

Subject Description Form

Subject Code	EIE1005
Subject Title	Fundamental AI and Data Analytics
Credit Value	2
Level	1
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	Data analytics is for extracting valuable knowledge from raw data. It is very critical to industry, business, and government. Artificial intelligence and machine learning are widely used to automate data analytics processes. This subject aims to provide students with the fundamental concepts of artificial intelligence and data analytics. In particular, it offers hands-on experiences and case studies in the applications of AI and data analytics. It also helps students appreciate how data analytics and artificial intelligence influence our daily life.
Intended Subject Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> 1. Understand the basic concepts and technologies of artificial intelligence. 2. Acquire the basic technical know-how on data analytics. <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> 3. Understand the data-driven process for problem-solving. 4. Demonstrate how to harness and process data for decision-making.
Subject Synopsis/ Indicative Syllabus	<ol style="list-style-type: none"> 1. <u>Understanding and Presenting Data</u> <ul style="list-style-type: none"> • Introduction to data analytics • Data quality and preprocessing • Data analysis – Basic statistics, clustering, frequent pattern mining • Data visualization with ParaView 2. <u>AI and Data Analytics in the Virtual World</u> <ul style="list-style-type: none"> • Introduction to machine learning • Development of game AI • Reward scheduling via data analytics • AI and data analytics in the Metaverse • Developing game AI with Unity ML-Agents 3. <u>AI and Data Analytics for Computer Vision</u> <ul style="list-style-type: none"> • Machine learning for computer vision • Predictive analytics for computer vision • Feature extraction • Pattern recognition • Convolutional neural network • Developing computer vision systems with Google Colab 4. <u>Conversational AI and Data Analytics</u> <ul style="list-style-type: none"> • Prescriptive analytics for human-computer interaction • Spoken language technologies • Natural language understanding • Understanding users' behaviours via data analytics • Google Dialogflow and Chatbots

Teaching/Learning Methodology

Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&A, discussions, and specially designed classroom activities.

Tutorial Workshops: Students will work on four AI and data analytics workshops using software tools. In each workshop, students may start from doing some small and easy tasks at the first stage. Students will solve a simple real-world problem commonly found in daily life in the second stage, using the knowledge and know-how that they have learnt from the first stage and the lectures. Tutorials are conducted in an interactive manner through discussions between students and tutors on the problems encountered during the workshop activities. The subject will offer the datasets used in the workshop..

Assignment and Demonstration: Students will write a report for each workshop and demonstrate their work for one of the four workshops.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)			
		1	2	3	4
1. Continuous Assessment (total: 100%)					
• Workshop report	60%	✓	✓	✓	✓
• Workshop demonstration	10%	✓	✓	✓	✓
• Tests	30%	✓	✓		
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Tutorial Workshops will require students to apply what they have learnt to solve problems. There will be open-ended tasks that allow students to exercise their creativity in solution design. Tutorial Workshops are group-based and the workshop reports weight 60% of the whole assessment.

Students will think critically to discuss various aspects of one of the four workshops in the demonstration. The demonstration will be assessed individually and weights 10% of the whole assessment. Each group member will demonstrate the part he/she is responsible for in the workshop.

Tests will assess students' achievement of the learning outcomes in a more formal manner. There will be a short test after each workshop and a final test for the whole subject. Tests are assessed individually and weights 30% of the whole assessment.

The workshops will use publicly available or proprietary software tools so that programming knowledge and mathematical skills are kept to a minimum, i.e., no programming and high-level mathematical background is assumed. Students will use available data sources, machine learning models, analytic algorithms, and evaluation methods from the tools to solve data analytics problems. Enthusiastic students could use the cloud-based API to perform more complex tasks.

Overall, 40% of the assessment is individual assessment and 60% is group-based assessment.

Student Study Effort Expected	Class contact (time-tabled):	
	• Lectures	8 Hours
	• Tutorial Workshops	16 Hours
	• Tests	2 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; Self-studying	24 Hours
	• Workshop assignment and demonstration; preparation for tests	20 Hours
	Total student study effort:	70 Hours
Reading List and References	Reference Materials: <ol style="list-style-type: none"> 1. J. Moreira, T. Horvath, and A. Carvalho, <i>A General Introduction to Data Analytics</i>, Newark: John Wiley & Sons, Incorporated, 2018. 2. K. Moreland. <i>The ParaView Tutorial</i>, Version 5.6. Technical Report SAND 2018-11803 TR, Sandia National Laboratories, 2018. 3. A. Majumder, <i>Deep Reinforcement Learning in Unity: With Unity ML Toolkit</i>. Berkeley, CA: Apress, 2020. 4. D. Buckley, "Unity ML-Agents Tutorials – Complete Guide," <i>GameDev Academy</i>, 2022 (online resource). 5. Deconstructing Chatbots: https://www.youtube.com/hashtag/deconstructingchatbots 6. A.R. Freed, <i>Conversational AI: Chatbots that work</i>. Manning, 2021 7. M. McTear, <i>Conversational Ai: Dialogue Systems, Conversational Agents, and Chatbots (Synthesis Lectures on Human Language Technologies)</i>. Morgan & Claypool, 2020 8. A. Dertat, "Applied Deep Learning – Part 4: Convolutional Neural Networks," https://towardsdatascience.com/applied-deep-learning-part-4-convolutional-neural-networks-584bc134c1e2 (online resources) 9. Vaibhav Verdhhan, <i>Computer Vision Using Deep Learning: Neural Network Architectures with Python and Keras</i>. Apress, 2021. 	
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