CAIE Renewal & Continuous Professional Development Handbook

by

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INTRODUCTION

The Chartered AI Engineer (CAIE) is a professional qualification programme that recognises and awards credentials to working professionals in AI-related engineering roles.

To ensure that engineers' knowledge, skills and experience remain updated, regular renewal is required for the Associate AI Engineer and CAIE 1 and 2 accreditation.

AI Professionals Association (AIP) is the conformity assessment body that issues the CAIE certification. It also runs the CAIE renewal process based on the CAIE Continuous Professional Development (CPD) framework which helps to ascertain if the engineers have been continuously engaged in professional development to maintain and upgrade their competencies in AI.

This handbook provides a guide for existing Chartered AI Engineers and Associate AI Engineers to renew their CAIE professional qualifications. It provides information on the renewal system, CPD requirements for renewal and the process involved.

ABOUT THE AI PROFESSIONALS ASSOCIATION

Founded in Singapore in July 2020, the AI Professionals Association (AIP) is the first grassroots-driven Association for engineers and professionals working in AI-related roles.

We aim to build an ecosystem that supports the growth and use of artificial intelligence (AI) to build a better society. To that end, the Association will drive an active and vibrant community of qualified engineers, technologists and practitioners to come together to learn, to collaborate and proactively harness the economic and scientific potential of AI for the betterment of humanity.

Through the strength of the community, AIP aims to gather and provide resources to individuals who are passionate about AI, to help them level up their AI capabilities and at the same time make a meaningful contribution to society. It also seeks to provide resources to organisations so that they can use AI ethically and with confidence.

For more information on AIP and its programmes, please visit https://aip.org.sg/

PROFESSIONAL QUALIFICATION RENEWAL

Chartered AI Engineers (with the exception of CAIE 3) are required to undergo regular renewal of their accreditation to ensure that their knowledge, skills and experience remain current.

Minimum continuous professional development (CPD) hours are required for renewal of each level of certification. For a definition of CPD hours and details of qualifying CPD activities please refer to section “CPD Activities” of this handbook.

The requirements for renewal are detailed below:

Qualification level	Renewal period	Required actions/documents
Associate AI Engineer	2 years	● Successful completion of the technical test and assessment interview ● Current AIP member ● Renewal fee: S$350 (nett)
Chartered AI Engineer Level 1	3 years	● A minimum of 75 CPD hours over the three years immediately preceding the renewal application (i.e. an average of 25 CPD hours per year), with verifiable documentation where applicable ● Current AIP member ● Updated curriculum vitae (CV) ● Renewal fee: S$390 (nett)
Chartered AI Engineer Level 2	4 years	● A technical report describing an AI solution or product that was deployed for a commercial project or an R&D/research initiative after the previous certification/recertification date ● A minimum of **100** CPD hours over the four years immediately preceding the renewal application (i.e. an average of 25 CPD hours per year), with accompanying verifiable documentation where applicable. ● Current AIP member ● Updated CV ● Renewal fee: S$460 (nett)

Chartered AI Engineer Level 3	NA	● The CAIE 3 qualification is valid as long as the recipient continues to contribute to the elevation of the AI profession and the growth of the AI ecosystem in Singapore.

CONTINUOUS PROFESSIONAL DEVELOPMENT

The CAIE Continuous Professional Development (CPD) framework helps to ascertain if CAIEs have been continuously engaged in professional development to maintain and upgrade their AI competencies. This is to ensure that their knowledge, skills and work experience are current and relevant to the field of AI.

There are four levels of CAIE professional qualifications:

- Associate AI Engineer (Assoc AI Engineer)
- Chartered AI Engineer Level 1 (CAIE 1)
- Chartered AI Engineer Level 2 (CAIE 2)
- Chartered AI Engineer Level 3 (CAIE 3)

Engineers have to meet the stipulated minimum CPD hours and submit AI project reports (where required) for CAIE renewal. CPD hours refer to the number of hours committed to relevant CPD activities (details in section “CPD Activities”). If the time committed is 45 minutes or more, it can be rounded up to the nearest hour.

Renewal requirements for different CAIE levels are as follows:

Assoc AI Engineer

- Renewal is based on a technical assessment and interview.

CAIE 1

- A minimum of 75 CPD hours over the three years immediately preceding the renewal application (i.e. an average of 25 CPD hours per year), with verifiable documentation where applicable.

