Unit of Study: ICT5357 Problem-Solving and Decision-Making with Machine Learning

Overview:

Problem-Solving and Decision-Making with Machine Learning equips students with the knowledge and skills to tackle complex problems using machine learning techniques.

Students will gain a deep understanding of various machine learning algorithms and their applications in regression, classification, clustering, and dimensionality reduction. They will explore problem-solving opportunities in forecasting, fraud detection, recommendation systems, time series analysis and more. Additionally, students will delve into advanced topics such as convolutional neural networks (CNNs), object detection, and image segmentation for visual data analysis. The course also covers automated machine learning (AutoML) and showcases real-world applications across domains like healthcare and natural language processing.

By the end of the unit, students will be proficient in leveraging machine learning to make data-driven decisions and solve complex problems effectively.

Course(s)	Master of Information Technology
Credit Points	8 credit points
Duration	12 weeks (10 teaching weeks; 1 revision week; 1 final assessment week)
Level	Postgraduate Intermediate
Student Workload	Students should expect to spend approximately 13 hours per week over 12 weeks (totalling approximately 156 hours) on learning activities for this unit.
Mode(s) of Delivery	Online
Pre-Requisites	ICT5356 Principles of Artificial Intelligence
Unit Coordinator	As per current timetable
Contact Information	Consultation: 1 hour scheduled session

Unit Learning Outcomes

On successful completion of this unit, students will be able to:

ULO1   Apply strategic problem-solving to achieve goals, complete tasks, make decisions with data

ULO2   Research supervised learning and unsupervised learning techniques and apply appropriate techniques to solve problems that involve classifying or clustering data

ULO3   Innovate applications of data visualisation and dimensionality reduction

ULO4   Plan, design and create machine learning models to solve a variety of problems, using automated machine learning (AutoML)

Weekly Schedule

Detailed information for each week's activities can be found on Unit's Weekly Modules in Canvas.

Week	Topic
Week 1	Introduction to Machine Learning and Problem Solving
Week 2	Classification and Regression
Week 3	Data Preprocessing and Model Training
Week 4	Clustering and Data Analysis
Week 5	Dimensionality Reduction and Data Visualisation
Week 6	Neural Networks and Deep Learning
Week 7	Time Series Analysis and Forecasting
Week 8	Convolutional Neural Networks and Image Analysis
Week 9	AutoML and Real-World Applications
Week 10	Future Trends and Strategic Problem Solving
Week 11	REVISION
Week 12	FINAL ASSESSMENT

Assessments

1. All assessments are compulsory.
2. To pass the unit students must:
   - achieve a total of 50% or more of marks offered; and
   - pass all individual invigilated assessments; and
   - have attempted all assessments.

   Where one or more of these requirements are not met, the Board of Examiners will consider a student's overall progress towards meeting the unit learning outcomes and any special circumstances before reaching a decision.

3. The Board of Examiners may grant a supplementary assessment where a student:
   - achieves a total of 45% or more; and
   - has passed all individual invigilated assessments in the unit; and
   - has attempted all assessments; and
   - has a recommendation for supplementary assessment by the Unit Coordinator and the Head of Discipline.

   Where one or more of these requirements are not met, the Board of Examiners will consider a student's overall progress towards meeting the unit learning outcomes and any special circumstances before reaching a decision. Attendance and engagement in class will be considered.

4. APIC awards common result grades as set out in the Award of Grade Policy.
5. Detailed information for each assessment can be found on the Unit's Home Page and in the Assessment Brief.

Assessment Task	Type	Weighting	Length	Due	ULOs Assessed
Assessment 1: Supervised Machine Learning Project Implement a machine learning model to perform a simple classification or regression task. Write a report outlining steps taken.	Individual	20%	1000 words + model	Week 4	ULO1 ULO2 ULO4
Assessment 2: Laboratory Practicum Regular invigilated practical tests, implementing some machine learning model or machine learning analysis to solve a problem.	Individual Invigilated	30%	equiv. 2500 words	Weeks 3, 4, 5, 6, 8	ULO1 ULO2 ULO3 ULO4
Assessment 3: Unsupervised Machine Learning Project Perform clustering and dimensionality reduction on a complex dataset and implement a machine learning model to perform a classification/regression task on the reduced dataset. Write a report outlining steps taken.	Group	25%	1000 words + model	Week 7	ULO1 ULO3 ULO4
Assessment 4: Computer Vision Case Study Apply strategic problem-solving in a domain involving visual data analysis. Write a report outlining steps taken.	Individual	25%	1000 words	Week 12	ULO1 ULO2 ULO4

equiv. – equivalent word count based on the Assessment Load Equivalence Guide. It means this assessment is equivalent to the normally expected time requirement for a written submission containing the specified number of words.

Course Reserve

Course Reserve includes all required resources and reading material for the unit of study. You can access Course Reserve via APIC Library or via the Course Reserve link on the unit's homepage.

Recommended Readings:

Burkov, A., 2019. The Hundred-Page Machine Learning Book, Self-published.

James, G., Witten, D., Hastie, T., Tibshirani, R., & Taylor, J., 2023. An Introduction to Statistical Learning, First Edition. Springer, NY, USA.

Taulli, T., 2019. Artificial Intelligence Basics, First Edition. Springer, NY, USA.

Other Resources Requirements:

Unit is completed online via a computer or similar device. Students need access to a computer.

Machine learning projects will be completed using Orange datamining software, which students will download.

Academic integrity

Ethical conduct and academic integrity and honesty are fundamental to the mission of APIC and academic misconduct will not be tolerated by the College. It is the responsibility of every student to make sure that they understand what constitutes academic misconduct and to refrain from engaging in it. Please refer to APIC's Academic Integrity Policy for further details.

Other Important Information and Links

Special consideration If your academic work is impacted by significant documented illness, hardship, or other adverse circumstances beyond your control, you may make an application for Special Consideration. Please refer to the Assessment Policy for further details.	**Late submission** Penalties apply when work is submitted after the due date without approval. Please refer to the Assessment Policy for information about late submission.
Assessment appeals If you are concerned about a mark you have received for an assessment or final grade, you may apply to formally appeal the grade. Please see the Assessment Policy for further details.	**Award of grades** APIC awards common result grades, set out in the Award of Grade Policy.
Expectations of student conduct Students are expected to conduct themselves in a manner that is consistent with a safe and respectful study environment. More information can be found in the Student Code of Conduct.	**Study resources** APIC Library and Student Learning Support resources and services can be accessed via the Student Lounge or your Dashboard on the OLS (Canvas).
Student Services The Student Services team provides administrative support for students and handles enquiries about enrolment, timetables, important dates and submitting forms. More information can be found on the Student Services page on the OLS (Canvas).	**Key dates** Key dates through the academic year, including teaching periods, census, payment deadlines and exams can be found on the Academic Calendar section of the APIC website.

Changes and Updates to the Unit of Study Guide

This Unit of Study Guide may be updated and amended from time to time. Students will be notified of any changes to the unit via the Online Learning System (Canvas) space for the unit.

This Unit of Study Guide was last modified on 2nd April 2024.