Course Title	:	Special Topics in CLD Cluster: Generative Artificial Intelligence
Course Code	:	CLD9099b
Recommended Study Year	:	1
No. of Credits/Term	:	3
Mode of Tuition	:	Lecture-Lab
Class Contact Hours	:	2-hour lecture and 1-hour lab per week
Category	:	Science, Technology, Mathematics and Society Cluster, Core Curriculum
Prerequisite(s)	:	Nil
Co-requisite	:	Nil
Exclusion	:	Students who have taken CCC8015 cannot enrol in this course
Exemption Requirement	:	Nil

Brief Course Description

This course introduces generative artificial intelligence (AI), including fundamental concepts, basic techniques for generating text, images and audio, methods for evaluating and enhancing models, and ethical considerations. Through lectures and hands-on labs, students with no prior AI knowledge will gain practical skills in implementing, critiquing, and refining generative models.

Aims

This course aims to provide students with fundamental knowledge and practical skills in generative AI. Through lectures and hands-on projects, students will learn to implement, critique, and refine basic generative models for creating original content. The course develops competencies in generative techniques while fostering critical thinking about ethical concerns and responsible advancement of the technology. Students will gain first-hand experience in training and leveraging these AI essentials to build a foundation for contributing to the field.

Learning Outcomes (LOs)

On completion of the course, students will be able to:
1. Define and discuss key concepts and terminology related to generative AI including latent spaces, generative adversarial networks, diffusion models, and prompting.
2. Generate novel text, image, and audio content using sampling, fine-tuning, and prompting with neural networks.
3. Develop the ability to evaluate the quality of generated content, identify potential biases, and suggest basic improvements to models and data.
4. Demonstrate the ability to apply pre-trained generative models and manipulate their parameters and inputs to meet specific project guidelines and requirements.
5. Discuss and critically reflect on the ethical concerns, limitations, and potential misuses of generative AI including data bias, misinformation, intellectual property, and effects on creative industries.

Indicative Contents

- Introducing AI and generative models
- Understanding and applying basic generative techniques
- Working with models for text generation
- Working with models for image generation
- Working with models for audio generation
- Evaluating quality and bias in generative AI
- Enhancing generative models
- Investigating ethical and societal implications of generative AI

Teaching Method

Students will meet twice per week:
- Two-hour lecture session in large lecture hall
- One-hour lab section in small groups of ~30 students

Lectures will provide an overview of key concepts and techniques in generative AI. The instructor will present slides, provide demonstrations, and facilitate discussions about real-world applications and ethical considerations.

During the hands-on labs, students will both employ pre-trained generative models and fine-tune their own models to generate text, image, and audio. The instructor will provide guidance as students train models, evaluate outputs, and suggest improvements. Labs will build cumulative skills in applying techniques covered in lectures. Students are encouraged to bring their own laptops. Collaboration is also encouraged during labs.

Measurement of Learning Outcomes

Assessment	LO1	LO2	LO3	LO4	LO5
Lab Continuous Assessment	X	X	X	X	
Lecture Continuous Assessment	X	X	X	X	
Essay Assignment	X	X	X		X
Coding Assignment		X	X	X	
Group Project	X	X	X	X	X

Assessment

Lab Continuous Assessment (in-class quizzes and attendance)	20%
Lecture Continuous Assessment (in-class quizzes and attendance)	20%
Essay Assignment (written report)	15%
Coding Assignment (code implementation)	15%
Group Project (project report and presentation)	30%

Recommended/Supplementary Readings

1. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. *Deep Learning*. MIT press, 2016.
2. Russell, Stuart J., and Peter Norvig. *Artificial Intelligence: A Modern Approach*. London, 2010.
3. Smith, Patrick D. *Hands-On Artificial Intelligence for Beginners: An introduction to AI concepts, algorithms, and their implementation*. Packt Publishing Ltd, 2018.
4. Kaddoura, Sanaa. *A Primer on Generative Adversarial Networks*. Springer Nature, 2023.