CAIE 2

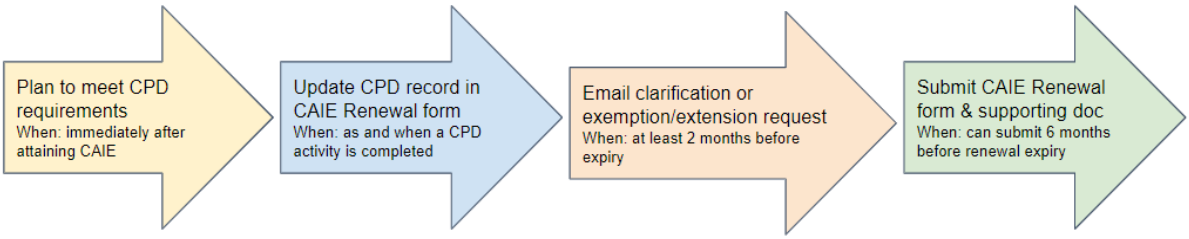
- A technical report describing an AI solution or product that was deployed for a commercial project or an R&D/research initiative after the previous certification/recertification date.
- A minimum of 100 CPD hours over the four years immediately preceding the renewal application (i.e. an average of 25 CPD hours per year), with accompanying verifiable documentation where applicable.
- At least 25 of the CPD hours must be related to project management/leadership courses such as Agile Project Management, ScrumMaster, Stakeholders Management etc.

CAIE 3

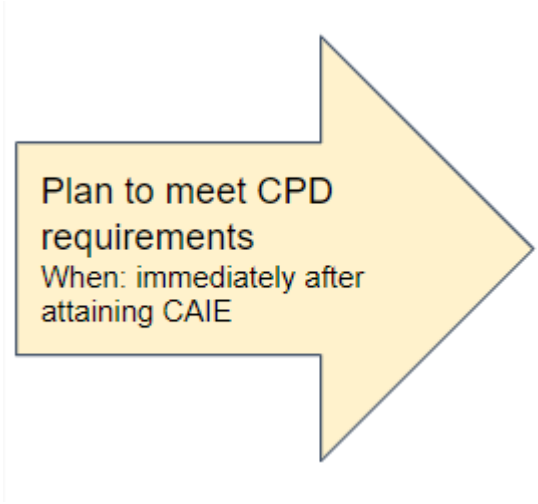
- No renewal is required. The qualification is valid as long as the recipient remains actively involved in any AI-related role.

CPD PROCESS

The following diagram depicts the CPD renewal process for CAIE 1 and CAIE 2 engineers:



1. Planning and execution of CPD activities

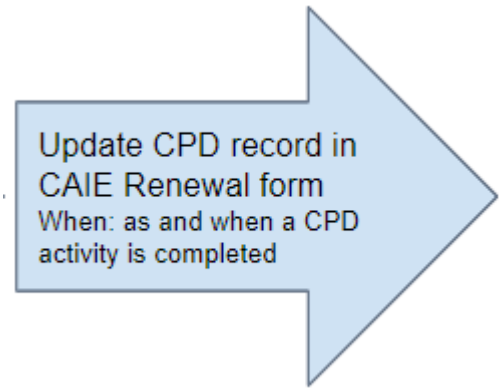


Planning and execution of CPD activities should start immediately after attaining the CAIE qualification.

The activities may include enrolment for relevant training courses, preparation and signing up for skills certification in specific areas of AI specialisation, and/or conducting courses on AI.

The activities should help the individual to enhance the skills required to retain the CAIE certification or upgrade to the next level.

2. Updating of CPD records



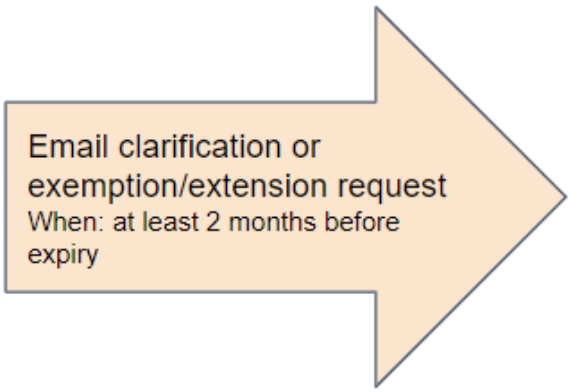
Upon completion of each CPD activity, the applicant should update his/her CPD records in the CAIE Renewal Form.

Important details include the activity type, duration (actual or estimated), date of completion and the organisation involved.

All relevant documents must be collated in readiness for the final submission.

Please download CAIE Renewal Form.

