# COMPETENCY STANDARDS

## MACHINE LEARNING MODEL VALIDATION AND TESTING LEVEL III



# INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR

**TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY**
East Service Road, South Luzon Expressway (SLEX), Taguig City, Metro Manila

Technical Education and Skills Development Act of 1994
(Republic Act No. 7796)

**Section 22, "Establishment and Administration of the National Trade Skills Standards" of the RA 7796 known as the TESDA Act mandates TESDA to establish national occupational skills standards. The Authority shall develop and implement a certification and accreditation program in which private industry group and trade associations are accredited to conduct approved trade tests, and the local government units to promote such trade testing activities in their respective areas in accordance with the guidelines to be set by the Authority.**

The Competency Standards (CS) serve as basis for the:

1 Registration and delivery of training programs;
2 Development of curriculum and assessment instruments; and

Each CS has two sections:

Section 1 **Definition of Qualification** describes the qualification and defines the competencies that comprise the qualification.

Section 2 **Competency Standards** gives the specifications of competencies required for effective work performance.

# TABLE OF CONTENTS

**INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR**

**MACHINE LEARNING MODEL VALIDATION AND TESTING LEVEL III**

Page No.

<div align="center">

**COMPETENCY STANDARDS FOR**

**MACHINE LEARNING MODEL VALIDATION
AND TESTING LEVEL III**

</div>

**SECTION 1: DEFINITION OF QUALIFICATION**

The **MACHINE LEARNING MODEL VALIDATION AND TESTING LEVEL III** qualification consists of competencies that a person must achieve to rigorously validate and test Data Science (DS) and AI models for accuracy, performance, and reliability, ensuring compliance with industry standards and operational readiness.

The Units of Competency comprising this Qualification include the following:

| UNIT CODE | BASIC COMPETENCIES |
|---|---|
| 400311319 | Lead workplace communication |
| 400311320 | Lead small teams |
| 400311321 | Apply critical thinking and problem-solving techniques in the workplace |
| 400311322 | Work in a diverse environment |
| 400311323 | Propose methods of applying learning and innovation in the organization |
| 400311324 | Use information systematically |
| 400311325 | Evaluate occupational safety and health work practices |
| 400311326 | Evaluate environmental work practices |
| 400311327 | Facilitate entrepreneurial skills for micro-small-medium enterprises (MSMEs) |

| UNIT CODE | COMMON COMPETENCIES |
|---|---|
| ICT315202 | Apply quality standards |
| ICT311203 | Perform computer operations |
| CS-ICT251122 | Ensure compliance with data privacy and ethics |

| UNIT CODE | CORE COMPETENCIES |
|---|---|
| CS-ICT251103 | Identify machine learning model validation principles |
| CS-ICT251104 | Apply machine learning model validation techniques |
| CS-ICT251105 | Conduct machine learning model testing |
| CS-ICT251106 | Document machine learning model validation results |

A person who has achieved this Qualification is competent to be:
- Junior AI Model Tester
- Validator AI Model Tester
- Machine Learning Model Validator
- AI Model Quality Analyst
- Predictive Model Tester
- Junior AI/ML Researcher

## SECTION 2:     COMPETENCY STANDARDS

This section gives the details of the contents of the units of competency required in **MACHINE LEARNING MODEL VALIDATION AND TESTING LEVEL III**

## BASIC COMPETENCIES

**UNIT OF COMPETENCY :  LEAD WORKPLACE COMMUNICATION**

**UNIT CODE             :  400311319**

**UNIT DESCRIPTOR      :**  This unit covers the knowledge, skills and attitudes    required to lead in the dissemination and discussion of ideas, information and issues in the workplace.

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1.  Communicate information about workplace processes | 1.1. Relevant ***communication method*** is selected based on workplace procedures<br>1.2. Multiple operations involving several topics/areas are communicated following enterprise requirements<br>1.3. Questioning is applied  to gain extra information<br>1.4. Relevant sources of information are identified in accordance with workplace/ client requirements<br>1.5. Information is selected and organized following enterprise procedures<br>1.6. Verbal and written reporting is | 1.1  Organization requirements for written and electronic communication methods<br>1.2  Effective verbal communication methods<br>1.3  Business writing<br>1.4  Workplace etiquette | 1.1  Organizing information<br>1.2  Conveying intended meaning<br>1.3  Participating in a variety of workplace discussions<br>1.4  Complying with organization requirements for the use of written and electronic communication methods<br>1.5  Effective business writing<br>1.6  Effective clarifying and probing skills<br>1.7  Effective questioning techniques (clarifying and probing) |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | undertaken when required<br>1.7. Communication and negotiation skills are applied and maintained in all relevant situations | | |
| 2. Lead workplace discussions | 2.1. Response to workplace issues are sought following enterprise procedures<br>2.2. Response to workplace issues are provided immediately<br>2.3. Constructive contributions are made to ***workplace discussions*** on such issues as production, quality and safety<br>2.4. Goals/objectives and action plans undertaken in the workplace are communicated promptly | 2.1 Organization requirements for written and electronic communication methods<br>2.2 Effective verbal communication methods<br>2.3 Workplace etiquette | 2.1 Organizing information<br>2.2 Conveying intended meaning<br>2.3 Participating in variety of workplace discussions<br>2.4 Complying with organization requirements for the use of written and electronic communication methods<br>2.5 Effective clarifying and probing skills |
| 3. Identify and communicate issues arising in the workplace | 3.1. Issues and problems are identified as they arise<br>3.2. Information regarding problems and issues are organized coherently to ensure clear and effective communication | 3.1. Organization requirements for written and electronic communication methods<br>3.2. Effective verbal communication methods<br>3.3. Workplace etiquette | 3.1. Organizing information<br>3.2. Conveying intended meaning<br>3.3. Participating in a variety of workplace discussions<br>3.4. Complying with organization requirements for the use of |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | 3.3. Dialogue is initiated with appropriate personnel<br>3.4. Communication problems and issues are raised as they arise<br>3.5. Identify barriers in communication to be addressed appropriately | 3.4. Communication problems and issues<br>3.5. Barriers in communication | written and electronic communication methods<br>3.5. Effective clarifying and probing skills<br>3.6. Identifying issues<br>3.7. Negotiation and communication skills |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Methods of communication | May include but not limited to:<br>1.1. Non-verbal gestures<br>1.2. Verbal<br>1.3. Face-to-face<br>1.4. Two-way radio<br>1.5. Speaking to groups<br>1.6. Using telephone<br>1.7. Written<br>1.8. Internet |
| 2. Workplace discussions | May include but not limited to:<br>2.1. Coordination meetings<br>2.2. Toolbox discussion<br>2.3. Peer-to-peer discussion |

## EVIDENCE GUIDE

| 1. Critical aspects of Competency | Assessment requires evidence that the candidate:<br>1.1. Dealt with a range of communication/information at one time<br>1.2. Demonstrated leadership skills in workplace communication<br>1.3. Made constructive contributions in workplace issues<br>1.4. Sought workplace issues effectively<br>1.5. Responded to workplace issues promptly<br>1.6. Presented information clearly and effectively written form<br>1.7. Used appropriate sources of information<br>1.8. Asked appropriate questions<br>1.9. Provided accurate information |
|---|---|
| 2. Resource Implications | **The following resources should be provided:**<br>2.1. Variety of Information<br>2.2. Communication tools<br>2.3. Simulated workplace |
| 3. Methods of Assessment | Competency in this unit must be assessed through<br>3.1. Case problem<br>3.2. Third-party report<br>3.3. Portfolio<br>3.4. Interview<br>3.5. Demonstration/Role-playing |
| 4. Context for Assessment | 4.1. Competency may be assessed in the workplace or in simulated workplace environment |

**UNIT OF COMPETENCY**   **:**   **LEAD SMALL TEAMS**

**UNIT CODE**                 **:**   **400311320**

**UNIT DESCRIPTOR**       **:**   This unit covers the knowledge, skills and attitudes to lead small teams including setting, maintaining and monitoring team and individual performance standards.

