**THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING**

# OCCUPATIONAL STANDARDS

# OCCUPATION: ARTIFICIAL INTELLIGENCE ENGINEER

## LEVEL: NTA LEVEL 7

**FEBRUARY 2024**

## TABLE OF CONTENTS

**ABBREVIATIONS**

| | |
|---|---|
| **ANN** | Artificial Neural Network |
| **AI** | Artificial Intelligence |
| **ASR** | Automatic Speech Recognition |
| **BERT** | Bidirectional Encoder Representation from Transformer |
| **CBET** | Competency Based Education and Training |
| **CNN** | Convolutional Neural Network |
| **CV** | Computer Vision |
| **DL** | Deep Learning |
| **DRL** | Deep Reinforcement Learning |
| **ELMo** | Embedding from Language Models |
| **GAN** | Generative Adversarial Network |
| **GPT** | Generative Pre-trained Transformer |
| **KG** | Knowledge Graph |
| **LSTM** | Long Short-Term Memory |
| **ML** | Machine Learning |
| **NACTVET** | National Council for Technical and Vocational Education and Training |
| **NLG** | Natural Language Generation |
| **NLP** | Natural Language Processing |
| **NOS** | National Occupational Standards |
| **OCR** | Optical Character Recognition |
| **OS** | Occupational Standards |

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| **RL** | Reinforcement Learning |
| **RNN** | Recurrent Neural Network |
| **TET** | Technical Education and Training |
| **TTS** | Text-to-Speech |
| **TVET** | Technical and Vocational Education and Training |

## GLOSSARY OF TERMS

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| **Circumstantial Knowledge:** | Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues. |
| **Competence:** | The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment. |
| **Competency:** | A description of the ability one possesses when able to perform a given occupational task effectively and efficiently. |
| **Competency-based Education:** | An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance. |
| **Curriculum:** | A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes". |
| **Educational/Training Programme:** | The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation. |
| **Occupation:** | A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker) |
| **Occupational Area:** | This is a broad grouping of related jobs. (Example: food service) |
| **Occupational Competence:** | The application of knowledge and skills that consistently meet the standards required by the work context. |
| **Occupational Standards:** | Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes. |
| **Occupational/Job Analysis:** | A process used to identify the tasks that are important to employees in any given occupation**.** |
| **Performance Criteria:** | Indicate expected end results or outcomes in the form of evaluative statements. |
| **Skills:** | The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor. |

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| **Standards:** | A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance. |
| **Task Analysis:** | The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it. |
| **Task:** | A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision. |
| **Underpinning Knowledge:** | Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task. |
| **Verification Process:** | The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation. |

## 1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status, with a high level of human development. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training (NACTVET) has begun the job of drafting Occupational Standards (OS) that will eventually be adopted as National Occupational Standards (NOS) for use in the delivery of TET that meets the needs of the labour market and the country's economic agenda.

Occupational Standards (OS) are performance criteria that are matched with labour market demands. Each of them describes the functions, performance standards, and understanding or knowledge underpinning a given occupation. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruitment, supervision, and appraisal, as well as TET Standards. They are also helpful for benchmarking and harmonizing job qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in application across all public and private institutions.

However, it must be noted that Occupational Standards are different from Training /Education Standards. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical circuits, performs troubleshooting in electrical circuits, etc.), and are usually defined by Employers following procedures as agreed upon by all the stakeholders. On the other hand, Training and Education Standards are developed from the activities defined in the occupational standards, and they specify learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him/her to function at an agreed level in an occupation. Training and Education Standards are used to define curricula in training institutions. It is critical, however, to establish a direct link between the occupational standards and the training standards for both of them to respond collaboratively to the demands of the labour market.

For the purpose of TET delivery, Tanzania has adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programmes. Therefore, it is quite

pertinent for TET institutions to use the relevant occupational standards as a benchmark for formulating their curricula.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training.

The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

## 2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The process of developing these Occupational Standards involved both local and international expertise. The process began with an examination of major documents that guide Tanzanian skills development including the *10-year National Skills Development Strategy (2016-2026).* NACTVET labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a team of experts in consultation with practitioners developed draft occupational standards. The draft document was used to develop an occupational profile for each occupation (DACUM Chart), which is attached as an **Appendix** to every Occupational Standard.

The occupational standards were validated during the stakeholders' forum held on 22nd and 23rd February 2024 at Morogoro. The information from the stakeholders' forum provides insight from the workplace, professional bodies, regulatory bodies and sector ministries regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation.

## 3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR ARTIFICIAL INTELLIGENCE ENGINEERS

The standards cover a broad range of duties and tasks that can be performed by an Artificial Intelligence Engineer. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Artificial Intelligence Engineer may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

Artificial Intelligence Engineers not only master the process of selecting, implementing, optimizing and applying basic AI models, but also work on the development and application of AI platforms, and the development, management technology consulting and evaluation of AI-related projects. They must always keep abreast of the latest technological advances, as a full understanding of these

advances is crucial for the continued development of their business. Generally, the Artificial Intelligence Engineer performs the following responsibilities:

a) Selection of AI algorithms

b) Implementation of AI algorithms

c) Optimization of AI algorithms

d) Application of AI algorithms

e) Management and operation of AI platforms

f) Development and analysis of natural language and speech processing requirements analysis report

g) Deployment of the technical architecture and business system of natural language and speech processing projects

h) Development and management of natural language and speech processing projects

i) Development and analysis of computer vision project requirements analysis reports

j) Training, inference, and deployment of basic algorithm models for computer vision

k) Engineering of common hardware environments and tool chains using computer vision algorithms

l) Development and management of computer vision basics projects

m) Development and analysis of requirements analysis reports for AI application integration

n) Development of data analysis and processing methods

o) Development and management of AI application integration models

p) Completion of the integration test of AI related projects (products)

q) Provision of technical consulting and evaluation services for AI projects

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA LEVEL 7 and 8.

