Subject Code	MM6762
Subject Title	Advanced Machine Learning in Business
Credit Value	3
Level	6
Normal Duration	1-semester
Pre-requisite/ Co-requisite/ Exclusion	None
Objectives	This subject contributes to the achievement of the programme outcome by sharpening students' ability to conduct applied research and innovation by critically applying knowledge and scientific skills within their academic discipline and formulating sophisticated solutions as critical thinkers (Outcome 1). Recent development in machine learning, such as Autoencoders, deep neural networks (DNN), transformers, generative adversarial networks (GAN), and most recently, artificial general intelligence (AGI), have greatly impacted the way researchers and practitioners analyze and understand data in different business contexts, in particular, marketing contexts. For example, applying Autoencoders to complex networks of users and brands, marketers now can project all users and brands into a common space and obtain their representations or embeddings, and perform a series of downstream tasks such as user segmentation, market structure analysis of the brands, as well as user-brand matching. For another example, with the help of DNNs, marketers now can decipher the emotion of a streamer in a live stream based on her facial expression, and quantify the effect of positive emotion, i.e., smile, on the number of tips viewers send into the live stream. This course will equip students with advanced knowledge and recent development in machine learning, and how it empowers the derivation of business intelligence. The course aims to achieve the following objectives: 1. Provide a deep understanding of how AI transform marketing strategies and practices. 2. Develop critical thinking and analytical skills to evaluate and implement AI-driven marketing solutions. 3. Foster the ability to formulate and execute AI-powered marketing strategies. 4. Prepare students for leadership roles in academia or industry which focus on AI management and marketing innovation.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Analyse and assess the impact of machine learning and AI on marketing functions, including customer segmentation, targeting, and personalization. b. Developing AI-driven marketing strategies that enhance customer engagement, loyalty, and business performance.

<table>
<tr><td></td><td>c. Contribute to the advancement of AI management and marketing research and innovation.
d. Communicate AI-driven marketing insights and strategies effectively to diverse stakeholders.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td>• Introduction to AI in marketing: Overview of machine learning and AI technology and its relevance to marketing; historical context and key development of AI-driven marketing strategies and practices.
• AI for customer insights and personalization: Customer data analytics and predictive modelling; customer journey mapping with machine learning and AI.
• AI and marketing automation: Chatbots, virtual assistants and conversational AI; A/B testing, field experiments and optimization with AI algorithms; AI marketing automation platform.
• AI in content creation and optimization: AIGC and copywriting; search engine optimization (SEO) and content marketing with AI; visual recognition and content recommendation systems.
• AI in market research and competitive analysis: AI-driven market segmentation and trend analysis; market structure analysis, competitive intelligence and AI-powered benchmarking; brand sentiment analysis.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>The teaching format of the subject will be a combination of lectures, case studies, guest speakers, individual research and presentations. The intensive learning experience will foster student engagement, encourage the application of knowledge, and cultivate problem-solving and critical thinking. Active participation is essential to promote the effectiveness of teaching and learning in the subject.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes
(Note 4)</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. Group project</td><td>30%</td><td></td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>2. Individual research report</td><td>40%</td><td>✓</td><td></td><td>✓</td><td></td></tr>
<tr><td>3. Individual reflection on AI marketing strategy</td><td>10%</td><td>✓</td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>4. Class discussion & presentation</td><td>20%</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 may be different, subject to each subject lecturer.