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Provide team leadership | 1.1. **Work requirements** are identified and presented to team members based on company policies and procedures <br> 1.2. Reasons for instructions and requirements are communicated to team members based on company policies and procedures <br> 1.3. **Team members' queries and concerns** are recognized, discussed and dealt with based on company practices | 1.1. Facilitation of Team work <br> 1.2. Company policies and procedures relating to work performance <br> 1.3. Performance standards and expectations <br> 1.4. Monitoring individual's and team's performance vis a vis client's and group's expectations | 1. Communication skills required for leading teams <br> 2. Group facilitation skills <br> 3. Negotiating skills <br> 4. Setting performance expectation |
| 2. Assign responsibilities | 2.1. Responsibilities are allocated having regard to the skills, knowledge and aptitude required to undertake the assigned task based on company policies. <br> 2.2. Duties are allocated having regard to individual | 2.1 Work plan and procedures <br> 2.2 Work requirements and targets <br> 2.3 Individual and group expectations and assignments <br> 2.4 Ways to improve group leadership and membership | 2.1 Communication skills <br> 2.2 Management skills <br> 2.3 Negotiating skills <br> 2.4 Evaluation skills <br> 2.5 Identifying team member's strengths and rooms for improvement |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | preference, domestic and personal considerations, whenever possible | | |
| 3. Set performance expectations for team members | 3.1 Performance expectations are established based on client needs<br>3.2 Performance expectations are based on individual team members knowledge, skills and aptitude<br>3.3 Performance expectations are discussed and disseminated to individual team members | 3.1 One's roles and responsibilities in the team<br>3.2 Feedback giving and receiving<br>3.3 Performance expectation | 3.1 Communication skills<br>3.2 Accurate empathy<br>3.3 Congruence<br>3.4 Unconditional positive regard<br>3.5 Handling of Feedback |
| 4. Supervised team performance | 4.1 Performance is *monitored* based on defined performance criteria and/or assignment instructions<br>4.2 Team members are provided with *feedback*, positive support and advice on strategies to overcome any deficiencies based on company practices<br>4.3 *Performance issues* which cannot be | 4.1 Performance Coaching<br>4.2 Performance management<br>4.3 Performance Issues | 4.1 Communication skills required for leading teams<br>4.2 Coaching skill |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
|  | rectified or addressed within the team are referenced to appropriate personnel according to employer policy<br><br>4.4 Team members are kept informed of any changes in the priority allocated to assignments or tasks which might impact on client/customer needs and satisfaction<br><br>4.5 Team operations are monitored to ensure that employer/client needs and requirements are met<br><br>4.6 Follow-up communication is provided on all issues affecting the team<br><br>4.7 All relevant documentation is completed in accordance with company procedures |  |  |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Work requirements | May include but not limited to:<br>1.1. Client Profile<br>1.2. Assignment instructions |
| 2. Team member's concerns | May include but not limited to:<br>2.1. Roster/shift details |
| 3. Monitor performance | May include but not limited to:<br>3.1. Formal process<br>3.2. Informal process |
| 4. Feedback | May include but not limited to:<br>4.1. Formal process<br>4.2. Informal process |
| 5. Performance issues | May include but not limited to:<br>5.1. Work output<br>5.2. Work quality<br>5.3. Team participation<br>5.4. Compliance with workplace protocols<br>5.5. Safety<br>5.6. Customer service |

**EVIDENCE GUIDE**

| 1. Critical aspects of Competency | **Assessment requires evidence that the candidate:**<br>1.1. Maintained or improved individuals and/or team performance given a variety of possible scenario<br>1.2. Assessed and monitored team and individual performance against set criteria<br>1.3. Represented concerns of a team and individual to next level of management or appropriate specialist and to negotiate on their behalf<br>1.4. Allocated duties and responsibilities, having regard to individual's knowledge, skills and aptitude and the needs of the tasks to be performed<br>1.5. Set and communicated performance expectations for a range of tasks and duties within the team and provided feedback to team members |
|---|---|
| 2. Resource Implications | **The following resources should be provided:**<br>2.1. Access to relevant workplace or appropriately simulated environment where assessment can take place<br>2.2. Materials relevant to the proposed activity or task |
| 3. Methods of Assessment | Competency in this unit may be assessed through:<br>3.1. Written Examination<br>3.2. Oral Questioning<br>3.3. Portfolio |
| 4. Context for Assessment | 4.1. Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center |

**UNIT OF COMPETENCY** : **APPLY CRITICAL THINKING AND PROBLEM-SOLVING TECHNIQUES IN THE WORKPLACE**

**UNIT CODE** : **400311321**

**UNIT DESCRIPTOR** : This unit covers the knowledge, skills and attitudes required to solve problems in the workplace including the application of problem solving techniques and to determine and resolve the root cause/s of specific problems in the workplace.