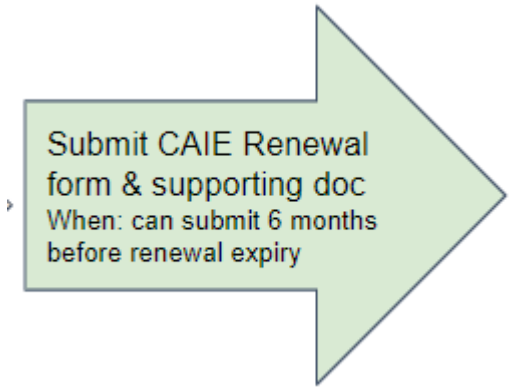
3. Seeking clarification



Any request for clarifications related to CAIE renewal, CPD activity or CPD hours, or for CPD exemption or deadline extension, must be submitted at least two months before the renewal due date.

Please send requests to cpd@aip.org.sg

4. Submitting the renewal form



The CAIE Renewal Form with all supporting documents and required reports must be submitted before the renewal due date.

All CAIE-certified engineers have to comply with the minimum CPD requirements. It is compulsory for CAIEs to declare their CPD compliance status in the CAIE Renewal Form.

Please download CAIE Renewal Form.

CPD ACTIVITIES

The CPD activities should be aligned with the competency areas spelt out in the CAIE assessment rubrics.

The list of activities included in this CPD framework is not intended to be inclusive but acts as a general guide. The CAIE is given the flexibility to select from any combination of activities listed below:

- Completing training courses
- Obtaining skills certification
- Conducting training courses (only applicable for CAIE 2 renewals)

1. Completing training courses

Applicants can submit details of structured training courses that they have completed for their CPD record. These may include onsite classroom courses or online courses and can be in the form of short courses, workshops or certification courses. The course content has to be relevant to the AI domain, and preferably aligned with the competency areas stated in the assessment rubrics.

Courses that are accepted for the CAIE renewal process include advanced diploma or specialist diploma courses designed to deepen AI-related knowledge and skills. Formal academic courses such as post-graduate diploma, degree or post-degree courses, whether full-time or part-time, are not included.

In-house training programmes by the applicant's company/organisation are included if they are aligned with the competency areas spelt out in the assessment rubrics. A letter from the organisation's Human Resource department and details of the training programme must be submitted for the CAIE renewal.

AIP reserves the right to disqualify CPD hours if the training courses are deemed to be irrelevant in contributing to the skills and competency of the applicants.

The core competencies required for CAIE 1 and 2 are:

Qualification	Required core competencies
Chartered AI Engineer Level 1	• Project management (for AI projects) • Exploratory data analysis • Data preparation • Model design and development • Model deployment AI governance
Chartered AI Engineer Level 2	• Project and team leadership (for AI projects) • Solution design and development • Model deployment workflow • Machine learning (ML) operations • AI governance • Business communication

For more details of the CAIE 1 and CAIE 2 assessment rubrics, please refer to Annexes A2 and A3.

For suggested courses or training providers, please refer to https://aip.org.sg/

2. Obtaining skills certification

Applicants can submit relevant specialised skills certification for their CPD record. The certification can be in AI or ML-related areas such modelling, design, deployment, infrastructure or project management etc.

In the event that there is no formal course duration based on a structured certification programme, estimated CPD hours can be submitted based on the duration of approved similar certification courses.

For skills certification recommendations, please refer to https://aip.org.sg/

3. Conducting training courses

CAIE 2 renewal applicants who have the expertise and experience to conduct AI-related training can also submit these training activities for their CPD record. The courses conducted must be in AI or ML-related areas such modelling, design, deployment, infrastructure or project management etc.

The submission must include a formal confirmation letter from the course organiser and the course outline.

Note: This option is not applicable for CAIEs who are employed full time as trainers or lecturers.

DECLARATION AND AUDIT

All CAIEs have to submit their full CPD record with all the supporting documents for CAIE renewal. It is compulsory to declare their CPD requirements compliance status in the CAIE Renewal Form.

AIP Singapore will review all CAIE declarations and conduct regular audits on the submitted CPD records.

Supporting documents

1) Completing training courses

Documentary evidence for **completing training courses** may include a combination of any of the following:

- Course receipt
- Course description or outline
- Course completion certificate
- Proof of attendance from course organiser

For company-sponsored courses or courses conducted in-house by the applicant's company or organisation, a confirmation letter from the human resource department is also required in addition to the above.

Please note that course duration and applicant's name should be stated clearly in any of the above submitted documents.

For online self-paced courses, course duration estimates must be provided by the course provider.