Supplementary Readings from a variety of sources will be uploaded on Moodle.

Important Notes

(1) Students are expected to spend a total of 9 hours (i.e., 3 hours of class contact and 6 hours of personal study) per week to achieve the course learning outcomes.

(2) Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examination and Coursework. In particular, plagiarism, being a kind of dishonest practice, is "the presentation of another person's work without proper acknowledgement of the source, including exact phrases, or summarised ideas, or even footnotes/citations, whether protected by copyright or not, as the student's own work". Students are required to strictly follow university regulations governing academic integrity and honesty.

(3) Students are required to submit writing assignment(s) using Turnitin.

(4) To enhance students' understanding of plagiarism, a mini-course "Online Tutorial on Plagiarism Awareness" is available on https://pla.ln.edu.hk/.

(5) Students are allowed to employ AI-enabled tools in their course assignments of Tech Report and Group Presentation. Declaration of the use of Generative AI tools and the explanation how the generated materials have been incorporated into the assignments should be included in the submitted assignments. Besides, students should reference the Generative AI generated materials in their work with accepted academic conventions.

Rubric for Lab Continuous Assessment

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Lab Participation and Attendance (10%)	Regular and engaged participant in labs, often sparking insightful discussions and providing peer support.	Attends labs regularly, participates in discussions, but may be hesitant to ask questions.	Attends most labs, occasionally participates in discussions.	Attendance is inconsistent and active contribution to discussions is rare.	Rarely attends labs, does not participate in discussions.
Code Quality (20%)	Produces efficient, clean, and well-documented code that demonstrates a superior understanding of programming best practices.	Code is understandable and organised, demonstrating a good grasp of programming.	Code is generally organised, though may lack some best practices.	Code is somewhat disorganised and hard to follow, signifying a need for improvement in coding skills.	Code is disorganised and hard to follow, signifying a lack of basic coding skills.
Data Management and Model Training (20%)	Excels in data pre-processing and model training, and is adept at choosing and applying the appropriate evaluation metrics.	Shows competency in data handling and model training, but may struggle with advanced techniques.	Can conduct basic data pre-processing and model training but struggles with more complex tasks.	Struggles significantly with data pre-processing, model training, and applying appropriate evaluation metrics.	Unable to conduct data pre-processing, model training, and applying appropriate evaluation metrics.
Debugging Skills (10%)	Exhibits excellent problem-solving skills, resolves issues effectively, and shows initiative in troubleshooting.	Can identify and resolve most issues, but may need occasional assistance.	Can identify some issues, often needs assistance.	Struggles to identify and resolve issues, often requires help.	Unable to identify and resolve issues, lacks a systematic approach to problem-solving.
Understanding of Course Concepts (10%)	Demonstrates deep understanding of AI principles and generative models.	Demonstrates good understanding of AI principles and generative models, but may struggle with some complex topics.	Understands basic AI principles and generative models, but struggles with complex topics.	Struggles significantly with understanding AI principles and generative models.	Unable to understand AI principles and generative models.
Ability to Apply Generative AI (10%)	Successfully applies generative techniques in different contexts with very few errors.	Generally applies generative techniques correctly, with some errors.	Applies generative techniques with frequent errors.	Struggles significantly with applying generative techniques correctly.	Unable to apply generative techniques correctly.
Evaluation of Generated Contents (10%)	Thoroughly understands how to evaluate generative AI outputs and recognise potential biases.	Has a good understanding of AI evaluation and bias, but may struggle with complex evaluations.	Understands basic AI evaluation and bias, but struggles with complex evaluations.	Struggles significantly with evaluating AI outputs and understanding bias.	Unable to evaluate AI outputs and understand bias.

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Ability to Enhance Generative Models (10%)	Shows excellent knowledge on how to enhance generative models for better performance.	Shows good understanding of how to enhance generative models, but may struggle with more complex enhancements.	Has a basic understanding of how to enhance generative models, but struggles with complex enhancements.	Struggles significantly with understanding how to enhance generative models.	Unable to understand how to enhance generative models.