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Examine specific workplace challenges | 1.1. Variances are examined from normal operating **parameters;** and product quality<br>1.2. Extent, cause and nature of the specific problem are defined through observation, investigation and *analytical techniques*<br>1.3. *Problems* are clearly stated and specified | 1.1. Competence includes a thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations<br>1.2. Competence to include the ability to apply and explain, enough for the identification of fundamental causes of specific workplace challenges<br>1.3. Relevant equipment and operational processes<br>1.4. Enterprise goals, targets and measures<br>1.5. Enterprise quality OHS and environmental requirements | 1.1. Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace<br>1.2. Identifying extent and causes of specific challenges in the workplace |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | | 1.6. Enterprise information systems and data collation<br>1.7. Industry codes and standards | |
| 2. Analyze the causes of specific workplace challenges. | 2.1. Possible causes of specific problems are identified based on experience and the use of problem solving tools / analytical techniques<br>2.2. Possible cause statements are developed based on findings.<br>2.3. Fundamental causes are identified per results of investigation conducted | 2.1 Competence includes a thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations.<br>2.2 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations.<br>2.3 Relevant equipment and operational processes.<br>2.4 Enterprise goals, targets and measures.<br>2.5 Enterprise quality OSH and environmental requirements.<br>2.6 Enterprise information systems and data collation. | 2.1 Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace.<br>2.2 Identifying extent and causes of specific challenges in the workplace.<br>2.3 Providing clear-cut findings on the nature of each identified workplace challenges. |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | | 2.7 Industry codes and standards. | |
| 3. Formulate resolutions to specific workplace challenges | 3.1. All possible options are considered for resolution of the problem<br>3.2. Strengths and weaknesses of possible options are considered.<br>3.3. Corrective actions are determined to resolve the problem and possible future causes<br>3.4. **Action *plans*** are developed identifying measurable objectives, resource needs and timelines in accordance with safety and operating procedures | 3.1. Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations<br>3.2. Relevant equipment and operational processes<br>3.3. Enterprise goals, targets and measures<br>3.4. Enterprise quality OSH and environmental requirement<br>3.5. Principles of decision making strategies and techniques<br>3.6. Enterprise information systems and data collation<br>3.7. Industry codes and standards | 3.1. Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace.<br>3.2. Identifying extent and causes of specific challenges in the workplace.<br>3.3. Providing clear-cut findings on the nature of each identified workplace challenges.<br>3.4. Devising, communicating, implementing and evaluating strategies and techniques in addressing specific workplace challenges. |
| 4. Implement action plans and communicate results | 4.1. Action plans are implemented and evaluated | 4.1 Competence to include the ability to apply and explain, | 4.1 Using range of analytical techniques (e.g., planning, |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | 4.2. Results of plan implementation and recommendations are prepared<br>4.3. Recommendations are presented to appropriate personnel<br>4.4. Recommendations are followed-up, if required | sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations<br>4.2 Relevant equipment and operational processes<br>4.3 Enterprise goals, targets and measures<br>4.4 Enterprise quality, OSH and environmental requirement<br>4.5 Principles of decision making strategies and techniques<br>4.6 Enterprise information systems and data collation<br>4.7 Industry codes and standards | attention, simultaneous and successive processing of information) in examining specific challenges in the workplace.<br>4.2 Identifying extent and causes of specific challenges in the workplace.<br>4.3 Providing clear-cut findings on the nature of each identified workplace challenges.<br>4.4 Devising, communicating, implementing and evaluating strategies and techniques in addressing specific workplace challenges. |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Parameters | May include but not limited to:<br><br>1.1 Processes<br>1.2 Procedures<br>1.3 Systems |
| 2. Analytical techniques | May include but not limited to:<br><br>2.1. Brainstorming<br>2.2. Intuitions/Logic<br>2.3. Cause and effect diagrams<br>2.4. Pareto analysis<br>2.5. SWOT analysis<br>2.6. Gantt chart, Pert CPM and graphs<br>2.7. Scattergrams |
| 3. Problem | May include but not limited to:<br><br>3.1. Routine, non – routine and complex workplace and quality problems<br>3.2. Equipment selection, availability and failure<br>3.3. Teamwork and work allocation problem<br>3.4. Safety and emergency situations and incidents<br>3.5. Risk assessment and management |
| 4. Action plans | May include but not limited to:<br><br>4.1. Priority requirements<br>4.2. Measurable objectives<br>4.3. Resource requirements<br>4.4. Timelines<br>4.5. Co-ordination and feedback requirements<br>4.6. Safety requirements<br>4.7. Risk assessment<br>4.8. Environmental requirements |

**EVIDENCE GUIDE**

| 1. Critical aspects of Competency | **Assessment requires evidence that the candidate:**<br>1.1. Examined specific workplace challenges.<br>1.2. Analyzed the causes of specific workplace challenges.<br>1.3. Formulated resolutions to specific workplace challenges.<br>1.4. Implemented action plans and communicated results on specific workplace challenges. |
|---|---|
| 2. Resource Implications | 2.1. Assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability over a range of situations. A bank of scenarios / case studies / what ifs will be required as well as a bank of questions which will be used to probe the reason behind the observable action. |
| 3. Methods of Assessment | **Competency in this unit may be assessed through:**<br>3.1. Observation<br>3.2. Case Formulation<br>3.3. Life Narrative Inquiry<br>3.4. Standardized test<br>The unit will be assessed in a holistic manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations, which will include disruptions to normal, smooth operation. Simulation may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual workplace and will include walk through of the relevant competency components.<br><br>These assessment activities should include a range of problems, including new, unusual and improbable situations that may have happened. |
| 4. Context for Assessment | 4.1. In all workplace, it may be appropriate to assess this unit concurrently with relevant teamwork or operation units. |

**UNIT OF COMPETENCY** **:** **WORK IN A DIVERSE ENVIRONMENT**

**UNIT CODE** **:** **400311322**

**UNIT DESCRIPTOR** **:** This unit covers the outcomes required to work effectively in a workplace characterized by diversity in terms of religions, beliefs, races, ethnicities and other differences.

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Develop an individual's cultural awareness and sensitivity | 1.1. Individual differences with clients, customers and fellow workers are recognized and respected in accordance with enterprise policies and core values. <br> 1.2. Differences are responded to in a sensitive and considerate manner <br> 1.3. ***Diversity*** is accommodated using appropriate verbal and non-verbal communication. | 1.1. Understanding cultural diversity in the workplace <br> 1.2. Norms of behavior for interacting and dialogue with specific groups (e. g., Muslims and other non-Christians, non-Catholics, tribes/ethnic groups, foreigners) <br> 1.3. Different methods of verbal and non-verbal communication in a multicultural setting | 1.1. Applying cross-cultural communication skills (i.e. different business customs, beliefs, communication strategies) <br> 1.2. Showing affective skills – establishing rapport and empathy, understanding, etc. <br> 1.3. Demonstrating openness and flexibility in communication <br> 1.4. Recognizing diverse groups in the workplace and community as defined by divergent culture, religion, traditions and practices |
| 2. Work effectively in an environment that acknowledges and values cultural diversity | 2.1 Knowledge, skills and experiences of others are recognized and documented in | 2.1 Value of diversity in the economy and society in terms of Workforce development | 2.1 Demonstrating cross-cultural communication skills and active listening |

