Module 1: Introduction to AI

1.1 Understanding AI

- **Definition and Scope of AI**
  - What is Artificial Intelligence?
  - Different types of AI (Narrow, General, and Super AI)
  - Goals of AI
- **History of AI**
  - Early developments in AI
  - Major milestones in AI history
  - Current state of AI research
- **AI vs. Machine Learning vs. Deep Learning**
  - Definitions and differences
  - Applications of each

1.2 Applications of AI

- **AI in Healthcare**
  - Medical imaging
  - Predictive analytics
  - Personalized medicine
- **AI in Finance**
  - Fraud detection
  - Algorithmic trading
  - Customer service automation
- **AI in Entertainment**
  - Recommendation systems
  - Content creation
  - Gaming AI
- **AI in Autonomous Systems**
  - Self-driving cars
  - Drones
  - Robotics

1.3 Basic Concepts in AI

- **Data Science and AI**
  - Role of data in AI
  - Data collection and preprocessing
- **Neural Networks**
  - Structure and functioning of neural networks
  - Introduction to layers, neurons, and activation functions
- **Natural Language Processing (NLP)**

    - Overview of NLP
    - Common NLP tasks (tokenization, sentiment analysis, etc.)
- **Computer Vision**
    - Basics of computer vision
    - Image classification and object detection

1.4 AI Ethics

- **Ethical Concerns in AI**
    - Bias and fairness
    - Accountability in AI decisions
- **Bias in AI**
    - Types of bias (data bias, algorithmic bias)
    - Mitigating bias in AI systems
- **Privacy Issues**
    - Data privacy laws and regulations
    - Techniques for preserving privacy in AI
- **Responsible AI**
    - Principles of responsible AI
    - Implementing ethical guidelines in AI development

Module 2: Fundamentals of Cloud Computing

2.1 Introduction to Cloud Computing

- **What is Cloud Computing?**
    - Definition and key characteristics
    - On-demand self-service, broad network access, resource pooling, rapid elasticity, measured service
- **Benefits of Cloud Computing**
    - Cost savings
    - Scalability
    - Flexibility
    - Disaster recovery

2.2 Cloud Deployment Models

- **Public Cloud**
    - Characteristics and use cases
- **Private Cloud**
    - Characteristics and use cases
- **Hybrid Cloud**
    - Characteristics and use cases

2.3 Cloud Service Providers

- **Overview of Major Providers**

    - Microsoft Azure
    - Amazon Web Services (AWS)
    - Google Cloud Platform (GCP)
- **Comparison of Services**
    - Core services offered by each provider
    - Strengths and weaknesses of each provider

2.4 Introduction to Microsoft Azure

- **Azure Portal Overview**
    - Navigating the Azure Portal
    - Key features and services
- **Azure Pricing and Cost Management**
    - Pricing models
    - Cost management tools and techniques
- **Setting up a Free Azure Account**
    - Steps to create an account
    - Free tier services and limits

Module 3: Getting Started with Azure

3.1 Azure Core Services

- **Azure Compute Services**
    - **Virtual Machines (VMs)**
        - Creating and managing VMs
        - VM sizes and pricing
    - **Azure App Services**
        - Web Apps
        - Mobile Apps
    - **Azure Functions**
        - Serverless computing
        - Creating and deploying functions
- **Azure Storage Services**
    - **Blob Storage**
        - Uploading and managing blobs
    - **Table Storage**
        - NoSQL key-value store
    - **Queue Storage**
        - Message queuing for communication between services
- **Azure Networking Services**
    - **Virtual Networks (VNets)**
        - Creating and configuring VNets
    - **Load Balancers**
        - Setting up load balancing for applications

    - **VPN Gateway**
        - Configuring secure connections between Azure and on-premises networks

