Linux, Windows and Macintosh operating systems.
- Apache web server software is also known as Apache HTTP server.

➤ **Free and Open Source Software (FOSS)**

- FOSS has a large community of users and developer who are contributing continuously towards adding new features or improving the existing features.
- The term free indicates that the software does not have constraints on copyrights. The term 'open source' refers software development from expert developers collaborating worldwide without any need for reverse engineering. Free and open source software may also be referred to as Free/libre open source software (FLOSS) or free open source software (FOSS).
- One major reason for the growth and use of FOSS technology is because users have access to the source so it is much easier to fix faults and improve the applications. In combination with the open license, this simplifies the development process for many enterprises and gives them flexibility that simply is not available with the confines of a proprietary or commercial product.
- For example, Linux Kernel based operating systems like Ubuntu and Fedora come under FOSS. Some of the popular FOSS tools are office packages, like Libre office, browser like Mozilla Firefox etc.

Know the terms

- **Plagiarism** : It means copying someone else's work and then passing it off as one's own.
- **License** : It is the permission granted by the holder of a copyright to another to use an original work.
- **OSS** : An OSS (open source software) refers to freedom to use, share and/or modify the source code and allow copyrights to other users.
- **Free and Open Source Licence** : It refers to a software that users can safely run, adapt and redistribute without legal restraint, and which emphasizes on freedom.
- **Shareware** : Shareware are copyrighted software that can be shared for a limited on a trial basis with the understanding that if the user decides to use it, he will pay for it.
- **Copyleft Licenses** : It allows modification and distribution of software with source code.



TOPIC-3

Cyber Crime and IT Act

Revision Notes

➤ Cyber Crime

- Criminal activities or offences carried out in a digital environment can be considered as a cyber crime. In such crimes, either the computer itself is the target or the computer is used as a tool to commit a crime.
- Cyber crimes are carried out against either an individual or a group or an organisation or even against a country, with the intent to directly or indirectly cause physical harm, financial loss or mental harassment. A cyber criminal attacks a computer or a network to reach other computers in order to disable or damage data or services.
- Apart from this, a cyber criminal may spread viruses and other malwares in order to steal private and confidential data for blackmailing and extortion. A Computer virus is a type of malicious code that can copy itself and can have detrimental effect on the computers, by destroying data or corrupting the system.
- Similarly, malware is a software designed to specifically gain unauthorised access to computer systems. The nature of criminal activities are alarmingly increasing day by day, with frequent reports of hacking, ransomware attacks, denial of services, phishing, e-mail fraud, banking fraud and identity theft.

1. Hacking

Hacking is the act of unauthorised access to a computer, computer network or any digital system. Hackers usually have technical expertise of the hardware and software.

They look for bugs to exploit and break into the system.

Hacking, when done with a positive intent is called ethical hacking. Such ethical hackers are known as white hat hackers. They are specialists in exploring any vulnerability or loophole during testing of the software. Thus, they help in improving the security of a software. An ethical hacker may exploit a website in order to discover its security loopholes or vulnerabilities. He then reports his findings to the website owner. Thus, ethical hacking is actually preparing the owner against any cyber attack.

A non-ethical hacker is the one who tries to gain unauthorised access to computers or networks in order to steal sensitive data with the intent to damage or bring down systems. They are called black hat hackers, or crackers. Their primary focus is on security cracking and data stealing. They use their skills for illegal or malicious purposes. Such hackers try to break through system securities for identity theft, monetary gain, to bring a competitor or rival site down, to leak sensitive information etc.

2. Phishing and Fraud e-Mails

Phishing is an unlawful activity where fake websites or e-mails that look original or authentic are presented to the user to fraudulently collect sensitive and personal details, particularly user names, passwords, banking and credit card details. The most common phishing method is through e-mail spoofing where a fake or forged e-mail address is used and the user presumes it to be from an authentic source. So you might get an e-mail from an address that looks similar to your bank or educational institution, asking for your information, but if you look carefully you will see their URL address is fake. They will often use logos of the original website, making them difficult to recognise if it is real or fake. Fraud phone calls or text messages are also common these days.

(i) **Identity Theft** : Identity thieves increasingly use personal information stolen from computers or computer networks, to commit fraud by using the data gained unlawfully. A user's identifiable personal data like demographic details, e-mail Id, banking credentials, passport, PAN, Aadhaar number and various such personal data are stolen and misused by the hacker on behalf of the victim. This is one type of phishing attack where the intention is largely for monetary gain. There can be many ways in which the criminal takes advantage of an individual's stolen identity. Given below are a few examples :

- **Financial identity theft** : When the stolen identity is used for financial gain.

