Data Science:

1. Collection of information, facts. Text, image. Audio, social media posts are some forms of data.
2. Data scientists transform raw data into actionable insights by extracting meaning information from data.

Types of data:

1. Structured data: Structured data has specific format. They are in the tabular format (rows and columns), organized table e.g., spreadsheets, excel etc.
2. Unstructured data: Those data that does not have specific tabular format. They can be in the form of Jason file, pdf, jpg etc. Images, audio, visuals and social media posts are the examples of unstructured data.
3. Semi-structured data: It is the combination of structured and unstructured data. Email is an example of semi-structured data. Senders and recipient’s address, CC, subject line are the structured data in email whereas content (images and text) and attachments are unstructured data.

AI:

1. It is the broader concept of mimicking or simulation of the intelligence or behavioral patterns of the human being.
2. It is more of a concept that give theories, theorems and tells what needs to be followed.

ML:

1. It can be considered as the implementation of AI. It focuses on enabling the machines to learn from data and improve their performance over time without being explicitly programmed.
2. Instead of programming specific rules, you provide a machine learning algorithm with data and let it discover patterns, relationships and insights on its own.
3. It is useful for average size of data and average size of computation.
4. Methods can be either supervised, unsupervised or semi-supervised.

DL:

1. It is a subset of machine learning that uses neural networks with multiple layers. Some examples are image and speech recognition, NLP, and playing complex games.
2. Convolutional Neural Networks for images and Recurrent Neural Networks for sequences are examples of deep learning architectures.

Artificial Neural Network (ANN):

1. It is a computational model inspired by the structure and functioning of biological neural networks, which are the intricate networks of interconnected neurons in the human brain.
2. Overall, it mimics the information processing and learning mechanisms of the human brain.

Computer Vision:

1. It is concerned with the automatic extraction, analysis and understanding of useful information from a single image or a sequence of images.
2. Visual analysis is done with computer vision system. For example: face recognition, diseases (cancer cell identification), image generation, self-driving cars etc.
3. Cameras in malls, traffic, they can capture any fast images.

NLP:

1. It focuses on enabling computers understand, interpret, and generate human language in a wat that is both meaningful and contextually relevant.
2. Goal is to bridge the gap between human communication and computer understanding.
3. Example: speech recognition, language generation (chatbots, automated content creation), google translator, sentiment analysis for market research (determining the emotional tone or sentiment expressed in a piece of text), question answering, Language modeling (building statistical models of language to predict the likelihood of a word or phrase given the preceding words), virtual assistants.

Python:

1. Python is a high-level general purpose programming language.
2. It has comprehensive standard library (batteries -included).
3. It supports multiple programming paradigms, including structured (particularly procedural), object-oriented and functional programming.
   1. Multiple programming paradigm: It means that it is a versatile programming language that allows developers to use different approaches and styles of programming to solve problems.
   2. Procedural programming: In this paradigm you organize your code into procedures or functions that perform specific tasks. Python supports this style by allowing you to define and call function in structured manner.
   3. Dynamic typing: Python’s dynamic typing system allows you to change the type of a variable during runtime, making it flexible and suitable for rapid development and prototyping.
   4. Functional programming: Python supports functional programming concepts like first-class functions, higher-order functions, and lambda expressions. You can write a code in a functional style, treating functions as first-class citizens and utilizing concepts like map, filter, and reduce.
   5. Object-oriented programming (OOP): It is a fully object-oriented language, which means you can define and manipulate classes and objects. It supports concepts like encapsulation, inheritance, and polymorphism, allowing you to create modular and reusable code.
      * + 1. Class: It is a blueprint or template for creating objects. It defined the properties (attributes) and behaviors (methods) that objects of that class will have.

Example: The car class has attributes ‘brand’ and ‘model’ as well as methods ‘start engine’ and ‘stop engine’. Method is a function defined within a class.

* + - * 1. Object: An object is an example of a class. Objects represent individual entities with distinct characteristics.

