

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



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PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: ARTIFICIAL INTELLIGENCE TECHNICIAN

LEVEL: NTA 4

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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 effectively meet the job requirements.
Competency:	The ability 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 comprehensive statement about "what is to be learned" by the trainee/student in a particular syllabus; description of "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction that is designed to prepare a person (in content and manner) for employment in a job or other special 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:	Broad groupings of related jobs, such as catering service.
Occupational Standards:	Specific requirements for competencies of personnel in a particular occupational area, including knowledge and relevant attitudes, which can also be adopted to evaluate the performance of a given outcome.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	A description of an expected outcome or achievement in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skills are conceived of as a composite of three completely interdependent components: cognitive, emotional and conscious activities.
Standards:	A set of statements, which, if proved true under working conditions, means that an individual is meeting an expected level and performance.
Task Analysis:	The process of analyzing each task to determine the steps, circumstantial knowledge, attitudes, performance criteria, 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, consists of two or more definite steps, and leads to products, service, or decisions.

**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 working conditions.

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 an Artificial Intelligence Technician. 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 and deep 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 4

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	HANDLING OF INFORMATION AND FAULTS	DUTY NO.	401
TASK TITLE	PROCESSING OF EXCEL DATA	TASK NO.	4011
PERFORMANCE CRITERIA	The person performing this task must be able to learn Excel data processing software in accordance with technical requirements and software operation methods.		
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. Excel software; 3. Other necessary external devices (e.g. removable hard disk, U disk, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Create workbooks and worksheets; 2. Manage data in worksheets; 3. Protect workbooks and worksheets; 4. Operate with formulas and functions; 5. Carry out data processing; 6. Create data charts; 7. Embellish data charts.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Manage Excel sheet data; 1.2 Operate Excel sheet data; 1.3 Visualize Excel sheet data. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of consistency in the format of data in the same column; 2.2 Principles of numbers without units; 2.3 Principles of data security; 2.4 Underpinning knowledge of Excel software; 2.5 Functional applications of Excel software. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Data cleaning; 3.2 Data screening;	

	3.3 Logical operation of data; 3.4 Data association matching; 3.5 Statistical analysis of data; 3.6 Time series. 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Problem-solving skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Excel data processing software under the operating system platform is independently and proficiently applied to complete the corresponding work.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	HANDLING OF INFORMATION AND FAULTS	DUTY NO.	401
TASK TITLE	TROUBLESHOOTING OF COMMON COMPUTER FAULTS	TASK NO.	4012
PERFORMANCE CRITERIA	The person performing this task must be able to resolve common computer faults 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. Computers; 2. Router; 3. Switch; 4. Network cable.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Disassemble and assemble computers; 2. Install computer systems and software; 3. Connect computer network; 4. Locate and diagnose common computer faults; 5. Troubleshoot common computer hardware faults; 6. Troubleshoot common computer software faults; 7. Troubleshoot common computer network faults.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Disassemble and assemble computers; 1.2 Check the operation of computers; 1.3 Run the PC self-check program; 1.4 Update and reinstall software; 1.5 Drive upgrade and reinstallation; 1.6 Analyze and determine fault types; 1.7 Replace hardware; 1.8 Check the network connection. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of troubleshooting computer faults; 2.2 Principles of computer assembly steps; 2.3 Principles of the steps for checking the operation of computers. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Hardware components of computers;	

