NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

JANUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: ARTIFICIAL INTELLIGENCE TECHNICIAN

LEVEL: NTA 6

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ABBREVIATIONS

AI	Artificial Intelligence
CBET	Competency Based Education and Training
DA	Data Analysis
DL	Deep Learning
DP	Data Processing
ML	Machine Learning
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training
WSL2	Windows Subsystem for Linux 2

GLOSSARY OF TERMS

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 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.
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.
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.

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. 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 of Tanzania has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupational Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing 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 delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training Standards/Qualifications Standards are different. 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 fault in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and Training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the Occupational Standards and the training standards to respond to demands of the labour market.

In TET delivery, Tanzania 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. TET institutions will be required to benchmark their curricula with relevant Occupational Standards.

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 (TET).

The Artificial Intelligence Technician Occupation has its own set of occupational standards. 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 Occupational Standards development process began with an examination of major documents that guide Tanzanian skill development. The *10-year National Skills Development Strategy (2016-2026)* was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes.

These sectors include: Transport and Logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE 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 workshop comprised of experts and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The Occupational Standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. Engineers, supervisory technicians on the job, and experienced Artificial Intelligence Technicians were key informants in the survey to discover occupational trends. The information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. A total of ..... online surveys were completed by experts from the

labour market across the country. Apart from the survey aiding in defining the scope for the occupational analysis, they also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by ... participants from different parts of the country representing various companies.

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

The standards cover a broad range of duties and tasks that can be performed by Artificial Intelligence Technicians. 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 Technician may perform tasks in a number of key areas of the occupational standards, but not necessarily in all areas.

The Artificial Intelligence Technician shall assist the Artificial Intelligence Engineer in collecting business data, annotating business data, processing business data, understanding commonly-used machine learning algorithms, and completing the selection and optimization of machine learning algorithms for addressing application requirements. Artificial Intelligence Technicians, on the other hand, not only assist Artificial Intelligence Engineers with the above tasks, but also deploy and operate the trained AI models.

Generally, the Artificial Intelligence Technician performs the following responsibilities:

a) Handling of information and faults

b) Installation of operating systems

c) Database creation and management

d) Data collection

e) Data annotation

f) Business data collection

g) Business data pre-processing

h) Implementation of data analysis and visualization

i) Implementation of machine learning algorithm selection

j) Application of machine learning algorithms

k) Primary AI project development

l) Business analysis process design

m) Business data processing and analysis

n) Deep learning algorithm selection

o) Deep learning algorithm implementation

p) Small AI project development

q) Small AI platform verification

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 4, 5 and 6.

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 TECHNICIAN - NTA 6

<table>
<tr><td>OCCUPATION</td><td>ARTIFICIAL INTELLIGENCE TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>BUSINESS ANALYSIS PROCESS DESIGN</td><td>DUTY NO.</td><td>601</td></tr>
<tr><td>TASK TITLE</td><td>BUSINESS ANALYSIS FRAMEWORK CONSTRUCTION</td><td>TASK NO.</td><td>6011</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to construct a business analysis framework in accordance with specific business analysis processes.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the office under the supervision of artificial intelligence engineers.
The tools and equipment to be used include:
1. High-performance computers;
2. Text editing software;
3. Data processing software;
4. Drawing and graphics software;
5. Internet.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Define the project development requirements;
2. Plan and design projects;
3. Construct business analysis frameworks;
4. Write business analysis texts.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Design business analysis process;
1.2 Standardize text writing.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 Principles of constructing business analysis frameworks;
2.2 Principles of data confidentiality;
2.3 Principles of data security.

