Trends in Computer Science
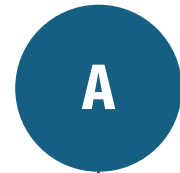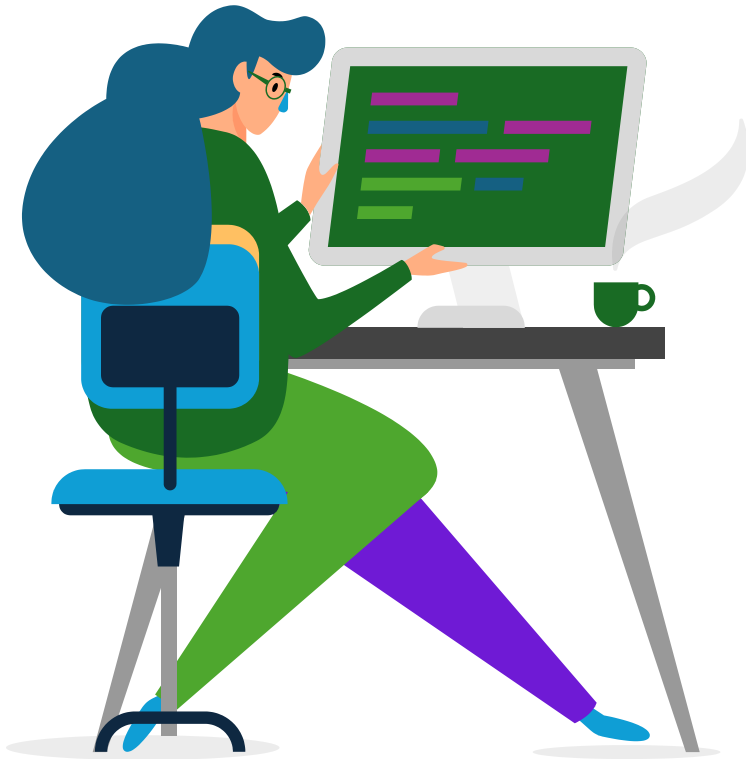
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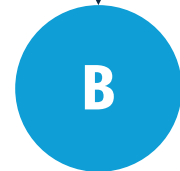# Machine Learning

Group 26 – 6

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Table of Content

Overview of Machine Learning

❖ Machine learning is a subcategory of artificial intelligence that focuses on building systems from data.

❖ It is used in various industries, such as predicting customer buying patterns and detecting malware threats in self-driving cars.

A

Comparison With Conventional Computing
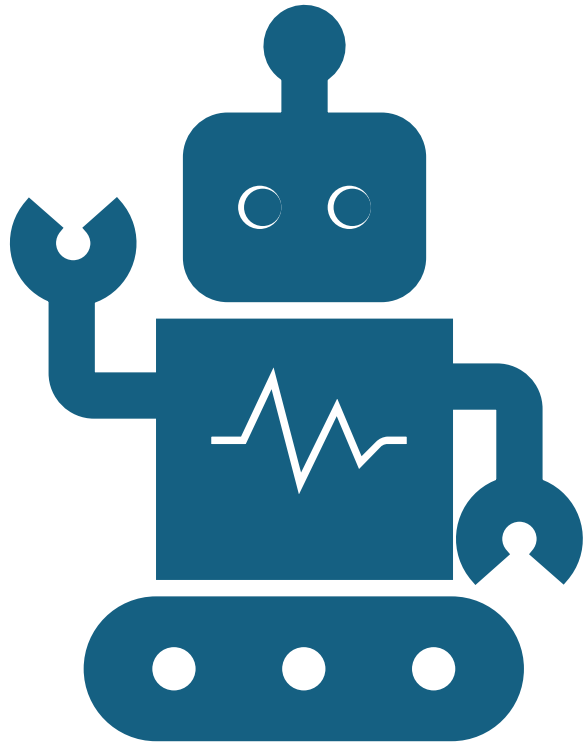
What is Machine Learning ?

❖ Machine learning algorithms require billions of past data inputs, making them powerful tools for problem-solving and business process automation.

❖ Training methods include Supervised Learning, Unsupervised Learning, and Reinforcement Learning.

❖ Supervised Learning: This type of training uses labelled training data, acting as a supervisor for the algorithms.