	3.2 Computer software systems; 3.3 Fundamentals of computer networks; 3.4 Application of common network test configuration commands. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Basic computer skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Common computer faults are troubleshooted in accordance with technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Basic commands for DOS; 2. Knowledge of resistors and other components; 3. Description of computer motherboards.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	HANDLING OF INFORMATION AND FAULTS	DUTY NO.	401
TASK TITLE	FORMATION OF SMALL LOCAL AREA NETWORKS	TASK NO.	4013
PERFORMANCE CRITERIA	The person performing this task must be able to create broadband connections and set up small local area networks (LANs) in accordance with technical requirements and application requirements so that computers can be connected to the Internet through the LAN.		
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. Router, modem, switch; 3. Transmission medium of equipment (twisted pair and optical fiber); 4. Other necessary external devices (e.g. removable hard disk, U disk, etc.).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Check commonly-used LAN cables and wiring equipment; 2. Check routers and firewalls; 3. Identify line equipment and its main models; 4. Connect network devices; 5. Build a topology according to the topology diagram; 6. Connect the transmission media to the switch and router; 7. Create a broadband Internet connection to access the extranet properly.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Build a topology according to the topology diagram; 1.2 Create a broadband network connection; 1.3 Use switches and routers; 1.4 Connect network devices. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of practicality; 2.2 Principles of advancement; 2.3 Principles of openness; 2.4 Principles of extendibility; 2.5 Principles of safety and reliability. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Types and basic functions of network devices;	

	3.2 Interface types and characteristics of commonly-used LANs; 3.3 Access status of the router; 3.4 Standards and methods of wiring. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Requirement analysis skills; 4.5 Problem-solving skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Simple small local area networks are built under the operating system platform.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Data privacy and security; 2. Database usage; 3. Data communication systems.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	HANDLING OF INFORMATION AND FAULTS	DUTY NO.	401
TASK TITLE	DEVELOPMENT OF SIMPLE APPLICATIONS	TASK NO.	4014
PERFORMANCE CRITERIA	The person performing this task must be able to complete simple application development in accordance with the PEP8 coding specification and program development 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. Computers; 2. Windows; 3. Python; 4. VSCode.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Install Python; 2. Install VSCode integrated development environment; 3. Develop simple applications in Python; 4. Test functions of the applications; 5. Debug faults of applications; 6. Optimize applications to improve efficiency.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Install and test Python; 1.2 Develop simple applications in Python; 1.3 Test and troubleshoot applications. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Specifications for the development of computer software; 2.2 Seven principles of programming. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Program development process; 3.2 Object-oriented programming; 3.3 Program debugging methods; 3.4 PEP8 specification; 3.5 Data structures and algorithms.	

	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. 5.0 Math Skills 5.1 Linear algebra; 5.2 Numerical computation.
DESCRIPTION OF THE END PRODUCT / SERVICE	Python applications are developed in accordance with program development specifications and processes.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTALLATION OF OPERATING SYSTEMS	DUTY NO.	402
TASK TITLE	MAINTENANCE OF COMMON OPERATING SYSTEMS	TASK NO.	4021
PERFORMANCE CRITERIA	The person performing this task must be able to maintain operating systems using O&M software are utilized in accordance with business requirements and the requirements of the application department.		
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. Computers and peripherals; 2. Windows, Linux, etc.; 3. Common office software.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Maintain network and equipment; 2. Maintained office hardware, software and desktop systems; 3. Install and maintain systems and application software for computers and servers; 4. Maintain secure server operation, data backup and rights management; 5. Install and maintain computer peripherals.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Troubleshoot common faults in the operating system; 1.2 Troubleshoot common faults and prevent risks; 1.3 Manage servers, data and users; 1.4 Maintain commonly-used office facilities. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Basic principles of maintaining an operating system. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Maintenance procedures for operating systems; 3.2 Maintenance plans for operating systems; 3.3 Risk prevention procedures for the use of operating systems; 3.4 Common commands for operating systems; 3.5 Access specifications of computer users; 3.6 Infrastructure operation.	

