

AI+ Cloud™ (5 Days)

Program Detailed Curriculum

Executive Summary

The AI+ Cloud™ certification program targets developers and IT professionals aspiring to excel in cloud computing integrated with artificial intelligence. The curriculum offers an in-depth exploration of AI and cloud computing, encompassing advanced cloud infrastructure and AI model deployment. Participants gain practical insights into cloud-based AI applications, culminating in an interactive capstone project. With these skills, graduates are primed to navigate the dynamic AI+ Cloud™ integration landscape, equipped to design and implement AI solutions seamlessly within cloud environments for sustained success.

Course Prerequisites

- A foundational understanding of key concepts in both artificial intelligence and cloud computing
- Fundamental understanding of computer science concepts like programming, data structures, and algorithms.
- Familiarity with cloud computing platforms like AWS, Azure, or GCP
- Basic knowledge of mathematics as it important for machine learning, which is a core component of AI+ Cloud program.

Module 1

Fundamentals of Artificial Intelligence (AI) and Cloud

1.1 Introduction to AI and its Application

- **Basic AI Concept:** Gain a solid understanding of the fundamental concepts, principles, and methodologies related to Artificial Intelligence.
 - **AI Applications:** Explore real-world examples of AI, showcasing its impact on technology and business.
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1.2 Overview of Cloud Computing and Its Benefits

- **Understanding Cloud Computing:** Uncover definition, Properties and Characteristics of Cloud Computing.
 - **Key benefits of Cloud Computing:** Discover how businesses and projects use the cloud in real life, making things faster and more efficient.
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1.3 Benefits and Challenges of AI-Cloud Integration

- **Advantages of AI-Cloud Integration:** Explore the interactions between AI and cloud computing, focusing on enhanced scalability, accessibility, and collaborative development.
- **Addressing Challenges in AI-Cloud Integration:** Investigate challenges related to security, privacy and how to make smart integration decisions.

Module 2

Introduction to Artificial Intelligence

2.1 Basic Concepts and Principles of AI

- **Understanding the Foundations:** Delve into the basic principles of artificial intelligence, exploring its core concepts and the underlying ideas that make AI possible.
 - **Key Components of AI:** Identify the key components that form the foundation of AI systems, including machine learning, natural language processing, and computer vision.
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2.2 Machine Learning and Its Applications

- **Introduction to Machine Learning:** Explore the world of machine learning, understanding how computers can learn from data and improve their performance over time.
 - **Types of Machine Learning:** Explore various types of machine learning like Supervised, Unsupervised, and Reinforcement Learning.
 - **Practical Applications of Machine Learning:** Discover real-world applications of machine learning, from recommendation systems and autonomous vehicles to healthcare diagnostics.
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2.3 Overview of Common AI Algorithms

- **Essential AI Algorithms:** Introduce commonly used AI algorithms, such as regression, classification, clustering and Understand the strengths and limitations of each algorithm, exploring when to use them for various tasks.
 - **Hands On:** Dive into practical application scenarios.
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2.4 Introduction to Python Programming for AI

- **Python Basics for AI:** Learn the basics of Python programming, a versatile language widely used in AI development.
- **Python Libraries for AI:** Explore Python libraries essential for AI, including NumPy, Pandas, and Scikit-learn, to manipulate data and implement machine learning models.

Module 3

Fundamentals of Cloud Computing

3.1 Cloud Service Models

- **Introduction to Cloud Services:** Understand the basic concepts of cloud service models, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).
- **IaaS: Building Blocks of Cloud Infrastructure:** Explore Infrastructure as a Service, learning how it provides fundamental computing resources like virtual machines and storage.