| ELEMENT | PERFORMANCE CRITERIA *Italicized* terms are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | relation to team objectives. 2.2 Fellow workers are encouraged to utilize and share their specific qualities, skills or backgrounds with other team members and clients to enhance work outcomes. 2.3 Relations with customers and clients are maintained to show that diversity is valued by the business. | 2.2 Importance of inclusiveness in a diverse environment 2.3 Shared vision and understanding of and commitment to team, departmental, and organizational goals and objectives 2.4 Strategies for customer service excellence | 2.2 Recognizing diverse groups in the workplace and community as defined by divergent culture, religion, traditions and practices 2.3 Demonstrating collaboration skills 2.4 Exhibiting customer service excellence |
| 3. Identify common issues in a multicultural and diverse environment | 3.1 *Diversity-related conflicts* within the workplace are effectively addressed and resolved. 3.2 Discriminatory behaviors towards customers/stakeholders are minimized and addressed accordingly. 3.3 Change management policies are in place within the organization. | 3.1 Value, and leverage of cultural diversity 3.2 Inclusivity and conflict resolution 3.3 Workplace harassment 3.4 Change management and ways to overcome resistance to change 3.5 Advanced strategies for customer service excellence | 3.1 Addressing diversity-related conflicts in the workplace 3.2 Eliminating discriminatory behavior towards customers and co-workers 3.3 Utilizing change management policies in the workplace |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Diversity | This refers to diversity in both the workplace and the community and may include divergence in :<br>1.1 Religion<br>1.2 Ethnicity, race or nationality<br>1.3 Culture<br>1.4 Gender, age or personality<br>1.5 Educational background |
| 2. Diversity-related conflicts | May include conflicts that result from:<br>2.1 Discriminatory behaviors<br>2.2 Differences of cultural practices<br>2.3 Differences of belief and value systems<br>2.4 Gender-based violence<br>2.5 Workplace bullying<br>2.6 Corporate jealousy<br>2.7 Language barriers<br>2.8 Individuals being differently-abled persons<br>2.9 Ageism (negative attitude and behavior towards old people) |

# COMMON COMPETENCIES

**UNIT TITLE** : **APPLY QUALITY STANDARDS**

**UNIT CODE** : **ICT315202**

**UNIT DESCRIPTOR** : This unit covers the knowledge, skills, attitudes and values needed to apply quality standards in the workplace. The unit also includes the application of relevant safety procedures and regulations, organization procedures and customer requirements.

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Assess quality of received materials | 1.1. Work instruction is obtained and work is carried out in accordance with standard operating procedures.<br>1.2. Received **materials** are checked against workplace standards and specifications.<br>1.3. Faulty materials related to work are identified and isolated.<br>1.4. **Faults** and any identified causes are recorded and/or reported to the supervisor concerned in accordance with workplace procedures.<br>1.5. Faulty materials are replaced in accordance with workplace procedures. | 1.1. Relevant production processes, materials and products<br>1.2. Characteristics of materials, software and hardware used in production processes<br>1.3. Quality checking procedures<br>1.4. Quality Workplace procedures<br>1.5. Identification of faulty materials related to work | 1.1. Reading skills required to interpret work instruction<br>1.2. Critical thinking<br>1.3. Interpreting work instructions |
| 2. Assess own work | 2.1 **Documentation** relative to quality | 2.1. Safety and environmental | 2.1. Carry out work in accordance |

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | within the company is identified and used.<br>2.2 Completed work is checked against workplace standards relevant to the task undertaken.<br>2.3 **Errors** are identified and isolated.<br>2.4 Information on the quality and other indicators of production performance are recorded in accordance with workplace procedures.<br>2.5 In cases of deviations from specific **quality standards**, causes are documented and reported in accordance with the workplace's standards operating procedures. | aspects of production processes<br>2.2. Fault identification and reporting<br>2.3. Workplace procedure in documenting completed work<br>2.4. Workplace Quality Indicators | with OHS policies and procedures |
| 3. Engage in quality improvement | 3.1 Process improvement procedures are participated in relative to workplace assignment.<br>3.2 Work is carried out in accordance with process | 3.1. Quality improvement processes<br>3.2. Company customers defined | 3.1. Solution providing and decision-making<br>3.2. Practice company process improvement procedure |

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
|  | improvement procedures.<br>3.3 Performance of operation or quality of product of service to ensure *customer* satisfaction is monitored. |  |  |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1  Materials | 1.1  Materials may include but not limited to:<br>    1.1.1.  Manuals<br>    1.1.2.  Job orders<br>    1.1.3.  Instructional videos |
| 2  Faults | 2.1  Faults may include but not limited to:<br>    2.1.1.  Materials not to specification<br>    2.1.2.  Materials contain incorrect/outdated information<br>    2.1.3.  Hardware defects<br>    2.1.4.  Materials that do not conform with any regulatory agencies |
| 3  Documentation | 3.1  Organization work procedures<br>3.2  Manufacturer's instruction manual<br>3.3  Customer requirements<br>3.4  Forms |
| 4  Errors | 4.1  Errors may be related but not limited to the following:<br>    4.1.1.  Deviation from the requirements of the Client<br>    4.1.2.  Deviation from the requirement of the organization |
| 5  Quality standards | 5.1  Quality standards may be related but not limited to the following:<br>    5.1.1.  Materials<br>    5.1.2.  Hardware<br>    5.1.3.  Final product<br>    5.1.4.  Production processes<br>    5.1.5.  Customer service |
| 6  Customer | 6.1  Co-worker<br>6.2  Supplier/Vendor<br>6.3  Client<br>6.4  Organization receiving the product or service |

**EVIDENCE GUIDE**

| 1 | Critical aspect of competency | **Assessment requires evidence that candidate:** |
|---|---|---|
| | | 1.1 Carried out work in accordance with the company's standard operating procedures |
| | | 1.2 Performed task according to specifications |
| | | 1.3 Reported defects detected in accordance with standard operating procedures |
| | | 1.4 Carried out work in accordance with the process improvement procedures |
| 2 | Method of assessment | **The assessor may select two (2) of the following assessment methods to objectively assess the candidate:** |
| | | 2.1 Observation |
| | | 2.2 Questioning |
| | | 2.3 Practical demonstration |
| 3 | Resource implication | 3.1 Materials, software and hardware to be used in a real or simulated situation |
| 4 | Context of Assessment | 4.1 Assessment may be conducted in the workplace or in a simulated environment |

| UNIT TITLE | : | **PERFORM COMPUTER OPERATIONS** |
| UNIT CODE | : | **ICT311203** |
| UNIT DESCRIPTOR | : | This unit covers the knowledge, skills, (and) attitudes and values needed to perform computer operations which include inputting, accessing, producing and transferring data using the appropriate hardware and software |

| ELEMENT | PERFORMANCE CRITERIA<br>*Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Plan and prepare for task to be undertaken | 1.1. Requirements of task are determined<br>1.2. Appropriate *hardware* and *software* are selected according to task assigned and required outcome<br>1.3. Task is planned to ensure *OH&S guidelines* and procedures are followed | 1.1. Main types of computers and basic features of different operating systems<br>1.2. Main parts of a computer<br>1.3. Information on hardware and software<br>1.4. Data security guidelines | 1.1. Reading and comprehension skills required to interpret work instruction and to interpret basic user manuals.<br>1.2. Communication skills to identify lines of communication, request advice, follow instructions and receive feedback.<br>1.3. Interpreting user manuals and security guidelines |
| 2. Input data into computer | 2.1. Data are entered into the computer using appropriate program/application in accordance with company procedures<br>2.2. Accuracy of information is checked and information is saved in accordance with standard operating procedures | 2.1. Basic ergonomics of keyboard and computer user<br>2.2. Storage devices and basic categories of memory<br>2.3. Relevant types of software | 2.1. Technology skills to use equipment safely including keyboard skills.<br>2.2. Entering data |

