This learning and assessment plan outlines how this unit or cluster of units will be delivered and assessed. The schedule of learning topics, assessments and the due date for assessments is included.

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| --- | --- |
| Qualification national code and title: | ICTSS00120 - Artificial Intelligence Skill Set |
| Delivery Period: | 2024, S2 |
| Cluster Name (if applicable) | Artificial Intelligence Skill Set |

|  |  |
| --- | --- |
| National ID | Name of unit |
| ICTAII401 | Identify opportunities to apply artificial intelligence, machine learning and deep learning |
| ICTAII501 | Automate work tasks using machine learning |
| ICTAII502 | Train and evaluate machine learning models |
| **You can access the full unit/s of competency here** (insert web address to unit of competency at [**www.training.gov.au**](http://www.training.gov.au) or equivalent link if available) | |
| Delivery Location/s (Campus/Room/Online): | Perth |

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| Student Learning Resources, text, equipment (Required/Optional) | | | | |
| Student to supply:  - USB (at least 16GB) - Adequate home workstation for out of class activities - Student's personal notes - Kaggle and or Huggingface account (Free). - Google account for Colab (Free). | | | | |
| College to supply: - On campus workstation  - Access to academic journals - Online databases and resources - Course materials and online textbooks - Choice of Kaggle or Colab or another Jupiter notebook/IPython environment. - Access to GPU accellerated compute environment. | | | | |
| **Lecturer Name:** | **Phone:** | **Email:** | **Contact times** | **Campus / Room** |
| Jordan Hill | -- | jordan.hill@nmtafe.edu.au | in-class or by appointment | Perth 306 |
|  |  |  |  |  |

## Assessment Summary

| Assessment | Title and brief description | Due Date |
| --- | --- | --- |
| Assessment 1 | **AT1 Identify Opportunities for AI Task Automation**  Demonstrate ability to research, verify, and pitch AI solutions | Week 7 |
| Assessment 2 | **AT2 Knowledge-Based Assessment (Weeks 1–6)**  Demonstrate an initial knowledge of AI, ML and DL concepts. | Week 10 |
| Assessment 3 | **AT3 Knowledge Based Assessment (Weeks 8-13)**  Demonstrate specific technical knowledge of deep learning processes and concepts. | Week 15 |
| Assessment 4 | **AT4 Apply Machine Learning to Task Automation**  Final project using machine learning to automate work tasks. | Week 18 |

**You will receive more detailed instructions on each assessment from your lecturer.**

The regular learning requirements to develop the skills and knowledge for this unit are outlined below.

Please refer to your timetable for session times.

**Please note:** This plan is to be used as a guide and may be adapted to meet the needs of students.

You will be notified of changes as they occur.

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| --- | --- |
| Your training will include **structured in and out of class activities\*** to be completed for this unit. | |
| *\*Out of class activities* may include(🗹): | |
| lectures or tutorials, online tasks and forums  assessments (when integrated with learning)  workplace experience  prescribed reading and research | workshop activities  projects, assignments  prescribed follow-up activities  other (please specify) |