- **PaaS: Platform for Application Development:** Delve into Platform as a Service, exploring how it offers a platform for developers to build, deploy, and scale applications without managing underlying infrastructure.
 - **SaaS: Software Delivery via the Cloud:** Understand Software as a Service and how it delivers software applications over the internet, eliminating the need for local installation and maintenance.
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3.2 Cloud Deployment Models

- **Public, Private, Hybrid: Deployment Choices:** Explore different cloud deployment models, including public, private, and hybrid clouds, understanding the advantages and considerations for each.
 - **Public Cloud: Services for Everyone:** Learn about public cloud deployments, where services are offered over the internet to a broad audience, with examples from major cloud providers.
 - **Private Cloud: Tailored Solutions:** Understand private cloud deployments designed for a specific organization, offering increased control and customization.
 - **Hybrid Cloud: Combining the Best of Both Worlds:** Explore hybrid cloud models, combining elements of both public and private clouds for flexibility and scalability.
 - **Hands-on Activity:**
 1. Create and deploy a virtual machine on AWS
 2. Deploying Web Services on Azure: Set up a web application on Azure App Service
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3.3 Key Cloud Providers and Offerings (AWS, Azure, Google Cloud)

- **AWS: Amazon's Cloud Ecosystem:** Dive into Amazon Web Services (AWS), understanding its services, infrastructure, and its role as a leading cloud provider.
- **Azure: Microsoft's Cloud Solutions:** Explore Microsoft Azure, its services, and how organizations leverage its cloud solutions for diverse applications.
- **Google Cloud: Innovation and Scalability:** Learn about Google Cloud Platform (GCP), its innovative services, and how it provides scalable solutions for businesses.

Module 4

AI Services in the Cloud

4.1 Integration of AI Services in Cloud Platforms

- **Overview of Cloud AI Services:** Explore cloud-based AI services offered by major providers (e.g., AWS AI services, Azure Cognitive Services, Google Cloud AI) and understand their capabilities.
 - **Integrating Cloud AI Services:** Hands-on exercise on integrating AI services into cloud platforms to enhance applications.
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4.2 Working with Pre-built Machine Learning Models

- **Leveraging Pre-built Models:** Understand the concept of pre-built machine learning models available in cloud environments.
 - **Practical Application:** Working with Pre-trained Models: Use a cloud-based service (e.g., Google Cloud Vision AI or Azure Computer Vision)
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- **Analyzing Results and Fine-tuning:** Evaluate the results of using pre-built models and explore the possibilities of fine-tuning parameters for specific use cases.
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4.3 Introduction to Cloud-based AI Tools

- **Overview of Cloud-based AI Development Tools:** Explore tools provided by cloud platforms for AI development, including notebooks, model training environments, and collaborative tools.

Module 5

AI Model Development in the Cloud

5.1 Building and Training Machine Learning Models

- **Traditional Machine Learning Model Development:** Explore traditional methods for developing machine learning models, covering foundational concepts, algorithms, and techniques in model development.
 - **Hands-on: Exercises on Building and Training Models using Code:** Engage in practical exercises to build and train machine learning models through hands-on coding, implementing algorithms, and evaluating performance.
 - **Building Machine Learning Models with AutoML:** Discover the power of AutoML in simplifying the machine learning model development process, leveraging automated tools for efficient model creation.
 - **Hands-on exercises: Demonstration of Building a Machine Learning Model using AutoML:** Dive into hands-on demonstrations illustrating the utilization of AutoML tools to build machine learning models swiftly.
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5.2 Model Optimization and Evaluation

- **Hyperparameter Tuning:** Learn techniques to optimize model performance by tweaking parameters for better accuracy and efficiency in machine learning models.
 - **Evaluation Metrics and Techniques:** Understand various metrics and techniques to assess model performance and choose the most suitable evaluation methods for different scenarios.
 - **Interpretability and Explainability:** Gain insights into techniques for explaining and understanding machine learning models, making their decisions transparent and interpretable for stakeholders.
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5.3 Collaborative AI Development in a Cloud Environment

- **Version Control for Machine Learning Projects:** Master Git and other tools to track changes, collaborate effectively, and manage versions in machine learning projects for enhanced productivity and reproducibility.
- **Collaborative Development Platforms:** Explore platforms like GitHub and GitLab to facilitate team collaboration, code sharing, and project management in machine learning development environments.
- **Model Deployment and Sharing:** Learn strategies and platforms for deploying machine learning models, enabling seamless integration into production environments and sharing insights with stakeholders.

Module 6

Cloud Infrastructure for AI

6.1 Setting up and Configuring Cloud Resources

- **Infrastructure as Code (IaC):** Learn to automate and manage infrastructure using tools like Terraform, ensuring consistent and scalable deployment for machine learning workflows.

