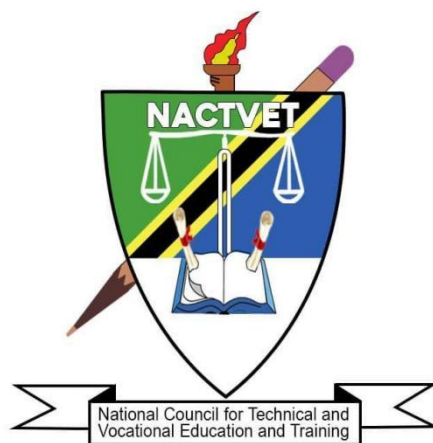


**NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND
TRAINING**



JANUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: ARTIFICIAL INTELLIGENCE TECHNICIAN

LEVEL: NTA 5

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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 Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
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. Artificial Intelligence Technicians 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.

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 5

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	BUSINESS DATA COLLECTION	DUTY NO.	501
TASK TITLE	INTERNET BUSINESS DATA COLLECTION	TASK NO.	5011
PERFORMANCE CRITERIA	The person performing this task must be able to collect Internet business data in accordance with technical requirements and data collection demand.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Internet; 3. Internet data collection software.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select data collection software; 2. Install data collection software; 3. Collate elements of Internet data collection; 4. Develop data collection programs (processes, strategies, etc.); 5. Implement the Internet data collection process; 6. Save the collected data.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Determine the selection requirements and installation process for data collection software; 1.2 Comprehend the Internet data collection process; 1.3 Optimize data collection programs. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of data standardization; 2.5 The principle of webpage requests. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Internet search engine technology; 3.2 Internet data types; 3.3 Data features of static and dynamic webpages 3.4 Data storage procedures and requirements; 3.5 Storage formats of data files.	

	4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Internet information retrieval skills; 4.4 Data collation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Internet data are collected by different tools and stored in accordance with the requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Internet data specifications; 2. Webpage crawling techniques; 3. Information confidentiality; 4. Information security.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	BUSINESS DATA COLLECTION	DUTY NO.	501
TASK TITLE	DATABASE BUSINESS DATA COLLECTION	TASK NO.	5012
PERFORMANCE CRITERIA	The person performing this task must be able to collect business data for the database in accordance with technical requirements and data collection requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Business data collection software (e.g. DAQ).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select data collection software; 2. Install data collection software; 3. Collate elements of business data collection for the database; 4. Develop data collection programs (processes, strategies, etc.); 5. Perform business data collection for the database; 6. Save the collected data.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Determine the selection requirements and installation process for business data collection software; 1.2 Identify types of business data and analyse the similarities and differences between different types of data; 1.3 Comprehend the business data collection process; 1.4 Optimize data collection programs. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of data standardization. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Features of business data; 3.2 Types of business data; 3.3 The difference between unstructured, semi-structured and structured data; 3.4 Data storage procedures and requirements;	

	3.5 Storage formats of data files; 3.6 Business data specifications; 3.7 Sensor technology; 3.8 RFID technology. 4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Business data collection skills; 4.4 Data collation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Business data of the database are collected by different tools and stored in accordance with the requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Information confidentiality; 2. Information security.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	BUSINESS DATA PRE-PROCESSING	DUTY NO.	502
TASK TITLE	BUSINESS DATA CLEANING	TASK NO.	5021
PERFORMANCE CRITERIA	The person performing this task must be able to determine the content of data cleaning in accordance with business requirements and objectives, while ensuring the effects of business data cleaning through consideration and trade-offs based on data quality evaluation criteria.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data processing software (e.g. Python, R, Java, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Clean the repeating data; 2. Clean the incomplete data; 3. Clean the data format; 4. Clean the wrong data; 5. Clean the relational data.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Sort a certain range of data; 1.2 Distinguish the importance of data table structure fields; 1.3 Comprehend the format specifications of data tables; 1.4 Make statistics, analysis, and identification of data error values or outliers; 1.5 Conduct correlation validation of multiple sources of data. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of data cleaning. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Data cleaning theory; 3.2 Data quality theory; 3.3 Data mining theory; 3.4 Database theory;	

