Subject Code	MM5433
Subject Title	Decision Analytics by Machine Learning
Credit Value	3
Level	5
Normal Duration	1-semester
Pre-requisite/ ~~Co-requisite/~~ ~~Exclusion~~	Launchpad to Advanced Analytics (MM5400)
Objectives	1. Introduce students to machine learning in decision-making context. 2. Justify the use of machine learning in the workplace. 3. Demonstrate pitfalls of machine learning.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate practical skills on predictive analytics b. Scrutinize insights based on predictive analytics c. Lead data collection and analytical projects at workplace d. Use machine learning as a routine tool for effective decisions
Subject Synopsis/ Indicative Syllabus	This subject offers students a journey from basic data analytics to advanced machine learning concepts, using R and XGBoost. Each week, through a representative business example study, we uncover how data shape effective management and decision making. The subject gradually builds on R-programming and machine learning knowledge, giving students hands-on experience with R-assignments linked to the weekly topics. Basic understanding of statistics and prior elementary programming skills in any language are required. --- Part I: Fundamentals of data analytics - Importance of data - Big data - The process of data collection - The process of data cleaning --- Part II: Human behavior - Non-linear relationships - Missing responses - Biases - Choices and value estimates --- Part III: Machine learning hiccups - Overfitting and underfitting - Corelation vs causality - Statistical hypothesis testing - Text analysis

<table>
<tr><td>Teaching/Learning Methodology</td><td>39 hours of class activities including lectures on the main concepts and models, together with applicational case studies, tutorials, class/group problem discussions, and presenting pre-class analysis of their work. Weekly representative simple case-based problems connect programming exercises to workplace problems.

Weekly R programming assignments slowly build up expertise in predictive analytics. Students should be able to work on the assignments on their regular laptop from home.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>Continuous Assessment*</td><td>100%</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1. Class Participation</td><td>10%</td><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>2. Weekly assignments</td><td>60%</td><td>✓</td><td></td><td>✓</td><td></td></tr>
<tr><td>3. Final decision making writeup</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
</table>
*Weighting of assessment methods/tasks in continuous assessment maybe different, subject to each subject lecturer.

To pass this subject, students are required to obtain Grade D or above in the overall subject grade.

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

Class Participation: Students are required to attend class and engage in discussions surrounding organizational issues and debate on applicational case studies.

Weekly Assignment: After-class assessment of the continuous understanding of the concepts, issues, models and applications of machine learning techniques by providing answers to given questions.

Final decision making write-up: The writeup is a potential solution to the organizational problem using machine learning. The reader is expected to be a senior executive of the firm and hence, should be presented in a simple form with charts for those executives to understand and critique.</td></tr>
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Student Study Effort Expected	Class contact:	
	▪ Seminars	39 Hrs.
	Other student study effort:	
	▪ Preparation for lectures	39 Hrs.
	▪ Preparation for individual assignment / group project / class quiz	44 Hrs.
	Total student study effort	122 Hrs.
Reading List and References	Kuhn, M., & Johnson, K. (2013). Applied Predictive Modeling. Springer. Retrieved from https://www.amazon.com/Applied-Predictive-Modeling-Max-Kuhn/dp/1461468485 Molnar, C. (2022). Interpretable Machine Learning: A Guide For Making Black Box Models Explainable. Independently published. Retrieved from https://www.amazon.com/Interpretable-Machine-Learning-Making-Explainable/dp/B09TMWHVB4 (web book available for free https://christophm.github.io/interpretable-ml-book/) Lantz, B. (2023). Machine Learning with R: Learn techniques for building and improving machine learning models, from data preparation to model tuning, evaluation, and working with big data, 4th Edition. Packt Publishing. Retrieved from https://www.amazon.com/Machine-Learning-cleansing-modeling-tidyverse/dp/1801071322	

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