❖ Unsupervised Learning: This type of training uses no labelled data, instead of providing inputs with correct output, it finds patterns between data sets by itself.

What is Conventional Computing ?
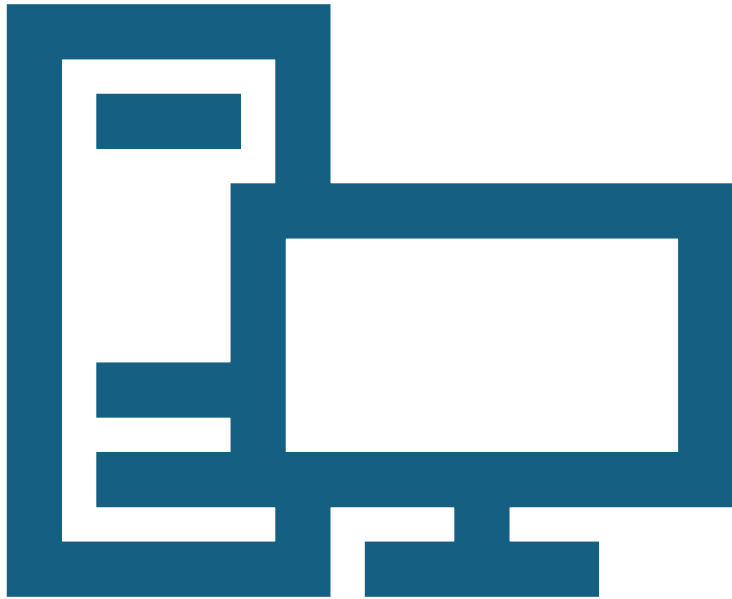
❖ Fourth-generation computers rely on binary logics, storing input data in 1 and 0.

❖ The CPU provides step-by-step instructions for data processing, including adding numbers, storing data, and moving data.

❖ Computer memory stores data until the CPU needs to process it.

❖ Input/output (I/O) operations allow real-world communication through keyboard keys, cursor movement, and video watching.

❖ Conventional computing can solve repetitive tasks like finding employee attendance.

Comparison between Conventional Computing and Machine Learning

Conventional Computing

- ❖ There must be human intervention
- ❖ Manual process
- ❖ Less accurate
- ❖ Takes more time to solve problems
- ❖ Based on Digital Circuits

Machine Learning

- ❖ No need of human intervention
- ❖ Automated process
- ❖ Highly accurate
- ❖ Takes less time to solve problems
- ❖ Based on Artificial Intelligence

B

Two Machine Learning Techniques

Two different machine learning techniques

❖ There are two different machine learning techniques.

1. Supervised Machine Learning
2. Unsupervised Machine Learning

❖ Both are used in Machine Learning to analyze data and make predictions.

❖ Main objective of supervised machine learning is to learn a mapping from inputs to outputs.

❖ Main objective of unsupervised machine learning is to look for hidden patterns within the data.

Supervised Machine Learning

❖ Utilizes algorithms trained on labelled data for predictions or judgements.

❖ Widely used in financial forecasting, medical diagnosis, picture and speech recognition, etc.

❖ Used in sentiment analysis models in natural language processing to categorize text sentiments.

❖ Primarily focuses on predicting outcomes based on labelled data.

❖ Unsupervised learning is divided into classification and regression.

Unsupervised Machine Learning

❖ Unsupervised machine learning finds hidden structures and patterns in data without explicit instruction.

❖ Examples include data exploration, customer segmentation, and recommendation systems.

❖ Clustering algorithms are used in bioinformatics to sort large gene expression datasets and identify complex biological relationships.

❖ Unsupervised learning is divided into clustering and association rules.

Two different machine learning techniques

Supervised Machine Learning

❖ Required labeled data as input

❖ Common task include classification and regression

❖ Supervision is required when training model

❖ More accurate and more trustful

❖ Use algorithms like K-Mean clustering, Neural networks.