3.0 Theories</td></tr>
</table>

	The person performing this task must be able to explain the following: 3.1 Internet search engine technology; 3.2 Text requirements for constructing business analysis frameworks; 3.3 Database knowledge; 3.4 Mathematical modeling knowledge; 3.5 Knowledge of programming. **4.0 Essential Skills** 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Teamwork skills; 4.4 Internet information retrieval skills; 4.5 Computer skills; 4.6 Report writing skills. **5.0 Math Skills** 5.1 Knowledge of statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	Business analysis frameworks are constructed in accordance with technical requirements and business features.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

<table>
<tr><td>OCCUPATION</td><td>ARTIFICIAL INTELLIGENCE TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>BUSINESS DEVELOPMENT PROCESS DESIGN</td><td>DUTY NO.</td><td>601</td></tr>
<tr><td>TASK TITLE</td><td>BUSINESS DEVELOPMENT PROCESS DESIGN</td><td>TASK NO.</td><td>6012</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to design business development process in accordance with technical requirements.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the office under the supervision of artificial intelligence engineers.
The tools and equipment to be used include:
1. High-performance computers;
2. Text editing software;
3. Data processing software;
4. Drawing and graphics software;
5. Internet.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Analyse development process requirements;
2. Plan and design development process;
3. Estimate development process workload;
4. Write the development process text.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Develop business process;
1.2 Conduct risk management and prevention.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 Business development process design principles;
2.2 Principles of data confidentiality;
2.3 Principles of data security.

3.0 Theories
The person performing this task must be able to explain the following:
3.1 Internet search engine technology;</td></tr>
</table>

	3.2 Text writing requirements of business development process requirements; 3.3 Database knowledge; 3.4 Mathematical modeling knowledge; 3.5 Knowledge of programming. **4.0 Essential Skills** 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Teamwork skills; 4.4 Internet information retrieval skills; 4.5 Computer skills; 4.6 Report writing skills. **5.0 Math Skills** 5.1 Knowledge of statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	Business development processes are designed in accordance with technical requirements and business features.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DATA SET CONSTRUCTION	**DUTY NO.**	602
TASK TITLE	AI BUSINESS DATA COLLECTION AND PROCESSING	**TASK NO.**	6021
PERFORMANCE CRITERIA	The person performing this task must be able to collect and process data in accordance with task requirements and specifications.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Computers; 2. Windows or Linux; 3. Deep learning frameworks; 4. Python; 5. Jupyter lab; 6. CVAT and Labelme; 7. BasicFinder.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Collect equipment or platform data; 2. Select data annotation modes; 3. Annotate various types of data; 3. Conduct pre-processing of the obtained data; 4. Store the preprocessed data.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose suitable data collection equipment; 1.2 Select suitable databases; 1.3 Augment data sets; 1.4 Set the standard data storage format. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of equipment selection; 2.2 Principles of annotation specification definition; 2.3 Principles of storage format selection. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Collection equipment selection theories;

	3.2 Data augmentation principles; 3.3 Annotation mode selection theories; 3.4 Data storage formats and reasons; 3.5 Task data requirements; 3.6 Basic knowledge of images. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Teamwork skills; 4.4 Learning skills. **5.0 Math Skills** 5.1 Advanced mathematics; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	The suitable collection equipment is selected, the corresponding annotation method is adopted, and the pre-processed data is stored in a standardized way in accordance with task requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DATA SET CONSTRUCTION	**DUTY NO.**	602
TASK TITLE	AI BUSINESS DATA ANALYSIS AND REVIEW	**TASK NO.**	6022
PERFORMANCE CRITERIA	The person performing this task must be able to complete the visualization analysis of data set contents and the data standardization calibration in accordance with task standards and specifications.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Computers; 2. Windows or Linux; 3. Deep learning frameworks; 4. Python; 5. Jupyter lab; 8. Deep learning operation and monitoring platforms.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Make statistics and analysis on data of different objects and categories; 2. Analyse the balance of data sets; 3. Review and calibrate data sets; 4. Write data visualization reports.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Read and save format documents; 1.2 Analyse data samples by monitoring platforms; 1.3 Review the sample type; 1.4 Visualize data sets. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Data type distribution; 2.2 Balance of data sets; 2.3 Data set supplement. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Judgment basis of the balance of data set samples; 3.2 Parameters and indicators of various types of data set information; 3.3 Types of data samples; 3.4 Visualization reports. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Data storage skills; 4.4 Data visualization skills; 4.5 Teamwork skills; 4.6 Computer skills. **5.0 Math Skills** 5.1 Advanced mathematics; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	Various data set information is analysed, data types and specifications are reviewed, and visualization reports are prepared in accordance with data set requirements and specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Document reading and conversion.