## 4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

## 5.0. OCCUPATIONAL STANDARDS

## 5.1 OCCUPATIONAL STANDARDS FOR ARTIFICIAL INTELLIGENCE ENGINEER - NTA LEVEL 7

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT SELECTION AND SIMPLE APPLICATION OF BASIC AI MODELS | **DUTY NO.** | 701 |
| **TASK TITLE** | CONSTRUCT AN AI MODEL DEVELOPMENT ENVIRONMENT | **TASK NO.** | 7011 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to construct an AI development environment in accordance with industry standards and national norms. | | |
| **RANGE STATEMENT** | The task can be performed independently or as a team in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents; i.e. manual and guide etc<br>2. Computers;<br>3. AI model related software tools;<br>4. Network infrastructures;<br>5. Safety gear. | | |

| **EVIDENCE REQUIREMENT** | |
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| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
| The person performing this task must be able to do the following:<br>1. Select and obtain development environment related software;<br>2. Install and configure software related to the AI model development environment;<br>3. Validate the correctness of the construction of the AI model development environment;<br>4. Analyse and solve installation and configuration problems;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Install an AI model development environment;<br>1.2 Configure an AI model development environment;<br>1.3 Upgrade the AI model development environment;<br>1.4 Uninstall the AI model development environment.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Operation of AI models;<br>2.2 Requirements of the AI model environment.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 AI development environment installation methods;<br>3.2 AI development environment configuration requirements; |

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| | 3.3 AI development environment upgrade procedures;<br>3.4 AI development environment uninstallation process.<br><br>**4.0 Essential Skills**<br>4.1 Analysis skills;<br>4.2 Critical thinking skills;<br>4.3 Problem-solving skills;<br>4.4 Communication skills;<br>4.5 Teamwork skills;<br>4.6 Leadership skills;<br>4.7 Project management skills;<br>4.8 Time management skills. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The AI model development environment is constructed in accordance with industry standards and national norms. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT SELECTION AND SIMPLE APPLICATION OF BASIC AI MODELS | **DUTY NO.** | 701 |
| **TASK TITLE** | RUN AI BASIC NEURAL NETWORK MODELS | **TASK NO.** | 7012 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to run AI basic models and the selected neural network model in accordance with industry standards and national norms. | | |
| **RANGE STATEMENT** | The task can be performed independently or as a team in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI model related software tools.<br>4. Network infrastructures;<br>5. Safety gear. | | |

| **EVIDENCE REQUIREMENT** | |
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| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
| The person performing this task must be able to do the following:<br>1. Select basic AI models;<br>2. Obtain AI model software;<br>3. Import AI neural network models;<br>4. Configure AI neural network models;<br>5. Run AI neural network models;<br>6. Analyse and solve problems in the running model;<br>7. Observe health and safety precautions;<br>8. Keep the workplace clean;<br>9. Store the tools;<br>10. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Build AI neural network models;<br>1.2 Run AI neural network models.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 AI neural network models;<br>2.2 AI neural network model operation;<br>2.3 AI neural network model configuration.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 AI neural network model standards;<br>3.2 AI neural network model configuration procedures;<br>3.3 AI neural network model running procedures.<br><br>**4.0 Essential Skills**<br>4.1 Problem analysis and solving skills;<br>4.2 Critical thinking skills;<br>4.3 Learning skills; |

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| | 4.4 Communication skills;<br>4.5 Teamwork skills;<br>4.6 Leadership skills;<br>4.7 Project management skills;<br>4.8 Time management skills. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | AI basic models and selected neural network models are imported, configured and run in accordance with industry standards and national norms. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT SELECTION AND SIMPLE APPLICATION OF BASIC AI MODELS | **DUTY NO.** | 701 |
| **TASK TITLE** | SOLVE ACTUAL BUSINESS PROBLEMS USING BASIC AI MODELS | **TASK NO.** | 7013 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to solve actual business problems using basic AI models in accordance with industry standards and national norms. | | |
| **RANGE STATEMENT** | The task can be performed independently or as a team in the office place under the supervision of Artificial Intelligence Engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI-related software tools;<br>4. Artificial intelligence engineer toolkit;<br>5. Network infrastructures;<br>6. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Analyse the characteristics of actual business;<br>2. Make comparative analysis of different deep learning or mainstream machine learning model algorithms;<br>3. Select suitable model algorithms for actual business;<br>4. Import AI models into the AI development environment;<br>5. Decompose the actual business into data acceptable to the model;<br>6. Import actual business data into the model;<br>7. Run AI models;<br>8. Analyse the running results;<br>9. Observe health and safety precautions;<br>10. Keep the workplace clean;<br>11. Store the tools;<br>12. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Select the appropriate AI machine learning model algorithm;<br>1.2 Apply deep learning or mainstream machine learning algorithm principles to write scripts to run them.<br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Application of AI machine learning algorithms;<br>2.2 Application of AI deep learning algorithms.<br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Machine learning algorithm requirements;<br>3.2 Deep learning algorithm requirements;<br>3.3 Operation of script languages;<br>3.4 Application of scenario strategies.<br>**4.0 Essential Skills** |

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| | 4.1 Problem analysis and solving skills;<br>4.2 Critical thinking skills;<br>4.3 Complex task control capabilities;<br>4.4 Communication skills;<br>4.5 Teamwork skills;<br>4.6 Leadership skills;<br>4.7 Project management skills;<br>4.8 Time management skills.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Basic AI models are used to solve actual business in accordance with industry standards and national norms. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Data processing;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | IMPLEMENT AND APPLY BASIC DEEP LEARNING ALGORITHMS | **DUTY NO.** | 702 |
| **TASK TITLE** | ANALYSE DEEP LEARNING FRAMEWORK | **TASK NO.** | 7021 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to analyse basic deep learning frameworks in accordance with industry standards and national information and communications technology guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI software tools (Deep learning frameworks.);<br>4. Network infrastructures;<br>5. Artificial intelligence engineer toolkit;<br>6. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Select mainstream deep learning framework models (PyTorch, Tensorflow, paddlepaddle, etc.);<br>2. Analyse the workflow of deep learning frameworks;<br>3. Analyse typical use cases of deep learning framework models;<br>4. Observe health and safety precautions;<br>5. Keep the workplace clean;<br>6. Store the tools;<br>7. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Distinguish mainstream deep learning frameworks;<br>1.2 Compare the applicable scope, advantages and disadvantages of each framework;<br>1.3 Analyse the functions of mainstream deep learning frameworks.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Deep learning frameworks;<br>2.2 Machine learning frameworks.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Classification, regression, and clustering of machine learning models;<br>3.2 Methods of data dimensionality reduction, selection and data pre-processing of machine learning models;<br>3.3 Tensor operations, matrix correlation operations, |

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| | complex operations, and reduction calculation methods for deep learning models;<br>3.4 Segmentation, sequence comparison, and index extraction of deep learning models.<br><br>**4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Communication skills;<br>4.4 Report writing skills;<br>4.5 Interpersonal skills;<br>4.6 Teamwork skills;<br>4.7 Time management skills.<br><br>**5.0 Math Skills**<br>5.1 Knowledge of statistics;<br>5.2 Knowledge of linear algebra matrix;<br>5.3 Knowledge of advanced mathematics functions. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Deep learning frameworks are analysed in accordance with industry standards and national information and communications technology guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | IMPLEMENT AND APPLY BASIC DEEP LEARNING ALGORITHMS | **DUTY NO.** | 702 |
| **TASK TITLE** | PERFORM INSTALLATION, UPGRADING, AND UNINSTALLATION OF DEEP LEARNING FRAMEWORKS | **TASK NO.** | 7022 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to install, upgrade, and uninstall deep learning frameworks in accordance with industry standards and national information and communications technology guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI software tools (PyCharm, etc.);<br>4. Network infrastructures;<br>5. Artificial intelligence engineer toolkit;<br>6. Safety gear. | | |