| Sessions(Hours) | | **Element**  **number** | **Topic** | **Learning**  **Resources\*** | **Structured out of class activities\*** | |
| --- | --- | --- | --- | --- | --- | --- |
| Session | **Hrs** |  |  |  | **Activity** | **Hrs** |
| 1 | 4.5 |  | Week 1: Introduction to AI, ML, and DL  * Overview and history of AI, ML, and DL. * Key features and functions of AI technologies. * Functions and features of industry-recognised AI, ML and DL technologies used in organisations. * Discussion of tasks and processes commonly automated using AI, ML, and DL * Explore advantages and disadvantages of AI, ML, and DL technologies.     *In-class Research Activity*: Industry technologies in AI, ML, & DL; Supervised and Unsupervised learning examples. Pair and Share. | [The Pattern on the Stone, by Danny Hillis](https://www.goodreads.com/book/show/277658.The_Pattern_on_the_Stone)  [The moment we stopped understanding AI [AlexNet]](https://www.youtube.com/watch?v=UZDiGooFs54)  [Can machines think?](https://academic.oup.com/mind/article/LIX/236/433/986238) | This week's extension reading is:  **"The Moon is a Harsh Mistress" by Robert A. Heinlein** (1966)   * A lunar colony's AI, named Mike, gains self-awareness and aids in a revolution against Earth's government, highlighting themes of AI autonomy and human-machine relationships. | 2.5 |
| 2 | 4.5 |  | Week 2: Data for Machine Learning  * Introduction to IPython Environment and Kaggle. * Identifying key data sources for machine learning * Types of data: Structured, Unstructured, Labelled, and Unlabelled. * Understanding ML Attributes:   Data Attributes  Model Attributes  Target Attributes   * Understanding relevant algorithms for labelled or unlabeled datasets. * Understand biases in datasets and methods for generating balanced data. * Intro to data pre-processing for ML:   Randomising, deduplication  Data cleaning  Creating training, validation, and test subsets, why?  *In-class Activity*: Find and load a dataset into Kaggle. Evaluate its usefulness for Machine Learning. Visualise the dataset and perform initial exploratory data analysis. | [Data Attributes and Model Attributes](https://docs.oracle.com/en/database/oracle/machine-learning/oml4sql/23/dmprg/about-attributes.html) | This week's extension reading is:  **"Schrödinger’s Kitten" by George Alec Effinger** (1989)  This short story skillfully combines elements of quantum mechanics and AI, making it a thought-provoking narrative about the nature of reality and consciousness. | 2.5 |
| 3 | 4.5 |  | Week 3: Essentials of ML and DL Technologies  * Understanding ML: Supervised vs. Unsupervised Learning * Introduction to DL and its place within AI * Regression & Classification — Supervised   Linear Regression, Support Vector Machines   * Clustering & Dimensionality — Unsupervised   PCA & Other Dimensionality Reduction Techniques  Introduction to K-Means clustering & DBSCAN   * Reinforcement Learning / Reward-based learning. * Deep Learning / Representation learning   Feed Forward Neural Networks (FNN)  Recurrent Neural Networks (RNN)  Transformers (Attention based Networks)  *Lab activity*: Apply Linear regression to a dataset using Ordinary Least Squares, in scikit learn. |  | This week's extension reading is:  **"The Bicentennial Man" by Isaac Asimov** (1977)  The story follows a robot on a journey to become more human. It delves deeply into the themes of AI and human rights. | 2.5 |
| 4 | 4.5 |  | Week 4: Data Bias and Ethics in AI  * Recognising biased vs. unbiased datasets * Implementation Risks * Ethics in AI, including Australia’s AI Ethics Framework   *Discussion-based Learning Session* | WA:  [AI Assurance Framework](https://www.wa.gov.au/system/files/2024-03/wagovernmentaiassuranceform_0.pdf)  [Artificial Intelligence Policy](https://www.wa.gov.au/system/files/2024-03/wagovaipolicy_0.pdf)  National:  [Australia’s Artificial Intelligence Ethics Framework](https://www.industry.gov.au/publications/australias-artificial-intelligence-ethics-framework)  Out of state:  [Artificial Intelligence Ethics Policy](https://www.digital.nsw.gov.au/policy/artificial-intelligence/artificial-intelligence-ethics-policy) | This week's extension reading is:  **"I Have No Mouth, and I Must Scream" by Harlan Ellison** (1968)  A harrowing short story about a supercomputer AI that has annihilated humanity, except for five individuals it tortures, is an intense and profound exploration of AI's potential for cruelty. | 2.5 |