<table>
<tr><td>OCCUPATION</td><td>ARTIFICIAL INTELLIGENCE TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>DEEP LEARNING ALGORITHM SELECTION</td><td>DUTY NO.</td><td>603</td></tr>
<tr><td>TASK TITLE</td><td>DEEP LEARNING DEVELOPMENT ENVIRONMENT MAINTENANCE</td><td>TASK NO.</td><td>6031</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to install, configure and upgrade the deep learning development environment in accordance with technical requirements.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the office under the supervision of artificial intelligence engineers.
The tools and equipment to be used include:
1. Computers;
2. Windows10/11 system;
3. Deep learning programming languages;
4. Deep learning development frameworks;
5. Deep learning third-party libraries.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Install the computer operating system;
2. Install the deep learning programming language;
3. Configure the deep learning development framework;
4. Install third-party libraries;
5. Upgrade the deep learning development environment.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Choose deep learning programming languages based on operating systems;
1.2 Choose appropriate development frameworks based on deep learning tasks;
1.3 Choose third-party libraries as required by deep learning tasks;
1.4 Install, uninstall and update deep learning programming languages based on operation documents;
1.5 Install, uninstall and update third-party libraries based on operation documents.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 The principle of legality;</td></tr>
</table>

	2.2 Principles of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of environment construction; 2.5 The principle of installation verification; 2.6 Operating system principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic situation of deep learning development environment; 3.2 Basic software and hardware environment requirements for deep learning development environment installation; 3.3 Commonly-used software installation knowledge; 3.4 Deep learning framework knowledge. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Teamwork skills; 4.4 Computer skills. **5.0 Math Skills** 5.1 Calculus; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	The software environment required is constructed for the development of corresponding deep learning projects.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Correct use of software; 2. Information confidentiality and data security.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DEEP LEARNING ALGORITHM SELECTION	**DUTY NO.**	603
TASK TITLE	NEURAL NETWORK ALGORITHM SELECTION	**TASK NO.**	6032
PERFORMANCE CRITERIA	The person performing this task must be able to choose the neural network algorithm model in accordance with actual tasks.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Computers; 2. Windows10/11 system; 3. Deep learning programming language; 4. Deep learning development frameworks; 5. Deep learning related documents.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Understand application tasks; 2. Analyse application data; 3. Analyse the principles and features of neural network algorithms; 4. Select the neural network algorithm.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyse the workflow of actual tasks; 1.2 Analyse the principles and features of neural network algorithms; 1.3 Choose the appropriate neural network algorithm according to the workflow of actual tasks. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 Principles of data security; 2.3 Neural network algorithm principles. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 Neural network algorithms; 3.2 Classification of neural network algorithms; 3.3 Application scenes of neural network algorithms; 3.4 Deep learning process. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Teamwork skills; 4.4 Computer skills. **5.0 Math Skills** 5.1 Calculus; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	Suitable neural network algorithms are selected in accordance with actual tasks.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Information confidentiality and security.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DEEP LEARNING ALGORITHM SELECTION	**DUTY NO.**	603
TASK TITLE	NEURAL NETWORK CONSTRUCTION AND APPLICATION	**TASK NO.**	6033
