

Subject Description Form

Subject Code	SN5897
Subject Title	AI in Healthcare: Application and Innovation
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	Artificial Intelligence (AI) is transforming the landscape of healthcare, offering innovative solutions to enhance patient care, streamline clinical workflows, and improve health outcomes. In the context of advanced practice nursing, AI provides powerful tools to process and analyze complex clinical data, support nursing clinical decision-making, and personalize patient treatment. The objective of this course is to equip nurses with the knowledge and skills to effectively integrate AI technologies into their clinical leadership role. Students will learn the process and roadmaps of AI model development, including processing various data format (i.e., unimodal and multimodal), extracting meaningful clinical insights, applying these insights to criticize the AI output, and improve patient care and operational efficiency. This course will cover AI applications such as predictive analytics for patient outcomes, natural language processing for clinical documentation, machine learning and large language models (LLMs) for personalized treatment plans. By the end of the course, students will be able to leverage and criticize AI technologies based on their AI reasoning skills and relevant clinical experience, which could enhance their advanced practice in daily operations, patient outcomes, clinical nursing leadership role and contribute to the advancement of healthcare delivery.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: - Critically analyze the roadmaps of Artificial Intelligence model development; - Describe the AI technology values, application of AI in nursing, and roles of nurses with AI applications; - Describe the fundamental data analytics skills; - Integrate knowledge of Artificial Intelligence applications in nursing and criticize potential problems in clinical settings with theoretical framework; and - Assess the potential challenges of global contemporary ethical issues and impact from AI applications in advanced nursing care.
Subject Synopsis/ Indicative Syllabus	Topics: - The Artificial Intelligence (AI) concepts, including the definition of its sub-categories, machine learning (ML), deep learning (DL), natural language processing (NLP), large language models (LLMs) and Generative AI (GenAI). - The practical data analytics skills, including the definition of data requirements, concepts of data collection, cleaning, pre-processing, post-processing, analytics, and implications in advanced nursing practice.

	3. The commonly used data analytics algorithms in AI models, including simple python codes to read, process, analyse, and visualize data in nursing settings by using Jupyter notebook in online mode. 4. Selected Artificial Intelligence (AI) applications in nursing and illustrate the critique examples with theoretical underpinnings such as SWOT/PAIR model: - Primary health care* - Chronic and ambulatory care - Global/Public health - Mental health - Nursing assessment and education* - Emergency nursing or acute care - Gerontology* (* compulsory) 5. Ethical issues of Artificial Intelligence in nursing, including informed consent to use data, safety and transparency, algorithmic fairness and biases, and data privacy.		
Teaching/Learning Methodology	Teaching and Learning Methods	Intended Subject Learning Outcome	Remarks
	(Hybrid) Lectures/ E-learning modules	a,b,c,d,e	AI concepts and fundamental data analytics skill (i.e. data pre-processing and exploratory) will be given through lectures. There will be in-class activities (e.g., discussions and pair-up exercises) to better engage students in active learning; E-learning modules will be provided for self-exploration.
	Tutorials/Case study	a,d,e	Case studies of AI in advanced practice clinical settings will be provided to illustrate the current application scope, challenges in adoption, clinical significance, thereby reinforcing the fundamental knowledge discussed in lectures. Online tutorials will be given to train hands-on data analytics skills through coding practice in computer-labs to solve AI-related problems in clinical settings.
	On-site/Online visit to health technology organizations (E.g., Google Health, Highmark Health, Microsoft Health, GetWellNetwork, HIMSS, UPMC, Mayo Clinic, ChristianaCare, McKinsey & Com etc.)	b,d,e	The on-site visit presents students with an opportunity to learn from nurse informatician team, or informatics pioneers at a consultation project. The students will be able to learn the critical thinking mindset, decision-making process as an advanced practice nurse with AI knowledge at an international level.

	Oral Presentations	a,b,d	Each group will prepare and deliver a 20-min presentation that describes the existing/newly-proposed AI models and criticize the clinical significance of AI output within advanced nursing practice.					
	Quiz/Test	a,b,c,d,e	Quiz/Test will be given to help students better understand the points discussed in lectures, and to gain more related knowledge through after-class reading and e-module learning.					
Assessment Methods in Alignment with Intended Learning Outcomes	Specific Assessment Methods/Tasks		% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)				
				a	b	c	d	e
	Continuous Assessment							
	• Group Presentation	50%	✓	✓		✓		
	• Online Quiz/ Test	50%	✓	✓	✓	✓	✓	
	Total	100%	✓	✓	✓	✓	✓	
	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:							
	For the continuous assessments, the group presentation is first used to assess learning outcomes a, b, and d; then quiz/test is used for outcomes assessment a - e. The details are as follows:							
	Group presentation: students are required to review the AI fundamental concepts, criticize the AI applications with SWOT analysis/ Nursing Process Model/ PAIR model, and propose actionable solutions to improve the nursing workflow, health outcomes, or operational efficiency.							
	Online Quiz/Test: Students are required to complete and pass the written test which consists of multiple-choice questions and/or short-answer questions for around 30 to 60 minutes.							
Student Study Effort Expected	Class contact:							
	▪ Lectures/Tutorials		39 Hrs.					
	Other student study effort:							
	▪ Self-study (E.g., web-based AI exploration, E-learning, data analytics programming example)		30 Hrs.					
	▪ Presentation preparation		25 Hrs.					
	▪ Quiz/Test preparation		25 Hrs.					
	Total student study effort		115 Hrs.					