6.2 Scalability and Performance Considerations

- **GPU and TPU Utilization:** Optimize machine learning workloads by harnessing the power of GPUs and TPUs for accelerated training and inference tasks.
- **Auto-Scaling Strategies:** Implement dynamic scaling strategies to adapt computing resources based on workload demands, ensuring efficient utilization and cost-effectiveness in machine learning deployments.

6.3 Data Storage and Management in the Cloud

- **Data Security and Compliance:** Explore strategies and technologies to safeguard sensitive data, ensuring compliance with regulations and protecting against breaches in machine learning environments.
- **Data Lifecycle Management:** Manage data from creation to disposal efficiently, ensuring quality, accessibility, and compliance throughout its lifecycle in machine learning workflows.

Module 7

Deployment and Integration

7.1 Strategies for Deploying AI Models in the Cloud

- **Popular Deployment Strategies & Pattern:** Explore popular deployment patterns like blue-green, canary releases, and others for efficient and reliable deployment of machine learning models at scale.
- **Platform-Specific Deployment:** Learn to deploy machine learning models on various platforms like AWS, Azure, and Google Cloud, leveraging platform-specific features for optimal performance.

7.2 Integration of AI Solutions with Existing Cloud-based Applications

- **Cloud Application Architecture:** Design scalable and resilient cloud-based architectures for machine learning applications, leveraging services like AWS, Azure, and Google Cloud for optimal performance.
- **Microservices and AI:** Explore the integration of microservices with AI, enabling modular and scalable architectures for building and deploying machine learning solutions.
- **Data Integration Considerations:** Address challenges and considerations in integrating diverse data sources, ensuring compatibility, quality, and reliability for effective machine learning workflows.

7.3 API Usage and Considerations

- **API Design for AI Services:** Master designing APIs for AI services, covering protocols, authentication, and documentation to ensure interoperability, security, and ease of use.
- **Testing APIs: Learn Testing Apis Through Various Tools Like Postman or Other Tools:** Develop proficiency in testing APIs using tools like Postman, ensuring reliability, functionality, and performance in AI service deployments.

Future Trends in AI+ Cloud Integration

8.1 Introduction to Future Trends

- **Introduction to Explainable AI or XAI:** Explore methods to interpret and explain AI models, enhancing transparency and trustworthiness in decision-making processes for diverse stakeholders.
 - **Federated Learning:** Delve into decentralized machine learning techniques, enabling model training across distributed devices while preserving data privacy and security.
 - **AI for Good:** Harness AI's potential to address global challenges, focusing on applications in healthcare, sustainability, education, and humanitarian efforts for societal benefits.
 - **Quantum Computing and AI:** Explore the intersection of quantum computing and AI, unlocking possibilities for solving complex problems and optimizing machine learning algorithms with quantum processing power.
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8.2 AI Trends Impacting Cloud Integration

- **Edge AI and Hybrid Cloud:** Implement AI models on edge devices and leverage hybrid cloud infrastructure, optimizing performance and privacy for decentralized applications.
- **Serverless AI:** Explore serverless computing for AI, enabling scalable and cost-efficient deployment without managing infrastructure, ideal for dynamic workloads.
- **AutoML and Automated MLOps:** Automate machine learning model selection, training, and deployment processes, streamlining ML operations and empowering developers with efficient AI solutions.
- **Responsible AI in the Cloud:** Integrate ethical considerations into cloud-based AI development, ensuring fairness, accountability, transparency, and privacy throughout the machine learning lifecycle.

Hands on Examples

9.1 Applying AI and Cloud Concepts to Solve a Real-world Problem

- **Exercise 1:** Diabetes Prediction Using Machine Learning.
- **Exercise 2:** Building & Deploying an Image Classification Web App with GCP AutoML Vision Edge, Tensorflow.js & GCP App Engine
- **Exercise 3:** How to deploy your own ML model to GCP in 5 simple steps
- **Exercise 4:** Google Cloud Platform Custom Model Upload , REST API Inference and Model Version Monitoring.
- **Exercise 5:** Deploy Machine Learning Model in Google Cloud Platform Using Flask