	4.0 Essential Skills 4.1 Troubleshooting skills; 4.2 Communication skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Common operating systems are maintained on an as-needed basis.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Network resource management; 2. Virus prevention and usage of garbage collection tools; 3. Management of commonly-used office equipment.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTALLATION OF OPERATING SYSTEMS	DUTY NO.	402
TASK TITLE	INSTALLATION OF LINUX AND OTHER OPERATING SYSTEMS	TASK NO.	4022
PERFORMANCE CRITERIA	The person performing this task must be able to install applicable operating systems for different business scenarios based on the requirements of the application department.		
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. Computers; 2. Linux system-related image files; 3. Virtualization software.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Distinguish between application scenarios and usage requirements for different versions of operating systems; 2. Acquire an operating system image; 3. Install virtualization software; 4. Perform a software image installation of the operating system; 5. Configure commonly-used network services for the operating system and plan and configure operating system files.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain the following: 1.1 Distinguish between application scenarios for different versions of the operating system; 1.2 Configure basic services for different operating systems; 1.3 Test the installation of the operating system. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Working principles of operating system installation. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Installation procedures for operating systems; 3.2 Installation process precautions; 3.3 Test flow of operating system booting; 3.4 Common commands for operating systems; 3.5 Acquisition and analysis of computer configuration information; 3.6 Knowledge of operating system installation; 3.7 Installation and configuration of virtualization software;	

	3.8 Driver installation; 3.9 Operation test. 4.0 Essential Skills 4.1 Resource acquisition skills; 4.2 Debugging skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Communication skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Operating systems such as Linux are installed in accordance with business requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DATABASE MANAGEMENT	DUTY NO.	403
TASK TITLE	DATABASE CREATION	TASK NO.	4031
PERFORMANCE CRITERIA	The person performing this task must be able to ensure that databases are created quickly using database management software in accordance with business requirements, objectives, industry standards, and data specifications.		
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. Computers; 2. Windows; 3. Database Management System.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Install the database management software; 2. Create databases; 3. View the database list; 4. Create database users; 5. Configure database user privileges; 6. Rationalize the database table structure; 7. Create database tables; 8. View table lists and table structures; 9. Optimize the database structure.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Install the database management software; 1.2 Create databases; 1.3 Configure database user privileges; 1.4 Plan the database table structure; 1.5 Create database tables. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Logical storage structure of a database; 2.2 Theory of database security. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Basic approaches to relational data model design; 3.2 Basic methods and processes for SQL programming data definitions; 3.3 Data model; 3.4 Database design specifications; 3.5 Set operation; 3.6 SQL syntax;	

	3.7 SQL programming skills. 4.0 Essential Skills 4.1 Communication skills; 4.2 Programming skills; 4.3 Safety consciousness; 4.4 Problem-solving skills; 4.5 Teamwork skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Databases are created in accordance with database design specifications and processes.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DATABASE MANAGEMENT	DUTY NO.	403
TASK TITLE	DATABASE MANAGEMENT AND MAINTENANCE	TASK NO.	4032
PERFORMANCE CRITERIA	The person performing this task must be able to manage and maintain databases in accordance with business needs and objectives in accordance with business requirements, objectives, industry standards, and data specifications.		
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. Computers; 2. Windows; 3. Database Management System.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Access to databases; 2. Query the data table for data; 3. Add data to the database; 4. Delete the data in the database; 5. Update the data in the database; 6. Verify the integrity and legitimacy of the data; 7. Import and export databases; 8. Back up and recover the database; 9. Manage database users.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Open the database management software and data tables; 1.2 Create query rules and perform query operations in database management software; 1.3 Update database tables and records; 1.4 Import and export databases; 1.5 Create database backups; 1.6 Back up and restore databases. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Integrity and legitimacy of data; 2.2 Safety specifications for databases. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Basic methods and processes of SQL programming data management; 3.2 SQL syntax;	

	3.3 SQL programming skills. 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; 4.6 Safety consciousness.
DESCRIPTION OF THE END PRODUCT / SERVICE	Databases are managed and maintained in accordance with database management principles.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Database safety specification.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DATA COLLECTION	DUTY NO.	404
TASK TITLE	ORIGINAL DATA COLLECTION FOR AI BUSINESS	TASK NO.	4041
PERFORMANCE CRITERIA	The person performing this task must be able to collect original data of AI business 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. Computers; 2. Windows; 3. Data collection tools.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select data collection tools; 2. Install data collection tools; 3. Develop processes and rules for data collection; 4. Implement processes and rules for data collection; 5. Monitor processes and rules for data collection; 6. Collect Internet application data; 7. Store Internet application data.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Select and install data collection tools; 1.2 Develop processes and rules for data collection; 1.3 Implement and monitor Internet application data collection; 1.4 Store the acquired data according to the storage specifications. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of data security; 2.2 Principles of data protection; 2.3 Principles of storage for a limited period; 2.4 Basic principles of data collection. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Data collection laws and regulations; 3.2 Basic flow of data collection; 3.3 Rules for data collection.	