2) Obtaining skills certification

Documentary evidence for **obtaining skills certification** may include a combination of any of the following:

- Certification receipt
- Certification of specialised skill
- Confirmation letter or email from organiser
- Relevant information on a similar course as reference (where estimated CPD hours are submitted)

Please note that applicant's name should be stated clearly in any of the above submitted documents.

3) Conducting training courses (For CAIE 2)

Documentary evidence for **conducting training courses** must include the following:

- Course description or outline
- Confirmation email or letter from the organiser

Please note that course duration and applicant's name should be stated clearly in any of the above submitted documents. Time required for course preparation should not be included.

All CPD records have to include the actual or estimated CPD hours of each activity. Submissions without the stated duration of CPD activities will not be considered.

All documentation should be scanned and zipped for submission. Only soft copies are required.

Please download CAIE Renewal Form.

CPD EXEMPTION OR **EXTENSION REQUEST**

Chartered AI Engineers who fail to comply with the CPD requirements will not have their CAIE status renewed unless an exemption or extension has been granted due to exceptional circumstances. Examples of these circumstances include a prolonged or critical medical condition, or maternity/paternity leave.

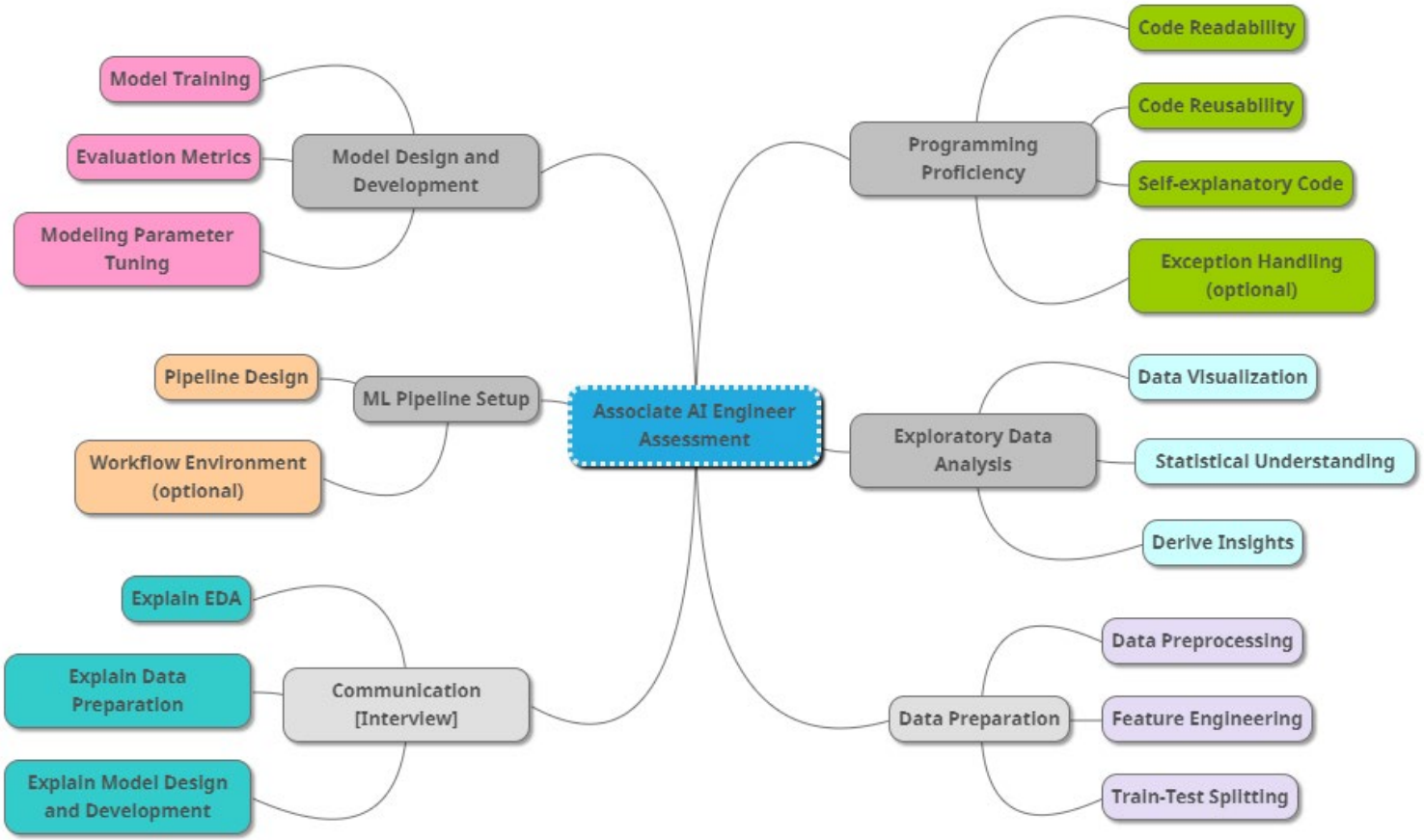
All requests will be reviewed and approved on a case-by-case basis.