PERFORMANCE CRITERIA	The person performing this task must be able to construct neural networks in accordance with the selected neural network algorithm, and apply them to solve practical tasks.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Computers; 2. Windows10/11 system; 3. Deep learning programming languages; 4. Deep learning development frameworks; 5. Deep learning related documents.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse application tasks; 2. Analyse application data; 3. Prepare training data; 4. Construct the neural network model; 5. Train the model; 6. Verify and evaluate the model; 7. Adjust hyper-parameters; 8. Choose the optimal model.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Import related software packages; 1.2 Conduct data pre-processing, including data standardization and dividing data sets into training sets, test sets and verification sets; 1.3 Construct, train and evaluate neural network models based on actual tasks; 1.4 Adjust the parameters of neural network models and select the optimal model. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 Principles of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of environment construction; 2.5 The principle of installation verification.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Deep learning integrated development environment; 3.2 Deep learning third-party libraries. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Teamwork skills; 4.4 Computer skills. **5.0 Math Skills** 5.1 Calculus; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	Neural networks are constructed and used to solve practical tasks.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Scope of duties; 2. Information confidentiality and data security.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DEEP LEARNING ALGORITHM IMPLEMENTATION	**DUTY NO.**	604
TASK TITLE	DEEP LEARNING FRAMEWORK MODEL TRAINING	**TASK NO.**	6041
PERFORMANCE CRITERIA	The person performing this task must be able to select the deep learning framework model for training in accordance with the tasks and deep learning specifications, and store the trained model.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Computers; 2. Windows10/11 system; 3. Python; 4. Deep learning development frameworks; 5. Jupyter lab; 6. Annotation tools.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Install deep learning frameworks and deep learning framework development environment; 2. Collect and process data sets and convert them into deep learning framework documents; 3. Invoke deep learning framework pre-training models based on actual tasks; 4. Modify the configuration documents of models; 5. Execute training models; 6. Adjust training parameters; 7. Save the models after training; 8. Package the models.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Install the deep learning framework development environment; 1.2 Convert data sets into deep learning framework files; 1.3 Invoke deep learning framework pre-training models; 1.4 Modify the configuration documents of pre-training models; 1.5 Execute training models; 1.6 Package the models. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Pre-training model invocation basis; 2.2 Knowledge of data processing.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Basic software and hardware environment for deep learning framework operation; 3.2 Deep learning frameworks; 3.3 Modification basis of pre-training model configuration documents. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Teamwork skills; 4.4 Learning skills. **5.0 Math Skills** 5.1 Calculus; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	Task-based model documents are generated (pb model documents or h5 model documents) in accordance with technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	DEEP LEARNING ALGORITHM IMPLEMENTATION	**DUTY NO.**	604
TASK TITLE	DEEP LEARNING FRAMEWORK MODEL TEST AND VERIFICATION	**TASK NO.**	6042
PERFORMANCE CRITERIA	The person performing this task must be able to test and verify the trained deep learning framework model in accordance with tasks and test specifications.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Computers; 2. Windows10/11 system; 3. Python; 4. Deep learning framework models; 5. Jupyter lab; 6. Deep learning operation and monitoring platforms; 7. Model analysis.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Test models; 2. Set up relevant evaluation indicators; 3. Install deep learning monitoring platforms; 4. Test the visualization accuracy and loss; 5. Test the calculation diagram of visualization models; 6. Install deep learning frameworks; 7. Visualize model indicators; 8. Verify the analytical models.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use test data to test models; 1.2 Test key indicators such as visualization accuracy and loss; 1.3 Conduct model verification using visualization model indicators. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Accuracy, loss and other key evaluation indicators. **3.0 Theories** The person performing this task must be able to explain the following:

	3.1 The definition of indicators such as accuracy and loss; 3.2 Conceptual calculation diagram of model structures; 3.3 The function of threshold in model verification; 3.4 Data visualization. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Teamwork skills; 4.4 Learning skills. **5.0 Math Skills** 5.1 Calculus; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	Model test analysis reports are generated in accordance with technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