	3.5 Data standardization theory. 4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Data cleaning skills; 4.5 Math skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Data cleaning is conducted in accordance with business requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Databases; 2. Programming; 3. Statistics; 4. Machine learning.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	BUSINESS DATA PRE- PROCESSING	DUTY NO.	502
TASK TITLE	INTEGRATION OF BUSINESS DATA	TASK NO.	5022
PERFORMANCE CRITERIA	The person performing this task must be able to determine the content of data integration in accordance with business requirements and objectives, while ensuring the effects of business data integration through consideration and trade-offs based on data quality, data security, and other factors.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data processing software (Talend, Pentaho, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Identify data sources and objectives; 2. Design data integration solutions; 3. Solve the problem of entity identification; 4. Solve the problem of redundancy; 5. Deal with data value conflicts; 6. Verify the data integration.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Conduct consistent treatment to different fields of the same entity; 1.2 Conduct multiple exports of the same attribute and redundancy removal; 1.3 Maintain standardized processing when merging different data sources. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of data cleaning. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Data integration theory; 3.2 Data quality theory; 3.3 Database theory; 3.4 Semantic modeling theory; 3.5 EAI (Enterprise Application Integration) theory	

	4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Data integration skills; 4.4 Math skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Multiple data sources are unified into a data collection to provide a complete data source for data processing.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Data sources; 2. ETL tools; 3. Data quality control; 4. Data security and privacy; 5. Domain knowledge; 6. Data formats.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	BUSINESS DATA PRE- PROCESSING	DUTY NO.	502
TASK TITLE	BUSINESS DATA CONVERSION	TASK NO.	5023
PERFORMANCE CRITERIA	The person performing this task must be able to determine the content of data conversion in accordance with business requirements and objectives, while ensuring the effects of business data conversion through consideration and trade-offs based on data quality, data value, and other factors.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data processing software (e.g. Excel, Python, R, SQL, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Remove data noises; 2. Summarize or totalize data operations; 3. Replace data objects with more abstract concepts; 4. Project relevant attribute data proportionally to a specific small area; 5. Construct a new attribute from an existing set of attributes.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Conduct data smoothing; 1.2 Conduct data aggregation; 1.3 Conduct data generalization; 1.4 Conduct data standardization; 1.5 Conduct property construction. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of data cleaning. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Theories of extraction, transformation and loading; 3.2 Data warehouse theory; 3.3 Data modeling theory; 3.4 Database theory; 3.5 Business process management theory.	

	4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Teamwork skills; 4.3 Math skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The data are converted into a format that is easy to store and analyse.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Data conversion tools; 2. Data format conversion; 3. Databases; 4. Programming; 5. Data quality control; 6. Domain knowledge.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	BUSINESS DATA PRE-PROCESSING	DUTY NO.	502
TASK TITLE	BUSINESS DATA REDUCTION	TASK NO.	5024
PERFORMANCE CRITERIA	The person performing this task must be able to determine the content of data reduction in accordance with business requirements and objectives, while ensuring the effects of business data reduction through consideration and trade-offs based on data quality, data value, and other factors.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data processing software (e.g. Excel, Python, R, SQL, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Determine business requirements and data objectives; 2. Conduct data dimension reduction; 3. Conduct data quantity reduction; 4. Conduct data compression.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Reduce the number of random variables or attributes considered; 1.2 Replace the original data with an alternative and smaller data representation; 1.3 Use encoding mechanism to compress data sets; 1.4 Conduct verification and test; 1.5 Conduct monitoring and maintenance. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of data reduction. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Business data reduction; 3.2 Data mining theory; 3.3 Database theory; 3.4 Statistical theory; 3.5 Information compression theory.	

	4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Data reduction skills; 4.4 Math skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The reduced representation of data is obtained on the basis of maintaining data integrity.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Data analysis tools; 2. Statistical analysis; 3. Data mining algorithms; 4. Data model design; 5. Domain knowledge; 6. Data privacy and security.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	IMPLEMENTATION OF DATA ANALYSIS AND VISUALIZATION	DUTY NO.	503
TASK TITLE	CLASSIFICATION OF THE PRE-PROCESSED DATA	TASK NO.	5031
PERFORMANCE CRITERIA	The person performing this task must be able to classify the annotated data by using classification tools in accordance with technical requirements and application requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data processing software (e.g. Excel, Python, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Comprehend the purpose of data classification; 2. Analyse and determine the data classification methods; 3. Select data classification tools; 4. Classify and annotate data.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Determine the method of data classification; 1.2 Analyse the dimension of classified data; 1.3 Comprehend the classification rules; 1.4 Select the classification models. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Commonly-used methods of data classification; 3.2 Unbalance of sample categories; 3.3 Selection of classification algorithms. 4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Data classification skills.	