- **Criminal identity theft** : Criminals use a victim's stolen identity to avoid detection of their true identity.
- **Medical identity theft** : Criminals can seek medical drugs or treatment using a stolen identity.

3. Ransomware

This is another kind of cyber crime where the attacker gains access to the computer and blocks the user from accessing, usually by encrypting the data. The attacker blackmails the victim to pay for getting access to the data or sometimes threaten to publish personal and sensitive information or photographs unless a ransom is paid.

Ransomware can get downloaded when the user visit any malicious or unsecure websites or download software from doubtful repositories. Some ransomware are sent as an e-mail attachments in spam mails. It can also reach our system when we click on a malicious advertisement on the Internet.

➤ **Combatting and Preventing Cyber Crime**

The challenges of cyber crime can be mitigated with the twin approach of being alert and taking legal help. Following points can be considered as safety measures to reduce the risk of cyber crime :

- Take regular backup of important data
- Use an antivirus software and keep it updated always
- Avoid installing pirated software. Always download software from known and secure (HTTPs) sites.
- Always update the system software which include the Internet browser and other application software.
- Do not visit or download anything from untrusted websites.
- Usually the browser alerts users about doubtful websites whose security certificate could not be verified, avoid visiting such sites.
- Use strong password for web login, and change it periodically. Do not use same password for all the websites. Use different combinations of alphanumeric characters including special characters. Ignore common words or names in password.
- While using someone else's computer, don't allow browser to save password or auto fill data and try to browse in your private browser window.
- For an unknown site, do not agree to use cookies when asked for, through a Yes/No option.
- Perform online transaction like shopping, ticketing, and other such services only through well known and secure sites.
- Always secure wireless network at home with strong password and regularly change it.

➤ **Cyber Bullying**

- Cyberbullying or bullying that takes place over digital devices like cell phones, computers and tablets. Cyberbullying can occur through SMS, text and apps or online in social media, forums or gaming where people can view, participate or share content.
- Cyberbullying includes sending, posting or sharing negative, harmful, false or mean content about someone else. It can include sharing personal or private information about someone else causing embarrassment or humiliation. Some cyberbullying crosses the line into unlawful or criminal behaviour.

The most common places where cyberbullying occurs are :

- Social media such as Facebook Instagram, Snapchat and Tik Tok (Now tiktok is are banned in India).
- Text messaging and messaging apps on mobile or tablet devices.
- Instant messaging, direct messaging and online chatting over the Internet.
- Online forums, chat rooms and message boards such as Reddit
- e-Mail
- Online gaming communities eg. MUDS (Multi-User Dungeons)

➤ **Cyber Law**

It is any law that applies to the Internet and Internet related technologies. Cyber law is one of the newest areas of the legal system. This is because Internet technology develops at such a rapid pace.

Cyber law provides legal protections to people using the Internet. This includes both businesses and everyday citizens. Understanding cyber law is of the utmost importance to anyone who uses the Internet. Cyber law has also been referred to as the “law of the Internet”.

➤ **Importance of Cyber law**

- It covers all transaction over Internet.
- It keeps eyes on all activities over Internet.
- It touches every action and every reaction is cyberspace.

➤ **Evolution of Cyber law in India**

With an increase in the dependency on the use of technology, the need for cyber law was necessary. Much like every coin has two sides, therefore, the dependency on technology has its pros and cons. The rise of the 21st century marked the evolution of cyberlaw in India with the **Information Technology Act, 2000** (popularly known as IT Act). The very first cybercrime was recorded in the year 1820.

➤ **India Information Technology Act (It Act)**

With the growth of Internet, many cases of cyber crimes, frauds, cyber attacks and cyber bullying are reported. The nature of fraudulent activities and crimes keeps changing. To deal with such menaces, many countries have come up with legal measures for protection of sensitive personal data and to safeguard the rights of Internet users.

The Parliament of India passed its first Cyber law the Information Technology (IT) Act, 2000, on the 17th October 2000, which provides the legal infrastructure for e-commerce in India. The purpose of the IT Act, 2000, as mentioned in the language of the Act is :

to provide legal recognition for transaction carried out by means of electronic data interchange and other means of electronic communication, commonly referred to as “electronic commerce”, which involves the use of alternative to paper based methods of communication and storage of information, to facilitate electronic filing of document with the Government agencies and further to amend the Indian Penal Code, the Indian Evidence Act, 1872, the Banker’s Book Evidence Act, 1891 and The Reserve Bank of India Act, 1934 and for matters connected therewith or incidental thereto.