<table>
<tr><td>OCCUPATION</td><td>ARTIFICIAL INTELLIGENCE TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>DEEP LEARNING ALGORITHM IMPLEMENTATION</td><td>DUTY NO.</td><td>604</td></tr>
<tr><td>TASK TITLE</td><td>PARAMETER OPTIMIZATION OF MODELS</td><td>TASK NO.</td><td>6043</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to optimize the parameters of models in accordance with model analysis reports and optimization principles.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the office under the supervision of artificial intelligence engineers.
The tools and equipment to be used include:
1. Computers;
2. Windows10/11 system;
3. Python;
4. Deep learning frameworks;
5. Jupyter lab;
6. Model operation monitoring platforms;
7. Model analysis;
8. Model hyper-parameter optimization tools.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Install parameter optimization tools;
2. Adjust hyper-parameters of models;
3. Retrain deep learning models with adjusted parameters.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Install model hyper-parameter optimization tools;
1.2 Use optimization tools to adjust hyper-parameters of models;
1.3 Conduct test setup and summary;
1.4 Adjust deep learning models;
1.5 Visualize the operation results of models.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 Hyper-parameter types of parameter optimization tools;
2.2 Hyper-parameter adjustment principles.</td></tr>
</table>

	3.0 Theories The person performing this task must be able to explain the following: 3.1 The meaning of hyper-parameter adjustment; 3.2 Types of hyper-parameters; 3.3 Operation steps of hyper-parameter adjustment; 3.4 Parameter optimization steps. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Teamwork skills; 4.4 Learning skills. **5.0 Math Skills** 5.1 Calculus; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	Models with optimized parameters are generated in accordance with technical requirements and optimization principles.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

OCCUPATION	ARTIFICIAL INTELLIGENCE	**OCCUPATION CODE**	
DUTY TITLE	SMALL AI PROJECT DEVELOPMENT	**DUTY NO.**	605
TASK TITLE	SMALL AI PROJECT DESIGN	**TASK NO.**	6051
PERFORMANCE CRITERIA	The person performing this task must be able to complete the high level design and detailed design of the project in accordance with the requirements of demand units.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Personal computers; 2. Flowchart drawing software; 3. Briefing making software; 4. Word processing software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse problems to be solved; 2. Design the whole process of business data collection; 3. Design the whole process of business data processing; 4. Design the whole process of business data review; 5. Select AI models; 6. Optimize business solutions and promote their implementation.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Set the problem; 1.2 Prepare data; 1.3 Design models. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Project design principles. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Requirements for design documents; 3.2 Knowledge of data process design tools; 3.3 Knowledge of business data related process. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Data storage skills;

	4.4 Customer service skills; 4.5 Teamwork skills; 4.6 Report writing skills; 4.7 Computer skills. **5.0 Math Skills** 5.1 Calculus; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	AI system design reports are completed in accordance with technical and business requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Business analysis methods; 2. Business optimization methods.

OCCUPATION	ARTIFICIAL INTELLIGENCE	**OCCUPATION CODE**	
DUTY TITLE	SMALL AI PROJECT DEVELOPMENT	**DUTY NO.**	605
TASK TITLE	CODE WRITING FOR SMALL AI PROJECTS	**TASK NO.**	6052
PERFORMANCE CRITERIA	The person performing this task must be able to write code for small AI projects in accordance with project requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Personal computers or graphics workstations with GPU computing power; 2. Deep learning frameworks; 3. Jupyter lab.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Design the process of data cleaning and annotation; 2. Formulate data cleaning and annotation specifications; 3. Maintain daily training sets and test sets; 4. Construct deep learning models of projects; 5. Adjust hyper-parameters of models.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Divide training sets, evaluation sets, and test sets; 1.2 Conduct data image enhancement and reduction; 1.3 Handle overfitting regular terms. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of dividing training sets and test sets; 2.2 Principles of improving model accuracy; 2.3 Principles of loss minimization; 2.4 Principles of intelligent training data processing tools; 2.5 Commonly-used API of deep learning frameworks; 2.6 Common deep learning models. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Fully connected models;

	3.2 Convolution models; 3.3 Pre-training convolution models; 3.4 Object detection models; 3.5 Intelligent training data processing knowledge; 3.6 Hyper-parameter setting of model training. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Data storage skills; 4.4 Data cleaning skills; 4.5 Data set dividing skills; 4.6 Teamwork skills; 4.7 Computer skills. **5.0 Math Skills** 5.1 Derivative; 5.2 Linear algebra.
DESCRIPTION OF THE END PRODUCT / SERVICE	AI models are constructed by programming and trained to generate corresponding model documents.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