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | 2.3. Inputted data are stored in **storage media** according to requirements<br>2.4. Work is performed within **ergonomic guidelines** | | |
| 3. Access information using computer | 3.1. Correct program/application is selected based on job requirements<br>3.2. Program/application containing the information required is accessed according to company procedures<br>3.3. **Desktop icons** are correctly selected, opened and closed for navigation purposes<br>3.4. Keyboard techniques are carried out in line with OH&S requirements for safe use of keyboards | 3.1. General security, privacy legislation and copyright<br>3.2. Productivity Application<br>3.3. Business Application | 3.1. Accessing information<br>3.2. Searching and browsing files and data |
| 4. Produce/ output data using computer system | 4.1. Entered data are processed using appropriate software commands<br>4.2. Data printed out as required using computer hardware/peripheral devices in accordance with standard | 4.1. Computer application in printing, scanning and sending facsimile<br>4.2. Types and function of computer peripheral devices | 4.1. Computer data processing<br>4.2. Printing of data<br>4.3. Transferring files and data |

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | operating procedures 4.3. Files, data are transferred between compatible systems using computer software, hardware/ peripheral devices in accordance with standard operating procedures | | |
| 5. Maintain computer equipment and systems | 5.1. Systems for cleaning, minor *maintenance* and replacement of consumables are implemented 5.2. Procedures for ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures 5.3. Basic file maintenance procedures are implemented in line with the standard operating procedures | 5.1 Computer equipment/syste m basic maintenance procedures 5.2 Viruses 5.3 OH&S principles and responsibilities 5.4 Calculating computer capacity 5.5 System Software 5.6 Basic file maintenance procedures | 5.1 Removing computer viruses from infected machines 5.2 Making backup files |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Hardware and peripheral devices | 1.1. Personal computers<br>1.2. Networked systems<br>1.3. Communication equipment<br>1.4. Printers<br>1.5. Scanners<br>1.6. Keyboard<br>1.7. Mouse |
| 2. Software | Software includes the following but not limited to:<br>2.1. Word processing packages<br>2.2. Data base packages<br>2.3. Internet<br>2.4. Spreadsheets |
| 3. OH & S guidelines | 3.1. OHS guidelines<br>3.2. Enterprise procedures |
| 4. Storage media | Storage media include the following but not limited to:<br>4.1. diskettes<br>4.2. CDs<br>4.3. zip disks<br>4.4. hard disk drives, local and remote |
| 5. Ergonomic guidelines | 5.1. Types of equipment used<br>5.2. Appropriate furniture<br>5.3. Seating posture<br>5.4. Lifting posture<br>5.5. Visual display unit screen brightness |
| 6. Desktop icons | Icons include the following but not limited to:<br>6.1. directories/folders<br>6.2. files<br>6.3. network devices<br>6.4. recycle bin |
| 7. Maintenance | 7.1. Creating more space in the hard disk<br>7.2. Reviewing programs<br>7.3. Deleting unwanted files<br>7.4. Backing up files<br>7.5. Checking hard drive for errors<br>7.6. Using up to date security solution programs<br>7.7. Cleaning dust from internal and external surfaces |

**EVIDENCE GUIDE**

| 1. Critical aspect of competency | **Assessment requires evidence that the candidate:**<br>1.1. Selected and used hardware components correctly and according to the task requirement<br>1.2. Identified and explain the functions of both hardware and software used, their general features and capabilities<br>1.3. Produced accurate and complete data in accordance with the requirements<br>1.4. Used appropriate devices and procedures to transfer files/data accurately<br>1.5. Maintained computer system |
|---|---|
| 2. Method of assessment | **2.1. The assessor may select two of the following assessment methods to objectively assess the candidate:**<br>    2.1.1. Observation<br>    2.1.2. Questioning<br>    2.1.3. Practical demonstration |
| 3. Resource implication | 3.1. Computer hardware   with peripherals<br>3.2. Appropriate software |
| 4. Context of Assessment | 4.1. Assessment may be conducted in the workplace or in a simulated work environment |

**UNIT OF COMPETENCY: ENSURE COMPLIANCE WITH DATA PRIVACY AND ETHICS**

**UNIT CODE:** CS-ICT252101

**UNIT DESCRIPTOR:** This unit covers the outcomes required to ensure data privacy, ethical handling, and the integrity of data throughout its lifecycle. It includes maintaining compliance with data privacy regulations, applying ethical guidelines, and implementing practices to safeguard data accuracy and reliability across various projects.

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Comply with data privacy regulations | 1.1. ***Data privacy regulations*** relevant to data handling are identified and followed based on industry standards<br>1.2. Data handling practices are ensured with Data privacy regulations<br>1.3. Secure storage practices are implemented to protect personal data based on industry standards | 1.1. RA 10173 (Data Privacy Act of 2012).<br>1.2. Secure data storage protocols, including encryption and access control<br>1.3 Data Privacy Regulations | 1.1. Identifying applicable data privacy regulations during annotation and labeling.<br>1.2. Following secure data handling procedures<br>1.3. Storing personal data in compliance with privacy laws |
| 2. Apply ethical standards in data handling | 2.1. ***Ethical guidelines*** are applied to avoid bias and promote fairness in data handling processes<br>2.2. Transparency in data usage is ensured through proper documentation of ***data handling practices***.<br>2.3. Consent for data usage is obtained and documented following ***ethical standards*** | 2.1. Knowledge of AI ethics principles, such as fairness, transparency, and accountability<br>2.2. RA 10175 (Cybercrime Prevention Act of 2012)<br>2.3. Importance of preventing bias in datasets and ensuring transparent practices | 2.1. Applying ethical standards during annotation and labeling to avoid bias<br>2.2. Documenting data handling and usage practices<br>2.3. Obtaining and recording user consent for data usage |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Data privacy regulations | May include but not limited to:<br>1.1. RA 10173 (Data Privacy Act of 2012)<br>1.2. Organizational policies on data privacy |
| 2. Ethical guidelines | May include but not limited to:<br>2.1. Guidelines to prevent bias in data annotation<br>2.2. Ethical AI principles<br>2.3. Transparency and accountability standards |
| 3. Data handling practices | May include but not limited to:<br>3.1. Secure data transmission<br>3.2. Data anonymization<br>3.3. Data encryption |
| 4. Ethical standards | May include but not limited to:<br>4.1. Fairness<br>4.2. Avoiding bias<br>4.3. Transparency<br>4.4. Accountability |

**EVIDENCE GUIDE**

| 1. Critical aspects of competency | **Assessment requires evidence that the candidate:**<br>1.1 Complied with data privacy regulations<br>1.2 Applied ethical standards in data handling |
|---|---|
| 2. Method of assessment | **The assessor may select from the following assessment methods but not limited to:**<br>2.1 Observation<br>2.2 Questioning<br>2.3 Practical demonstration |
| 3. Resource implication | 3.1 Access to relevant privacy regulations and ethical guidelines.<br>3.2 Documentation tools for compliance and tracking consent.<br>3.3 AI datasets requiring secure handling and compliance with privacy laws |
| 4. Context of Assessment | 4.1 Assessment may be conducted in a workplace or simulated environment. |