| **EVIDENCE REQUIREMENT** | |
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| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
| The person performing this task must be able to do the following:<br>1. Install deep learning frameworks (PyTorch, Tensorflow, paddlepaddle, etc.);<br>2. Perform data backup;<br>3. Upgrade deep learning frameworks;<br>4. Backup and restore deep learning frameworks;<br>5. Uninstall deep learning frameworks;<br>6. Test the deep learning framework that has been installed, upgraded;<br>7. Observe health and safety precautions;<br>8. Keep the workplace clean;<br>9. Store the tools;<br>10. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Perform data backup;<br>1.2 Install deep learning frameworks;<br>1.3 Upgrade deep learning frameworks;<br>1.4 Uninstall deep learning frameworks;<br>1.5 Test deep learning frameworks.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 AI data backup;<br>2.2 Deep learning frameworks.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Deep learning framework installation procedures;<br>3.2 Deep learning framework software library;<br>3.3 Script languages for operating frameworks;<br>3.4 Data backup methods. |

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| | **4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Data backup skills;<br>4.4 Communication skills;<br>4.5 Report writing skills;<br>4.6 Interpersonal skills;<br>4.7 Teamwork skills;<br>4.8 Time management skills. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Installation, upgrading, and uninstallation of deep learning framework is performed in accordance with industry standards and national information and communications technology guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | IMPLEMENT AND APPLY BASIC DEEP LEARNING ALGORITHMS | **DUTY NO.** | 702 |
| **TASK TITLE** | TRAIN AND USE DEEP LEARNING MODELS | **TASK NO.** | 7023 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to train and use deep learning models in accordance with industry standards and national information and communications technology guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents (Manuals and guidelines);<br>2. Computers;<br>3. AI software tools (Deep learning frameworks.);<br>4. Network infrastructures.<br>5. Artificial intelligence engineer toolkit;<br>6. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>2. Deploy and run deep learning framework models (PyTorch, Tensorflow, Paddlepaddle, etc.)on a local computer;<br>3. Use deep learning models;<br>4. Test the trained deep learning model;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Operate deep learning models based on script languages;<br>1.2 Train deep learning models;<br>1.3 Test the trained deep learning model.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Deep learning models;<br>2.2 Use of deep learning models.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Deep learning models test procedures;<br>3.2 Deep learning framework software library;<br>3.3 Script languages for operating models;<br>3.4 Data backup methods.<br><br>**4.0 Essential Skills** |

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| | 4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Data backup skills;<br>4.4 Communication skills;<br>4.5 Report writing skills;<br>4.6 Interpersonal skills;<br>4.7 Teamwork skills;<br>4.8 Project management skills;<br>4.9 Time management skills.<br><br>**5.0 Math Skills**<br>5.1 Knowledge of statistics;<br>5.2 Knowledge of linear algebra matrix;<br>5.3 Knowledge of advanced mathematics functions. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Training and using at least one deep learning model are conducted in accordance with industry standards and national information and communications technology guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | OPERATE AND USE AI PLATFORMS | **DUTY NO.** | 703 |
| **TASK TITLE** | PERFORM INSTALLATION, UPGRADING, AND UNINSTALLATION OF AI PLATFORM SERVER SYSTEM SOFTWARE | **TASK NO.** | 7031 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to install, upgrade, and uninstall AI platform server system software in accordance with industry standards and national information and communications technology guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI software tools (PyCharm, etc.);<br>4. Network infrastructures;<br>5. Artificial intelligence engineer toolkit;<br>6. Safety gear. | | |

| **EVIDENCE REQUIREMENT** | |
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| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
| The person performing this task must be able to do the following:<br>1. Obtain AI platform server system software;<br>2. Install AI platform server system software;<br>3. Perform data backup;<br>4. Upgrade AI platform server system software;<br>5. Backup and restore AI platform server system software;<br>6. Uninstall AI Plattform Server System Software;<br>7. Test the AI platform server system software that has been installed, upgraded, or uninstalled;<br>8. Observe health and safety precautions;<br>9. Keep the workplace clean;<br>10. Store the tools;<br>11. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Remotely log in to the AI platform server operating system;<br>1.2 Use script languages to operate the server;<br>1.3 Back up data;<br>1.4 Install, upgrade and uninstall AI platform server system software;<br>1.5 Test the AI platform server system software that has been installed, upgraded, or uninstalled.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 AI platform server operation;<br>2.2 AI platform server test;<br>2.3 AI platform data backup and restoration.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following: |

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| | 3.1 Installation, upgrade, and uninstallation strategies for platform server system software;<br>3.2 Server system software library;<br>3.3 Server script languages;<br>3.4 Data backup methods.<br><br>**4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Analysis skills;<br>4.4 Communication skills;<br>4.5 Report writing skills;<br>4.6 Interpersonal skills;<br>4.7 Teamwork skills;<br>4.8 Time management skills;<br>4.9 Platform operation capabilities. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The installation, upgrading, and uninstallation of AI platform server system software performed in accordance with industry standards and national information and communications technology guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | OPERATE AND USE AI PLATFORMS | **DUTY NO.** | 703 |
| **TASK TITLE** | CARRY OUT CONFIGURATION AND USING AI PLATFORM SERVER SYSTEM SOFTWARE | **TASK NO.** | 7032 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to configure and use AI platform server system software in accordance with industry standards and national information and communications technology guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI software tools (PyCharm, etc.);<br>4. Network infrastructures;<br>5. Artificial intelligence engineer toolkit;<br>6. Safety gear. | | |

| **EVIDENCE REQUIREMENT** | |
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| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
| The person performing this task must be able to do the following:<br>1. Log in to the server;<br>2. Run AI platform server system software;<br>3. Configure AI platform server system software;<br>4. Use the configured AI platform server system software;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Remotely log in to the server;<br>1.2 Use script languages to operate the server;<br>1.3 Configure AI platform server system software;<br>1.4 Test the configured server system software;<br>1.5 Use server system software.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 AI platform server system software configuration;<br>2.2 AI platform server system software use.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 AI platform server system software test methods;<br>3.2 AI platform server system software configuration methods;<br>3.3 Server script languages;<br>3.4 AI Plattform Server System Software usage; |