OCCUPATION	ARTIFICIAL INTELLIGENCE	**OCCUPATION CODE**	
DUTY TITLE	SMALL AI PROJECT DEVELOPMENT	**DUTY NO.**	605
TASK TITLE	SMALL AI PROJECT TEST	**TASK NO.**	6053
PERFORMANCE CRITERIA	The person performing this task must be able to complete the model tests of projects and write test reports in accordance with test requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. **The tools and equipment to be used include:** 1. Personal computers or graphics workstations with GPU computing power; 2. Deep learning frameworks; 3. Jupyter lab; 4. Flowchart drawing tools; 5. Briefing making software; 6. Word processing software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyse product requirements; 2. Develop test plans; 3. Program test cases; 4. Execute test cases; 5. Analyse and record product defects; 6. Track product defects and give feedback; 7. Conduct the regression test; 8. Write test reports.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Establish the evaluation indicators of AI model test; 1.2 Conduct black-box tests; 1.3 Conduct integration tests; 1.4 Analyse the performance tests and indicators. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 The independence of the test sets and training sets; 2.2 Multi- indicator investigation models; 2.3 Basic principles of algorithm training tools. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Standard indicators of model output;

	3.2 Methods of improving model accuracy; 3.3 Test flow of AI system; 3.4 Indicators of AI models; 3.5 Business process of AI system. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Data storage skills; 4.4 Test sets testing skills; 4.5 Visualization indicators; 4.6 Teamwork skills; 4.7 Computer skills. **5.0 Math Skills** 5.1 Linear algebra; 5.2 Derivative.
DESCRIPTION OF THE END PRODUCT / SERVICE	AI project tests are conducted and the test reports are completed.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	SMALL AI PLATFORM VERIFICATION	**DUTY NO.**	606
TASK TITLE	AI PLATFORM TEST PLAN DEVELOPMENT	**TASK NO.**	6061
PERFORMANCE CRITERIA	The person performing this task must be able to test the main components of AI platforms in accordance with the technical and verification requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Computers; 2. Windows10/11 system; 3. Install Windows subsystem for Linux (hereinafter referred to as WSL2); 4. Linux distributions; 5. Deep learning framework servers; 6. Dockers Desktop; 7. Windows Terminal Preview ; 8. Python; 9. VSCode.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Check computer configuration and performance; 2. Download and install WSL2; 3. Download and install Ubuntu operating system; 4. Download and install Windows Terminal Preview; 5. Download and install Dockers Desktop; 6. Download and install deep learning application system; 7. Conduct AI model conversion and deployment; 8. Operate TF inference platform in operating containers; 9. Use Python to program RESTful and gPRC programs;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use WSL environment and Linux operating system; 1.2 Manage containers based on the Dockers commands or Dockers Desktop; 1.3 Deploy deep learning inference servers; 1.4 Program and test AI client programs. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Linux operating system principles; 2.2 Dockers container principles; 2.3 Deep learning application system; 2.4 RESTful programming;