DESCRIPTION OF THE END PRODUCT / SERVICE	Data classification is conducted correctly, which is the basis of data analysis and correct analysis results.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Common sense of data and information; 2. Information security and confidentiality; 3. Safety operation of computers; 4. Professional ethics.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	IMPLEMENTATION OF DATA ANALYSIS AND VISUALIZATION	DUTY NO.	503
TASK TITLE	STATISTICS OF THE PRE- PROCESSED DATA	TASK NO.	5032
PERFORMANCE CRITERIA	The person performing this task must be able to use statistical tools to make statistics on the annotated data and analyse their internal relations		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data processing software (e.g. Excel, Python, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Comprehend the purpose of data statistics; 2. Determine the method of data statistics; 3. Select data statistical tools; 4. Make statistics on the annotated data.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Conduct basic calculation on classified data; 1.2 Select and use statistical analysis functions; 1.3 Use conventional statistical functions; 1.4 Conduct clustering. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of choosing analytical methods and tools. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Data descriptive analysis theory; 3.2 Conventional statistical theory; 3.3 Group statistical theory. 4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Data analysis skills.	

	5.0 Math Skills 5.1 Advanced mathematics (derivative); 5.2 Linear algebra; 5.3 Fundamentals of Statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	Data analysis results are used to guide business decision-making and bring benefits.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Information confidentiality and security; 2. Computer security; 3. Professional ethics.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	IMPLEMENTATION OF DATA ANALYSIS AND VISUALIZATION	DUTY NO.	503
TASK TITLE	VISUAL OUTPUT OF CLASSIFICATION STATISTICS	TASK NO.	5033
PERFORMANCE CRITERIA	The person performing this task must be able to visualize the data by using visualization tools in accordance with technical requirements and business requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data visualization software (Excel, Power BI, Python, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Determine the topic of data visualization; 2. Refine the data of visualization topics; 3. Choose the types of charts; 4. Conduct visualization layout; 5. Implement data visualization; 6. Write data analysis reports.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Determine the data visualization contents; 1.2 Analyse the features of different chart types; 1.3 Use drawing functions; 1.4 Create visual charts. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of visual element balance; 2.5 The principle of using the best data mode. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Data visualization charts; 3.2 Visual interaction modes. 4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Problem-solving skills; 4.3 Report writing skills.	