# CORE COMPETENCIES

| UNIT OF COMPETENCY | : | IDENTIFY MACHINE LEARNING MODEL VALIDATION PRINCIPLES |
|---|---|---|
| UNIT CODE | : | CS- ICT251103 |
| UNIT DESCRIPTOR | : | This unit covers the outcomes required to recognize and categorize key principles and frameworks in AI and/or machine learning model validation, focusing on ensuring accuracy, fairness, and reliability in AI or non-AI projects. |

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | Required Knowledge | Required Skills |
|---|---|---|---|
| 1. Identify key model validation frameworks | 1.1. ***Model validation Frameworks*** are identified, focusing on accuracy, fairness, and reliability<br>1.2. ***Model Validation principles*** are reviewed based on industry standards<br>1.3. Industry-standard metrics used for model validation are identified and documented | 1.1. Familiarity with validation frameworks<br>1.2. Knowledge of bias detection and fairness principles<br>1.3. Understanding of overfitting, underfitting, and model generalization | 1.1. Identifying relevant frameworks and principles based on AI model requirements<br>1.2. Categorizing model validation metrics according to model type and data usage<br>1.3. Documenting key validation principles and metrics<br>1.4. Applying appropriate model validation techniques |
| 2. Identify key metrics for evaluating model performance | 2.1. Supervised and unsupervised validation approaches are | 2.1. Key metrics used for assessing model performance<br>2.2. Familiarity with | 2.1. Differentiating between validation approaches |

| ELEMENT | PERFORMANCE CRITERIA<br>*Italicized terms* are elaborated in the Range of Variables | Required Knowledge | Required Skills |
|---|---|---|---|
| | distinguished based on the ***type of AI model***<br>2.2. ***Specific performance metrics*** are categorized by use case<br>2.3. ***Factors affecting model performance*** are identified based on job requirements | concepts affecting model performance | based on the AI model type<br>2.2. Categorizing performance metrics according to model validation needs<br>2.3. Understanding the purpose of data partitioning<br>2.4. Familiarity with data partitioning techniques |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Model validation frameworks | May include but not limited to:<br>1.1. Cross-validation (e.g. k-fold, stratified k-fold repeated k-fold, leave-one-out (LOOCV))<br>1.2. Hold-out validation |
| 2. Data partitioning | May include but not limited to:<br>2.1. Training sets<br>2.2. Validation sets<br>2.3. Test sets |
| 3. Validation metrics | May include but not limited to:<br>3.1. Accuracy<br>3.2. Precision<br>3.3. Recall<br>3.4. F1 score |
| 4. Model validation principles | May include but not limited to:<br>4.1. Bias mitigation<br>4.2. Overfitting detection<br>4.3. Generalization techniques |
| 5. Types of AI model | May include but not limited to:<br>5.1. Supervised models<br>5.2. Unsupervised models<br>5.3. Reinforcement learning models |
| 6. Validation Principles | May include but not limited to:<br>6.1. Bias Mitigation<br>6.2. Overfitting detection |
| 7. Performance Metrics | May include but not limited to:<br>7.1. accuracy<br>7.2. precision<br>7.3. recall |
| 8. Factors affecting model performance | May include but not limited to:<br>8.1. Data Issues<br>8.2. Feature Engineering<br>8.3. Model Issues<br>8.4. Hyperparameter Selection<br>8.5. Training Problems<br>8.6. Evaluation Challenges |

**EVIDENCE GUIDE**

| 1. Critical aspects of competency | **Assessment requires evidence that the candidate:**<br>1.1. Correctly identify model validation principles and frameworks.<br>1.2. Distinguish between different validation approaches for supervised and unsupervised models.<br>1.3. Document and categorize relevant metrics for model performance. |
|---|---|
| 2. Method of assessment | **The assessor may select from the following assessment methods:**<br>2.1. Observation<br>2.2. Practical demonstration<br>2.3. Interviews or questioning<br>2.4. Review of documentation or reports prepared by the candidate<br>2.5. Written or oral examinations |
| 3. Resource implication | **Resources should include:**<br>3.1. Access to model validation tools and metrics.<br>3.2. AI models and datasets for validation tasks.<br>3.3. Guidelines and frameworks for validation practices. |
| 4. Context of Assessment | 4.1. Assessment may occur in a simulated environment or workplace.<br>4.2. Tasks should reflect real-world validation scenarios and metrics. |

**UNIT OF COMPETENCY** **:** **APPLY MACHINE LEARNING MODEL VALIDATION TECHNIQUES**

**UNIT CODE** **:** **CS-ICT251104**

**UNIT DESCRIPTOR** **:** This unit covers the outcomes required to apply various validation techniques to AI models. It includes practical knowledge on how to implement cross-validation, hold-out validation, and other advanced validation methods. Learners will also gain an understanding of selecting appropriate techniques based on model complexity and data characteristics.

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Select appropriate validation techniques based on model complexity | 1.1. ***Model validation techniques*** are selected based on the ***model complexity*** and data characteristics <br> 1.2. ***Advanced validation methods*** are applied to models that require more robust testing <br> 1.3. Validation results are interpreted and used to guide model adjustments and hyperparameter tuning | 1.1. Understanding of how model complexity and data size affect validation technique selection <br> 1.2. Familiarity with advanced validation methods like bootstrap validation and when to use them <br> 1.3. Knowledge of interpreting validation results to make informed decisions about model adjustments | 1.1. Choosing suitable validation techniques based on model complexity and data properties <br> 1.2. Applying advanced validation techniques such as bootstrap validation for robust model evaluation <br> 1.3. Using validation outcomes to guide model tuning and further improvements |
| 2. Implement model | 2.1. Appropriate | 2.1. Understandin | 2.1. Applying |

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| validation techniques | ***model validation techniques*** are applied to assess model performance across subsets of data<br>2.2. Data is partitioned and processed to avoid leakage and ensure a balanced evaluation of model performance<br>2.3. Validation results are documented and analyzed to improve model performance and generalization | g the purpose of validation techniques to evaluate model performance and generalization to unseen data<br>2.2. Knowledge of different validation methods and their applications<br>2.3. Knowledge of ***data partitioning*** techniques to ensure balanced validation and prevent data leakage<br>2.4. Familiarity with analyzing validation results to improve model performance and generalization | validation techniques to assess model performance and ensure robustness<br>2.2. Partitioning data correctly for training, validation, and testing while avoiding leakage<br>2.3. Documenting and analyzing validation outcomes to identify areas for optimization and generalization |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1 Model validation techniques | May include but not limited to:<br>1.1. Cross-validation (e.g. k-fold, stratified k-fold repeated k-fold, leave-one-out (LOOCV))<br>1.2. Hold-out validation (e.g. Simple hold-out, Train-validation-test split, Data leakage prevention) |
| 2 Data partitioning | May include but not limited to:<br>2.1.Training set<br>2.2. Validation set<br>2.3. Test set |
| 3 Model complexity | May include but not limited to:<br>3.1. Large datasets<br>3.2. Complex model architectures<br>3.3. High-dimensional data |
| 4 Advanced validation methods | May include but not limited to:<br>4.1. Bootstrap validation<br>4.2. Monte Carlo cross-validation<br>4.3. Time series validation |

