Learning objectives

After completing this course, you should be able to:
- Explain what artificial intelligence (AI) is.
- Describe the field of AI and its subfields: Machine learning, natural language processing (NLP), and computer vision.

- List applications of AI in the industry and government.
- Describe machine learning.
- Describe different type of machine learning algorithms.
- Apply machine learning algorithms to specific problems.
- Explain deep learning.
- Explain convolutional neural networks and neural networks.
- Describe examples of unsupervised and supervised learning.
- Describe IBM Watson.
- Explain how IBM Watson technology is applied to solve real world problems.
- Explain the capabilities of each IBM Watson service.
- Describe IBM Watson Studio, its components, and key applications.
- Describe the CRISP-DM process model and explain where machine learning fits in the CRISP-DM process.
- Create machine learning models for different machine learning algorithms by using IBM Watson Studio.
- Explain domain adaptation.
- Describe the purpose of training the various IBM Watson services.
- Describe IBM Watson Knowledge Studio capabilities and use.
- Explain what NLP is.
- List tools and services for NLP.
- Identify NLP use cases.
- Explain main NLP concepts.
- Explain how to evaluate the quality of an NLP algorithm.
- Identify the IBM Watson services based on NLP technology.
- Use IBM Watson Discovery to build a cognitive query application.
- Describe chatbot applications and chatbots design guidelines.
- Explain core concepts and artifacts needed to build a chatbot application.
- Build chatbot applications with IBM Watson Assistant and Node-RED.
- Explain what computer vision is.
- Identify computer vision use cases.
- Explain how computer vision analyzes and processes images and describe commonly used computer vision techniques.
- Use the IBM Watson Visual Recognition service to classify an image, detect faces, and recognize text in an image.
- Create custom models with IBM Watson Visual Recognition.
- Train the IBM Watson Visual Recognition service with IBM Watson Studio.
- Integrate multiple IBM Watson services to build a comprehensive intelligent solution.

Prerequisites Skills

- Computer science fundamentals
- Basic knowledge of applied math, algorithms, and data modeling
- Basic knowledge of probability and statistics
- Basic knowledge of Node.js and cloud computing
- Access to IBM Cloud
- Exposure to the IBM Skills Academy Portal learning environment

Duration
36 hours

Skill level
Basic – Intermediate
Hardware requirements

Classroom (ILT) setup requirements	
Processor	2 GHz or higher
GB RAM	8 GB
GB free disk space	80 GB
Network requirements	Yes
Other requirements	IBM ID

Notes

The following unit and exercise durations are estimates, and might not reflect every class experience. If the course is customized or abbreviated, the duration of unchanged units will probably increase.

Course Agenda

MODULE I – AI OVERVIEW

Course I – AI Overview

Duration: 3 hours and 30 minutes

Course Overview Duration: 5 minutes

Unit 1. Introduction to artificial intelligence

Unit 1. Introduction to artificial intelligence Duration: 3 hours	
Overview	This unit explains what artificial intelligence (AI) is, its history and evolution, AI types, integral components of AI systems, factors that influenced the evolution of AI, and applications of AI in the industry, government, and science.
Learning objectives	After completing this unit, you should be able to: • Explain what AI is. • Describe the types of AI. • List the factors that influenced the advancement of AI in recent years. • List the applications of AI in the industry, science, and government. • List the subfields that are the focus of AI research.

Unit 2. Business analytics

Unit 2. Business analytics Duration: 30 minutes	
Overview	This unit introduces business analytics and describes different approaches and types of business analytics.
Learning objectives	After completing this unit, you should be able to: • Explain what business analytics is. • Describe different approaches and types of business analytics. • Describe analytical solutions. • Explain the challenges of analytical solutions.

MODULE II – Prerequisites

Course I – IBM Watson overview

Duration: 6 hours and 30 minutes

Unit 1. Introduction to IBM Watson

Unit 1. Introduction to IBM Watson
Duration: 1 hour

Overview	This unit introduces IBM Watson and its history.
Learning objectives	After completing this unit, you should be able to: • Explain what IBM Watson is and how it works. • Explain how Watson technology is made available to developers and organizations.