Reading List and References	1. Martinez-Ortigosa, A., Martinez-Granados, A., Gil-Hernández, E., Rodriguez-Arrastia, M., Ropero-Padilla, C., & Roman, P. (2023). Applications of artificial intelligence in nursing care: a systematic review. <i>Journal of Nursing Management</i>, 2023(1), 3219127. 2. Ahmad, S., & Jenkins, M. (2022). Artificial Intelligence for Nursing Practice and Management: Current and Potential Research and Education. <i>CIN: Computers, Informatics, Nursing</i>, 40(3), 139-144. 3. Ashrafiyan, H., & Darzi, A. (2018). Transforming health policy through machine learning. <i>PLoS Medicine</i>, 15(11), e1002692. 4. Bishop, Christopher M., <i>Pattern Recognition and Machine Learning</i>. Springer, 2016. 5. Topaz, M., Peltonen, L. M., Michalowski, M., Stiglic, G., Ronquillo, C., Pruinelli, L., ... & Fukahori, H. (2024). The ChatGPT effect: nursing education and generative artificial intelligence. <i>Journal of Nursing Education</i>, 1-4. 6. Boyd, S. and Vandenberghe, L., Introduction to Applied Linear Algebra, <i>Cambridge University Press</i>, 2018. 7. Char, D. S., Shah, N. H., & Magnus, D. (2018). Implementing machine learning in health care—addressing ethical challenges. <i>The New England journal of medicine</i>, 378(11), 981. 8. Deo, R. C. (2015). Machine learning in medicine. <i>Circulation</i>, 132(20), 1920-1930. 9. Flaxman, A. D., & Vos, T. (2018). Machine learning in population health: opportunities and threats. <i>PLoS medicine</i>, 15(11), e1002702. 10. Dos Santos, F. C., Johnson, L. G., Madandola, O. O., Priola, K. J., Yao, Y., Macieira, T. G., & Keenan, G. M. (2024). An example of leveraging AI for documentation: ChatGPT-generated nursing care plan for an older adult with lung cancer. <i>Journal of the American Medical Informatics Association</i>, ocae116. 11. He, J., Baxter, S. L., Xu, J., Xu, J., Zhou, X., & Zhang, K. (2019). The practical implementation of artificial intelligence technologies in medicine. <i>Nature medicine</i>, 25(1), 30-36. 12. Irani, C. S., & Chu, C. H. (2022). Evolving with technology: Machine learning as an opportunity for operating room nurses to improve surgical care—A commentary. <i>Journal of Nursing Management</i>. 13. Jake VanderPlas, <i>Python Data Science Handbook</i>, O'Reilly Media, Inc., 2016. 14. Mobayen, M., Ghazanfari, M. J., Feizkhah, A., Zeydi, A. E., & Karkhah, S. (2022). Machine learning for burns clinical care: Opportunities & challenges. <i>Burns: journal of the International Society for Burn Injuries</i>, S0305-4179. 15. Ng, Z. Q. P., Ling, L. Y. J., Chew, H. S. J., & Lau, Y. (2022). The role of artificial intelligence in enhancing clinical nursing care: A scoping review. <i>Journal of nursing management</i>, 30(8), 3654-3674. 16. Peter Bruce and Andrew Bruce, <i>Practical Statistics for Data Scientists</i>, O'Reilly Media, 2017. 17. Rajkomar, A., Dean, J., & Kohane, I. (2019). Machine learning in medicine. <i>New England Journal of Medicine</i>, 380(14), 1347-1358. 18. Stewart, J., <i>Calculus: Early Transcendentals</i>, 8th Edition, Cengage Learning, 2015. 19. Thapa, R., Garikipati, A., Shokouhi, S., Hurtado, M., Barnes, G., Hoffman, J., ... & Das, R. (2022). Predicting falls in long-term care facilities: machine learning study. <i>JMIR aging</i>, 5(2), e35373.
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	20. von Gerich, H., Moen, H., Block, L. J., Chu, C. H., DeForest, H., Hobensack, M., ... & Peltonen, L. M. (2022). Artificial Intelligence-based technologies in nursing: A scoping literature review of the evidence. <i>International journal of nursing studies</i>, 127, 104153. 21. Chang, C. Y., Jen, H. J., & Su, W. S. (2022). Trends in artificial intelligence in nursing: Impacts on nursing management. <i>Journal of Nursing Management</i>, 30(8), 3644-3653. 22. Yasaka, K., & Abe, O. (2018). Deep learning and artificial intelligence in radiology: Current applications and future directions. <i>PLoS medicine</i>, 15(11), e1002707.
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