DESCRIPTION OF THE END PRODUCT / SERVICE	Visual mapping is conducted by using the most convenient tools after data cleaning and data processing according to the business purpose.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of computers; 2. Correct use of software; 3. Database or data warehouse; 4. Information confidentiality; 5. Information security.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	IMPLEMENTATION OF MACHINE LEARNING ALGORITHM SELECTION	DUTY NO.	504
TASK TITLE	MACHINE LEARNING DEVELOPMENT ENVIRONMENT CONSTRUCTION	TASK NO.	5041
PERFORMANCE CRITERIA	The person performing this task must be able to construct the machine learning development environment in accordance with technical requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Machine learning development environment (Pycharm, Anaconda, etc.); 3. Third-party machine learning libraries (Numpy, Pandas, Matplotlib, etc.); 4. Internet.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Analyse application tasks; 2. Clarify the computer software and hardware environment; 3. Select machine learning software; 4. Select third-party libraries; 5. Install, uninstall and update machine learning software; 6. Install, uninstall and update third-party libraries.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 View the computer hardware configuration; 1.2 Download machine learning software; 1.3 Install machine learning software; 1.4 Configure the machine learning development environment; 1.5 Install machine learning third-party libraries. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle 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 Integrated development environment; 3.2 Machine learning third-party libraries; 3.3 Operating system usage theory; 3.4 Installation theory of commonly-used software; 3.5 Safety operation theory of computers; 3.6 The theory of correct software usage. 4.0 Essential Skills 4.1 Problem analysis skills; 4.2 Problem-solving skills; 4.3 Communication skills; 4.4 Software installation skills; 4.5 Operating software skills;
DESCRIPTION OF THE END PRODUCT / SERVICE	The software environment required is constructed for the development of corresponding machine learning projects.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Scope of duties; 2. Information confidentiality and data security.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	IMPLEMENTATION OF MACHINE LEARNING ALGORITHM SELECTION	DUTY NO.	504
TASK TITLE	ANALYSIS AND SELECTION OF MACHINE LEARNING ALGORITHMS	TASK NO.	5042
PERFORMANCE CRITERIA	The person performing this task must be able to analyse and select machine learning algorithms in accordance with technical requirements and application requirements		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Machine learning development environment (Pycharm, Anaconda, etc.) 3. Machine learning related documents.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Obtain data through appropriate methods; 2. Divide the data sets into training sets, verification sets and test sets; 3. Choose the appropriate machine learning algorithm; 4. Train the model with training sets; 5. Evaluate the model using verification sets; 6. Adjust the parameters and optimize the model according to the test results; 7. Choose the optimal machine learning model.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Conduct event tracking and network data crawling; 1.2 Use cross validation to divide data sets; 1.3 Operate machine learning algorithms; 1.4 Use cross validation to check accuracy; 1.5 Use confusion matrix to evaluate the model; 1.6 Optimize hyper-parameters. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of machine learning algorithms. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Machine learning algorithms; 3.2 Classification of machine learning algorithms; 3.3 Application scenes of machine learning algorithms;	

	3.4 Machine learning process. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Document reading skills. 5.0 Math Skills 5.1 Advanced mathematics (calculus); 5.2 Linear algebra; 5.3 Probability theory.
DESCRIPTION OF THE END PRODUCT / SERVICE	Analysis of machine learning algorithm selection and machine learning project flow is completed.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Data scale; 2. Data sets; 3. Information confidentiality; 4. Information security; 5. Scope of duties.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	IMPLEMENTATION OF MACHINE LEARNING ALGORITHM SELECTION	DUTY NO.	504
TASK TITLE	EVALUATION AND SELECTION OF MACHINE LEARNING MODELS	TASK NO.	5043
PERFORMANCE CRITERIA	The person performing this task must be able to accurately select the corresponding machine learning algorithm to solve practical tasks in accordance with application requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Machine learning development environment (PyCharm, etc.); 3. Machine learning related documents; 4. Data sets.		
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 requirements; 3. Conduct data acquisition and pre- processing; 4. Divide data sets; 5. Select machine learning models; 6. Train the model; 7. Test and optimize the model; 8. Select the best model according to the model performance.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Consult and collate relevant materials; 1.2 Conduct application data pre-processing; 1.3 Divide data sets by the setting-aside method; 1.4 Use cross validation to divide data sets; 1.5 Operate machine learning algorithms; 1.6 Verify and evaluate the model; 1.7 Optimize hyper-parameters. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Advantages and disadvantages of different machine learning algorithms and their application fields; 2.2 Classification principles of machine learning algorithms; 2.3 Principles of machine learning selection. 3.0 Theories	

	The person performing this task must be able to explain the following: 3.1 Data scale; 3.2 Accuracy, loss, and calculation speed; 3.3 Underfitting and overfitting; 3.4 Machine learning process. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Comprehension; 4.4 Consciousness of responsibility; 4.6 Development software skills. 5.0 Math Skills 5.1 Linear algebra (derivative); 5.2 Probability theory.
DESCRIPTION OF THE END PRODUCT / SERVICE	Different machine learning algorithms are selected from the machine learning algorithm library.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Data collection; 2. Machine learning frameworks; 3. Model evaluation and optimization; 4. Information confidentiality and security; 5. Professional ethics.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	APPLICATION OF MACHINE LEARNING ALGORITHMS	DUTY NO.	505
TASK TITLE	MACHINE LEARNING FRAMEWORK INSTALLATION AND UPGRADING	TASK NO.	5051
PERFORMANCE CRITERIA	The person performing this task must be able to install and upgrade the machine learning framework in accordance with technical requirements and software usage.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Machine learning development software (PyCharm, etc.); 3. Basic machine learning libraries; 4. Internet.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select machine learning frameworks; 2. Search and obtain the machine learning framework; 3. Install the machine learning framework; 4. Upgrade the machine learning framework.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Select machine learning frameworks; 1.2 Search for machine learning frameworks on the Internet; 1.3 Download the machine learning framework; 1.4 Install and upgrade the machine learning framework using commands. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of machine learning framework selection; 2.3 Software installation. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Acquisition operation of machine learning frameworks; 3.2 Basic knowledge of machine learning framework; 3.3 Use of machine learning frameworks;	