1. It consistently ranks as one of the most popular programming languages.

Features:

1. Open source and free: We don’t have to pay, and anybody can contribute to the enhancement of that language.
2. Large Standard Open-Source Library: Collection of code and resources that are freely available for anyone to use, modify, and distribute. Some examples: NumPy, Pandas, Matplotlib etc.
3. Large community support: Python community is very rich community, and it provides upgrade regularly. Every 6 or 8 month there is new release of python. Companies contribute in the form of libraries. TensorFlow is provided by google free of cost. Every new update is available for free to users.
4. Easy to Learn: It has a comprehensive standard library, and it has large community that creates guides and documentation making it easier for new users to find help and resources.
5. Readable language: Readable error messages, it provides clear, informative explanations when something goes wrong. English like keywords-its keywords are chosen to resemble natural language constructs.
6. Extensible and Embeddable: Python has ability to easily integrate and work with code written in other languages (C and C++). If we have a software which is outdated one, and Python provides libraries for that, and that same software can be connected to python. It means any old system can be revived. Refers to the ability of a software system or technology to be easily expanded or enhanced with new features.

Embeddability: the ability of a language to be seamlessly integrated into or “embedded” within applications written in another language. This enables developers to use Python as a scripting or automation tool within their existing applications. Ability of a software component or technology to be seamlessly integrated into another software application or system.

1. Interpreted language: It will interpret the code one by one and it will give error line by line.
2. Dynamically Typed Language: There is no need to declare the variable. We don’t have to declare the type of variable while assigning a value to a variable.
   1. Benefit of dynamically typed language: Ease of development, often requires fewer lines of code this can lead to faster development.
   2. Makes less cluttered and easier to read.
3. Platform Independent: It is a programming language that can run on multiple computer platforms or operating systems without significant modifications to the code. If you are developing some code in one OS than same set of code can be used in Linux or any other OS.
4. OOP Programming Paradigm:
5. Garbage Collection: Whenever we are using multiple variables in a program, if some variables are used only one time or not used many times, python helps to garbage those type of variable so the memory can be freed.
6. GUI Support: In python we can create GUIs using various libraries that provides tools for designing and building graphical user interfaces. GUIs are commonly used for desktop applications, software tools, games, and other programs where visual interaction is important.

Applications of Python Language:

1. Automation
2. Computer networking
3. Data analytics
4. Databases
5. Documentation
6. Graphical user interfaces
7. Image Processing
8. Machine Learning
9. Mobile apps
10. Multimedia
11. Scientific computing
12. System administration
13. Test frameworks
14. Text processing
15. Web frameworks
16. Web scrapping

Python Variable: It is a named location/symbolic name in memory used to store data values. To assign value to the variable we use the assignment operator “=”. We can also reassign the value of a variable.

Valid/Invalid Variable:

1. Anything starting with alphabet (a-z, A-Z) is valid variable name.
2. Other than underscore (‘\_’ ) symbol no other symbol/special characters or number can be used for stating variable name.
3. Variable name cannot start with number, but numbers can be used in between variable names.
4. Variable names with space are invalid.

Standard Data Type:

1. Integer: Represents whole number both positive and negative.
2. Floating: Represents Decimal numbers
3. String: Represents sequences of characters enclosed in single, double, or triple quotes.
4. Boolean: Represents the values ‘True’ or ‘False’ often used in logical operations and conditional statements. For example: permission access,
5. List: Represents an ordered collection of elements. Lists can contain elements of different data types. [] List can contain duplicate elements.
6. Tuple: Similar to lists, but immutable (cannot be changed after creation). (). Tuples are fixed in size.
7. Dictionary (dict): Represents a collection of key-value pairs, where keys are unique identifiers for values. Ex: {grade: A}
8. Set: Represents an unordered collection of unique elements. {}
9. None: Represents the absence of value or null value.
10. Range: Represents an immutable sequence of numbers. Range (1,6) #Represents [1,2,3,4,5]

Question:

1. Extensible and embeddable feature of python.