Please email all CPD exemption or extension requests to cpd@aip.org.sg at least two months before the renewal deadline.

APPENDIX

ANNEX A1:

Assessment Rubrics for Associate AI Engineer



1. Programming Proficiency Assessment	
Code Readability	● Code is organized in a clean and readable format
Code Reusability	● Code is structured to minimize repeated code (e.g. using Functions)
Self-Explanatory Code	● Proper Naming Conventions for variables, functions, classes ● Include documentation with In-line Comments in source code ● Intent of Functions and Classes stated clearly
Exception Handling (Optional)	● Include codes to catch and handle exceptions, such as insufficient data, empty dataset, wrong data type etc

2. Exploratory Data Analysis Assessment	
Data Visualization	● Use appropriate visualization tools to generate plots to show the relationship between variables
Statistical Understanding	● Generate and provide good explanation of descriptive statistics (mean, median, mode, standard deviation, and variance) ● Include analysis between variables
Derive Insights	● Extract and explain insights from the EDA ● Link insights into a coherent story ● Engineer features based on the insights drawn

3. Data Preparation Assessment	
Data Pre-processing	● Perform Missing Data Analysis and take care of missing data appropriately by either removing data records with missing values or perform data imputation ● Perform Outliers Analysis and take care of outliers appropriately by either removing outlier records or replace outlier data ● Perform data investigation to check for erroneous data and perform appropriate data pre-processing to correct erroneous data
Feature Engineering	● Perform basic transformations for data; e.g. for numerical data, perform mathematical transformations, binning into categories etc; e.g. for string data, perform string replacement, extract substring, concatenate multiple strings etc ● Perform basic feature engineering to improve model accuracy
Train-Test Split	● Perform basic train-test-validate data split for model building to ensure the final model is not overfitted and model testing is unbiased

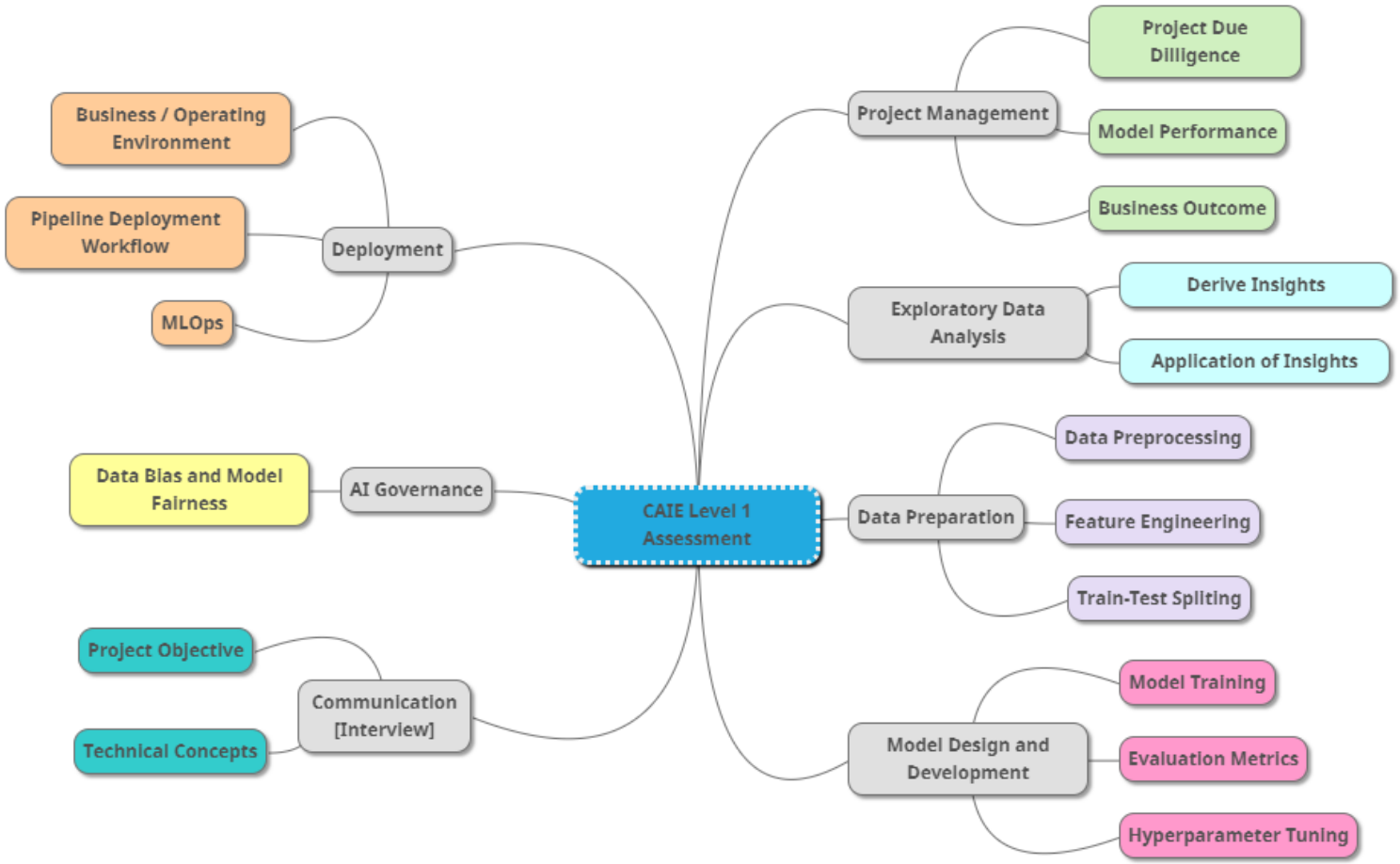
4. Model Design and Development Assessment	
Model Training	● Display good conceptual understanding of ML algorithms and models ● Built an appropriate model for the task using major ML framework
Evaluation Metrics	● Evaluate model performance using suitable metrics ● Able to explain the core concept for model selection, such as the trade-off between Variance vs Bias
Modelling Parameter Tuning	● Include consideration for a few modelling parameters and architecture for comparison