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| | 3.5 Data backup methods.<br><br>**4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Analysis skills;<br>4.4 Communication skills;<br>4.5 Report writing skills;<br>4.6 Interpersonal skills;<br>4.7 Teamwork skills;<br>4.8 Time management skills. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The configuration and use of AI platform server system software carried out in accordance with industry standards and national information and communications technology guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF NATURAL LANGUAGE AND SPEECH PROCESSING PROJECTS | **DUTY NO.** | 704 |
| **TASK TITLE** | CARRY OUT DEVELOPMENT AND ANALYSIS OF SIMPLE NATURAL LANGUAGE AND SPEECH PROCESSING REQUIREMENTS ANALYSIS | **TASK NO.** | 7041 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to develop simple natural language and speech processing requirements analysis reports in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. AI-related software tools;<br>3. Network infrastructures;<br>4. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Understand the overall overview of the project;<br>2. Understand the project and organize the project process;<br>3. Refine and validate project requirements;<br>4. Complete the project requirements analysis report;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Identify the main service target;<br>1.2 Analyse requirements;<br>1.3 Analyse requirements in combination with using habits.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Natural language requirements analysis;<br>2.2 Speech processing requirements analysis.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Speech recognition methods;<br>3.2 Speech synthesis methods;<br>3.3 Natural language processing methods;<br>3.4 Application method of natural language processing |

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| | tools;<br>3.5 Natural language and speech processing algorithms.<br><br>**4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Analysis skills;<br>4.4 Communication skills;<br>4.5 Report writing skills;<br>4.6 Interpersonal skills;<br>4.7 Teamwork skills;<br>4.8 Project management skills;<br>4.9 Time management skills.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Simple natural language and speech processing requirements developed and analysed in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF NATURAL LANGUAGE AND SPEECH PROCESSING PROJECTS | **DUTY NO.** | 704 |
| **TASK TITLE** | ASSESS AND BUILD THE BASIC NATURAL LANGUAGE AND SPEECH PROCESSING TECHNOLOGY ARCHITECTURE | **TASK NO.** | 7042 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to study and build the basic natural language and speech processing technology architecture in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of senior artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Network infrastructures;<br>3. AI-related software tools;<br>4. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Understand the classification of technical architecture;<br>2. Obtain corpora;<br>3. Pre-process corpora;<br>4. Characterize corpora;<br>5. Build a technical framework;<br>6. Observe health and safety precautions;<br>7. Keep the workplace clean;<br>8. Store the tools;<br>9. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Research basic algorithms;<br>1.2 Apply specific scenarios;<br>1.3 Prepare technical documents;<br>1.4 Transform business requirements into technical solutions.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Operation of natural language processing;<br>2.2 Operation of speech processing.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Speech recognition methods;<br>3.2 Speech synthesis methods;<br>3.3 Natural language processing methods; |

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| | 3.4 Application method of natural language processing tools;<br>3.5 Natural language and speech processing algorithms.<br><br>**4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Analysis skills;<br>4.4 Communication skills;<br>4.5 Interpersonal skills;<br>4.6 Teamwork skills;<br>4.7 Leadership skills;<br>4.8 Project management skills;<br>4.9 Time management skills.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The basic natural language and speech processing technology architecture is built in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF NATURAL LANGUAGE AND SPEECH PROCESSING PROJECTS | **DUTY NO.** | 704 |
| **TASK TITLE** | WRITE CODE FOR NATURAL LANGUAGE AND SPEECH PROCESSING PROJECTS (PRODUCTS) | **TASK NO.** | 7043 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to write code for natural language and speech processing projects (products) in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. AI-related software tool;<br>3. Network infrastructures;<br>4. Safety gear. | | |

| **EVIDENCE REQUIREMENT** | |
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| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
| The person performing this task must be able to do the following:<br>1. Create a code writing plan;<br>2. Run code routines;<br>3. Observe code routines;<br>4. Create a code writing report;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Interpret project requirements as code;<br>1.2 Translate user requirements into code;<br>1.3 Write code.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Algorithm development;<br>2.2 Code writing.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Speech recognition methods;<br>3.2 Speech synthesis methods;<br>3.3 Natural language processing methods;<br>3.4 Application method of natural language processing tools; |

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| | 3.5 Natural language and speech processing algorithms.<br><br>**4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Analysis skills;<br>4.4 Communication skills;<br>4.5 Report writing skills;<br>4.6 Interpersonal skills;<br>4.7 Teamwork skills;<br>4.8 Time management skills;<br>4.9 Algorithm application skills.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Code for natural language and speech processing projects (products) performed in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF NATURAL LANGUAGE AND SPEECH PROCESSING PROJECTS | **DUTY NO.** | 704 |
| **TASK TITLE** | PERFORM INTEGRATION TEST OF NATURAL LANGUAGE AND SPEECH PROCESSING PROJECTS (PRODUCTS) | **TASK NO.** | 7044 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to complete the integration test of natural language and speech processing projects (products) in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Project integration test guidelines;<br>2. Project integration test standards;<br>3. Business cases;<br>4. Project requirements specifications;<br>5. Computers;<br>6. AI-related software tools;<br>7. Network infrastructures;<br>8. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Create an integration test scheme;<br>2. Run integration test routines;<br>3. Observe integration test routines;<br>4. Create an integration test report;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Read and explain the integration test scheme;<br>1.2 Use integration test tools;<br>1.3 Draft the project integration test scheme;<br>1.4 Explain integration test routines;<br>1.5 Present the test report.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Project integration test;<br>2.2 Test specification.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following: |

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| | 3.1 Project integration test technology;<br>3.2 Project integration test methods.<br><br>**4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Analysis skills;<br>4.4 Communication skills;<br>4.5 Report writing skills;<br>4.6 Interpersonal skills;<br>4.7 Teamwork skills;<br>4.8 Project management skills;<br>4.9 Time management skills;<br>4.10 Project test capabilities. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The integration test of natural language and speech processing projects (products) completed in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF COMPUTER VISION PROJECTS | **DUTY NO.** | 705 |
| **TASK TITLE** | DEVELOP AND RECOMMEND SIMPLE COMPUTER VISION PROJECT REQUIREMENTS ANALYSIS REPORTS | **TASK NO.** | 7051 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to develop and recommend the implementation of simple computer vision project requirements analysis in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Computer vision related software and tools;<br>3. Computer vision related guidelines and development manuals;<br>4. Network infrastructures;<br>5. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Understand project user usage scenarios and hardware platforms;<br>2. Sort out the main process of project research and development;<br>3. Refine and validate project business requirements;<br>4. Complete the project requirements analysis report;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Identify the main service target;<br>1.2 Analyse application scenario requirements;<br>1.3 Develop requirements analysis reports.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Computer vision project requirements analysis;<br>2.2 Computer vision project operation.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Technical architecture of computer vision;<br>3.2 Computer vision software and hardware standards;<br>3.3 Writing standards for computer vision requirements analysis reports;<br>3.4 Guidelines for computer vision scenario analysis. |