10. Program and run test-side applications.	2.5 Container virtualization principles; 2.6 Knowledge of Windows operating system and WSL2; 2.7 Principles of Ubuntu operating system. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating system; 3.2 Dockers containers; 3.3 RESTful programming; 3.4 Python programming skills; 3.5 HTTP request/service communication; 3.6 Object-oriented programming. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Programming skills; 4.3 Debugging skills; 4.4 Problem-solving skills; 4.5 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Container-based AI platforms and inference models are deployed, and the main components of the AI platform are tested.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	VERIFICATION OF SMALL AI PLATFORMS	**DUTY NO.**	606
TASK TITLE	FUNCTION, ACCURACY AND PERFORMANCE VERIFICATION OF AI PLATFORMS	**TASK NO.**	6062
PERFORMANCE CRITERIA	The person performing this task must be able to verify the function, accuracy and performance of the AI platform in accordance with technical and business requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of artificial intelligence engineers. The tools and equipment to be used include: 1. Computers; 2. Windows10/11 system; 3. WSL2 and Dockers Desktop; 4. Python; 5. VSCode; 6. Deep learning application system; 7. Deep learning application expansions; 8. Load test tools and software.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Download and install deep learning expansions; 2. Deploy AI production platform; 3. Write test programs to verify the inference function; 4. Conduct data annotation, pre-processing, enhancement and simulation data generation; 5. Conduct model self-training, interactive modeling and visual modeling; 6. Conduct third-party model import, model approval, model release and model deletion;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Conduct production management based on AI production platform; 1.2 Conduct data processing based on the platform; 1.3 Develop models based on the platform; 1.4 Manage models based on the platform; 1.5 Conduct forecast services based on the platform. **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Principles of AI production platforms; 2.2 Function, accuracy and performance of AI production platforms;

7. Deploy AI services, service policies, service orchestration, and service monitoring.	2.3 Principles of automated machine learning; 2.4 Knowledge of Windows operating system and WSL2; 2.5 Principles of Ubuntu operating system. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Model training and model management of production environment; 3.2 Evaluation of production environment indicators; 3.3 Dockers containers; 3.4 HTTP communication; 3.5 RESTful programming; 3.6 Python programming skills; 3.7 Containerized service orchestration. **4.0 Essential Skills** 4.1 Application model management skills; 4.2 Operation and maintenance skills of production platform; 4.4 Communication skills; 4.5 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	AI project management and prediction verification are conducted by using model training and management tools.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:**

<table>
<tr><td>OCCUPATION</td><td>ARTIFICIAL INTELLIGENCE TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>VERIFICATION OF SMALL AI PLATFORMS</td><td>DUTY NO.</td><td>606</td></tr>
<tr><td>TASK TITLE</td><td>IMPLEMENTATION OF AUTOMATED MACHINE LEARNING PROCESS</td><td>TASK NO.</td><td>6063</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to implement the automated machine learning process of AI in accordance with the technical and verification requirements.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the office under the supervision of artificial intelligence engineers.
The tools and equipment to be used include:
1. Computers;
2. Windows10/11 system;
3. WSL2 and Dockers Desktop;
4. Python;
5. VSCode;
6. Deep learning application system;
7. Deep learning expansion;
8. Automated machine learning;</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Prepare environment for Linux operating system;
2. Install virtual environment for Python programming;
3. Install VSCode integrated development environment;
4. Install automatic machine learning libraries;
5. Use the automatic machine learning library to conduct data reading, pre-processing, cleaning, formatting, and coding;
6. Use the feature engineering, feature selection, parameter optimization, and parameter verification of the automatic machine learning library;</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Use automatic machine learning/deep learning platform software and build related production lines;
1.2 Conduct data processing based on automated machine learning/deep learning platform;
1.3 Conduct model training, optimization and prediction based on automated machine learning/deep learning platforms.

2.0 Principles
The person performing this task must be able to explain the following principles:
2.1 Principles of automated machine learning/deep learning model selection;</td></tr>
</table>

7. Use the automatic machine learning library to build automatic production lines to make predictions on test sets.	2.2 Principles of automated machine learning/deep learning operation and maintenance optimization; 2.3 Concepts and principles of automated machine learning; 2.4 Principles of automated machine learning production lines. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Machine learning and deep learning theories. **4.0 Essential Skills** 4.1 System deployment skills; 4.2 Application programming skills; 4.3 Debugging, operation, and maintenance skills; 4.4 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The automated machine learning system is deployed, operated and maintained in accordance with AI project requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Knowledge of data preprocessing, cleaning and coding; 2. Knowledge of feature engineering and feature selection; 3. Knowledge of hyper-parameter optimization.