5. ML Pipeline Setup Assessment	
Pipeline Design	● Design modular pipeline to ingest data, perform data cleaning, data transformation, train models, generate evaluation metrics and make inference ● Automate pipeline workflow ● Functional pipeline that can be successfully ran end-to-end ● Include a README file to describe how to run the pipeline
Workflow Environment (Optional)	● Set up ML workflow environment and file structure to facilitate pipeline ● Include library versioning requirements file, e.g. “requirements.py” or “conda.yml” depending on the setup option

6. Communication [During Interview]	
Explain EDA	● Able to draw insights using EDA ● Able to collate insights into a coherent story and articulate it clearly
Explain Data Preparation	● Able to justify the methods used for imputing missing values, correcting erroneous data, or handling outliers ● Able to show how the new features help with model improvement ● Able to explain the rationale of train-test-validate data split strategy adopted
Explain Model Design and Development	● Able to explain how the solution addresses the problem statement ● Able to clearly articulate the benefits and drawbacks of the ML solution ● Familiar with how to evaluate the solution submitted ● Able to identify and address blockers that might arise in the workflow (data curation, model training and inference, deployment)

ANNEX A2:

Assessment Rubrics for Chartered AI Engineer Level 1



1. Project Management Assessment	
Project Due Diligence	● Can clearly articulate how the technical solution links to the stated objective/business need ● The benefits achieved from the deployment are detailed clearly
Model Performance	● There is ongoing evaluation of the model performance according to a clear set of metrics ● or, if monitoring has not commenced, there is an appreciation of how to enable it
Business Outcome	● Understand who are the end users and able to explain how the AI solution will benefit them ● Able to estimate the business impact of the AI solution

2. Exploratory Data Analysis Assessment	
Derive Insights	● EDA performed with good domain understanding and data insights derived
Application of Insight	● EDA performed resulting in relevant data cleaning or feature engineering

3. Data Preparation Assessment	
Data Pre-processing	● Appropriate choices made in basic pre-processing techniques, for outliers handling, missing data handling, erroneous data correction and other data transformation
Feature Engineering	● Feature engineering/ input pre-processing reflects an understanding of the algorithm, with linkages to insights from the EDA
Train-Test Split	● Perform train-test-validate data split for model building to ensure the final model is not overfitted and testing is unbiased, with linkages to insights from the EDA ● Apply sampling method to ensure all classes are well represented in each dataset ● Ensure there is no data leakage with the train-test split approach used