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| | **4.0 Essential Skills**<br>4.1 Communication, reporting and analysis report writing skills;<br>4.2 Problem analysis and solving skills;<br>4.3 Communication skills;<br>4.4 Leadership skills;<br>4.5 Knowledge of simple computer vision projects;<br>4.6 Tracking of new development trends of computer vision technology;<br>4.7 Project analysis and development capabilities;<br>4.8 Time management skills;<br>4.9 Report writing skills.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics;<br>5.4 Probability theory and mathematical statistics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The simple computer vision project requirements analysis reports are developed and recommended to be implemented in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF COMPUTER VISION PROJECTS | **DUTY NO.** | 705 |
| **TASK TITLE** | TRAIN, INFERENCE, AND DEPLOY BASIC COMPUTER VISION ALGORITHMS | **TASK NO.** | 7052 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to train, inference, and deployment of basic computer vision algorithms in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Computer vision related software and tools;<br>3. Computer vision related guidelines and development manuals;<br>4. Network infrastructures;<br>5. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Understand project application scenarios;<br>2. Select appropriate algorithms;<br>3. Train and test basic computer vision algorithms;<br>4. Deploy basic computer vision algorithms;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Select appropriate AI computer vision algorithms;<br>1.2 Train and test basic AI computer vision algorithms;<br>1.3 Infer and deploy basic computer vision algorithms.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Computer vision algorithms;<br>2.2 Computer vision algorithm application scenarios.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Technical architecture of computer vision;<br>3.2 Mainstream algorithms in computer vision;<br>3.3 Computer vision algorithm training methods;<br>3.4 Computer vision algorithm inference methods;<br>3.5 Computer vision algorithm deployment methods;<br>3.6 Basic process and operation guidelines for computer |

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| | vision.<br><br>**4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Analysis skills;<br>4.4 Communication skills;<br>4.5 Report writing skills;<br>4.6 Skills in quick judgement and selection of mainstream algorithms of computer vision;<br>4.7 Teamwork skills;<br>4.8 Leadership skills;<br>4.9 Project management skills;<br>4.10 Time management skills.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics;<br>5.4 Probability theory and mathematical statistics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The training, inference, and deployment of basic computer vision algorithms are performed in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF COMPUTER VISION PROJECTS | **DUTY NO.** | 705 |
| **TASK TITLE** | CONDUCT MAINTAINANCE IN COMMONLY USED HARDWARE ENVIRONMENTS AND TOOL CHAINS USING COMPUTER VISION ALGORITHMS | **TASK NO.** | 7053 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to carry out engineering in commonly-used hardware environment and tool chain engineering using computer vision algorithms in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Computer vision related software and tools;<br>3. Computer vision related guidelines and development manuals;<br>4. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Maintain the commonly-used hardware environment using computer vision algorithms;<br>2. Maintain development tool chains using computer vision algorithms<br>3. Debug computer vision engineering algorithms;<br>4. Solve the faults and problems during the operation of computer vision engineering algorithms;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Maintain the commonly-used hardware environment using the project;<br>1.2 Maintain the commonly-used development tool chain using the project;<br>1.3 Debug and solve project faults and problems.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Computer vision algorithm engineering application;<br>2.2 Development tool chain application;<br>2.3 Fault debugging.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Technical architecture of computer vision;<br>3.2 Knowledge of mainstream software and hardware in |

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| | computer vision;<br>3.3 Computer vision tool chain requirements.<br><br>**4.0 Essential Skills**<br>4.1 Problem-solving skills;<br>4.2 Critical thinking skills;<br>4.3 Analysis skills;<br>4.4 Teamwork skills;<br>4.5 Leadership skills;<br>4.6 Project management skills;<br>4.7 Time management skills;<br>4.8 Algorithm engineering capabilities;<br>4.9 Innovative application capabilities.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics;<br>5.4 Probability theory and mathematical statistics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Maintenance of commonly-used hardware environment and tool chain is carried out using computer vision algorithms in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF COMPUTER VISION PROJECTS | **DUTY NO.** | 705 |
| **TASK TITLE** | WRITE CODES FOR COMPUTER VISION PROJECTS (PRODUCTS) | **TASK NO.** | 7054 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to write code for computer vision projects (products) in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Computer vision related software and tools;<br>3. Computer vision related guidelines and development manuals;<br>4. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Select reasonable AI algorithms;<br>2. Implement the whole-process and detailed design and development of project modules in combination with AI algorithms;<br>3. Test the integration code of each module;<br>4. Modify problems in testing and optimize algorithms;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Complete the whole-process and detailed design and development of project modules;<br>1.2 Test and modify computer vision algorithms;<br>1.3 Implement the development of computer vision project modules.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Whole-process design of computer vision projects;<br>2.2 Development of computer vision project modules;<br>2.3 Development rules of computer vision project modules;<br>2.4 Business problem modeling.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Technical architecture of computer vision;<br>3.2 Computer vision software and hardware theories;<br>3.3 Target detection methods; |

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| | 3.4 Image segmentation methods;<br>3.5 Target tracking methods.<br><br>**4.0 Essential Skills**<br>4.1 Communication and reporting skills;<br>4.2 Problem analysis and solving skills;<br>4.3 Solution development skills;<br>4.4 Leadership skills;<br>4.5 Project analysis and development capabilities.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics;<br>5.4 Probability theory and mathematical statistics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The code for computer vision projects (products) is written in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF COMPUTER VISION PROJECTS | **DUTY NO.** | 705 |
| **TASK TITLE** | PERFORM INTEGRATION TEST OF COMPUTER VISION PROJECTS (PRODUCTS) | **TASK NO.** | 7055 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to perform integration test of computer vision projects (products) in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Computer vision related software and tools;<br>3. Computer vision related guidelines and development manuals;<br>4. Network infrastructures;<br>5. Safety gear. | | |

| **EVIDENCE REQUIREMENT** | |
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| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
| The person performing this task must be able to do the following:<br>1. Design the validation process and details of computer vision AI scenarios;<br>2. Design a test plan for the main components of computer vision applications;<br>3. Validate the functionality, accuracy, and performance of computer vision projects;<br>4. Observe health and safety precautions;<br>5. Keep the workplace clean;<br>6. Store the tools;<br>7. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Design the validation process and details of computer vision projects;<br>1.2 Design a test plan for the main components of the computer vision project;<br>1.3 Validate the functionality, accuracy, and performance of computer vision projects.<br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Computer vision AI scenario validation;<br>2.2 Computer vision project test.<br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Technical architecture of computer vision;<br>3.2 Computer vision software and hardware methods;<br>3.3 Target detection methods; |

