

Conceptual Understanding (Report)

1. Difference between AI, Machine Learning, Deep Learning, and Data Science

- **Artificial Intelligence (AI):**
AI is the broad field of making machines mimic human intelligence. It focuses on enabling computers to think, reason, and make decisions like humans.
Example: A self-driving car using sensors and rules to drive safely.
 - **Machine Learning (ML):**
ML is a subset of AI that teaches machines to learn from data and improve their performance over time without being explicitly programmed.
Example: Email spam filters that learn to classify emails as spam or not based on past data.
 - **Deep Learning (DL):**
DL is a specialized area of ML that uses neural networks with many layers to handle complex tasks such as image recognition, speech, and natural language.
Example: Face recognition in smartphones (detecting and unlocking with your face).
 - **Data Science (DS):**
Data Science is about collecting, cleaning, analyzing, and interpreting data to extract insights and make decisions. It often uses AI and ML tools.
Example: Netflix analyzing user watch history to recommend new shows.
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2. Mutable vs Immutable Data Types

- **Mutable data types:** These can be changed after creation (you can modify their contents without creating a new object).
Examples in Python: lists, dictionaries, sets.
Example: A shopping cart (list) where you can add or remove items.
 - **Immutable data types:** These cannot be changed once created. Any modification creates a new object.
Examples in Python: strings, tuples, integers.
Example: A movie ticket number (string) – once printed, it cannot be changed.
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3. Deep Copy vs Shallow Copy

- **Shallow Copy:** Creates a new object, but references the same elements inside it. Changes to nested objects affect both copies.
Example: Copying a library catalog but still pointing to the same set of books – if one book changes, both catalogs show the change.
 - **Deep Copy:** Creates a completely independent copy of the object and all nested elements. Changes in one copy don't affect the other.
Example: Copying a library catalog along with brand new books – changes in one library don't affect the other.
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4. Git Branching and its Importance

- **Git Branching:** A feature that allows developers to create separate lines of development within the same repository. Each branch can be used for new features, bug fixes, or experiments without affecting the main codebase.
- **Why it is important in collaborative development:**
 1. Developers can work on features independently without conflicts.
 2. The main branch (e.g., main or master) remains stable.
 3. Easier to test and review code before merging.
 4. Reduces risk of breaking the project.

Example: In a team building a website, one developer works on the login feature in a separate branch, another works on the payment system in another branch, and later both branches are merged into the main project.