

# MCNS Training Program

## Machine Learning



[01101]

# Machine Learning

Machine Learning will offer participants a clear presentation and deep understanding on state-of-the-art machine learning concepts, ranging from regression, classification and clustering techniques to deep learning, adversarial learning, and reinforcement learning

## COURSE REVIEW

The course content is split into five parts:

- Part 1 introduces basic machine learning models and algorithms with a focus on supervised learning methods such as regression and classification
- Part 2 introduces additional machine learning models and algorithms with a focus on unsupervised learning techniques such as clustering
- Part 3 presents deep learning methods – including neural network models, convolutional neural networks, recurrent neural networks; it also presents adversarial learning methods such as GANs
- Part 4 focuses on reinforcement learning, deep reinforcement learning, and their applications
- Part 5 covers emerging topics in machine learning such as privacy, fairness, and explainability in machine learning and artificial intelligence

The course also offers – across these five parts – an overview of applications of the various machine learning approaches, in a variety of areas such as computer vision, speech recognition, speech translation, and natural language processing. Participants will be able to learn about, study and review modern aspects of machine learning; participants will also experiment with various data-oriented problems, challenges, and use-cases using Python and/or Jupiter notebooks.

## AIMED AT

**Machine Learning** is a five-day course that is designed for technical professionals, including software engineers, data engineers, data scientists, machine learning engineers, machine learning scientists, and IT professionals.

Prerequisites: Participants should have a relatively good understanding – at undergraduate level – of **calculus, linear algebra, optimization, probability, and statistics**. Participants are also expected to be familiar with coding in a high-level language (ideally Python) for the hands-on sessions required.



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## Course Benefits for individuals (Professionals)

- Understanding **key machine learning principles, methods, and tools** for supervised and unsupervised learning
- Understanding cutting-edge machine learning approaches such as **deep learning, reinforcement learning, adversarial learning**, and other **state-of-the-art techniques**
- Gaining a competitive advantage by exploring **applications of cutting-edge machine learning and artificial intelligence techniques** in computer vision, speech recognition, speech translation, and natural language processing
- Diving into **emerging topics in AI** such as Privacy, Fairness, Transparency, Explainability, and Accountability

## Course Benefits for your Organization

- Equipping the engineers of your organization with the necessary knowledge to develop **state-of-the-art machine learning models, algorithms, and methods**
- Preparing your team for future deployments of artificial intelligence by exposing your team to topics such as **AI Privacy, Fairness, Transparency, and Ethics**
- Enhancing your team's technical understanding of **emerging applications of machine learning and artificial intelligence**, to areas such as big data, computer vision, and natural language processing
- Offering your team a view of **real-world case studies** to ensure that it is ready to recognize machine learning opportunities for your organization

## Training Format

Instructor-Led Training  
On-Site Classroom: 5 days  
Web delivered (Virtual): 5 days  
Excellent and descriptive course material – pdf files and associated code (Jupyter notebooks) will be provided

## Customer Tailored!

We can tailor the included topics, tech level, and duration of this course right to your team's technical requirements and needs

## Section 1: The Elements of Machine Learning

# Course Program Outline

### *Module 1: Introduction to Machine Learning I*

- Introduction to supervised learning
- Linear regression, polynomial regression, and logistic regression
- Regularization techniques, and cross-validation
- Learning algorithms: gradient descent, mini-batch and SGD
- Support vector machines and kernels
- Hands-on workshop in Python and/or Jupyter notebooks

### *Module 2: Introduction to Machine Learning II*

- Introduction to unsupervised learning
- Clustering: k-means, hierarchical, and spectral clustering
- Density estimation: parametric and non-parametric
- Feature reduction, selection, and transformation
- Hands-on workshop in Python and/or Jupyter notebooks



Section 2: Modern Developments in Machine Learning

## Course Program Outline

### Module 3: Deep Learning

- Introduction to neural networks: motivation, representation, and learning
- Convolutional neural networks and applications in computer vision
- Recurrent neural networks and applications in natural language proc.
- Long short term memory (LSTM) networks
- Transformers and applications
- Adversarial learning and generative adversarial networks
- Hands-on workshop in Python and/or Jupyter notebooks

### Module 4: Reinforcement Learning

- Introduction to reinforcement learning
- Exploration vs exploitation; practical solving and learning methods
- Deep reinforcement learning
- Deep reinforcement learning applications
- Hands-on workshop in Python and/or Jupyter notebooks



## Course Program Outline

### *Module 5: Trustworthy Machine Learning*

- Introduction to trustworthy machine learning
- Machine learning privacy
- Machine learning fairness
- Machine learning explainability
- Federated learning
- Hands-on workshop in Python and/or Jupyter notebooks