Unit 2. IBM Watson applied to industry, business and science

Unit 2. IBM Watson applied to industry, business and science
Duration: 1 hour and 30 minutes

Overview	This unit provides several examples that demonstrate how IBM Watson is transforming industry, business and science.
Learning objectives	After completing this unit, you should be able to: • Provide examples of Watson AI technologies applied to several industries.

Unit 3. IBM Watson use cases

Unit 3. IBM Watson use cases
Duration: 30 minutes

Overview	This unit presents two use cases showing organizations that successfully implemented AI solutions, based on IBM Watson technology.
Learning objectives	After completing this unit, you should be able to: • Describe how IBM Watson technology is being applied to solve real world problems.

Unit 4. Evolution from DeepQA to IBM Watson services

Unit 4. Evolution from DeepQA to IBM Watson services
Duration: 1 hour

Overview	This unit describes the evolution of Watson technology from the original DeepQA architecture to the present.
Learning objectives	After completing this unit, you should be able to: • Explain what the DeepQA architecture was. • Explain why IBM decided to commercialize Watson. • Describe the evolution of Watson services from the original DeepQA architecture to the present. • Recognize the Watson services available today on the IBM Cloud.

Unit 5. IBM Watson services overview

Unit 5. IBM Watson services overview
Duration: 2 hours

Overview	This unit provides an overview of the Watson services available in IBM Cloud.
Learning objectives	After completing this unit, you should be able to: • List the Watson services. • Explain the capabilities of each Watson service.

Exercise 0. Setting up your hands-on environment

Exercise 1. Setting up your hands-on environment
Duration: 30 min

Overview	This exercise guides you through the setup of your workstation before you perform the exercises in this course.
Learning objectives	After completing this exercise, you should have: • An IBM Cloud Lite account. • cURL installed on your workstation. • Node.js installed on your workstation. • Git installed on your workstation. • A code/text editor installed on your workstation.

MODULE III – AI Analyst (Classroom)

Duration: 26 hours
Course introduction

Course introduction Duration: 30 minutes	

Unit 1. Introduction to machine learning

Unit 1. Introduction to machine learning Duration: 1 hour and 30 min	

Overview	This unit recaps the main topics in Module I, AI overview and provides a deeper view into complex subjects such as: • Machine learning • Machine learning algorithms • Neural networks • Deep learning
Learning objectives	After completing this unit, you should be able to: • Explain what machine learning is. • Describe machine learning types and approaches. • List different machine learning algorithms. • Explain what neural networks and deep learning are, and why they are important in today's AI field. • Explain how to evaluate your machine learning model.

Exercise 1. Applying machine learning algorithms

Exercise 1. Applying machine learning algorithms Duration: 1 hour 30 min	

Overview	In this exercise, you apply machine learning algorithms to solve real problems.
Learning objectives	After completing this exercise, you should be able to: • Determine the centroids of a data set with the K-means clustering algorithm. • Predict the class of an object with the Naïve Bayes classifier. • Apply the linear regression algorithm to solve supervised learning problems. • Construct a decision tree to predict outcomes.

Unit 2. Introduction to IBM Watson

Unit 2. Introduction to IBM Watson
Duration: 1 hour

Overview	This unit provides an overview of key IBM Watson services, their purpose, how they work, and helps you get started with Watson services on IBM Cloud.
Learning objectives	After completing this unit, you should be able to: • Explain what IBM Watson is. • List IBM Watson services offerings. • List IBM Cloud Watson services. • Explain the capabilities of each Watson service. • List the Watson services that can be trained. • List the Watson services that cannot be trained. • Create a Watson service instance on IBM Cloud.

Exercise 2. Exploring IBM Watson services

Exercise 2. Exploring IBM Watson services
Duration: 1 hour 15 min

Overview	This exercise introduces you to Watson REST APIs. You will use cURL commands to submit requests to and receive responses from several Watson services.
Learning objectives	After completing this exercise, you should be able to: • Create Watson service instances. • Copy credentials from a service instance. • Submit API calls with the appropriate parameters. • Analyze the response returned from the Watson service. • Use Watson API Reference documentation.