TABLE 1: DACUM CHARTS FOR ARTIFICIAL INTELLIGENCE TECHNICIAN - NTA 6

DUTIES	TASKS	ENABLERS
1.0 Business analysis process design	1.1 Business analysis framework construction. 1.2 Knowledge of business development process design.	**General skills and knowledge** · Knowledge of business analysis framework construction · Knowledge of business development process design · Knowledge of document writing specifications · Problem analysis skills · Problem-solving skills · Document reading skills · Communication skills **Tools and equipment** · Computers · Process design software **Materials** · Project development materials **Requirements for employees** · Patience in solving problems · Sense of responsibility for work · Data security consciousness · Logical methods of working
2.0 Data set construction	2.1 AI business data collection and processing. 2.2 AI business data analysis and review.	**General skills and knowledge** · Knowledge of mathematics and statistics · Data collection, processing and annotation skills · Data classification and statistics skills · Problem analysis skills · Problem-solving skills · Document reading skills · Communication skills **Tools and equipment** · High-performance computers

DUTIES	TASKS	ENABLERS
		· Data processing software **Materials** · Data **Requirements for employees** · Patience · Sense of responsibility · Confidentiality consciousness
3.0 Deep learning algorithm selection	3.1 Deep learning development environment maintenance. 3.2 Neural network algorithm selection. 3.3 Neural network construction and application.	**General skills and knowledge** · Basic knowledge of neural network algorithms · Deep learning environment configuration skills · Neural network algorithm selection skills · Problem analysis skills · Problem-solving skills · Communication skills **Tools and equipment** · Computers · Windows10/11 system · Python · Deep learning frameworks · Jupyter lab · Numpy, Pandas, and Matplotlib **Materials** · Data sets **Requirements for employees** · Patience · Sense of responsibility · Confidentiality consciousness
4.0 Deep learning algorithm implementation	4.1 Deep learning framework model training.	**General skills and knowledge** · Deep learning framework knowledge.

DUTIES	TASKS	ENABLERS
	4.2 Deep learning framework model test and verification. 4.3 Parameter optimization of models.	· Deep learning environment configuration skills · Training model skills · Model test and validation skills · Problem analysis skills · Problem-solving skills · Document reading skills · Algorithm training and evaluating skills · Communication skills **Tools and equipment** · Computers · Windows10/11 system · Python · Deep learning frameworks · Jupyter lab · Numpy, Pandas, and Matplotlib **Materials** · Data sets **Requirements for employees** · Patience · Sense of responsibility · Safety consciousness
5.0 Small AI project development	5.1 Small AI project design. 5.2 Code writing for small AI projects. 5.3 Small AI project test.	**General skills and knowledge** · Project high level design knowledge · Project detailed design knowledge · Deep learning knowledge · Model selection knowledge · Project code writing skills · Project testing skills · Problem analysis skills · Problem-solving skills · Communication skills **Tools and equipment**

DUTIES	TASKS	ENABLERS
		· Personal computers or graphics workstations with GPU computing power · Deep learning frameworks · Jupyter lab · Pandas · Scipy · Matplotlib · Visio, PowerPoint, and Word **Materials** · Data sets **Requirements for employees** · Patience · Sense of responsibility · Safety consciousness
6.0 Small AI platform verification	6.1 AI platform test plan development. 6.2 Function, accuracy and performance verification of AI platforms. 6.3 Implementation of automated machine learning process.	**General skills and knowledge** · Installation and deployment skills of automated machine learning/deep learning platform and software · Skills of building automated machine learning/deep learning production lines · Skills of using automated machine learning/deep learning platform to conduct data pre-processing, cleaning and coding · Skills of conducting model training and optimization based on automated machine learning/deep learning platforms. · System deployment skills · Application programming skills · Debugging, operation, and maintenance skills · Teamwork skills **Tools and equipment** · Computers · Windows10/11 system

DUTIES	TASKS	ENABLERS
		· WSL2 and Dockers Desktop · Python · VSCode · Deep learning application system · Deep learning expansion · Automated machine learning libraries **Materials** · Data sets **Requirements for employees** · Patience · Sense of responsibility · Safety consciousness