3.2 Azure Management Tools

- **Azure Portal**
    - Overview of the Azure Portal
    - Key management tasks
- **Azure CLI**
    - Installing and using Azure CLI
    - Common CLI commands
- **Azure PowerShell**
    - Installing and using Azure PowerShell
    - Common PowerShell cmdlets
- **Azure Resource Manager (ARM) Templates**
    - Introduction to ARM templates
    - Creating and deploying ARM templates

3.3 Azure Security Basics

- **Azure Identity and Access Management**
    - Azure Active Directory (AD)
    - Role-Based Access Control (RBAC)
- **Azure Security Center**
    - Security monitoring and management
    - Security recommendations
- **Azure Key Vault**
    - Storing and managing secrets
    - Using Key Vault in applications

Module 4: Introduction to Azure AI Services

4.1 Overview of Azure AI

- **AI and Machine Learning on Azure**
    - Introduction to Azure AI and ML services
- **Azure AI Services Overview**
    - Categories of AI services (Vision, Speech, Language, Decision)

4.2 Azure Cognitive Services

- **Vision Services**
    - **Computer Vision API**
        - Image analysis
        - Recognizing text (OCR)
    - **Face API**

        - Face detection
        - Emotion recognition
- **Speech Services**
    - **Speech-to-Text**
        - Converting speech to text
    - **Text-to-Speech**
        - Converting text to speech
    - **Speech Translation**
        - Real-time speech translation
- **Language Services**
    - **Text Analytics**
        - Sentiment analysis
        - Key phrase extraction
    - **Language Understanding (LUIS)**
        - Building and training language models
- **Decision Services**
    - **Personalizer**
        - Personalization and recommendations

4.3 Azure Machine Learning

- **Introduction to Azure Machine Learning**
    - Overview of Azure ML services
    - Key concepts and features
- **Azure Machine Learning Studio**
    - Navigating the ML Studio
    - Creating and managing experiments
- **Key Concepts in Azure Machine Learning**
    - Data preparation
    - Model training and evaluation
- **Model Training and Deployment on Azure**
    - Training models using Azure ML
    - Deploying models for inference

Module 5: Deep Dive into Azure Cognitive Services

5.1 Computer Vision

- **Analyzing Images**
    - Using the Computer Vision API
    - Common image analysis tasks
- **Recognizing Text (OCR)**
    - Optical Character Recognition with Computer Vision API
    - Applications of OCR
- **Custom Vision**

    - Creating custom image classifiers
    - Training and evaluating custom models
- **Image Classification and Object Detection**
    - Techniques for image classification
    - Implementing object detection models

5.2 Speech

- **Setting Up Speech Services**
    - Creating and configuring speech services
- **Custom Speech Service**
    - Building custom speech models
    - Training and deploying speech models
- **Speech Synthesis and Recognition**
    - Converting text to speech
    - Recognizing and processing speech

5.3 Language Understanding

- **Building LUIS Models**
    - Creating and configuring LUIS applications
    - Defining intents and entities
- **Integrating LUIS with Applications**
    - Using LUIS in conversational applications
    - API integration with LUIS
- **Managing Intents and Entities**
    - Best practices for defining intents
    - Managing complex entities

5.4 Text Analytics

- **Sentiment Analysis**
    - Analyzing sentiment in text data
- **Key Phrase Extraction**
    - Identifying key phrases in text
- **Language Detection**
    - Detecting languages in text data
- **Named Entity Recognition**
    - Recognizing named entities in text

Module 6: Azure Machine Learning in Depth

6.1 Azure Machine Learning Workspace

- **Setting up an AML Workspace**
    - Creating and configuring workspaces

- **Navigating the AML Studio**
  - Overview of the AML Studio interface
- **Key features and tools in AML Studio**

6.2 Data Preparation

- **Data Import and Export**
  - Importing data into AML
  - Exporting data from AML
- **Data Cleaning and Transformation**
  - Techniques for data cleaning
  - Transforming data for ML models