	3.4 Safety operation theory of computers; 3.5 The theory of correct software usage. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Information search skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Machine learning frameworks are used correctly.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Scope of duties; 2. Professional ethics.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	APPLICATION OF MACHINE LEARNING ALGORITHMS	DUTY NO.	505
TASK TITLE	MODEL TRAINING USING MACHINE LEARNING FRAMEWORKS	TASK NO.	5052
PERFORMANCE CRITERIA	The person performing this task must be able to use machine learning frameworks to train models in accordance with technical requirements and application requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data sets; 3. Machine learning development environment (PyCharm, etc.); 4. Basic machine learning libraries.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Import the machine learning framework; 2. Divide data sets; 3. Train machine learning models; 4. Test machine learning models.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Import machine learning frameworks into the machine learning development environment; 1.2 Divide data sets by the setting-aside method; 1.3 Use cross validation to divide data sets; 1.4 Train models using machine learning frameworks. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The algorithm principle; 2.4 The model training principle. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Data set processing; 3.2 Fundamentals of machine learning frameworks; 3.3 Use of machine learning frameworks; 3.4 Model training process;	

	3.5 Safety operation theory of computers; 3.6 The theory of correct software usage; 3.7 Machine learning algorithms. 4.0 Essential Skills 4.1 Requirement analysis skills; 4.2 Teamwork skills; 4.3 Program development skills; 4.4 Development software skills. 5.0 Math Skills 5.1 Advanced mathematics (derivative); 5.2 Linear algebra; 5.3 Probability theory and mathematical statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	Models are trained by using machine learning frameworks and tested by using the test set data based on the selected machine learning algorithm and training sets.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Scope of duties; 2. Information confidentiality.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	APPLICATION OF MACHINE LEARNING ALGORITHMS	DUTY NO.	505
TASK TITLE	MACHINE LEARNING MODEL VERIFICATION AND EVALUATION	TASK NO.	5053
PERFORMANCE CRITERIA	The person performing this task must be able to verify and evaluate the model in accordance with technical requirements and application requirements.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Machine learning development environment (PyCharm, etc.); 3. Basic machine learning libraries.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Verify the model and calculate the accuracy of the model; 2. Evaluate model performance; 3. Optimize hyper-parameters; 4. Repeat the training model; 5. Optimize the hyper-parameters to further improve model performance and model generalization ability.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Adjust hyper-parameters; 1.2 Conduct cross validation; 1.3 Calculate the accuracy and recall rate. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of model evaluation. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Model evaluation concepts; 3.2 Model verification methods; 3.3 Model evaluation indicators; 3.4 Model evaluation methods; 3.5 Model debugging methods; 3.6 Model optimization methods. 4.0 Essential Skills	