Unit 3. Introduction to IBM Watson Studio

Unit 3. Introduction to IBM Watson Studio Duration: 30 minutes	
Overview	This unit provides a high level overview of Watson Studio, its components, key applications and the value added by the IBM offering.
Learning objectives	After completing this unit, you should be able to: • Describe Watson Studio. • Identify industry use cases. • List Watson Studio offerings. • Create Watson Studio projects. • Describe Watson Studio and Spark. • Describe Watson Studio and Object Storage. • Explain Watson Studio high availability considerations. • Prepare and analyze data. • Use Jupyter notebooks.

Exercise 3. Getting started with IBM Watson Studio

Exercise 3. Getting started with IBM Watson Studio Duration: 1 hour and 30 min	
Overview	This exercise introduces you to the basic tasks that you have to perform when using Watson Studio.
Learning objectives	After completing this exercise, you should be able to: • Create a Watson Studio project. • Manage the project. • Assign collaborators. • Load a data set into the project's object store. • Manage Object Storage. • Analyze data by using Watson Studio. • Use PixieDust for data visualization.

Unit 4. Introduction to IBM Watson Machine Learning

Unit 4. Introduction to IBM Watson Machine Learning
Duration: 30 minutes

Overview	This unit describes the CRoss Industry Standard Process for Data Mining known as CRISP-DM and explains the process of preparing data for a machine learning algorithm. This unit provides an overview of the IBM Watson Machine Learning service available on IBM Cloud.
Learning objectives	After completing this unit, you should be able to: • Describe the CRISP-DM process model. • Explain where machine learning fits in the CRISP-DM process. • Describe data preparation before feeding into machine learning algorithms. • Describe Watson Machine Learning features and capabilities.

Exercise 4. Getting started with IBM Watson Machine Learning

Exercise 4. Getting started with IBM Watson Machine Learning
Duration: 1 hour and 30 minutes

Overview	This exercise introduces you to the basic tasks that you have to perform while building machine learning models for different algorithms using Watson Machine Learning and Watson Studio.
Learning objectives	After completing this exercise, you should be able to: • Create a machine learning model by using Watson Studio and Watson Machine Learning. • Use data sets to train the model. • Use different estimators to train the machine learning model representing different machine learning algorithms. • Deploy machine learning models. • Evaluate the deployed models. • Call the deployed models from your applications. • Test the model with your data.

Exercise 5. Exploring deep learning and neural network modeling with IBM Watson Studio

Exercise 5. Exploring Deep Learning and Neural Network Modeler with IBM Watson Studio
Duration: 1 hour

Overview	This exercise guides you through designing, building, and training a deep learning model to recognize handwritten digits. The optional exercise guides you through using the MNIST computer vision data set to train a TensorFlow model to recognize handwritten digits.
Learning objectives	After completing this exercise, you should be able to: • Build a neural network to recognize handwritten digits. • Create a neural network design flow by using the neural network modeler. • Train models with experiment builder. • Work with Watson Machine Learning experiments to train deep learning models (TensorFlow).

Unit 5. Introduction to natural language processing (NLP)

Unit 5. Introduction to natural language processing (NLP)
Duration: 30 minutes

Overview	This unit introduces NLP. It covers key applications of NLP, basics concepts and terminology, tools and services and NLP challenges.
Learning objectives	After completing this unit, you should be able to: • Explain what NLP is. • Identify NLP use cases. • Explain basic NLP concepts and terminology. • List the tools and services for NLP.

Unit 6. NLP concepts and components

Unit 6. NLP concepts and components
Duration: 30 minutes

Overview	This unit covers NLP components, the NLP pipeline, natural language understanding, natural language generation, information retrieval, and information extraction.
Learning objectives	After completing this unit, you should be able to: • Define the NLP categories. • Describe the NLP pipeline. • Explain the challenges in natural language understanding. • Explain the concepts of information retrieval and extraction. • Describe sentiment analysis.

Unit 7. NLP evaluation metrics

Unit 7. NLP evaluation metrics
Duration: 30 minutes

Overview	This unit explains how to evaluate the quality of your NLP algorithm.
Learning objectives	After completing this unit, you should be able to: • Define various metrics to measure the quality of your NLP algorithm. • Understand the difference between these metrics.