6.3 Model Training and Evaluation

- **Choosing Algorithms**
  - Overview of popular ML algorithms
  - Selecting appropriate algorithms for tasks
- **Training Models**
  - Setting up training experiments
  - Monitoring and managing training runs
- **Hyperparameter Tuning**
  - Techniques for hyperparameter tuning
  - Implementing hyperparameter tuning in AML
- **Model Evaluation Metrics**
  - Common evaluation metrics
  - Interpreting evaluation results

6.4 Deploying and Managing Models

- **Deploying Models to Azure**
  - Deployment options in AML
  - Real-time vs. batch deployment
- **Real-time and Batch Inference**
  - Setting up real-time inference endpoints
  - Implementing batch inference pipelines
- **Monitoring and Maintaining Models**
  - Monitoring deployed models
  - Retraining and updating models

Module 7: Advanced Topics in Azure AI

7.1 Natural Language Processing (NLP)

- **Advanced Text Analytics**
  - Advanced techniques in text analysis

    - Case studies and applications
- **Building Chatbots with Azure Bot Service**
    - Overview of Azure Bot Service
    - Designing and implementing chatbots
    - Integrating bots with LUIS and other services

7.2 AI and Big Data

- **Integrating Azure AI with Azure Data Services**
    - Overview of Azure Data Services
    - Using data services with Azure AI
- **Using Azure Databricks for AI**
    - Introduction to Azure Databricks
    - Implementing AI workflows in Databricks

7.3 Ethics and Responsible AI

- **Implementing Ethical AI Practices**
    - Guidelines for ethical AI
    - Case studies of ethical AI implementation
- **Ensuring Fairness and Transparency in AI Models**
    - Techniques for ensuring fairness
    - Tools for model transparency
- **Compliance and Regulatory Considerations**
    - Overview of AI-related regulations
    - Ensuring compliance in AI projects

Module 8: Practical Projects and Case Studies

8.1 Project 1: Building an AI-Powered Image Recognition System

- **Requirements Gathering**
    - Defining project scope and requirements
- **System Design**
    - Designing the architecture
- **Implementation Using Azure Cognitive Services**
    - Implementing image recognition using Azure services
    - Testing and deploying the system

8.2 Project 2: Developing a Chatbot with LUIS and Azure Bot Service

- **Designing Conversational Flows**
    - Designing user interactions
- **Implementing the Bot**
    - Building the chatbot using Azure Bot Service
    - Integrating LUIS for natural language understanding

- **Testing and Deployment**
    - Testing the chatbot
    - Deploying to production

8.3 Project 3: Real-time Sentiment Analysis of Feeds

- **Data Collection and Preprocessing**
    - Collecting data
    - Preprocessing text data
- **Building and Deploying the Sentiment Analysis Model**
    - Training sentiment analysis models
    - Deploying models for real-time analysis

Module 9: Certification and Beyond

9.1 Azure AI Engineer Associate Certification

- **Exam Overview**
    - Certification requirements and structure
- **Key Study Resources**
    - Recommended study materials and resources
- **Practice Tests**
    - Preparing for the certification exam with practice tests

9.2 Continued Learning and Resources

- **Joining AI and Cloud Computing Communities**
    - Online communities and forums
    - Networking opportunities
- **Attending Workshops and Conferences**
    - Recommended events and conferences
- **Following Industry Trends and Updates**
    - Staying updated with AI and cloud computing advancements

Resources and Tools

Textbooks and Online Resources

- **Recommended Books on AI and Azure**
    - List of essential readings
- **Online Courses and Tutorials**
    - Suggested online courses for further learning

Software and Tools

- **Azure Free Account Setup**

    - Guide to setting up a free Azure account
- **Essential Software (VS Code, Jupyter Notebooks, etc.)**
    - List of essential tools and software for AI development

Community and Support

- **Forums and Discussion Groups**
    - Recommended forums for Q&A and discussions
- **Official Azure Support Channels**
    - Accessing official Azure support resources