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| | 3.4 Image segmentation methods;<br>3.5 Target tracking methods.<br><br>**4.0 Essential Skills**<br>4.1 Problem analysis and solving skills;<br>4.2 Solution development skills;<br>4.3 Project management skills;<br>4.4 Tracking of new development trends of computer vision technology;<br>4.5 Project analysis and development capabilities. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The integration test of computer vision projects (products) is performed in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF SMALL AI APPLICATION INTEGRATION PROJECTS | **DUTY NO.** | 706 |
| **TASK TITLE** | DEVELOP REQUIREMENTS ANALYSIS REPORTS FOR SMALL AI APPLICATION INTEGRATION PROJECTS | **TASK NO.** | 7061 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to develop requirements analysis reports for small AI application projects in accordance with industry standards and national information and communications technology governance guidelines | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Related AI application integration software and tools;<br>3. Relevant guidelines and development manuals;<br>4. Network infrastructures;<br>5. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Understand project application scenarios;<br>2. Organize the main demands of AI application integration users;<br>3. Transform AI application integration requirements;<br>4. Guide and develop AI application integration requirements analysis reports;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Understand project user requirements;<br>1.2 Organize project requirements;<br>1.2 Guide and write project requirements analysis documents.<br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 AI application integration analysis;<br>2.2 Standardized writing of requirements analysis documents.<br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 AI application integration algorithm methods;<br>3.2 AI application integration requirements survey methods; |

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| | 3.3 AI application project requirements management process.<br><br>**4.0 Essential Skills**<br>4.1 Communication and reporting skills;<br>4.2 Problem analysis and solving skills;<br>4.3 Solution development skills;<br>4.4 Presentation skills;<br>4.5 Project analysis and development capabilities.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics;<br>5.4 Probability theory and mathematical statistics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Requirements analysis reports for small AI application projects are developed in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF SMALL AI APPLICATION INTEGRATION PROJECTS | **DUTY NO.** | 706 |
| **TASK TITLE** | DEVELOP COMMON DATA ANALYSIS AND PROCESSING METHODS | **TASK NO.** | 7062 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to develop common data analysis and processing method in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Related AI application integration software and tools;<br>3. Relevant guidelines and development manuals;<br>4. Network infrastructures;<br>5. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Analyse AI application integration requirements reports;<br>2. Formulate AI application integration project development plans;<br>3. Design and develop AI application integration data analysis methods;<br>4. Design and develop AI application integration data processing methods;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Analyse project requirements reports;<br>1.2 Design project development plans;<br>1.3 Design and develop project data analysis and processing methods.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 AI application integration data analysis;<br>2.2 AI application integration data processing;<br>2.3 AI application integration design scheme preparation.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Basic AI application integration algorithms;<br>3.2 AI application integration data analysis methods;<br>3.3 AI application integration data processing methods. |

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| | **4.0 Essential Skills**<br>4.1 Communication, reporting and analysis report writing skills;<br>4.2 Problem analysis and solving skills;<br>4.3 Solution development skills;<br>4.4 Leadership skills;<br>4.5 Project analysis and development capabilities;<br>4.6 Time management skills.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics;<br>5.4 Probability theory and mathematical statistics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Common data analysis and processing method are developed in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF SMALL AI APPLICATION INTEGRATION PROJECTS | **DUTY NO.** | 706 |
| **TASK TITLE** | RECOMMEND THE IMPLEMENTATION OF LOW CODE DEVELOPMENT OF AI APPLICATION INTEGRATION MODULES | **TASK NO.** | 7063 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to recommend the implementation of low code development of a certain AI application integration module in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Related AI application integration software and tools;<br>3. Relevant guidelines and development manuals;<br>4. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Analyse AI application integration project requirements report;<br>2. Select the appropriate AI application algorithm model;<br>3. Combine AI application algorithm models;<br>4. Sort out the integration relationship of AI application integration projects;<br>5. Complete the whole-process and detailed development of AI application modules;<br>6. Apply AI to achieve low code integration;<br>7. Observe health and safety precautions;<br>8. Keep the workplace clean;<br>9. Store the tools;<br>10. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Select AI application algorithms;<br>1.2 Manage and organize the integration of AI application projects;<br>1.3 Develop and implement AI application integration projects.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Combination of AI application products;<br>2.2 Integration relationship between AI applications;<br>2.3 Development of AI application modules.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 AI application algorithms;<br>3.2 Application integration model training techniques. |

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| | **4.0 Essential Skills**<br>4.1 Communication and reporting skills;<br>4.2 Problem analysis and solving skills;<br>4.3 Solution development skills;<br>4.4 Project leadership skills;<br>4.5 Project low code development capabilities;<br>4.6 Writing skills.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics;<br>5.4 Probability theory and mathematical statistics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | The low code development of a certain AI application integration module is recommended to be implemented in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CONDUCT RESEARCH AND DEVELOPMENT OF SMALL AI APPLICATION INTEGRATION PROJECTS | **DUTY NO.** | 706 |
| **TASK TITLE** | DEVELOP BASIC AI APPLICATION INTERFACES | **TASK NO.** | 7064 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to develop a basic AI application interfaces in accordance with industry standards and national norms. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. Computers;<br>2. Related AI application integration software and tools;<br>3. Relevant guidelines and development manuals;<br>4. Network infrastructures;<br>5. Safety gear. | | |

| **EVIDENCE REQUIREMENT** | |
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| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
| The person performing this task must be able to do the following:<br>1. Select the appropriate AI application algorithm model;<br>2. Implement , train and test the selected AI algorithm model;<br>3. Understand and master the integration relationship between applications;<br>4. Design and develop software and hardware interfaces between AI application integration projects;<br>5. Complete the development of general integration middleware;<br>6. Observe health and safety precautions;<br>7. Keep the workplace clean;<br>8. Store the tools;<br>9. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Select AI algorithm models based on development requirements;<br>1.2 Complete the design and development of software and hardware interfaces for AI application integration projects;<br>1.3 Complete the development of middleware for AI application integration projects.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Design and development of AI application software and hardware interfaces;<br>2.2 Integration middleware development;<br>2.3 AI application algorithm selection.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 AI application algorithms; |

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| | 3.2 Application integration model training techniques;<br>3.3 Integration middleware requirements.<br><br>**4.0 Essential Skills**<br>4.1 Communication, reporting and writing skills;<br>4.2 Problem analysis and solving skills;<br>4.3 Solution development skills;<br>4.4 Project leadership skills;<br>4.5 Project development capabilities;<br>4.6 Time management skills;<br>4.7 Application integration analysis skills.<br><br>**5.0 Math Skills**<br>5.1 Statistics;<br>5.2 Linear algebra;<br>5.3 Advanced mathematics;<br>5.4 Probability theory and mathematical statistics. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Basic AI application interfaces developed in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CARRY OUT BASIC TECHNICAL CONSULTING FOR AI PROJECTS | **DUTY NO.** | 707 |
| **TASK TITLE** | PROVIDE TECHNICAL CONSULTING SERVICES FOR AI PLATFORM PROJECTS | **TASK NO.** | 7071 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to provide technical consulting services for AI platform projects in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI-related software tools;<br>4. Network infrastructures;<br>5. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Plan the direction of AI platforms;<br>2. Develop a phased upgrade plan for the AI platform;<br>3. Consult corresponding services using modern engineering consulting methods;<br>4. Complete the preparation of AI platform project proposals;<br>5. Prepare feasibility study reports and implementation plans;<br>6. Observe health and safety precautions;<br>7. Keep the workplace clean;<br>8. Store the tools;<br>9. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Plan the direction and development strategies of AI platforms;<br>1.2 Use modern engineering consulting methods;<br>1.3 Complete the writing of consulting documents related to the AI platform project.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Operation of AI platforms;<br>2.2 AI platform implementation planning.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 AI platform development strategies;<br>3.2 Phased upgrade plan for the AI platform;<br>3.3 AI platform implementation plans.<br><br>**4.0 Essential Skills** |