Unit 8. NLP and IBM Watson

Unit 8. NLP and IBM Watson
Duration: 30 minutes

Overview	This unit lists the Watson services and software that are based on NLP and explains the main capabilities of Watson Natural Language Classifier, Watson Natural Language Understanding, Watson Discovery.
Learning objectives	After completing this unit, you should be able to: • List the NLP Watson services • List the Watson services that perform information extraction. • Describe the capabilities of IBM Watson Natural Language Classifier. • Describe the capabilities of the IBM Watson Natural Language Understanding. • Describe the capabilities of IBM Watson Discovery.

Exercise 6. Ingest, Convert, Enrich and Query with IBM Watson Discovery Service

Exercise 6. Ingest, Convert, Enrich and Query with IBM Watson Discovery Service
Duration: 1 hour 30 minutes

Overview	This exercise takes you through the process of preparing a collection of documents and running queries to extract insights from the documents. In the optional exercise you will work with the Discovery API.
Learning objectives	After completing this exercise, you should be able to: • Create a Watson Discovery service instance. • Create a collection. • Add content to a collection. • Create a custom configuration. • Build queries. • Use the Discovery API.

Unit 9. Introduction to IBM Watson Knowledge Studio

Unit 9. Introduction to IBM Watson Knowledge Studio
Duration: 45 minutes

Overview	This unit introduces Watson Knowledge Studio, its capabilities, and features. This unit explains the end-to-end domain adaptation process.
Learning objectives	After completing this unit, you should be able to: • Describe IBM Watson Knowledge Studio. • List the Watson services that are trained by Knowledge Studio. • List the Knowledge Studio workspace resources. • Explain the process to build Knowledge Studio models that can be deployed and used with other Watson services.

Exercise 7. Creating a machine learning model with Watson Knowledge Studio

	Exercise 7. Creating a machine learning model with Watson Knowledge Studio. Duration: 1 hour and 15 minutes
Overview	This exercise takes you through the process of building a machine learning model with Knowledge Studio that you can deploy and use with Watson services. In the optional exercise, you will create a rule-based model that you can use to find text patterns in documents.
Learning objectives	After completing this exercise, you should be able to: • Create a workspace for Watson Knowledge Studio. • Configure the workspace resources. • Create document sets. • Pre-annotate documents. • Create tasks for human annotators. • Analyze inter-annotator agreement and adjudicate conflicts in annotated documents. • Create machine learning models.

Unit 10.Introduction to chatbots

	Unit 10.Introduction to chatbots Duration: 30 minutes
Overview	This unit provides a high level introduction to chatbots, chatbot applications and guidelines to consider when designing a chatbot.
Learning objectives	After completing this unit, you should be able to: • Explain what a chatbot is. • Describe common applications of chatbots. • Identify factors that drive the growing popularity of chatbots. • Recognize the guidelines to consider when designing a chatbot. • List examples of tools and services that you can use to create chatbots.

Unit 11. Introduction to IBM Watson Assistant

Unit 11. Introduction to IBM Watson Assistant
Duration: 1 hour

Overview	This unit covers the core concepts that you need to understand to build a chatbot with Watson Assistant.
Learning objectives	After completing this unit, you should be able to: • Explain assistants and skills. • Explain intents. • Explain entities. • Explain context variables. • Describe how the nodes in a dialog are triggered. • Describe how the dialog flow is processed. • Describe the features that can be used to enrich the chatbot.

Exercise 8. Getting started with IBM Watson Assistant

Exercise 8. Getting started with IBM Watson Assistant
Duration: 45 minutes

Overview	This exercise introduces IBM Watson Assistant and walks you through the process of creating a very simple chatbot with Watson Assistant.
Learning objectives	After completing this exercise, you should be able to: • Create a Watson Assistant service instance. • Create a Watson Assistant skill. • Add intents. • Build a dialog.

Exercise 9. Help Desk chatbot

Exercise 9. Help Desk chatbot
Duration: 1 hour 30 minutes

Overview	In this exercise you will create a chatbot application with Node-RED without coding and integrate it with the Watson Assistant service.
Learning objectives	After completing this exercise, you should be able to: • Create a Watson Assistant skill. • Add intents and entities. • Build a dialog. • Create a Node-RED application that integrates with the Watson Assistant service. • Set up Slack as a front-end chat service for the Help Desk chatbot.