The General Assembly of the United Nations, by its resolution A/RES/51/162 dated 30th January 1997, adopted the Model Law on Electronic Commerce adopted by the United Nations Commission on International Trade Law. The same resolution recommends among other things that all states give favourable consideration to the Model Law when they enact or revise their law, keeping in mind the need for uniformity of law pertaining to alternatives to paper-based methods of communication and storage of information. The Indian Information Technology Act, 2000, accordingly draws upon the Model Law.

The implementation of this Act has kick-started a new era of e-governance and will have a lot of impact on the way people do business in India and will also open up new opportunities for E-business as people would be less apprehensive about the legal hassles and issues not under the jurisdiction of law, e.g. authenticity of legal document, hacking, digital signatures and so on.

Therefore, it is essential for us to understand what the IT Act offers and what are its various perspectives.

The Government of India’s Information Technology Act, 2000 amended in 2008, provides guidelines to the user for the processing, storage and transmission of sensitive information. In many Indian states, there are cyber cells in police stations where one can report any cyber crime. The act provides legal framework for electronic governance by giving recognition to electronic records and digital signatures.

➤ **Highlights of IT ACT, 2000**

For a basic understanding of the IT Act by the layman, the salient features of the Act and its relevant portion of an e-business are enumerated below:

- Electronic contracts are legally valid – EDI accorded legal recognition.
- Legal recognition according to digital signature.
- Digital signature to be affected by use of asymmetric crypto system and hash function.

- Security procedure for electronic records and digital signature.
 - Appointment of Certifying Authorities (CAs) and the Controller of Certifying Authorities (CCA) including recognition of foreign Certifying Authorities.
 - Controller to be appointed, who will act as repository of all digital signature certificates.
 - Certifying Authorities require to get license to issue digital signature certificates.
 - Various types of computer crimes defined and stringent penalties provided under the Act.
 - Appointment of Adjudicating Officer for holding enquiries under the Act.
 - Establishment of Cyber Appellate Tribunal under the Act.
 - Appeal from order of Adjudicating Officer to Cyber Appellate Tribunal and not to any civil court.
 - Appeal from order of Cyber Appellate Tribunal to High Court.
 - Act to apply for offences or contraventions committed outside India.
 - Network Service providers not to be liable in certain cases.
 - Power to Police officers and other officers to enter into any public place and search and arrest without warrant.
 - Constitution of Cyber Regulations Advisory Committee to advise the Central Government and Controller.
 - Amendments effected in :
 - (a) Indian Penal Code
 - (b) Indian Evidence Act
 - (c) Banker's Books Evidence Act
 - (d) Reserve Bank of India Act
- **Some of the important concepts introduced in the IT ACT,2000 are :**
- Electronic record
 - Secure electronic record
 - Digital signature
 - Secure digital signature
 - Certifying authority
 - Digital signature certificate.
- **Some of section under it act 2000 are given below :**

Section	Offence	Penalty
67A	Publishing images containing sexual acts.	Imprisonment up to seven years, or/and with fine up to Rs. 1,000,000
67B	Publishing child porn or predating children online.	Imprisonment up to five years, or/and with fine up to Rs. 1,000,000 on first conviction. Imprisonment up to seven years, or/and with fine up to Rs. 1,000,000 on second conviction.
67C	Failure to maintain records.	Imprisonment up to three years, or/an with fine.
68	Failure/refusal to comply with orders.	Imprisonment up to three years, or/and with fine up to Rs. 200,000
69	Failure/refusal to decrypt data	Imprisonment up to seven years and possible fine.
70	Securing access or attempting to secure access to a protected system	Imprisonment up to ten years, or/an with fine.
71	Misrepresentation	Imprisonment up to two years, or/an with fine up to Rs. 100,000