4. Model Design and Development Assessment	
Model Training	● Display good conceptual understanding of ML algorithms and models ● Adequately and correctly present the underpinning statistical or deep learning framework for the chosen algorithm ● Adapt current AI research paper or publication to problem statement
Evaluation Metrics	● Evaluate model performance using suitable metrics ● Able to explain the core concept for model selection, such as the trade-off between Variance vs Bias ● Able to link the metric assessment back to business goal
Modelling Parameter Tuning	● Include a few modelling parameters and architecture for comparison ● Fine-tuned the model to achieve metrics that are reasonable compared to current state-of-the-art models ● Include parameter tuning methodology and able to explain the experiments conducted, as well as draw conclusion from the tuning

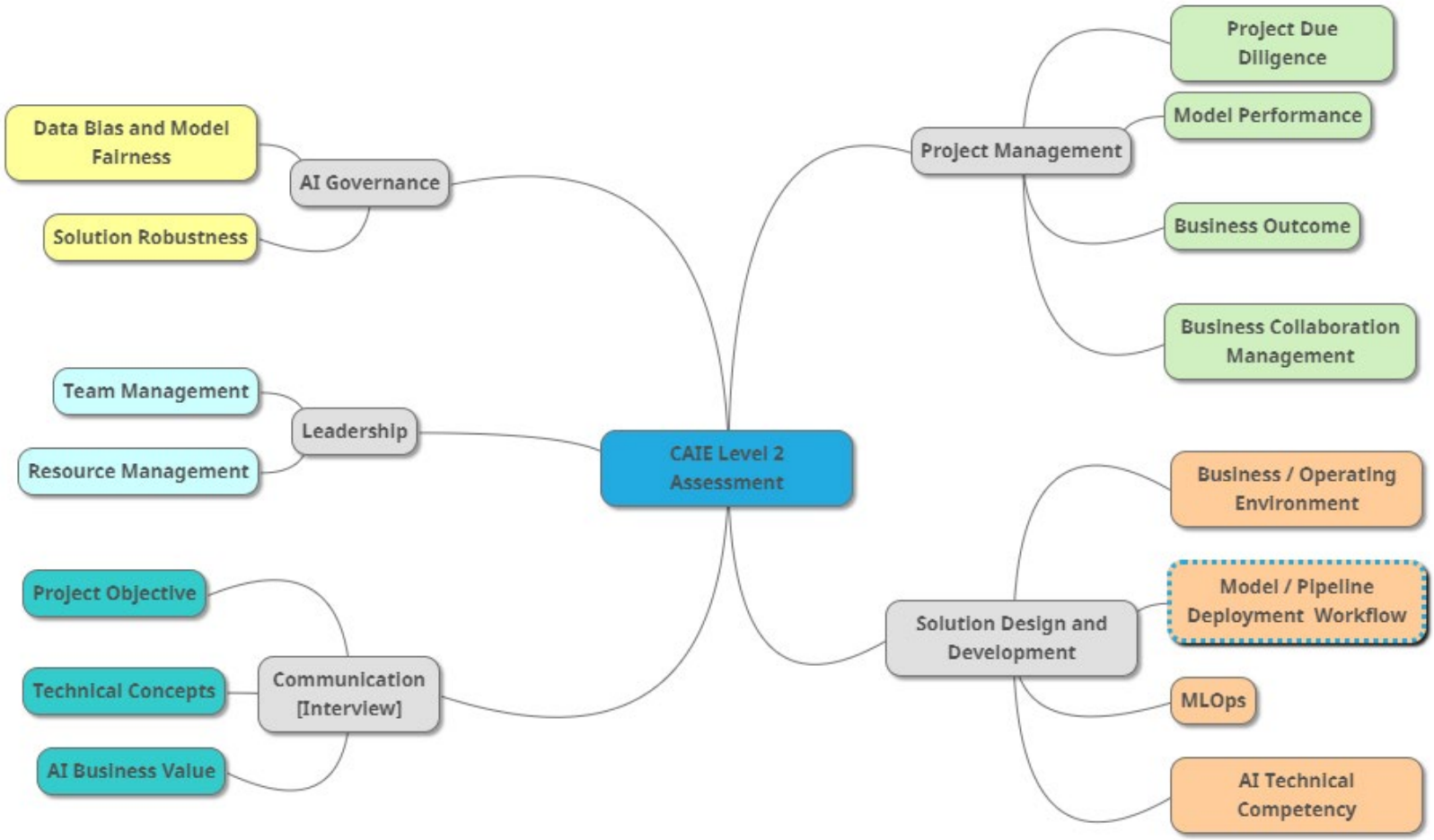
5. Deployment Assessment	
Business / Operating Environment	● Address business/operating environment considerations when developing the AI solution ● Able to describe the high-level architecture ● Project data is organized and versioned
Pipeline Deployment Workflow	● Pipelines are organized in a modularized fashion with reasonable adherence to software engineering best practices ● Automated/collaborated on the automation of the pipelines for key tasks, including data ingestion, data preparation, model training, metric evaluation, and performance monitoring ● Solution workflow environment and file structure are setup to facilitate pipeline
ML Ops	● Understand how to set up consistent infrastructure/platform to support ML development and deployment ● Able to gauge the need to scale data processing, model training and inference for the ML systems and clarify how to scale where required ● Able to track system performance of ML deployments (at LEAST ONE identified metrics/KPIs)