	4.0 Essential Skills 4.1 Communication skills; 4.2 Data collection skills; 4.3 Debugging skills; 4.4 Problem-solving skills; 4.5 Teamwork skills; 4.6 Data security consciousness.
DESCRIPTION OF THE END PRODUCT / SERVICE	Internet application data is collected based on data collection principles and rules.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Data collection laws and regulations; 2. Information security and confidentiality.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DATA COLLECTION	DUTY NO.	404
TASK TITLE	SIMPLE CLEANING OF AI BUSINESS DATA	TASK NO.	4042
PERFORMANCE CRITERIA	The person performing this task must be able to collect original data of AI business 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. Computers; 2. Windows; 3. Data collection tools.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select and install data cleaning tools; 2. Develop rules for data cleaning; 3. Implement data cleaning with a cleaning tool based on the cleaning rules; 4. Monitor the implementation of data cleaning; 5. Select and install visualization tools; 6. Simply visualize the cleaned data with tools.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Select and install data cleaning tools; 1.2 Develop rules and procedures for data cleaning; 1.3 Perform and monitor data cleaning according to the types of data cleaning; 1.4 Visualize the cleaned data simply with proper tools. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Principles of data legality; 2.2 Principles of data security; 2.3 Principles of data cleaning; 2.4 Principles of visualization. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Importance of data cleaning; 3.2 Main types of data cleaning; 3.3 Basic flow of data cleaning; 3.4 Commonly-used methods of data cleaning; 3.5 Data storage specifications;	

	3.6 Data structure types; 3.7 Data integrity; 3.8 Data uniqueness. 4.0 Essential Skills 4.1 Communication skills; 4.2 Data cleaning skills; 4.3 Debugging skills; 4.4 Problem-solving skills; 4.5 Data security consciousness.
DESCRIPTION OF THE END PRODUCT / SERVICE	The collected data is cleaned in accordance with the data cleaning requirements and rules.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DATA ANNOTATION	DUTY NO.	405
TASK TITLE	AI BUSINESS DATA ANNOTATION	TASK NO.	4051
PERFORMANCE CRITERIA	The person performing this task must be able to annotate label AI business data correctly in accordance with business requirements and text, speech, and image labeling specifications.		
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. Computers; 2. Data annotation software (platforms).		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Organize data files that need to be annotated; 2. Label images or video files with frame labels, region labels, stroke labels, or other labels, and so on; 3. Compose voice files as required and correctly label where appropriate; 4. Annotate NLP text or OCR text according to different corpus; 5. Record, sort out and file the problems in the annotation process.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Use software annotation tools to annotate data; 1.2 Use office software to track the progress of annotation; 1.3 Use office software to provide feedback on annotation quality. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Working principles of data annotation; 2.2 Data annotation rules and processes; 2.3 Principles of information protection. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Data encoding method; 3.2 Data binary encoded file parsing; 3.3 Business context of data annotation; 3.4 Types of data annotation; 3.5 Format analysis of result files for data annotation; 3.6 Characteristics and attributes of data annotation objects; 3.7 Characteristics of the data annotation object;	

	3.8 Quality indicators for data annotation. 4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Basic computer skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Data in text, voice, image or video is annotated in accordance with business requirements.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational quality of data annotation; 2. Industry contextual needs for data annotation.