**EVIDENCE GUIDE**

| | | |
|---|---|---|
| 1 | Critical aspects of competency | **Assessment requires evidence that the candidate:**<br>1.1. Applied appropriate validation techniques to evaluate model performance effectively.<br>1.2. Ensured proper data partitioning and avoided data leakage during validation.<br>1.3. Selected suitable validation methods based on the requirements of the model and characteristics of the dataset.<br>1.4. Utilized validation results to inform model refinement and enhance overall performance. |
| 2 | Method of assessment | **The assessor may select from the following assessment methods:**<br>2.1. Observation<br>2.2. Practical demonstration<br>2.3. Interviews or questioning<br>2.4. Review of documentation or reports prepared by the candidate<br>2.5. Written or oral examinations |
| 3 | Resource implication | **Resources should include:**<br>3.1 Access to validation tools and techniques<br>3.2 Documentation templates for validation techniques and model evaluation<br>3.3 Large datasets and high-complexity models for testing validation methods |
| 4 | Context of Assessment | Assessment may be conducted in the workplace or in a simulated environment where validation techniques can be applied to evaluate AI model performance based on complexity and data characteristics. |

**UNIT OF COMPETENCY** : **CONDUCT MACHINE LEARNING MODEL TESTING**

**UNIT CODE** : **CS- ICT251105**

**UNIT DESCRIPTOR** : This unit covers the outcomes required to conduct comprehensive model testing to ensure the reliability and robustness of AI models. It includes testing the model against unseen data, assessing generalization capabilities, and performing stress tests. The unit also focuses on identifying weaknesses, edge cases, and the model's performance under varying conditions.

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1  Test model against unseen data | 1.1. Model is tested on *unseen data* to assess generalization capabilities and performance<br>1.2. Test results are analyzed to determine overfitting and underfitting issues<br>1.3. Models are re-tested after adjustments to ensure improved generalization on *unseen data* | 1.1. Knowledge of how unseen data is used to evaluate AI models<br>1.2. Understanding of overfitting, underfitting, and their implications for model reliability<br>1.3. Familiarity with re-testing processes and model adjustments after initial validation | 1.1. Applying unseen data to assess the generalization capabilities and real-world performance of models<br>1.2. Identifying and addressing overfitting and underfitting issues in model performance through analysis and model tuning<br>1.3.  Re-testing models after adjustments to ensure changes lead to improve generalization and reliability |
| 2  Perform stress tests on the model | 2.1. *Stress tests* are conducted to evaluate model robustness under | 2.1. Understanding of stress testing techniques to evaluate model | 2.1. Performing stress tests to assess how models behave |

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | extreme or unusual conditions<br>2.2. The model's performance is monitored under high data volumes and varying input conditions<br>2.3. The model's resilience to ***performance degradation*** under stress is documented and analyzed | robustness<br>2.2. Knowledge of testing models under different data loads and input scenarios.<br>2.3. Familiarity with performance degradation factors during stress testing | under extreme conditions<br>2.2. Testing model performance when exposed to high data volumes or complex input variations<br>2.3. Documenting performance degradation and identifying the model's limits during stress tests |
| 3 Test and monitor for data and model drift | 3.1 ***Data drift and model drift*** is monitored over time using statistical drift detection methods and performance monitoring<br>3.2 ***Data drift and model drift detection techniques*** and data drift detection are applied to detect early signs of drift<br>3.3 The results of ***data drift and model drift monitoring*** are documented | 3.1 Knowledge of model drift and performance degradation.<br>3.2 Knowledge of PSI, K-S Test, and feature drift analysis.<br>3.3 Knowledge of retraining and recalibration processes.<br>3.4 Knowledge of documentation for drift monitoring. | 3.1 Apply drift detection techniques<br>3.2 Analyze drift test results and identify corrective actions.<br>3.3 Implement model retraining or recalibration.<br>3.4 Document drift results and model adjustments. |
| 4 Identify edge cases and model weaknesses | 4.1 ***Edge cases*** and rare conditions are tested to identify weaknesses in the | 4.1 Knowledge of identifying edge cases and testing their impact on | 4.1 Testing models against edge cases to uncover weaknesses in |

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | model's decision-making process<br>4.2 ***Model Weaknesses*** identified in the model are recorded and addressed with appropriate adjustments or tuning methods<br>4.3 Results of model testing are used to optimize performance and ensure the model can handle real-world applications | model performance.<br>4.2 Familiarity with adjusting models to handle identified weaknesses effectively.<br>4.3 Understanding of optimization techniques to improve model robustness after testing. | decision-making.<br>4.2 Adjusting and tuning models to mitigate weaknesses and improve robustness. |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1 Unseen data | May include but not limited to:<br>1.1. Test sets<br>1.2. Validation sets<br>1.3. Out-of-sample data<br>1.4. New data sources |
| 2 Stress tests | May include but not limited to:<br>1.1. High data volume tests<br>1.2. Edge cases<br>1.3. Unusual or extreme input conditions |
| 3 Performance degradation | May include but not limited to:<br>2.1. Reduced accuracy<br>2.2. Slower processing times<br>2.3. Model instability during high load or extreme conditions |
| 4 Model Drift Detection Techniques | May include but not limited to:<br>4.1. Population Stability Index (PSI)<br>4.2. Kolmogorov-Smirnov Test (K-S Test)<br>4.3. Feature drift analysis<br>4.4. Retraining models with new data<br>4.5. Monitoring key performance metrics (e.g., accuracy, precision, recall) |
| 5 Corrective Actions for Model Drift | May include but not limited to:<br>5.1. Retraining models using updated data<br>5.2. Adjusting hyperparameters to handle new data distributions<br>5.3. Applying feature engineering techniques to mitigate drift |
| 6 Edge cases | May include but not limited to:<br>6.1. Rare data inputs<br>6.2. Unusual scenarios<br>6.3. Special cases not frequently encountered in training |
| 7 Model weaknesses | May include but not limited to:<br>7.1. Decision-making errors<br>7.2. Inability to generalize<br>7.3. Sensitivity to small changes in input data |

**EVIDENCE GUIDE**

| | | |
|---|---|---|
| 1 | Critical aspects of competency | **Assessment requires evidence that the candidate:**<br>1.1. Tested the model on unseen data to evaluate its generalization capabilities<br>1.2. Conducted stress tests to assess model performance under extreme or unusual conditions<br>1.3. Identified edge cases, weaknesses, and model drift, and applied corrective actions.<br>1.4. Used testing results to optimize the model's performance for real-world applications |
| 2 | Method of assessment | **The assessor may select from the following assessment methods:**<br>2.1. Observation<br>2.2. Practical demonstration<br>2.3. Interviews or questioning<br>2.4. Review of documentation or reports prepared by the candidate<br>2.5. Written or oral examinations |
| 3 | Resource implication | 3.1. Access to testing tools and datasets for unseen data and edge cases<br>3.2. Documentation templates for recording test results and adjustments<br>3.3. Access to stress-testing environments to evaluate model performance under high-load scenarios |
| 4 | Context of Assessment | Assessment may be conducted in the workplace or in a simulated environment where model testing techniques can be applied to evaluate model reliability, robustness, and performance under varying conditions. |

**UNIT OF COMPETENCY** : **DOCUMENT MACHINE LEARNING MODEL VALIDATION RESULTS**

**UNIT CODE** : **CS-ICT251106**

**UNIT DESCRIPTOR** : This unit covers the outcomes required to effectively document the results of AI model validation. It includes structuring validation reports, summarizing key findings, highlighting performance metrics, and presenting recommendations for model improvement. Emphasis is placed on clear and concise communication of validation outcomes to stakeholders.