Rubric for Lecture Continuous Assessment

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Lecture Participation and Attendance (10%)	Regularly attends and actively participates in all lectures.	Mostly attends and participates in lectures, with a few absences.	Attends some lectures, but rarely participates.	Frequently absent and/or does not actively participate in lectures.	Rarely attends lectures, does not participate in discussions.
Understanding of Course Concepts (30%)	Demonstrates deep understanding of AI principles and generative models.	Demonstrates good understanding of AI principles and generative models, but may struggle with some complex topics.	Understands basic AI principles and generative models, but struggles with complex topics.	Struggles significantly with understanding AI principles and generative models.	Unable to understand AI principles and generative models.
Ability to Apply Generative AI (20%)	Successfully applies generative techniques in different contexts with very few errors.	Generally applies generative techniques correctly, with some errors.	Applies generative techniques with frequent errors.	Struggles significantly with applying generative techniques correctly.	Unable to apply generative techniques correctly.
Evaluation of Generated Contents (20%)	Thoroughly understands how to evaluate generative AI outputs and recognise potential biases.	Has a good understanding of AI evaluation and bias, but may struggle with complex evaluations.	Understands basic AI evaluation and bias, but struggles with complex evaluations.	Struggles significantly with evaluating AI outputs and understanding bias.	Unable to evaluate AI outputs and understand bias.
Ability to Enhance Generative Models (20%)	Shows excellent knowledge on how to enhance generative models for better performance.	Shows good understanding of how to enhance generative models, but may struggle with more complex enhancements.	Has a basic understanding of how to enhance generative models, but struggles with complex enhancements.	Struggles significantly with understanding how to enhance generative models.	Unable to understand how to enhance generative models.

Rubric for Essay Assignment

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Understanding of Course Concepts (20%)	Demonstrates deep understanding of AI principles and generative models.	Demonstrates good understanding of AI principles and generative models, but may struggle with some complex topics.	Understands basic AI principles and generative models, but struggles with complex topics.	Struggles significantly with understanding AI principles and generative models.	Unable to understand AI principles and generative models.
Ability to Apply Generative AI (20%)	Successfully applies generative techniques in different contexts with very few errors.	Generally applies generative techniques correctly, with some errors.	Applies generative techniques with frequent errors.	Struggles significantly with applying generative techniques correctly.	Unable to apply generative techniques correctly.
Evaluation of Generated Contents (20%)	Thoroughly understands how to evaluate generative AI outputs and recognise potential biases.	Has a good understanding of AI evaluation and bias, but may struggle with complex evaluations.	Understands basic AI evaluation and bias, but struggles with complex evaluations.	Struggles significantly with evaluating AI outputs and understanding bias.	Unable to evaluate AI outputs and understand bias.
Critical Thinking of Generative AI (10%)	Provides a balanced, in-depth analysis of the ethical implications, limitations, and potential misuses of generative AI models.	Identifies key ethical issues and attempts to reflect critically on the pros and cons of generative AI models.	Attempts to reflect on the ethical implications of generative AI, but lacks depth in analysis.	Struggles to critically reflect on the ethical implications of generative AI.	Unable to mention ethical concerns or limitations and lack critical analysis and reflection on generative AI.
Report Format (10%)	Follows through the formal scientific report conventions.	Follows most of the format with occasional mistakes.	Follow most of the format which sequences mixed.	Fail to follow most of the format.	Completely fail to follow the format.
Literature Review (10%)	Uses a variety of relevant sources, correctly cited following academic standards.	Uses some relevant sources, with minor citation errors.	Uses few sources and/or has several citation errors.	Uses few to no sources and/or frequently incorrectly cites sources.	Few to no sources used, or sources are incorrectly cited.
Uses language effectively (10%)	Clear, engaging writing, with almost no mistakes in grammar or spelling.	Occasional mistakes in grammar or spelling which do not interfere with comprehension.	Substantial mistakes that sometimes make comprehension difficult.	Significant portions cannot be accurately assessed because of problems with the writing.	The content is difficult or impossible to evaluate.