| 5 | 4.5 | **Elements:**  **ICTAII401:** Element 1 | Week 5: Identify an Opportunity for Task Automation  * Establishing organisational AI, ML and DL objectives * Identifying existing organisational AI technologies and processes * Identifying common tasks/processes for automation * Examples of AI in email campaigns, chatbots, data analysis * Introduction to the Final Project.   *Students to complete Task 1*: Identify an Opportunity for Task Automation of AT1 in-class.  **Assessment 1 Start** |  | Assessment work | 2.5 |
| 6 | 4.5 | **Elements:**  **ICTAII401:** Element 2 | Week 6: Evaluating ML Opportunities  * Identifying and documenting ML opportunities * Evaluation and comparison of AI, ML, and DL technologies * Key advantages and disadvantages of AI, ML and DL technologies * What kinds of datasets are useful for automating work tasks? * Industry-recognised ML principles and techniques.   *Students to Complete Task 2 & 3 & 4 of Assessment 1 in class* |  | **"The Secret Place" by Richard McKenna** (1966)  This story follows an AI in a mining colony located on a distant planet, delving into themes of self-discovery and what it means to be sentient. | 2.5 |
| 7 | 4.5 | **Elements:**  **ICTAII401:** Element 3 | Week 7: Student Presentation Week — Assessment 1 **Assessment 1 Due**  *Perform a 5 to 10-minute pitch on a particular opportunity for Automation in AI.* |  | Students to prepare presentations. | 2.5 |
| 8 | 4.5 |  | Week 8: Hyper Parameter Tuning  * Model Output Evaluation Methods * Documenting ML model Evaluations * Evaluation metrics:   f-score  accuracy  precision/recall  loss metrics  confusion  *Lab: Let’s apply grid search to optimize an email spam filter.* |  | **"The Algorithms for Love" by Ken Liu** (2004)  This story gives a deep look into AI and love, making it a valuable addition for discussions on AI emotions and ethics. | 2.5 |
| 9 | 4.5 |  | Week 9: Deep Learning Foundations  * Introduction to Neural Networks * What are ‘hidden layers’? * How can we teach machines to think good?   Training, Test, and Validation Loops  Stochastic Gradient Descent  Backpropagation of the Loss   * Machine Vision   Multilayer Perceptron (MLP)  Convolutional Neural Networks (CNN)  *Lab: Continue spam filter? or Work with Sci-kit learn more* | [But what is a neural network?](https://www.youtube.com/watch?v=aircAruvnKk) [Gradient descent, how neural networks learn](https://www.youtube.com/watch?v=IHZwWFHWa-w) [What is backpropagation really doing?](https://www.youtube.com/watch?v=Ilg3gGewQ5U) | **"Computer Friendly" by Eileen Gunn** (1989)  This short story is a speculative look at AI in education, exploring the impact of computer-managed teaching on students and society. | 2.5 |
| 10 | 4.5 |  | Week 10: What is a Tensor? And why is it important?  * Computing Tensors, GPU vs CPU * Feature Engineering and Data Preprocessing Techniques * Activation functions:   *Let’s build: A card classifier using pytorch.*  *Term Break* | [Vectors and Tensors](https://youtu.be/f5liqUk0ZTw?si=Kbu-3dZr6AUp-5W0)  [GPU vs CPU Mythbusters](https://www.youtube.com/watch?v=-P28LKWTzrI)  [Extension: CUDA & NVLink](https://www.youtube.com/watch?v=hBKcL8fNZ18)  [GPU for AI/ML/DL](https://www.youtube.com/watch?v=YiX9p8A7LqE)  [activation\_functions.md](AI Skillset/Learning Materials/Week 8/activation_functions.md)  Activity:  [Build Your First Pytorch Model In Minutes! [Tutorial + Code]](https://www.youtube.com/watch?v=tHL5STNJKag)  [Kaggle Notebook](https://www.kaggle.com/code/robikscube/train-your-first-pytorch-model-card-classifier) | **"The Girl-Thing Who Went Out for Sushi" by Pat Cadigan** (2013)  Set in an environment of body modification and post-humanity, this story looks at AI and transhumanism through the fascinating lens of transformed humans working in space. | 2.5 |
| 11 | 4.5 |  | Week 11: Applying AI/ML and Data Science Methodologies  * Understanding CRISP-DM methodology and software development for ML.   Cross-Industry Standard Process for Data Mining (CRISP-DM)  Applying Organizational Policies and Procedures to AI  Software development methodologies relevant to AI/ML  Applying organizational policies and procedures, and legislation to work tasks | [CRISP-DM in 5 mins](https://www.youtube.com/watch?v=q_okDS2RtzY)  3 Explanations of CRISP-DM:  [Crisp-DM (Data Science Process Alliance)](https://www.datascience-pm.com/crisp-dm-2/)  [Crisp-DM IBM](https://www.ibm.com/docs/en/spss-modeler/saas?topic=dm-crisp-help-overview)  [Crisp-DM O'Reilly](https://learning.oreilly.com/library/view/r-data-mining/9781787124462/05ec6eb6-bd0b-4180-ac01-21f83d8afcc7.xhtml)  CRISP-DM Expanded for ML:  [The ML Process](https://learning.oreilly.com/library/view/machine-learning-pocket/9781492047537/ch02.html) | **"Eliot Wrote" by Nancy Kress** (2008)  This story focuses on an AI developed to replicate the literary style of T.S. Eliot, examining the possibilities and limits of AI in creative endeavors. | 2.5 |