	4.1 Requirement analysis skills; 4.2 Teamwork skills; 4.3 Program development skills. 5.0 Math Skills 5.1 Advanced mathematics (derivative); 5.2 Linear algebra; 5.3 Probability theory and mathematical statistics.
DESCRIPTION OF THE END PRODUCT / SERVICE	Models are verified, evaluated, and optimized by repeating the training model based on requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Scope of duties; 2. Professional ethics; 3. Information confidentiality; 4. Information security.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PRIMARY AI PROJECT DEVELOPMENT	DUTY NO.	506
TASK TITLE	HIGH LEVEL AND DETAILED DESIGN OF PRIMARY AI PROJECTS	TASK NO.	5061
PERFORMANCE CRITERIA	The person performing this task must be able to conduct high level and detailed design of the project and select machine learning algorithms in accordance with customer demand.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Software (such as Microsoft Visio) with the ability to draw hierarchical functional diagrams and flowcharts; 3. Word processing software (Microsoft Word, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Determine the software and hardware environment; 2. Write brief requirement analysis documents; 3. Design and draw the system function structure diagram; 4. Design and draw system business flowcharts; 5. Select machine learning algorithm models; 6. Design the detailed functions of each module.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Analyse the version dependency of each framework; 1.2 Conduct demand survey of demands and network research; 1.3 Use function decomposition to design functional structure; 1.4 Adopt the analysis and drawing process design of system flowchart; 1.5 Analyse and compare the applicable scope, advantages and disadvantages of each machine learning algorithm model; 1.6 Conduct the detailed design according to the functions of each module. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of high level design following modular design, top-down gradual refinement, and information concealment; 2.2 Machine learning model selection pursuing accurate model prediction; 2.3 The principle that detailed design processing shall be understandable;	

	2.4 The algorithm principle. 3.0 Theories The person performing this task must be able to explain the following: 3.1 The process and principle of high level design; 3.2 Machine learning algorithm selection; 3.3 Detailed design process. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Document writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Brief analysis and design instructions.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Computer software and hardware; 2. Software analysis and design; 3. Graphics software; 4. Machine learning; 5. Domain knowledge; 6. Professional ethics and information confidentiality.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	PRIMARY AI PROJECT DEVELOPMENT	DUTY NO.	506
TASK TITLE	CODE WRITING AND TESTING OF PRIMARY AI PROJECTS	TASK NO.	5062
PERFORMANCE CRITERIA	The person performing this task must be able to obtain the code file of the software in accordance with the result of detailed design and test the code.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data collection tools or the Internet; 3. Data processing software (Excel, Python, etc.); 4. Programming development environment (PyCharm, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Build development environment; 2. Prepare training data sets; 3. Conduct training data pre-processing; 4. Configure the training process; 5. Create and train the model; 6. Save the model; 7. Verify the model; 8. Write business code; 9. Test related items.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Use command mode, offline mode or directly install each framework in the development environment; 1.2 Analyse and compare the applicable scope, advantages and disadvantages, and difficulty level of self-collected data and public-selected data sets; 1.3 Clean, integrate, convert and reduce data according to business and algorithm requirements, and divide data sets; 1.4 Read the data of training sets; create the model and train with it ML frameworks; 1.5 Use the data of test sets to test the model; 1.6 Complete code writing and testing according to service logic. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of data cleaning;	

	2.5 The principle of completing software coding in strict accordance with the detailed design instructions; 2.6 The principle of accurate model prediction; 2.7 The principle of software testing; 2.8 The model training principle. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Coding specification; 3.2 Machine learning modeling process; 3.3 Test methods. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Programming skills; 4.4 Model training evaluation skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Code files of software.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Software installation; 2. Data collection; 3. Data processing; 4. Machine learning; 5. Fundamentals of programming; 6. Professional ethics and information confidentiality.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATIO N CODE	
DUTY TITLE	PRIMARY AI PROJECT DEVELOPMENT	DUTY NO.	506
TASK TITLE	APPLICATION OF PRIMARY AI PROJECTS	TASK NO.	5063
PERFORMANCE CRITERIA	The person performing this task must be able to visualize the results of the AI project.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior artificial intelligence technicians or engineers. The tools and equipment to be used include: 1. High-performance computers; 2. Data collection tools or the Internet; 3. Data processing software (Excel, Python, etc.); 4. Programming development environment (PyCharm, etc.); 5. Visualization framework (Matplotlib, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Collect business data of production environment; 2. Conduct business data pre-processing; 3. Use the trained model to predict; 4. Perform visual output of results.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Analyse the equipment needed and its cost performance for production environment data collection, and select the appropriate equipment; 1.2 Analyse and compare the applicable scope, advantages and disadvantages of various pre-processing methods, and choose suitable methods; 1.3 Set the model to prediction mode; 1.4 Select appropriate visualization frameworks. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The principle of legality; 2.2 The principle of data security; 2.3 The principle of storage for a limited period; 2.4 The principle of data cleaning; 2.5 The principle of model prediction; 2.6 The machine learning process. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Data collection;	

	3.2 Model prediction; 3.3 Visualization of results; 3.4 Data processing; 3.5 Machine learning; 3.6 Visual programming. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Data collection skills; 4.4 Model prediction skills; 4.5 Visual programming skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	AI projects are applied in production environments.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Professional ethics and information confidentiality.