6. AI Governance Assessment	
Data Bias and Model Fairness	● Able to explain assessments performed on the fairness of the ML models to mitigate data bias

7. Communication [During Interview]	
Project Objective	● Able to elaborate the business objectives or goals of the project
Technical Concepts	● Able to explain the technical design and implementation of the project to a technical person

ANNEX A3:

Assessment Rubrics for Chartered AI Engineer Level 2



1. Project Management Assessment	
Project Due Diligence	● Display good understanding of project development process ● The benefits achieved from the deployment are detailed clearly, together with objective evidence of success as well as considerations for future needs and/or scalability ● Assumptions for the project (including models) to perform are well articulated, with built-in plans to discover and recover. ● Able to manage data-to-insight latency to meet application requirement
Model Performance	● There is ongoing evaluation of the model performance according to a clear set of metrics, ● Improvement plans have been thought up with reported issues being consistently managed
Business Outcome	● Understand who are the end users and able to explain how the AI solution will benefit them, and manage their expectations ● Able to explain both the business impact including both business value and risk of the AI solution
Business Collaboration Outcome	● Able to work effectively with business stakeholders and take in their input to co-develop AI solutions and drive the subsequent business adoption. ● Able to educate business stakeholders and add value to the business proposition of the AI solution during the co-development

2. Solution Design and Development Assessment	
Business / Operating Environment	● Sufficient understanding and analysis of the business needs with the business requirements clearly playback to business stakeholders and gained their confirmation ● Design of the solution sufficiently addresses the problem statement and reflects business and practical realities ● Employed a user-centered approach to design and develop the integrated AI solution, taking into account ease of use, human-in-the-loop processes, and change management
Model / Pipeline Deployment Workflow	● All stages in the model development process are sound in terms of quality and efficiency: o Data pipeline engineering and data model design o Model integration o Test planning ● Able to put in controls to track and manage input data quality ● Able to synthesize and integrate technologies for AI solution implementation, testing and deployment in production with knowledge of the trade-offs ● Management and security plan for project data defined and implemented
ML Ops	● Able to clarify the costs or the budget for ML systems such as costs of data collection and data processing ● Able to clarify and reason about scaling issues of ML systems ● Able to plan for change in the tech stack of ML systems ● Able to set up infra-as-code and automation to support ML development and deployment workflows ● Able to provide inputs into the procurement of ML infrastructure ● Able to interpret the output and the anomalies of ML systems for business leaders' appreciation ● Able to propose relevant metrics and track system performance of ML deployment

AI Technical Competency	● Able to demonstrate good understanding of AI technical competencies, as exampled below, for engineering high-performance AI solution: ○ Computational modelling, computer vision, text analytics with computational thinking skills ○ Self-learning systems

3. AI Governance Assessment	
Data Bias and Model Fairness	● Able to explain the consequences of flawed data and model bias ● Able to explain the steps taken to reduce model bias during solution development ● Include effort to perform assessment on the fairness of the ML models to mitigate data bias
Solution Robustness	● Regulations to ensure that the cybersecurity and safety of users and systems are taken into account during the full lifecycle of an AI product

4. Leadership Assessment	
Team Management	● Provide a clear plan and evidences of successful execution for coordinating and managing a development team during the project ● Provide example of conflict resolution
Resource Management	● Provide a clear plan and evidences of successful execution on managing and planning resources and budgets within his or her team

5. Communication [During Interview]	
Project Objective	● Able to elaborate the business objectives or goals of the project
Technical Concepts	● Able to explain technical design and implementation of the project well to non-technical person
AI Business Value	● Able to summarize the benefits and limitations of the AI approach to solving business challenges