| 12 | 4.5 |  | Week 12: Transformers and Embeddings  * Attention is all you need! * Intro to Huggingface   *Code Investigation: card classifier what does ReLU do?* | [Transformers](https://huggingface.co/learn/nlp-course/chapter1/1?fw=pt)  [Attention Visually Explained](https://www.youtube.com/watch?v=eMlx5fFNoYc)  Further Reading:  [Attention is all you need!](https://arxiv.org/abs/1706.03762)  [Efficient Estimation of Word Representations in Vector Space](https://arxiv.org/pdf/1301.3781) | **"For a Breath I Tarry" by Roger Zelazny** (1966)  Set in a post-human world, it follows an AI’s quest to become human and explores deeply philosophical themes of identity and existence. | 2.5 |
| 13 | 4.5 |  | Week 13: Intro to Language Models Llama and Gemma  * Who is LoRA?   Fine-tuning Large Language Models  Model sizes & related challenges | [Explanation of 'decoder only' Transformers](https://ai.stackexchange.com/questions/40179/how-does-the-decoder-only-transformer-architecture-work)  Further Reading:  [LoRA: Low-Rank Adaptation of Large Language Models](https://arxiv.org/abs/2106.09685) | **"Coming of Age in Karhide" by Ursula K. Le Guin** (1995)  Although it includes broader themes, the perspective on societal evolution with AI-environment integration is relevant and enriches discussions about AI in different cultural contexts.  Further Reading:  [Arthur C. Clarke, 2001: A Space Odyssey](https://www.goodreads.com/book/show/70535.2001?ref=nav_sb_ss_1_20) [Philip K. Dick, Do Androids Dream of Electric Sheep?](https://www.goodreads.com/book/show/36402034-do-androids-dream-of-electric-sheep?from_search=true&from_srp=true&qid=MOgdPJZLho&rank=1) [Neuromancer](https://www.goodreads.com/book/show/6088007-neuromancer?ref=rae_0) | 2.5 |
| 14 | 4.5 |  | Week 14: On the horizon: ViT — Applying Transformers to vision  * Applying transformer architecture to multi-modal problems |  | Read this relevant series of essays from ex-OpenAI superalignment expert to ground our broader readings in current events and advances. Worth reading, but worth reading critically!  ["SITUATIONAL AWARENESS: The Decade Ahead by Leopold Aschenbrenner, June 2024"](https://situational-awareness.ai/)  [Introduction](https://situational-awareness.ai/) [I. From GPT-4 to AGI: Counting the OOMs](https://situational-awareness.ai/from-gpt-4-to-agi/) | 2.5 |
| 15 | 4.5 | **Elements:**  **ICTAII501:** Element 1 Element 2  **ICTAII502:** Element 1 | Week 15: Practical - Begin Project Assessment  * Starting the final project: data sourcing and initial model design. |  | [II. From AGI to Superintelligence: the Intelligence Explosion](https://situational-awareness.ai/from-agi-to-superintelligence/) | 2.5 |
| 16 | 4.5 | **Elements:**  **ICTAII501:** Element 3  **ICTAII502:** Element 2 | Week 16: Practical - Continue Project Assessment  * Model training and testing. |  | [IIIa. Racing to the Trillion-Dollar Cluster](https://situational-awareness.ai/racing-to-the-trillion-dollar-cluster/) | 2.5 |
| 17 | 4.5 | **Elements:**  **ICTAII501:** Element 4  **ICTAII502:** Element 3 Element 4 | Week 17: Practical - Continue Project Assessment  * Model evaluation and tuning. |  | [IIIb. Lock Down the Labs: Security for AGI](https://situational-awareness.ai/lock-down-the-labs/) | 2.5 |
| 18 | 4.5 | **Elements:**  **ICTAII502:** Element 5 | Week 18: Practical - Finalize Project Assessment  * Final adjustments to the model and prepare a white paper |  | [IIIc. Superalignment](https://situational-awareness.ai/superalignment/) | 2.5 |
| 19 | 4.5 |  | Week 19: Non Contact Assessment Feedback Week |  | [IIId. The Free World Must Prevail](https://situational-awareness.ai/the-free-world-must-prevail/) | 2.5 |
| 20 | 4.5 |  | Week 20: Resubmission Period |  | [IV. The Project](https://situational-awareness.ai/the-project/) [V. Parting Thoughts](https://situational-awareness.ai/parting-thoughts/) | 2.5 |
| **Total Hours** | 81 |  | |  | **Total hours out of class activities** | 45 |
| **Total amount of training for this unit:** (sum of Session Hours + Out of Class Hours) | | | | | 126 | |