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| | 4.1 Communication, reporting and document writing skills;<br>4.2 Platform planning capabilities;<br>4.3 Solution development skills;<br>4.4 Project leadership skills;<br>4.5 Project consulting capabilities. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Technical consulting services for AI platform projects are provided in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CARRY OUT BASIC TECHNICAL CONSULTING FOR AI PROJECTS | **DUTY NO.** | 707 |
| **TASK TITLE** | PROVIDE TECHNICAL CONSULTING SERVICES FOR NATURAL LANGUAGE PROCESSING AND SPEECH RECOGNITION | **TASK NO.** | 7072 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to provide technical consulting services for natural language processing and speech recognition in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI-related software tools;<br>4. Network infrastructures;<br>5. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Complete technical consulting for natural language processing, speech recognition, speech synthesis and semantic understanding projects;<br>2. Develop and design the technical architecture and scheme of natural language and speech processing projects;<br>3. Complete the preparation of project proposals, feasibility study reports, and implementation plans;<br>4. Observe health and safety precautions;<br>5. Keep the workplace clean;<br>6. Store the tools;<br>7. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Implement technical consulting services for natural language and speech processing projects;<br>1.2 Complete the preparation of consulting documents related to natural language and speech processing projects.<br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Natural language processing;<br>2.2 Speech recognition;<br>2.3 Speech synthesis;<br>2.4 Semantic understanding;<br>2.2 Natural language and speech processing planning.<br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Natural language processing methods; |

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| | 3.2 Speech recognition methods;<br>3.3 Speech synthesis methods;<br>3.4 Semantic understanding methods.<br><br>**4.0 Essential Skills**<br>4.1 Communication, reporting and document writing skills;<br>4.2 Problem analysis and solving skills;<br>4.3 Solution development skills;<br>4.4 Project leadership skills;<br>4.5 Project consulting capabilities. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Technical consulting services for natural language processing and speech recognition are provided in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CARRY OUT BASIC TECHNICAL CONSULTING FOR AI PROJECTS | **DUTY NO.** | 707 |
| **TASK TITLE** | PROVIDE TECHNICAL CONSULTING SERVICES FOR COMPUTER VISION PROJECTS | **TASK NO.** | 7073 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to provide technical consulting services for computer vision projects in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI-related software tools;<br>4. Network infrastructures;<br>5. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Complete the technical evaluation of computer vision projects;<br>2. Consult services using modern engineering consulting methods;<br>3. Complete the technical architecture and scheme design of computer vision projects;<br>4. Prepare project proposals, feasibility study reports, and implementation plans;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Evaluate computer vision project technology;<br>1.2 Use modern engineering consulting methods;<br>1.3 Complete the preparation of consulting documents for computer vision projects.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 Computer vision project technology;<br>2.2 Technical architecture of computer vision projects;<br>2.3 Scheme design of computer vision projects;<br>2.4 Computer vision project implementation planning.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Engineering consulting methods for computer vision projects;<br>3.2 Feasibility study standards of computer vision projects; |

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| | 3.3 AI ethical requirements.<br><br>**4.0 Essential Skills**<br>4.1 Communication, reporting and document writing skills;<br>4.2 Problem analysis and solving skills;<br>4.3 Solution development skills;<br>4.4 Project leadership skills;<br>4.5 Written and oral communication skills;<br>4.6 Project consulting capabilities. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Simple technical consulting services for computer vision projects are provided in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

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| **OCCUPATION** | ARTIFICIAL INTELLIGENCE ENGINEER | **OCCUPATION CODE** | |
| **DUTY TITLE** | CARRY OUT BASIC TECHNICAL CONSULTING FOR AI PROJECTS | **DUTY NO.** | 707 |
| **TASK TITLE** | PROVIDE TECHNICAL CONSULTING SERVICES FOR AI APPLICATION INTEGRATION PROJECTS | **TASK NO.** | 7074 |
| **PERFORMANCE CRITERIA** | The person performing this task must be able to provide technical consulting services for AI application integration projects in accordance with industry standards and national information and communications technology governance guidelines. | | |
| **RANGE STATEMENT** | The task can be performed in the office place under the supervision of artificial intelligence engineers.<br>The tools and equipment to be used include:<br>1. System documents;<br>2. Computers;<br>3. AI-related software tools;<br>5. Network infrastructures;<br>6. Safety gear. | | |

**EVIDENCE REQUIREMENT**

| **PRACTICAL PERFORMANCE** | **UNDERPINNING KNOWLEDGE** |
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| The person performing this task must be able to do the following:<br>1. Complete the planning AI application integration project workflow;<br>2. Consult corresponding services using modern engineering consulting methods;<br>3. Complete the technical architecture and scheme design of AI application integration projects;<br>4. Prepare project proposals, feasibility study reports, and implementation plans;<br>5. Observe health and safety precautions;<br>6. Keep the workplace clean;<br>7. Store the tools;<br>8. Observe health, occupational and environmental safety rules and regulations. | **Detailed knowledge about:**<br>**1.0 Methods**<br>The person performing this task must be able to explain how to:<br>1.1 Plan the AI application integration project workflow;<br>1.2 Use modern engineering consulting methods;<br>1.3 Complete the preparation of consulting documents for AI application integration projects.<br><br>**2.0 Principles**<br>The person performing this task must be able to explain the following principles:<br>2.1 AI application integration project technology;<br>2.2 Technical architecture of AI application integration projects;<br>2.3 Scheme design of AI application integration projects;<br>2.4 AI application integration project implementation planning.<br><br>**3.0 Theories**<br>The person performing this task must be able to explain the following:<br>3.1 Engineering consulting for AI application integration projects; |

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| | 3.2 Feasibility study standards of AI application integration projects;<br>3.3 AI ethical requirements.<br><br>**4.0 Essential Skills**<br>4.1 Communication, reporting and document writing skills;<br>4.2 Problem analysis and solving skills;<br>4.3 Solution development skills;<br>4.4 Project leadership skills;<br>4.5 Written and oral communication skills;<br>4.6 Project consulting capabilities. |
| **DESCRIPTION OF THE END PRODUCT / SERVICE** | Technical consulting services for AI application integration projects are provided in accordance with industry standards and national information and communications technology governance guidelines. |
| **CIRCUMSTANTIAL KNOWLEDGE** | **Detailed knowledge about:**<br>1. Occupational health and safety;<br>2. Computer security;<br>3. Network security. |