TABLE 1: DACUM CHARTS FOR ARTIFICIAL INTELLIGENCE TECHNICIAN - NTA 5

DUTIES	TASKS	ENABLERS
1.0 Business data collection	1.1 Internet data collection.	General skills and knowledge • Computer network knowledge • Operating system knowledge and operation skills • Skills of data collection, software installation and application • Database knowledge and skills • Problem analysis skills • Problem-solving skills • Document reading skills • Communication skills Tools and equipment • High-performance computers • Data collection software Materials • Data sets Requirements for employees • Patience • Sense of responsibility • Safety consciousness
	1.2 Database business data collection.	
2.0 Business data pre-processing	2.1 Business data cleaning according to business and algorithm requirements.	General skills and knowledge • Knowledge of mathematics and statistics • Operating system knowledge and operation skills • Programming skills • Database knowledge and skills • Problem analysis skills • Problem-solving skills • Document reading skills • Communication skills Tools and equipment
	2.2 Business data integration according to business and algorithm requirements.	
	2.3 Business data conversion according to business and algorithm requirements.	

DUTIES	TASKS	ENABLERS
	2.4 Business data reduction according to business and algorithm requirements.	• High-performance computers • Data processing software (Python, Excel) Materials • Data Requirements for employees • Patience • Sense of responsibility • Confidentiality consciousness
3.0 Data analysis and visualization	3.1 Classification of the annotated data.	General skills and knowledge • Knowledge of mathematics and statistics • Programming skills • Database knowledge and skills • Problem analysis skills • Problem-solving skills • Communication skills Tools and equipment • High-performance computers • Data processing software (Python, Excel) Materials • Data Requirements for employees • Patience • Sense of responsibility • Confidentiality consciousness
	3.2 Statistics on annotated data.	
	3.3 Visual output of the results of the classification statistics by visualization tools.	
4.0 Machine learning algorithm selection	4.1 Installation, configuration, and upgrading of ML development environments.	General skills and knowledge • Knowledge of mathematics and statistics • Computer network knowledge and skills • Operating system knowledge and skills • Programming skills • Problem analysis skills • Problem-solving skills • Document reading skills • Data analysis skills
	4.2 Machine learning algorithm understanding and machine learning process analysis.	
	4.3 Selection and use of machine learning	

DUTIES	TASKS	ENABLERS
	algorithms for solving practical tasks.	• Algorithm training and evaluating skills • Communication skills Tools and equipment • High-performance computers • Machine learning software Materials • Data sets Requirements for employees • Patience • Sense of responsibility • Safety consciousness
5.0 Application of machine learning algorithms	5.1 Machine learning framework installation and upgrading.	General skills and knowledge • Computer network skills • Essential skills of operating system • Data processing skills • Math skills • Programming skills • Algorithm skills • Problem analysis skills • Problem-solving skills • Communication skills Tools and equipment • High-performance computers • Data processing software (such as Python) • Integrated development environment (IDE) Materials • Data sets Requirements for employees • Patience • Sense of responsibility • Safety consciousness
	5.2 Training and use of machine learning framework models.	
	5.3 Testing and verification of machine learning algorithms.	
6.0 Simple machine learning project development	6.1 High level and detailed design of primary AI projects.	General skills and knowledge • Communication skills • Customer service skills

DUTIES	TASKS	ENABLERS
	6.2 Code writing and testing of primary AI projects.	• Teamwork skills • Document writing skills • Data collection skills • Programming skills • Model training evaluation skills • Model prediction skills • Visual programming skills Tools and equipment • High-performance computers • Software with graphic drawing functions • Word processing software (Word, etc.) • Data collection tools • Data processing software (Excel, Python, etc.) • Program development environment • Visualization framework Materials • Data sets Requirements for employees • Patience • Sense of responsibility • Safety consciousness
	6.3 Application of primary AI projects.	