Vs

Unsupervised Machine Learning

❖ Required unlabeled data as input

❖ Common Task include grouping with similar point

❖ Supervision is not required when training model

❖ Less accuracy and less trustworthy

❖ Use algorithms like Decision tree, Linear regression

C
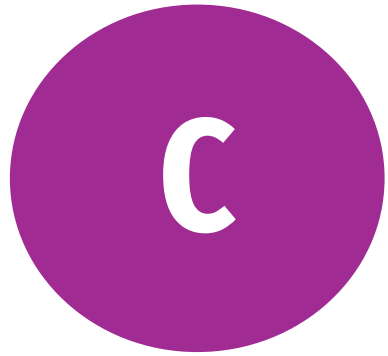
Purpose of Code of Practise

Machine Learning and Software Development

Machine Learning is actively being used in Software Development.

Used to tackle repetitive tasks in development.

Slowly being implemented in every stage of SDLC.

Without adequate knowledge, software engineers are at a risk of becoming irrelevant.

Machine Learning in the SDLC

- Used in the following phases for the following tasks

  - Planning and Analysis: For text processing and requirement gathering

  - Design: To identify design patterns and flaws

  - Implementation: Code generation, document gathering and code modification

  - Testing: Performance testing and test case generation

  - Maintenance: Bug detection and code refactoring.

Similarities to a Code of Practice

Code of Practice refers to the guidelines laid out for a profession by an organization

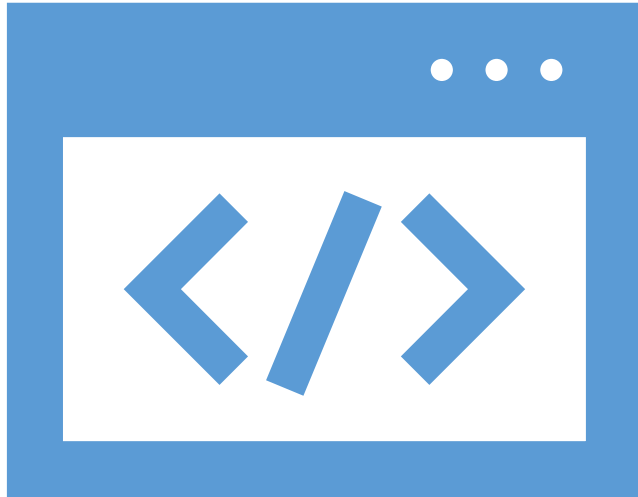BCS Code of Practice is considered the most relevant guideline for IT professionals.

Highlights accessibility, knowledge sharing, respect, and professionalism.

Machine learning has also entered the ranks of being required for a Software developer

Ethical considerations and guidelines

- A machine learning model could be updated by many developers in its lifetime.

- Developers need to consider how to keep it updatable.

- Google has already set guidelines in their organization.

- Some of the rules are
  - Use machine learning only when it's required
  - Use machine learning over complex code
  - Have a clear metric system and objective

D

Purpose of Code of Practice

Overview of Opportunities and Threats

1. New chances to create innovative solutions

2. Risks it poses (privacy violation, job loss, etc.)
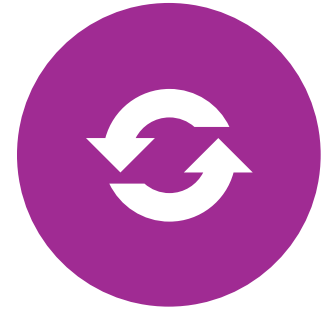
Opportunities of Machine Learning

DEVELOPING INNOVATIVE PRODUCTS AND SERVICES

AUTOMATION AND EFFICIENCY

EFFICIENT DATA HANDLING

CONTINUOUS IMPROVEMENT

Threats of Machine Learning

JOB LOSS

PRIVACY CONCERNS

Legal, Ethical and Social Concerns of Machine Learning

Legal Concerns of Machine Learning

- Data privacy and security

- Bias and discrimination

- Intellectual property

- US Employment discrimination

- General Data Privacy Regulation

Ethical Concerns of Machine Learning

- Privacy and Data Protection

- Bias and Fairness

- Transparency and accountability

- Algorithm discrimination

- Organizational justice

Social Concerns of Machine Learning

- Automation and Job Displacement

- Social Segregation and Filter Bubbles

- Digital Inequality

Conclusion

✓ Machine learning is now a crucial component of numerous applications and industries, including marketing, finance, and healthcare.

✓ Its capacity to evaluate numerous volumes of data, spot trends, and generate predictions can offer useful analysis and support organizations in making defensible decisions.

✓ It's critical to remember ethical issues as the subject develops and to make sure machine learning is applied sensibly and for the good of society at large.

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