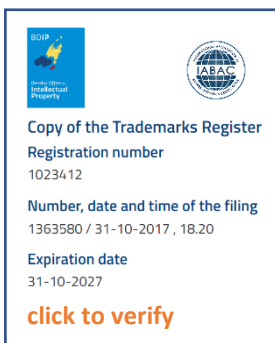




Certified Computer Vision Expert (CCVE)

CODE: AI3080

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.

IABAC™ founding principles are based on Edison Data Science Framework (EDSF), a European commission initiative, with the goal of aligning data science skills to industry requirements. IABAC was founded in the year 2017 as an association and, in the year 2018, registered as The Netherlands B.V (equivalent of English Private Limited).

KVK-nummer (Commercial Registration Number): 73234893 (click to verify)

Copyright © IABAC 2017-2020.

IABAC®, IABAC logo®, DSF®, CDS®, CAIE®, CNLPE®, CCVE®, CDSHR®, CDSFIN®, CVAE®, CDLE®, CDSHC®, CDSMKT®, CDS®, DSCMGR®, AICE®, CDS® and CMLE® are registered trademarks of IABAC BV, The Netherlands. Registration Number (KVK-nummer) :73234893. Reproduction of any part of this material requires written permission of IABAC BV.

All rights reserved. EN_CCVE_2020_Syllabus_V1.0

CONTENTS

1	Introduction	3
2	Course Syllabus	3
2.1	Introduction to Computer Vision	3
2.2	Image Representation and Analysis	3
2.3	Convolutional Neural Network	3
2.4	Features and Object Recognition	3
2.5	Image Segmentation	3
2.6	Project: Automatic Image Captioning	3
2.7	Advanced CNN Architectures	3
2.8	Recurrent Neural Networks	4
2.9	Attention Mechanisms	4
2.10	Image Captioning	4
2.11	Project: Landmark Detection and Tracking	4
2.12	Object Motion and Tracking	4
2.13	Optical Flow and Feature Matching	4
3	Examination	Error! Bookmark not defined.
3.1	Pre-requisite qualifications	Error! Bookmark not defined.
3.2	Material permitted	Error! Bookmark not defined.
3.3	Exam Duration and Format	Error! Bookmark not defined.
3.4	Exam mode	Error! Bookmark not defined.
3.5	Exam Format	Error! Bookmark not defined.
3.6	Pass Criteria	Error! Bookmark not defined.
3.7	Results Timeline	Error! Bookmark not defined.
3.8	Certificate Issuance	Error! Bookmark not defined.
4	IABAC® Knowledge Areas Mapping	6
5	Bloom's Taxonomy Reference	8

1 INTRODUCTION

This document is intended to provide information on Certified Computer Vision Expert (CCVE – AI3080) certification for registered training providers to structure the course curriculum as per IABAC syllabus guidelines and for individuals, who are preparing for IABAC CCVE certification exam.

2 COURSE SYLLABUS

2.1 INTRODUCTION TO COMPUTER VISION

- Learn where computer vision techniques are used in industry
- Prepare for the course ahead with a detailed topic overview
- Start programming your own applications

2.2 IMAGE REPRESENTATION AND ANALYSIS

- See how images are represented numerically
- Implement Image Processing techniques like colour and
- Geometric Transforms

2.3 CONVOLUTIONAL NEURAL NETWORK

- Learn about the layers of a Deep Convolutional Neural Network
- Convolutional, Max Pooling, and Fully Connected Layers
- Build a CNN-based Image Classifier in PyTorch
- Learn about Layer Activation and Feature Visualization techniques

2.4 FEATURES AND OBJECT RECOGNITION

- Learn why distinguishing features are important in pattern and object recognition tasks
- Write code to extract information about an object's colour and shape
- Use features to identify areas on a face and to recognize the shape of a car or pedestrian on a road

2.5 IMAGE SEGMENTATION

- Implement K-Means Clustering to break an image up into parts
- Find the contours and edges of multiple objects in an image
- Learn about background subtraction for video

2.6 PROJECT: AUTOMATIC IMAGE CAPTIONING

Combine CNN and RNN knowledge to build a deep learning model that produces captions given an input image. Image captioning requires that you create a complex deep learning model with two components: a CNN that transforms an input image into a set of features, and an RNN that turns those features into rich, descriptive language. In this project, you will implement these cutting-edge deep learning architectures.

2.7 ADVANCED CNN ARCHITECTURES

- Learn about advanced CNN architectures

Copyright © IABAC 2017-2020.

IABAC®, IABAC logo®, DSF®, CDS®, CAIE®, CNLPE®, CCVE®, CDSHR®, CDSFIN®, CVAE®, CDLE®, CDSHC®, CDSMKT®, CDS®, DSCMGR®, AICE®, CDSO® and CMLE® are registered trademarks of IABAC BV, The Netherlands. Registration Number (KVK-nummer) :73234893. Reproduction of any part of this material requires written permission of IABAC BV.