</td></tr>
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	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: The chosen assessment methods are carefully designed to ensure a comprehensive evaluation of all students effectively and fairly in this subject. *Group project*: The group project offers students a valuable opportunity to conduct a study using AI agents. Working collaboratively in small teams, students are tasked with designing and implementing an experiment that involves AI agents. They begin by selecting an intriguing area and conducting research on a proposed topic. Subsequently, the team narrows down the topic to a few falsifiable research problems and formulates theory-driven and testable hypotheses. Using the hypotheses, students design the experiment, collect the data from AI agents, or both AI agents and human subjects, analyze the data, and report their findings. *Individual research report*: The individual research report aims to develop students' ability to independently carry out practical research work. Each student takes the initiative to discuss research ideas with classmates and the lecturer, eventually selecting a specific research topic for further exploration. Students are required to write a comprehensive report outlining their research plan. This assessment method enhances their understanding and elevates their confidence in conducting research by themselves. *Individual reflection*: This individual reflection assesses students' comprehension of how qualitative and quantitative methods can be applied to AI marketing strategy and entrepreneurship topics. *Class participation and interactions*: As a crucial assessment method in this advanced workshop, class participation and interaction provide valuable feedback to each classmate regarding their research ideas. The experience sharing session in the workshop is evaluated based on active participation, which helps clarify concepts, methodologies, and critical success factors in conducting research projects. *Immediate feedback*: Following presentations, students receive immediate feedback, and all students are encouraged to participate in the subsequent discussions. To pass this subject, students are required to obtain <u>Grade D or above</u> in the Continuous Assessment components.	
Student Study Effort Expected	Class contact:	
	▪ Lectures	30 Hrs.
	Other student study effort:	
	▪ Preparation for lectures	30 Hrs.
	▪ Preparation for assignment / group project and presentation	60 Hrs.
	Total student study effort	120 Hrs.

Reading List and References	Sudhir, K., and Olivier Toubia (2023). *Artificial Intelligence in Marketing*. *Review of Marketing Research*. 20. Emerald Publishing Limited. Rust, Roland T., and Ming-Hui Huang (2021). The Feeling Economy: How Artificial Intelligence is Creating the Era of Empathy. Palgrave Macmillan. Huang, Ming-Hui, and Roland Rust (2021). A strategic framework for artificial intelligence in marketing. *Journal of the Academy of Marketing Science*, 49:30-50. Grewal, Rajdeep, Sachin Gupta, and Rebecca Hamilton (2021). Marketing insights from multimedia data: Text, Image, Audio, and Video. *Journal of Marketing Research*, 58(6):1025-1033. Davenport, Thomas H., Abhijit Guha, and Dhruv Grewal (2021). How to design an AI marketing strategy. Harvard Business Review. Ludwig, Jens, and Sendhil Mullainathan (2024). Machine learning as a tool for hypothesis generation. *Quarterly Journal of Economics*. Forthcoming. Gentzkow, Matthew, Bryan Kelly, and Matt Taddy (2019). Text as data. *Journal of Economic Literature*, 57(3):535-574. Kleinberg, Jon, Himabindu Lakkaraju, Jure Leskovec, Jens Ludwig, and Sendhil Mullainathan (2018). Human decisions and machine predictions. *Quarterly Journal of Economics*, 133(1):237-293. Huang, Ming-Hui, and Roland Rust (2022). A framework for collaborative artificial intelligence in marketing. *Journal of Retailing*, 98(2):209-223. Dzyabura, Daria, and Hema Yoganarasimhan (2018). Machine learning and marketing. In *Handbook of Marketing Analytics: Methods and Applications in Marketing Management, Public Policy, and Litigation Support*, 255-279. Li, Yiyi, and Ying Xie (2020). Is a picture worth a thousand words? An empirical study of image content and social media engagement. *Journal of Marketing Research*, 57(1):1-19. Lin, Yan, Dai Yao, and Xingyu Chen (2021). Happiness begets money: Emotion and engagement in live streaming. *Journal of Marketing Research*, 58(3):417-438. Hao, Yulin, and Dai Yao (2024). Store visits, Locations, and Customer Perceptions: Market structure analysis with customer trajectories in shopping malls. *Working paper*. Reisenbichler, Martin, Thomas Reutterer, David A. Schweidel, and Daniel Dan (2022). Frontiers: Supporting content marketing with natural language generation. *Marketing Science*, 41(3):441-452. Li, Peiyao, Noah Castelo, Zsolt Katona, and Miklos Sarvary (2024). Determining the validity of large language models for automated perceptual analysis. *Marketing Science*, forthcoming.