Rubric for Coding Assignment

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Ability to Apply Generative AI (20%)	Successfully applies generative techniques in different contexts with very few errors.	Generally applies generative techniques correctly, with some errors.	Applies generative techniques with frequent errors.	Struggles significantly with applying generative techniques correctly.	Unable to apply generative techniques correctly.
Evaluation of Generated Contents (20%)	Thoroughly understands how to evaluate generative AI outputs and recognise potential biases.	Has a good understanding of AI evaluation and bias, but may struggle with complex evaluations.	Understands basic AI evaluation and bias, but struggles with complex evaluations.	Struggles significantly with evaluating AI outputs and understanding bias.	Unable to evaluate AI outputs and understand bias.
Ability to Enhance Generative Models (20%)	Shows excellent knowledge on how to enhance generative models for better performance.	Shows good understanding of how to enhance generative models, but may struggle with more complex enhancements.	Has a basic understanding of how to enhance generative models, but struggles with complex enhancements.	Struggles significantly with understanding how to enhance generative models.	Unable to understand how to enhance generative models.
Code Quality (10%)	Produces efficient, clean, and well-documented code that demonstrates a superior understanding of programming best practices.	Code is understandable and organised, demonstrating a good grasp of programming.	Code is generally organised, though may lack some best practices.	Code is somewhat disorganised and hard to follow, signifying a need for improvement in coding skills.	Code is disorganised and hard to follow, signifying a lack of basic coding skills.
Data Management and Model Training (20%)	Excels in data pre-processing and model training, and is adept at choosing and applying the appropriate evaluation metrics.	Shows competency in data handling and model training, but may struggle with advanced techniques.	Can conduct basic data pre-processing and model training but struggles with more complex tasks.	Struggles significantly with data pre-processing, model training, and applying appropriate evaluation metrics.	Unable to conduct data pre-processing, model training, and applying appropriate evaluation metrics.
Debugging Skills (10%)	Exhibits excellent problem-solving skills, resolves issues effectively, and shows initiative in troubleshooting.	Can identify and resolve most issues, but may need occasional assistance.	Can identify basic issues but often needs assistance to resolve them.	Struggles to identify and resolve issues, frequently requires help.	Unable to identify and resolve issues, lacks a systematic approach to problem-solving.

Rubric for Group Project Report

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Team Collaboration (10%)	All team members actively participate during the project, exhibiting cohesive teamwork and balanced contributions.	Most team members participate with minor issues in balance or cohesion.	Some team members participate, but there are evident issues in balance and cohesion.	Participation is uneven among team members with significant issues in collaboration.	Little to no effective team interaction, severe issues in collaboration.
Report Format (10%)	Follows through the formal scientific report conventions.	Follows most of the format with occasional mistakes.	Follow most of the format which sequences mixed.	Fail to follow most of the format.	Completely fail to follow the format.
Literature Review (5%)	Uses a variety of relevant sources, correctly cited following academic standards.	Uses some relevant sources, with minor citation errors.	Uses few relevant sources, with several citation errors.	Few to no sources used, or sources are incorrectly cited.	Does not use sources or fails to cite them appropriately.
Uses language effectively (5%)	Clear, engaging writing, with almost no mistakes in grammar or spelling.	Occasional mistakes in grammar or spelling which do not interfere with comprehension.	Substantial mistakes that sometimes make comprehension difficult.	Significant portions cannot be accurately assessed because of problems with the writing.	The content is difficult or impossible to evaluate.
Understanding of Course Concepts (10%)	Demonstrates deep understanding of AI principles and generative models.	Demonstrates good understanding of AI principles and generative models, but may struggle with some complex topics.	Understands basic AI principles and generative models, but struggles with complex topics.	Struggles significantly with understanding AI principles and generative models.	Unable to understand AI principles and generative models.
Ability to Apply Generative AI (20%)	Successfully applies generative techniques in different contexts with very few errors.	Generally applies generative techniques correctly, with some errors.	Applies generative techniques with frequent errors.	Struggles significantly with applying generative techniques correctly.	Unable to apply generative techniques correctly.
Evaluation of Generated Contents (10%)	Thoroughly understands how to evaluate generative AI outputs and recognise potential biases.	Has a good understanding of AI evaluation and bias, but may struggle with	Understands basic AI evaluation and bias, but struggles with complex evaluations.	Struggles significantly with evaluating AI outputs and understanding bias.	Unable to evaluate AI outputs and understand bias.