\*Learning Resources - to enable learners to meet the requirements of this unit of competency or cluster.

**Recognition of Prior Learning (RPL) / Credit**

You may be eligible for Recognition of Prior Learning (RPL) / Credit towards your studies If you have relevant existing skills, knowledge, or formal qualifications. Please discuss available options with your lecturer.

**Reasonable Adjustment**

We recognise that every student has different learning styles and needs. Please let your lecturer know if there is anything that may have an effect on your learning so they may be able to adjust your plan.

**Results and Appeals**

Students may lodge an appeal against an academic result. Appeals must be lodged within four weeks from notification of the assessment result. Please see details under Academic Appeals on the NMT website.

**Absences**

If you are unable to attend any class or assessment session you must inform your lecturer as soon as possible.

If you miss an assessment due to illness, please provide your lecturer with a medical certificate in order to negotiate an alternate time for the assessment.

**Plagiarism**

Plagiarism is using another person's ideas and words without clearly acknowledging the source of the information. It is not acceptable to submit an assessment that is based on another person's work and claim it as your own. If you submit an assessment that is significantly or recognizably the same or similar in content as submitted by another student (current or past) you may have to submit another assessment.

**Assessment Resit/Resubmission**

You shall be permitted to have at least two attempts to demonstrate competency against a unit of competency or cluster of units of competency.

To qualify for re-assessment:

* you must have made a reasonable attempt to complete the assessment satisfactorily

AND

* you must have submitted the original assessment by the due date

OR

* you must have attended and participated in the original assessment event

In the case of a re-assessment opportunity, your lecturer will give you a due date for your second attempt. Should you not achieve a Satisfactory result on the second attempt, you will need to re-enrol (R) in the unit.

Be aware, in certain situations there are limited reassessment options (such as one-off Performances and Exhibitions).