TOPIC-4

Technology and Society

Revision Notes

➤ e-Waste Management

- In most part of the world, underground water is not drinkable directly. Long ago, people simply used to draw up water from wells and drink it. But now, you have to use some sort of filter to purify the water and make it drinkable. Why? It is just one of the many problems and hazards of e-waste. The electronic devices, dead cells and batteries you throw away with other garbage contains lead that easily mixes with underground water, making it unfit for direct consumption. That is just the tip of the iceberg – the problems of e-waste disposal.
- This word has caught up in the recent past only when someone studying the subject noted that our environment will be 3x more congested with e-waste by 2017. E-waste is growing in huge volumes. The reason why e-waste is increasing is that technology is growing fast and in an attempt to get better devices, we casually get rid of old electronics – the best examples being that of smart-phones.
- One may ask the relationship between old electronics and e-waste. e-waste is actually the old electronic goods that people simply give away to garbage trucks that are then dumped into landfill or similar sites. Electronics have a number of harmful elements that react with air and water to create problems of e-waste such as water, air and soil pollution as well as problems that affect human beings in the form of diseases.
- In the above example, we used old cells and batteries as an example. Most of the cheaper batteries are lead based and easily react with water (rain or moisture) to seep and mix with underground water along with polluting the soil and air where it was disposed by the garbage department.
- Thus, everything that falls into electronics category, that you intend to throw away, is e-waste (electronic waste). This includes computers, laptops, tablets, smart-phones and so on. There are proper methods to dispose off electronic items. They should be handled differently, but unfortunately, even the developed countries do not have strong policies to take care of such harmful, toxic garbage.
- The solder present on the motherboard of computers and TV contain high levels of lead. Even the glass panels of computer monitors and of course, the lead batteries contaminate air, water, and soil. In addition, they distort the process of brain development, while posing danger to central nervous system and kidneys. This (lead poisoning) is among the most dangerous hazards of e-waste.
- Other than lead, motherboards also have high levels of Mercury. Improper disposal may create skin and respiratory disorders. Mercury poisoning also causes acute brain damages.
- The cables and PVC panels as well as glass, when reacts with moisture and oxygen, creates hazardous soil that may not be suitable for even building a home as the people breathing that air will suffer from reproduction and proper development of body parts, including the brain. It also spoils the immune system. Stress, anxiety, and other mental problems that can arise out of breathing air polluted with glass, PVC and other forms of plastic remains found in electronic items.
- The motherboard circuits can cause lung cancer when you breathe air polluted by the fumes released when the motherboard elements react and create Beryllium. It is also responsible for skin diseases, including warts and certain forms of dangerous allergies.

➤ Treating e-Waste

- As of now, there are no proper methods being implemented even in the first world to eliminate the problem of e-waste. The two methods that found interesting for proper treatment of e-waste are recycling and refurbishing.
- For recycling, there may be products that cannot be recycled completely. PVC layers, for example, stay as such for ages and cannot be recycled. It would be better if the manufacturers use recyclable material so that the e-waste is converted into something that can be used again without harming the planet and its inhabitants. Thus, one of the major factors in treating e-waste is to compel manufacturers to use green elements.
- If electronics are refurbished, they can be sold again at a lower price. Thus, both the society and environment will be benefited. Instead of simply dumping your old TV into the garbage bin, you might want to think

about calling the vendor and ask him where to present the item for refurbishing. If you cannot find, consider donating the item to some charity that can either use it as such or get it repaired and use it. I do not think it is a practice well implemented, but it would be nice if all vendors provide a refurbishing facility.

➤ Proper disposal of used electronics gadgets

- Following are the proper steps to dispose e-waste.
 1. Some companies will offer free take back services. Nokia and Lenovo in China are on the forefront of free take back services.
 2. The minamata Convention is a worldwide effort to discontinue the use of mercury in health care by the year 2020. Thermometers and sphygmomanometer are being replaced by newer and safer health care apparatuses. However old school physicians still like the classical mercury sphygmomanometer which is way they still remain on the market. Health care facilities will have to make sure about the exact life span of medical equipment prior to purchase and how to dispose when they expire. Minamata Convention is able to trace mercury substances from the beginning of its production till its disposal.
 3. There is a movement to prohibit the export of second hand electronics to Africa. This will have a major impact on the ability of developing countries of reaching the goals of the United Nations Millennium Development. Even though technically the problem is not with the equipment it is with the lack of e waste regulation.

There is also a new company called, East African Compliant Recycling. It is a full scale e waste recycling plant that will be launched in Nairobi, Kenya. This plant will be the model that will eventually be used throughout Africa. Not only will it prevent unsafe waste disposal for the environment and the people, but it will create jobs and recover valuable materials that can be sold and reused.

4. It is also crucial for America to learn from Japan. This country has been in the forefront of e waste management. Already in the 1990's, Japan was the first country to enact e waste laws. The Japanese model has been admired by Russia as well. Japan recycles more than 2 million tons of e waste each year. As opposed to America with only 679,000 tons annually. In 2000, Japan introduced , the Manifest System. This procedure beings tracking e waste form the time it leaves the facility where it was produced initially until it reaches the e final e waste facility. No other country has this cradle to grave system yet.