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| 1. Structure validation reports | 1.1. Validation reports are structured to include *key performance metrics,* methodologies, and findings based on industry standards <br> 1.2. *Validation methods* and results are described clearly to ensure stakeholder understanding <br> 1.3. The report format is customized based on *stakeholder needs* and project requirements | 1.1. Knowledge of report structuring techniques for technical documentation <br> 1.2. Understanding of different validation methodologies and how to explain them concisely <br> 1.3. Knowledge of tailoring reports to different audiences and their needs | 1.1. Structuring validation reports that are clear and well-organized <br> 1.2. Documenting validation methods and outcomes in a way that is accessible to both technical and non-technical audiences <br> 1.3. Customizing reports for stakeholders, including project-specific and general summaries |
| 2. Summarize key findings | 2.1. The report highlights *critical findings* from validation activities, | 2.1. Knowledge of how to identify and summarize key findings from validation | 2.1. Summarizing validation outcomes that emphasize performance |

| ELEMENT | PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables | REQUIRED KNOWLEDGE | REQUIRED SKILLS |
|---|---|---|---|
| | including performance gaps and strengths<br>2.2. ***Key performance metrics*** are included and explained in a clear manner to facilitate decision-making<br>2.3. Key insights and implications for the model's future development are highlighted for model optimization<br>2.4. ***Validation outcomes*** are presented to stakeholders in a structured and comprehensible manner, ensuring clarity of model performance and improvement areas | processes<br>2.2. Understanding of how to communicate technical performance metrics effectively<br>2.3. Familiarity with how validation insights contribute to model optimization | strengths and gaps<br>2.2. Presenting performance metrics in a way that informs stakeholders of the model's current status and capabilities<br>2.3. Highlighting implications for model improvement based on validation results |

**RANGE OF VARIABLES**

| VARIABLE | RANGE |
|---|---|
| 1. Key performance metrics | May include but not limited to:<br>1.1. Accuracy<br>1.2. Precision<br>1.3. Recall<br>1.4. F1 score<br>1.5. Confusion matrix |
| 2. Validation methods | May include but not limited to:<br>2.1. Cross-validation<br>2.2. Hold-out validation<br>2.3. Bootstrap validation |
| 3. Stakeholder needs | May include but not limited to:<br>3.1. Technical teams<br>3.2. Non-technical stakeholders<br>3.3. Decision-makers |
| 4. Critical findings | May include but not limited to:<br>4.1. Model performance strengths<br>4.2. Model weaknesses<br>4.3. Areas for improvement |
| 5. Validation outcomes | May include but not limited to:<br>5.1. Performance metrics<br>5.2. Error rates<br>5.3. Bias and fairness analysis<br>5.4. Cross-validation results<br>5.5. Model robustness metrics |

**EVIDENCE GUIDE**

| 1. Critical aspects of competency | **Assessment requires evidence that the candidate:** 1.1. Structured validation reports that clearly summarize validation outcomes<br>1.2. Highlighted key performance metrics and critical findings from the validation process<br>1.3. Provided actionable recommendations for model improvement based on validation results<br>1.4. Communicated validation outcomes and recommendations effectively to various stakeholders |
|---|---|
| 2. Method of assessment | **The assessor may select from the following assessment methods:**<br>2.1. Observation<br>2.2. Practical demonstration<br>2.3. Interviews or questioning<br>2.4. Review of documentation or reports prepared by the candidate<br>2.5. Written or oral examinations |
| 3. Resource implication | **Resources should include:**<br>3.1. Access to validation reports, performance metrics, and model evaluation tools<br>3.2. Documentation templates for structuring validation results<br>3.3. Tools for presenting recommendations and communicating with stakeholders |
| 4. Context of Assessment | Assessment may be conducted in the workplace or in a simulated environment where validation results can be documented and communicated effectively to support model improvements and decision-making. |

# GLOSSARY OF TERMS

| | |
|---|---|
| **Bias** | Systematic error that leads to unfair or incorrect predictions in an AI model, often caused by imbalanced or incomplete training data |
| **Confusion Matrix** | Systematic error that leads to unfair or incorrect predictions in an AI model, often caused by imbalanced or incomplete training data. |
| **Cross-Validation** | A technique where a dataset is divided into multiple subsets; the model is trained on some subsets and tested on others to ensure generalizability. |
| **F1-Score** | A performance metric that balances precision and recall by taking their harmonic mean, particularly useful when dealing with imbalanced datasets. |
| **Generalization** | The ability of an AI model to perform well on new, unseen data, rather than just on the data it was trained on. |
| **Hold-Out Validation** | A simple validation technique where the dataset is split into two parts: one for training and the other for testing. |
| **K-Fold Cross-Validation** | A method where the dataset is split into K parts; each part is used as a test set once while the rest are used for training. |
| **Latency** | The time taken by the AI model to produce a prediction or output after receiving an input. |
| **Overfitting** | When a model learns the training data too well, including its noise, leading to poor performance on new, unseen data. |
| **Precision** | A metric that measures the number of true positive predictions out of all positive predictions made by the model. |
| **Stress Testing** | Testing a model under extreme conditions (e.g., high data volume or noisy data) to assess its robustness and scalability. |

# ACKNOWLEDGEMENTS

- **THE MANAGEMENT AND STAFF OF TESDA**

    - Qualifications and Standards Office (QSO)
      1. Dir. El Cid H. Castillo    - QSO
      2. Ms. Bernadette S. Audije   - QSO/CSDD
      3. Mr. Adrian Brian C. Sabanal  - QSO/CSDD
      4. Ms. Luz M. Vergara    - QSO/CPSDD
      5. Ms. Kimberly C. Caballero  - QSO/CPSDD
      6. Ms. Maria Sofia Jasmin A. Cea - QSO/CPSDD

- **THE NATIONAL INDUSTRY TVET BOARD (NITB)**

**ANALYTICS AND ARTIFICIAL INTELLIGENCE ASSOCIATION
OF THE PHILIPPINES (AAP)**
www.aap.ph