Professional Certificate in AI for Operations Management

Introduction to Artificial Intelligence

Artificial Intelligence (AI): The simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using the rules to reach approximate or definite conclusions), and self-correction.

Machine Learning (ML): A subset of AI that involves the practice of using algorithms to parse data, learn from it, and then make a determination or prediction about something in the world.

Deep Learning (DL): A subset of ML that makes the computation of multi-layer neural networks feasible. It is responsible for advances in image and speech recognition.

Neural Network: A computing model whose layered structure resembles the neural network of the human brain. It is used in DL to model complex patterns and prediction problems.

Supervised Learning: A type of ML where the model is trained on a labeled dataset. It is used for classification and regression problems.

Unsupervised Learning: A type of ML where the model is trained on an unlabeled dataset. It is used for clustering and association problems.

Reinforcement Learning: A type of ML where an agent learns to behave in an environment, by performing certain actions and observing the results/rewards.

Natural Language Processing (NLP): A field of AI that focuses on the interaction between computers and human language. It involves making sense of text and speech data.

Computer Vision: A field of AI that trains computers to interpret and understand the visual world.

Robotics: A field of AI that focuses on the design, construction, and use of robots, often aiming to develop machines that can substitute for humans and replicate human actions.

Expert Systems: AI programs that simulate the knowledge and analytical skills of human experts. They can make decisions and solve problems that are difficult enough to require human expertise.

Genetic Algorithms: Optimization and search algorithms based on the concepts of natural selection and genetics.

Fuzzy Logic: A computing approach based on "degrees of truth" rather than the usual true or false (1 or 0) Boolean logic. It is used to handle the concept of partial truth, where the truth value may range between completely true and completely false.

Markov Decision Process (MDP): A mathematical framework for modeling decision-making in situations

where outcomes are partly random and partly under the control of a decision-maker.

Naive Bayes: A family of simple probabilistic classifiers based on applying Bayes' theorem with strong (naive) independence assumptions between the features.

Support Vector Machines (SVMs): A set of supervised learning methods used for classification, regression and outliers detection.

Principal Component Analysis (PCA): A statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components.

Apriori Algorithm: A classic algorithm for frequent itemset mining and association rule learning over transactional databases.

K-means Clustering: A method of clustering data into K groups of equal variance.

Latent Dirichlet Allocation (LDA): A generative statistical model that allows sets of observations to be explained by unobserved groups.

Hidden Markov Models (HMMs): Statistical models used in AI to describe the evolution of observable events that depend on internal factors, which are not directly observable.

Partially Observable Markov Decision Process (POMDP): A framework for modeling decision making in situations where information is incomplete.

Recurrent Neural Networks (RNNs): A class of artificial neural networks where connections between nodes form directed cycles.

Convolutional Neural Networks (CNNs): A class of deep, feed-forward artificial neural networks, designed to automatically and adaptively learn spatial hierarchies of features from tasks with grid-like topology.

Long Short-Term Memory (LSTM): An artificial recurrent neural network architecture for learning long-term dependencies of time series data.

Gated Recurrent Units (GRUs): A variant of RNN that uses gates to control the flow of information.

Recommender Systems: Systems that recommend items (products, services, information) to users based on their preferences.

Chatbots: Computer programs designed to simulate conversation with human users, especially over the Internet.

Autonomous Vehicles: Vehicles that are capable of sensing their environment and navigating without human input.

Intelligent Personal Assistants (IPAs): Software agents that can understand natural language voice

commands and perform tasks for the user.

Affective Computing: The study and development of systems and devices that can recognize, interpret, process, and simulate human affects (emotions).

Swarm Intelligence: The emergent collective intelligence of groups of simple agents.

Multi-agent Systems: Systems composed of multiple interacting intelligent agents.

Ontology: A formal naming and definition of the types, properties, and interrelationships of the entities that really or fundamentally exist for a particular domain of discourse.

Semantic Web: An extension of the World Wide Web through embedding of machine-readable metadata about pages and how they interlink.

Markup Language: A system for annotating a document in a way that is syntactically distinguishable from the text.

Extensible Markup Language (XML): A markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

Resource Description Framework (RDF): A standard model for data interchange on the Web.

Simple Protocol and RDF Query Language (SPARQL): A query language for RDF.

Web Ontology Language (OWL): A Semantic Web language designed to represent rich and complex knowledge about things, groups of things, and relations between things.

These terms and concepts are fundamental to the study of AI and its applications. Understanding them will provide a solid foundation for further study and practical application in the field of AI for Operations Management. Familiarity with these terms will enable learners to engage with more advanced topics and to communicate effectively with other professionals in the field.