According to the Department of Japanese Studies, Japan is the most environmentally aware country in the world. Chris McMoran stated that the reason that Japan is one on the cutting edge of this e waste management is due largely to its tragic history with industrial waste as well as pollution during the decades immediately post war.

Reusable metals in Japan are being recycled in very practical ways. Instead of spending money importing these rare metals why not retrieve them and send them back to a factory in Japan to be used productively again ? The bottom line is money talks. Even though Japan is being praised for being at the forefront of the worldwide "green" campaign, it is more the profit motive than the love of nature that is the catalyst.

It is compulsory to recycle items such as automobiles, computers and other electronic equipments in Japan. it impels recycling by imposing strict laws on both the consumers themselves and the manufacturers or electronic components.

As notes, not only is e waste recycling a green conscious effort, it is also motivated by profit. The revenue is expected to bring in one trillion yen by the year 2020.

5. We must help developing countries improve the working conditions for all e waste workers so that they will properly protected. One hundred percent elimination of child labour in this industry paramount.
- Instead of automatically buying a new PC, consider upgrading software or hardware on your present computer. Search for charity organizations in your vicinity that may want your old electronics. There are local electronic donations centres in most towns.

➤ Awareness about health concerns related to the usage of technology

As digital technologies have penetrated into different fields, we are spending more time in front of screens, be it mobile, laptop, desktop, television, gaming console, music or sound device. But interacting in an improper posture can be bad for us-both physically and mentally. Besides, spending too much time on the Internet can be addictive and can have a negative impact on our physical and psychological well being.

Here are a few key considerations around technology use and how it affects our health :

- (i) **Eyes strain** : When we gaze at a screen for long periods of time, we often forget to blink. In fact, research has shown that digital eye strain reduces our blink rate by half, which means the tears that protect our eyes

evaporate without being replaced. Additionally, reading the smaller fonts on a smartphone or other portable device can intensify the strain.

- (ii) **Sleep Disorders** : We loves our devices so much that many of us even sleep with them. One study found that 72% of smartphone owners keep their phone next to their bed at night to ensure they do not miss a thing. It might seem like a harmless habit but late night technology use can interfere with your ability to sleep.

To avoid sleep disruption, try replacing late night technology use with sleep conducive activities such as taking a bath or reading in bed. Resisting the urge to keep your phone on your nightstand can also help minimize nighttime interruptions.

- (iii) **Physical Inactivity** : When we are using technology like computers, video games or TVs, we generally are not exercising. That's why there's an increasing body of research linking the overuse of digital devices to decreasing exercise and fitness levels.

Logically, spending more time on watching TV or playing video games reduces the time you spend staying active.

- (iv) **Mental Health** : More than three billion people interact with each other over social media every day. While many of our exchanges are generally harmless, over-using these services can impact our well being. Social media addiction is linked to a rise in mental health disorders like depression, suicidal ideation, particularly in teenagers. Researchers mode that correlation by highlighting how platforms like Facebook, Instagram and Twitter place higher social pressures on young people and adults that can lead to instances of cyberbullying, increased need for approval and general feelings of discontent.

➤ e-Waste management Rules in India

The Environment, Forest, and Climate Change Ministry (MoEF&CC) have announced the E-Waste Management Rules 2016. These new rules replaced the earlier E-Waste (Management and Handling) Rules of 2011.

The New Rules make for stricter norms and are a part of the government's increased commitment towards environmental governance.

Highlight of the new e-Waste Management Rules 2016 :

1. It includes CFLs or Compact Fluorescent Lamps as well as other lamps with mercury, and similar equipment.
2. The Rules for the first time, bring producers under the ambit to the Extended Producer Responsibility or EPR together with the targets.
3. Producers have been made accountable for e-waste collection and e-waste exchange as well.
4. Additional stakeholder included are :
 - (a) Manufacturers
 - (b) Dealers
5. Compact Fluorescent Lamp (CFL) and other mercury-containing lamps have been brought under the purview of the rules.

India's Environment Ministry has notified rules targeting the wide range of groups like hotels, residential colonies, bulk producers of consumer goods, ports, railway stations, airports and pilgrimage sports. This is to ensure that the solid waste generated in their facilities is treated and recycled.

Know the Terms

- PCB – Pollution Control Board
- ICT – Information and Communication Technology
- EPA – Environmental Protection Agency
- PVC – Polyvinyl Chloride
- UNDP – United Nations Development Program
- GHE – Green House Effect
- CFC – ChloroFluoroCarbon
- CRT – Cathode Ray Tube
- TFT – Thin Film Transistors
- LED – Light Emmited Diode