OCCUPATION	ARTIFICIAL INTELLIGENCE TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DATA ANNOTATION	DUTY NO.	405
TASK TITLE	SIMPLE CATEGORICAL STATISTICS FOR ANNOTATED DATA	TASK NO.	4052
PERFORMANCE CRITERIA	The person performing this task must be able to categorize the annotated data for text, speech, and images in accordance with the technical requirements for data classification statistics.		
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. Computers; 2. Statistical software (platform) for data disaggregation.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Understand data annotation documentation; 2. Perform a simple statistical analysis of annotated tag categories; 3. Perform simple graphical analysis and visualization of data annotation results; 4. Organize the data annotation results to develop a statistical analysis report.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Categorize data with different characteristics; 1.2 Analyze all types of data statistically. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Data statistical analysis process; 2.2 Purpose of statistical analysis of data; 2.3 Information protection. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Business context of data annotation; 3.2 Types of data annotation; 3.3 Data descriptive statistics; 3.4 Data clustering analysis statistics; 3.5 Data regression analysis statistics; 3.6 Data analysis analysis statistics; 3.7 Visualization of statistical analysis of data; 3.8 Data classification characteristics.	

	4.0 Essential Skills 4.1 Communication skills; 4.2 Customer service skills; 4.3 Teamwork skills; 4.4 Report writing skills; 4.5 Basic computer skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The annotation results are categorized for simple statistical analysis in accordance with business requirements to complete text, speech, image or video data annotation.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1.

TABLE 1: DACUM CHARTS FOR ARTIFICIAL INTELLIGENCE TECHNICIAN - NTA 4

DUTIES	TASKS	ENABLERS
1.0 Handling of information and faults	1.1 Processing of Excel data.	General skills and knowledge • Knowledge of office software • Computer network knowledge • LAN set-up skills • Knowledge of computer components • Computer inspection and maintenance skills • Simple application development knowledge • Problem analysis skills • Problem-solving skills • Document reading skills • Communication skills Tools and equipment • Computers • Office software (Word/Excel/PPT) • Programming software (Python and VSCode) • Network devices (router, modem, switch) • Necessary external devices (e.g. removable hard disk, U disk, etc.). Materials • Transmission medium (double glue wire and optical fiber) Requirements for employees • Patience in solving problems • Sense of responsibility for work • Data security consciousness • Logical methods of working
	1.2 Troubleshooting of common computer faults.	
	1.3 Formation of small local area networks.	
	1.4 Development of simple applications.	
2.0 Installation of operating systems	2.1 Maintenance of common operating systems.	General skills and knowledge • Knowledge of Windows Operating System • Knowledge of the Linux operating system • Maintenance of common operating system skills
	2.2 Installation of linux and other operating systems.	

DUTIES	TASKS	ENABLERS
		• Installation skills for common operating systems • Problem analysis skills • Problem-solving skills • Document reading skills • Communication skills Tools and equipment • Computers • Operating system software (Windows/linux) Requirements for employees • Patience • Sense of responsibility • Confidentiality consciousness
3.0 Database management	3.1 Database creation.	General skills and knowledge • Database knowledge • Skills for creating, managing and maintaining databases • Programming skills • Problem analysis skills • Problem-solving skills • Communication skills Tools and equipment • Computers • Database software (Mysql) Materials • Data Requirements for employees • Patience • Sense of responsibility • Confidentiality consciousness
	3.2 Database management and maintenance.	
4.0 Data collection	4.1 Original data collection for AI business.	General skills and knowledge • Computer network knowledge • Operating system knowledge • Knowledge and skills in the usage of data collection tools
	4.2 Simple cleaning of AI business data.	

DUTIES	TASKS	ENABLERS
		• Knowledge and skills of data cleaning • Programming skills • Problem analysis skills • Problem-solving skills • Document reading skills • Communication skills Tools and equipment • Computers • Data collection software Materials • AI business data Requirements for employees • Patience • Sense of responsibility • Safety consciousness
5.0 Data annotation	5.1 AI business data annotation.	General skills and knowledge • Computer network knowledge • Operating system knowledge • Knowledge and skills of data annotation tools • Data classification and statistics skills • Skills for simple visualization of data • Problem analysis skills • Problem-solving skills • Communication skills Tools and equipment • Computers • Data annotation software Materials • Data sets Requirements for employees • Patience • Sense of responsibility • Safety consciousness
	5.2 Simple categorical statistics for annotated data.	

