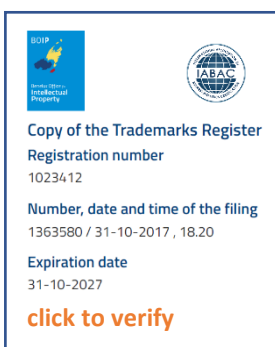




# Certified Machine Learning Expert (CMLE)

## CODE: DS2040

## Syllabus and Examination



*The International Association for Data Science Certification (IABAC®) is a globally recognized professional association dedicated to growing and enhancing the field of applied Data Science and Business Analytics.*

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# 1 INTRODUCTION

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This document is intended to provide information on Certified Machine Learning Expert (CMLE-DS2040) certification for registered training providers to structure the course curriculum as per IABAC syllabus guidelines and for individuals, who are preparing for IABAC CMLE certification exam.

## 2 COURSE SYLLABUS

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### 2.1 PYTHON FOR DATA SCIENCE

- Introduction to Data Science with Python
- Python Basics: Basic Syntax, Data Structures
- Data objects, Math, Comparison Operators, Condition Statements, loops, lists, tuples, dicts, functions
- Numpy Package
- Pandas Package
- Python Advanced: Data Munging with Pandas
- Python Advanced: Visualization with Matplotlib
- Exploratory Data Analysis: Data Cleaning, Data Wrangling
- Exploratory Data Analysis: Case Study

### 2.2 STATISTICS FOR DATA SCIENCE

- Introduction to Statistics
- Harnessing Data
- Exploratory Analysis
- Distributions
- Hypothesis & Computational Techniques
- Correlation & Regression

### 2.3 SQL FOR DATA SCIENCE

- Install SQL packages and Connecting to DB
- RDBMS (Relational Database Management) Basics
- Basics of SQL DB, Primary Key, Foreign Key
- SELECT SQL command, WHERE Condition
- Retrieving data with SELECT SQL command and WHERE Condition to Pandas DataFrame.
- SQL JOINS
- Left Join, Right Joins, multiple joins

### 2.4 MACHINE LEARNING ASSOCIATE

- Machine Learning Introduction
- What is ML? ML vs AI. ML Workflow, Statistical Modelling of ML. Application of ML
- Machine Learning Algorithms
- Popular ML Algorithms, Clustering, Classification and Regression, Supervised vs Unsupervised

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- Choice of ML
- Supervised Learning
- Simple and Multiple Linear regression, KNN, and more
- Linear Regression and Logistic Regression
- Theory of Linear Regression, hands on with use cases
- K-Nearest Neighbour (KNN)
- Decision Tree
- Naïve Bayes Classifier
- Unsupervised Learning: K-Means Clustering

## 2.5 MACHINE LEARNING EXPERT

- Advanced Machine Learning Concepts
- Tuning with Hyper parameters
- Random Forest – Ensemble
- Ensemble theory, Random Forest Tuning
- Support Vector Machine (SVM)
- Simple and Multiple Linear Regression, KNN
- Natural Language Processing (NLP)
- Text Processing with Vectorization, Sentiment Analysis with Text Blob, Twitter Sentiment Analysis.
- Naïve Bayes Classifier
- Naïve Bayes for Text Classification, News Articles tagging
- Artificial Neural Network (ANN)
- Basic ANN for Regression and Classification
- TensorFlow Overview
- Deep Learning Intro

## 2.6 MODEL DEPLOYMENT

- Basics of Application Program Interface (API)
- API basics, Loosely Coupled Architecture
- Installing Flask
- Installation and configuring Flask and cross domain authentication
- End to End ML project with API deployment
- Complete project flow with API deployment and assessing through the website
- Various Deep Learning models in practice and applications
- Convolutional Neural Network CNN Intro
- Case Study: Keras–TensorFlow Image Classification
- CNN hands on application for Classification Images of Cats and Dogs

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## 3 EXAMINATION

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### 1.1 PRE-REQUISITE QUALIFICATIONS

1. No mandatory pre-requisite
2. Recommended essential knowledge in
  - a. Mathematics: Calculus, Statistics, Linear Algebra, Probability
  - b. Machine Learning and Python/R Programming
3. Training: Though formal training is not mandatory; it is recommended to attend IABAC® registered course through Registered Education Partners

### 1.2 MATERIAL PERMITTED

1. The examination is an 'open book'
2. Candidates can refer to any material

### 1.3 EXAM DURATION AND FORMAT

1. Exam format is through a Project Submission
2. The assessment duration is 8 hours.
3. The project is graded for three areas: Project Summary with recommendations, Machine Learning model performance and Exploratory Data Analysis

### 1.4 EXAM MODE

1. Project needs to be submitted at IABAC project submit page, as per exam guidelines
2. Any copied work, ideas, concepts or a piece of text needs to be marked with reference as per IABAC project plagiarism guidelines

### 1.5 PASS CRITERIA

1. The candidate needs to score assessment grade A+, A, B+, B, C+, C as a PASS Criteria
2. The candidate will be awarded grade F in case of failing to meet the pass criteria
3. The results will be declared after validation with the project guidelines