Unit 12. Introduction to computer vision

Unit 12. Introduction to computer vision
Duration: 30 minutes

Overview	This unit provides a high level introduction to computer vision.
Learning objectives	After completing this unit, you should be able to: • Define computer vision. • Explain the history of computer vision and its advancement with AI. • Identify computer vision use cases. • List tools and services for computer vision.

Unit 13. Computer vision fundamentals

Unit 13. Computer vision fundamentals
Duration: 30 minutes

Overview	This unit explains the basic steps of a typical computer vision pipeline, how CV analyzes and processes images, and explores commonly used techniques in CV.
Learning objectives	After completing this unit, you should be able to: • Describe image representation for computers. • Describe the computer vision pipeline. • Describe different preprocessing techniques. • Explain image segmentation. • Explain feature extraction and selection. • Describe when object recognition takes place.

Unit 14. Introduction to IBM Watson Visual Recognition

Unit 14. Introduction to IBM Watson Visual Recognition
Duration: 45 min

Overview	This unit introduces the Watson Visual Recognition service, describes its capabilities and how to train the service.
Learning objectives	After completing this unit, you should be able to: • Describe the IBM Watson Visual Recognition service. • List the features available with Watson Visual Recognition. • Describe the output provided by the Watson Visual Recognition service. • Explain the capabilities of the default classifier. • Explain the difference between a default and a custom classifier. • Describe how to train a custom classifier.

Exercise 10. IBM Watson Visual Recognition model builder in IBM Watson Studio

Exercise 10. IBM Watson Visual Recognition model builder in IBM Watson Studio
Duration: 1hour

Overview	In this exercise, you learn how to create, train, and test a custom model. With a custom model, you can train the Watson Visual Recognition service to classify images to suit your business needs.
Learning objectives	After completing this exercise, you should be able to: • Create a Watson Visual Recognition service. • Create and train a custom Watson Visual Recognition model by using Watson Studio. • Edit and retrain the trained model. • Describe the effect of adding a negative class when training a Watson Visual Recognition model.

Unit 15. Designing and building an intelligent solution

Unit 15. Designing and building an intelligent solution
Duration: 45 minutes

Overview	This unit explains the benefits of integrating multiple Watson services to build a comprehensive intelligent solution. This unit presents two intelligent solutions use cases: Cognitive banking FAQ chatbot and Intelligent procurement system.
Learning objectives	After completing this unit, you should be able to: • Explain the need to integrate multiple IBM Watson services to build an intelligent solution. • Describe the general outline for the integration of IBM Watson Assistant with other services and applications. • Explain the key concepts that enable Watson Assistant integration. • Describe the integration flow between Watson Assistant, Watson Discovery, Watson Natural Language Understanding, and Watson Tone Analyzer to build the cognitive banking chatbot. • Describe the integration flow between Watson Knowledge Studio and Watson Discovery.

Exercise 11. Creating a cognitive banking FAQ chatbot

Exercise 11. Creating a cognitive banking FAQ chatbot
Duration: 1 hour and 30 minutes

Overview	This exercise introduces you to IBM Watson Node.js SDK to include conversation interactions, anger detection, natural language understanding, and answer discovery in your FAQ chatbot application.
Learning objectives	After completing this exercise, you should be able to: • Create a chatbot using Watson Assistant and Node.js. • Use Watson Discovery with passage retrieval to find answers in FAQ documents. • Use Watson Tone Analyzer to detect emotion in a conversation. • Identify entities in the user's input with Watson Natural Language Understanding.

Exercise 12. Integrating Watson Knowledge Studio with Discovery for the procurement domain (optional)
Duration: 1 hour

Overview	In this exercise, you will create a Discovery collection with procurement documents initially enriched by the Discovery Default Configuration. Then, you will create a Knowledge Studio machine learning model trained for the procurement domain and deploy the model to Discovery. Finally, you will evaluate the results.
Learning objectives	After completing this exercise, you should be able to: • Create a machine learning model in Watson Knowledge Studio and deploy it to Watson Discovery. • Create a Watson Discovery custom configuration and leverage a Watson Knowledge Studio model to enrich entities and relations. • Integrate a custom model from Watson Knowledge Studio with the Discovery service to provide custom entity and relations enrichments customized for a specific procurement domain.