**APPENDIX: DACUM CHARTS FOR ARTIFICIAL INTELLIGENCE ENGINEER - NTA LEVEL 7**

| DUTIES | TASKS | ENABLERS |
|---|---|---|
| 1.0 Conduct selection and simple application of basic AI algorithms | 1.1 Construct of an AI model development environment.<br>1.2 Run AI basic neural network models.<br>1.3 Solve actual business using basic AI models. | **General skills and knowledge**<br>· Development environment construction skills<br>· Essential script language skills<br>· Data analysis skills<br>· Application model selection capabilities<br>· Computer network skills<br>· Python programming skills<br>· Operating system command usage capabilities<br>· Problem-solving skills<br>· Interpersonal communication skills<br><br>**Tools and equipment**<br>· Computers<br>· Remote access tools<br>· Database management tools<br>· Anti-static wristbands<br>· Network infrastructures.<br><br>**Materials**<br>· Software installation packages<br>· Configuration documents (Manual, guideline etc)<br><br>**Requirements for employees**<br>· Time management<br>· Teamwork |
| 2.0 Implement and apply basic deep learning algorithms | 2.1 Analyse deep learning framework models.<br>2.2 Perform Installation, upgrading, and uninstallation of deep learning frameworks.<br>2.3 Train and use deep learning framework models. | **General skills and knowledge**<br>· Essential skills of operating system<br>· Computer network skills<br>· Hardware skills<br>· Essential script language skills<br>· Knowledge of basic AI models<br>· Desire to learn new technologies and master changing technology trends<br>· Communication, report writing and analysis skills<br>· Problem analysis and solving skills<br>· Time management skills |

| DUTIES | TASKS | ENABLERS |
|---|---|---|
| | | · Project management skills<br><br>**Tools and equipment**<br>· Computers<br>· Remote access tools<br>· Database management tools<br>· Anti-static wristbands<br>· Network infrastructures.<br><br>**Materials**<br>· User profile<br>· Software installation packages<br><br>**Requirements for employees**<br>· Time management<br>· Teamwork |
| 3.0 Operate and use AI platforms | 3.1 Perform Installation, upgrading, and uninstallation of AI platform server system software.<br><br>3.2 Carry out Configuration and using AI platform server system software. | **General skills and knowledge**<br>· Essential skills of operating system<br>· Computer network skills<br>· Hardware skills<br>· Essential script language skills<br>· Knowledge of complex systems and how they work together<br>· Desire to learn and master changing technology trends<br>· Communication, report writing and analysis skills<br>· Problem analysis and solving skills<br>· Time management skills<br>· Project management skills<br><br>**Tools and equipment**<br>· Computers<br>· Remote access tools<br>· Database management tools<br>· Anti-static wristbands<br>· Network infrastructures.<br><br>**Materials**<br>· User profile<br>· Software installation packages<br><br>**Requirements for employees** |

| DUTIES | TASKS | ENABLERS |
|---|---|---|
| | | · Time management<br>· Teamwork |
| 4.0 Conduct Research and development of natural language and speech processing projects | 4.1 Carry out development and analysis of simple natural language and speech processing requirements analysis reports.<br>4.2 Study and build the basic natural language and speech processing technology architecture.<br>4.3 Complete code writing for natural language and speech processing projects (products).<br>4.4 Complete the integration test of natural language and speech processing projects (products). | **General skills and knowledge**<br>· Skills required to organize and translate into natural language and speech processing<br>· Natural language and speech processing technology architecture skills<br>· Code writing skills<br>· Integration test skills<br>· Problem-solving skills<br>· Interpersonal communication skills<br>· Moral skills<br><br>**Tools and equipment**<br>· Computers<br>· Remote access tools<br>· Database management tools<br>· Anti-static wristbands<br>· Network infrastructures.<br><br>**Materials**<br>· Data<br>· Configuration documents<br><br>**Requirements for employees**<br>· Time management<br>· Teamwork<br>· Standardized writing |
| 5.0 Conduct Research and development of computer vision projects | 5.1 Develop and recommend simple computer vision project requirements analysis reports.<br>5.2 Train, inference, and deploy basic computer vision algorithms.<br>5.3 Carry out engineering of common hardware environments and tool chains using computer vision algorithms.<br>5.4 Undertake Code writing for computer vision projects (products). | **General skills and knowledge**<br>· Computer vision requirements analysis skills<br>· Basic computer vision algorithm training and deployment capabilities<br>· Project process design capabilities<br>· Code writing skills<br>· Integration test skills<br>· Problem-solving skills<br>· Interpersonal communication skills<br><br>**Tools and equipment**<br>· Computers<br>· Remote access tools |

| DUTIES | TASKS | ENABLERS |
|---|---|---|
| | 5.5 Perform integration test of computer vision projects (products). | · Network infrastructures.<br>· Database management tools<br>· Anti-static wristbands<br><br>**Materials**<br>· Data<br>· Configuration documents<br><br>**Requirements for employees**<br>· Time management<br>· Teamwork<br>· Standardized writing |
| 6.0 Conduct Research and development of small AI application integration projects | 6.1 Develop of requirements analysis reports for small AI application integration projects.<br>6.2 Develop common data analysis and processing methods.<br>6.3 Recommend and implement of Low code development of AI application integration module.<br>6.4 Develop basic AI application interfaces. | **General skills and knowledge**<br>· Skills required to organize and translate into AI application integration<br>· Data analysis skills<br>· Data processing skills<br>· Integration project algorithm selection skills<br>· Application module development skills<br>· Communication and report writing skills<br>· Problem-solving skills<br><br>**Tools and equipment**<br>· Computers<br>· Remote access tools<br>· Database management tools<br>· Anti-static wristbands<br>· Network infrastructures.<br><br>**Materials**<br>· Integration data<br><br>**Requirements for employees**<br>· Time management<br>· Teamwork<br>· Standardized writing |
| 7.0 Carry out Basic technical consulting for AI projects | 7.1 Provide technical consulting services for AI platform projects.<br>7.2 Provide simple technical | **General skills and knowledge**<br>· Skills for writing project proposals and feasibility study reports<br>· Engineering consulting methods and |

| DUTIES | TASKS | ENABLERS |
|---|---|---|
| | consulting services for natural language processing and speech recognition.<br>7.3 Provide simple technical consulting services for computer vision projects.<br>7.4 Provide simple technical consulting services for AI application integration projects. | system analysis theories<br>· Ethical knowledge<br>· Project consulting capabilities<br>· Interpersonal skills<br>· Communication, reporting and report writing skills<br>· Problem-solving skills<br><br>**Tools and equipment**<br>· Computers<br>· Remote access tools<br>· Database management tools<br>· Anti-static wristbands<br><br>**Materials**<br><br>**Requirements for employees**<br>· Time management<br>· Teamwork<br>· Standardized writing |