### 1.6 RESULTS TIMELINE

1. The preliminary results are usually released within **9 days** of the exam date
2. The official results are usually released within **15 days** from the exam date

### 1.7 CERTIFICATE ISSUANCE

- IABAC® e-certificate will be issued through the candidate's registered email
- The e-certificate is digital verifiable at <https://www.iabac.org/verify-certificate>
- The candidate has a license to share digital certificate validation in professional networking portals such as [www.linkedin.com](http://www.linkedin.com)
- The candidate has a license to print physical copy (hardcopy) of the certificate

## 4 IABAC® KNOWLEDGE AREAS MAPPING

Knowledge Area	Syllabus Details	Bloom's Index
<p><b>KAG1-DSDA:</b> Data Analytics group including Machine Learning, Statistical Methods, and Business Analytics</p>	<ul style="list-style-type: none"> <li>● Case Study on Statistical Analysis</li> <li>● Curating the Data and performing, Discrete Mathematics, Probabilistic Reasoning</li> <li>● Statistical Methods, including Descriptive Statistics, Exploratory Data Analysis (EDA) and Confirmatory Data Analysis (CDA)</li> <li>● Case Study &amp; Creating Machine Learning Model</li> <li>● With detailed implementation of algorithms: Artificial Intelligence, Natural Language Processing</li> <li>● Knowledge Representation and Reasoning</li> <li>● Data Mining and knowledge discovery</li> <li>● Text analysis, Data Mining, Text Analytics including Statistical, Linguistic, and Structural Techniques to analyse Structured and Unstructured data</li> <li>● Creating Predictive Forecasting Models</li> <li>● Decision Analysis and Decision Support Systems</li> </ul>	6
<p><b>KAG2-DSENG:</b> Data Science Engineering group including Software and Infrastructure Engineering</p>	<ul style="list-style-type: none"> <li>● Set Up Infrastructure and Big Data Applications</li> <li>● Computer Networks for high-performance computing and Big Data Infrastructure</li> <li>● Cloud Enabled Applications development</li> <li>● Modelling and Simulation</li> <li>● Modelling and Simulation Theory and Techniques (general and domain oriented)</li> <li>● Large Scale Modelling and Simulation Systems</li> <li>● Set up Big Data (Data Science) Applications Design</li> <li>● Programming Languages for Big Data Analytics: R, Python, others</li> <li>● Models and Languages for complex interlinked Data Presentation and Visualisation</li> </ul>	5
<p><b>KAG3-DSDM:</b> Data Management group including Data Curation, Preservation and Data Infrastructure</p>	<ul style="list-style-type: none"> <li>● Creating Database Models and Data Curation</li> <li>● Data Modelling, Databases and Database Management Systems, Data Models and Query Languages, Database Administration</li> <li>● Set up Data Management and Enterprise Data Infrastructure</li> <li>● Data management, including Reference and Master Data, Data Warehousing and Business Intelligence, Data storage and Operations</li> <li>● Data Archives/Storage Compliance and Certification Metadata, Linked data, Provenance</li> </ul>	4

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	<ul style="list-style-type: none"> <li>• Data Infrastructure, Data Management and Organisation Research Data Infrastructure, Open Science, Open Data, Open Access, Data Infrastructure Compliance and Certification, Ethical Principle and Data Privacy</li> </ul>	
<b>KAG4-DSRM:</b> Scientific and Research Methods group	<ul style="list-style-type: none"> <li>• Scientific/Research Methods</li> <li>• Research Methodology, Paradigms and Research Cycle, Modelling and Experiment Planning</li> <li>• Data Selection and Quality Evaluation</li> <li>• Use Case Analysis: Research Infrastructures and Projects Research Data Management plan and Ethical Issues</li> </ul>	6
<b>KAG5-DSBPM:</b> Business Process Management group	<ul style="list-style-type: none"> <li>• Business Process Management</li> <li>• Business Processes and Operations, Project Scope and Risk Management</li> <li>• Business Analysis - Organisation and Management</li> <li>• Business Analysis - Planning and Monitoring</li> <li>• Requirements Analysis and Design Definition</li> <li>• Requirements Life Cycle Management (from inception to retirement) Solution Evaluation and Improvements Recommendation</li> <li>• Business analysis and Enterprise Organisation</li> <li>• Agile Data Driven Methodologies, Processes and Enterprises</li> <li>• Use Case Analysis: Business and Industry</li> </ul>	4
<b>KAG6-DSDK:</b> Data Science Domain Knowledge group includes domain specific knowledge	<ul style="list-style-type: none"> <li>• Applied Data Science use cases in Domains, HR, Retail, Fraud Analytics, Finance Trends, Health Care, Infrastructure Management</li> </ul>	2

## 5 BLOOM'S TAXONOMY REFERENCE

Bloom's Learning Index	Description
1	Remembering: Recall or retrieve previous learned information.
2	Understanding: Comprehending the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.
3	Applying: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the workplace.
4	Analysing: Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.
5	Evaluating: Make judgments about the value of ideas or materials.
6	Creating: Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure.

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