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
		complex evaluations.			
Ability to Enhance Generative Models (20%)	Shows excellent knowledge on how to enhance generative models for better performance.	Shows good understanding of how to enhance generative models, but may struggle with more complex enhancements.	Has a basic understanding of how to enhance generative models, but struggles with complex enhancements.	Struggles significantly with understanding how to enhance generative models.	Unable to understand how to enhance generative models.
Critical Thinking of Generative AI (10%)	Provides a balanced, in-depth analysis of the ethical implications, limitations, and potential misuses of generative AI models.	Identifies key ethical issues and attempts to reflect critically on the pros and cons of generative AI models.	Attempts to reflect on the ethical implications of generative AI, but lacks depth in analysis.	Struggles to critically reflect on the ethical implications of generative AI.	Unable to mention ethical concerns or limitations and lack critical analysis and reflection on generative AI.

Rubric for Group Project Presentation

Criteria	Excellent (A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Poor (D+, D)	Fail (F)
Team Collaboration (20%)	All team members actively participate during the presentation, exhibiting cohesive teamwork and balanced contributions.	Most team members participate with minor issues in balance or cohesion.	Some team members participate, but there are evident issues in balance and cohesion.	Participation is uneven among team members with significant issues in collaboration.	Little to no effective team interaction, severe issues in collaboration.
Presentation Organization (30%)	The presentation content is well-articulated, easy to understand, and follows a logical flow from problem definition to solution.	Most of the presentation content is clear, with some sections lacking coherence or logical flow.	Some parts of the presentation are clear, but many sections lack coherence or logical flow.	The presentation is often unclear, disjointed or difficult to follow.	The presentation is consistently unclear, disjointed, or difficult to follow.
Visual Aids (20%)	Visual aids such as animations or props are used effectively, enhancing audience understanding. The aids are clear, relevant, and professionally designed.	Visual aids are mostly effective, but some could be clearer, more relevant, or more professionally designed.	Visual aids are used, but many could be clearer, more relevant, or more professionally designed.	Visual aids are poorly designed, irrelevant, overly complex, or confusing, or are not used when they could enhance understanding.	Visual aids are either absent, irrelevant, or counterproductive to audience understanding.
Engagement of Audience (20%)	The team engages the audience effectively, maintaining interest throughout the presentation. The team invites questions, responds well to them, and integrates audience feedback.	The team attempts to engage the audience and respond to questions, but there's room for improvement in maintaining interest or handling Q&A.	The team somewhat engages the audience and responds to questions, but struggles significantly in maintaining interest or handling Q&A.	The team does not effectively engage the audience, often fails to handle questions well, or does not invite or respond well to feedback.	The team fails to engage the audience, cannot handle questions effectively, and does not respond well to feedback.
Time Management (10%)	The presentation fits within the allotted time, with appropriate pacing that neither rushes nor drags, allowing for questions and discussion.	The presentation mostly fits within the allotted time, with minor issues in pacing, possibly rushing some parts or not leaving enough time for questions.	The presentation barely fits within the allotted time, with noticeable issues in pacing, either rushing through content or exceeding the allotted time.	The presentation does not fit well within the allotted time, with significant issues in pacing, either rushing through content or exceeding the allotted time.	The presentation is far beyond the allotted time, or too short, with severe pacing issues.