All rights reserved. EN_CCVE_2020_Syllabus_V1.0

- See how region-based CNN's, like Faster R-CNN, have allowed for fast, localized object recognition in images
- Work with a YOLO/single shot object detection system

2.8 RECURRENT NEURAL NETWORKS

- Learn how Recurrent Neural Networks learn from ordered sequences of data
- Implement an RNN for sequential text generation
- Explore how memory can be incorporated into a Deep Learning model
- Understand where RNN's are used in deep learning applications

2.9 ATTENTION MECHANISMS

- Learn how attention allows models to focus on a specific piece of input data
- Understand where attention is useful in Natural Language and Computer Vision applications

2.10 IMAGE CAPTIONING

- Learn how to combine CNNs and RNNs to build a complex captioning model
- Implement an LSTM for caption generation
- Train a model to predict captions and understand a visual scene

2.11 PROJECT: LANDMARK DETECTION AND TRACKING

Use feature detection and key point descriptors to build a map of the environment with SLAM (Simultaneous Localization and Mapping). Implement a robust method for tracking an object over time, using elements of Probability, Motion Models, and Linear Algebra. This project tests your knowledge of localization techniques that are widely used in autonomous vehicle navigation

2.12 OBJECT MOTION AND TRACKING

- Learn how to programmatically track a single point over time
- Understand motion models that define object movement over time
- Learn how to analyse videos as sequences of individual image frames

2.13 OPTICAL FLOW AND FEATURE MATCHING

- Implement a method for tracking a set of unique features over time
- Learn how to match features from one image frame to another
- Track a moving car using optical flow

3 EXAMINATION

3.1 PRE-REQUISITE QUALIFICATIONS

1. Certified Deep learning Expert Course (CDLE) or Demonstrable competence at CDLE level
2. Recommended advanced knowledge in
 - a. Mathematics: Calculus, Statistics, Linear Algebra, Probability
 - b. Machine Learning
3. Training: Though formal training is not mandatory; it is recommended to attend IABAC® registered course through Registered Education Partners

3.2 MATERIAL PERMITTED

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

3.3 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

3.4 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

3.5 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

3.6 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

3.7 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
- 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>KAG1-DSDA: Data Analytics group including Machine Learning, Statistical Methods, and Business Analytics</p>	<ul style="list-style-type: none"> ● Case Study on Statistical Analysis ● Curating the Data and performing, Discrete Mathematics, Probabilistic Reasoning ● Statistical Methods, including Descriptive Statistics, Exploratory Data Analysis (EDA) and Confirmatory Data Analysis (CDA) ● Case Study & Creating Machine Learning Model ● With detailed implementation of algorithms: Artificial Intelligence, Natural Language Processing ● Knowledge Representation and Reasoning ● Data Mining and knowledge discovery ● Text analysis, Data Mining, Text Analytics including Statistical, Linguistic, and Structural Techniques to analyse Structured and Unstructured data ● Creating Predictive Forecasting Models ● Decision Analysis and Decision Support Systems ● Data Mining 	6
<p>KAG2-DSENG: Data Science Engineering group including Software and Infrastructure Engineering</p>	<ul style="list-style-type: none"> ● Set Up Infrastructure and Big Data Applications ● Computer Networks for high-performance computing and Big Data Infrastructure ● Cloud Enabled Applications development ● Modelling and Simulation ● Modelling and Simulation Theory and Techniques (general and domain oriented) ● Large Scale Modelling and Simulation Systems ● Set up Big Data (Data Science) Applications Design ● Programming Languages for Big Data Analytics: R, Python, others ● Models and Languages for complex interlinked Data Presentation and Visualisation 	5
<p>KAG3-DSDM: Data Management group including Data Curation, Preservation and Data Infrastructure</p>	<ul style="list-style-type: none"> ● Creating Database Models and Data Curation ● Data Modelling, Databases and Database Management Systems, Data Models and Query Languages, Database Administration ● Set up Data Management and Enterprise Data Infrastructure ● Data management, including Reference and Master Data, Data Warehousing and Business Intelligence, Data storage and Operations 	4

Copyright © IABAC 2017-2020.

IABAC®, IABAC logo®, DSF®, CDS®, CAIE®, CNLPE®, CCVE®, CDSHR®, CDSFIN®, CVAE®, CDLE®, CDSHC®, CDSMKT®, CDS®, DSCMGR®, AICE®, CDSD® and CMLE® are registered trademarks of IABAC BV, The Netherlands. Registration Number (KVK-nummer) :73234893. Reproduction of any part of this material requires written permission of IABAC BV.

All rights reserved. EN_CCVE_2020_Syllabus_V1.0

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

Copyright © IABAC 2017-2020.

IABAC®, IABAC logo®, DSF®, CDS®, CAIE®, CNLPE®, CCVE®, CDSHR®, CDSFIN®, CVAE®, CDLE®, CDSHC®, CDSMKT®, CDS®, DSCMGR®, AICE®, CDSD® and CMLE® are registered trademarks of IABAC BV, The Netherlands. Registration Number (KVK-nummer) :73234893. Reproduction of any part of this material requires written permission of IABAC BV.

All rights reserved. EN_CCVE_2020_Syllabus_V1.0