

# 國立清華大學 學習科學與科技所

## 新素養和內容分析與生成

(暫擬課綱)

Fall 2024, 3 credits (中文授課)

Time: Tuesday, 2, 3, 4 Location: Room 409, General Building

授課老師: 陳素燕教授 ([suychen@mx.nthu.edu.tw](mailto:suychen@mx.nthu.edu.tw))

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數位學習: eLearn 平台

### 課程說明

日新月異的科技正在重新定義 21 世紀的讀寫素養(literacy)、資訊理解與表達能力(information understanding and expression)、以及內容分析詮釋(content analysis and interpretation)與內容生成創用(content generation, appropriation and creation)。新素養(New Literacies)研究從偏重傳統課堂文本理解到數位資訊和網路參與文化，從文字為主體的讀寫素養到多模態素養(本課程專注在文字與圖像兩種模態的討論)，從基本技能到個人/公民/生涯發展的多重素養，再銜接到 Generative AI 時代下 ChatGPT, Midjourney, and Stable Diffusion 等模型的 text2text 和 text2image 的應用作為最前沿新素養的想像。

在課程內容上，老師在第二週和第四週會(一)介紹新素養的理念以及和內容分析與生成的關連；然後(二)進入文字和圖像的內容分析、內容生成和分析生成的綜合運用；接著(三)探討生成式 AI 在三個 domains 的最新應用研究:學習領域、身心健康照護領域、和說故事領域。

本課程兩個層次的教學目標為：(1)通過文獻討論，構立對新素養、內容分析與生成等學術論文的基本理解。(2)安排實作範例，邀請有實務經驗的研究者與學生專家來進行交流。在課程規劃上，約有 3/4 的週次是簡報分享與討論(paper presentation and leading discussion)，1/4 的週次是實做交流(invited talk, workshops, final project presentation)。在學習期待上，每位同學需進行三篇論文簡報與討論帶領，在論文的挑選上，此版本課綱所羅列的論文選單只是提供修課同學參考，非常歡迎同學在選單外提供自選論文。Final project 則形式多元，可以從事文本分析或圖像分析，或者進行文字生成與圖像生成的嚐試與研究實驗。

本課程鼓勵學生利用 AI 進行協作或互學，以提升本門課產出品質。根據清華大學公布之「大學教育場域 AI 協作、共學與素養培養指引」，本門課程採取有條件開放，以下說明如何使用生成式 AI 於課程產出:學生須於課堂作業或報告中的「標題頁註腳」或「引用文獻後」簡要說明如何使用生成式 AI 進行議題發想、文句潤飾或結構參考等使用方式。相對地，本門課授課教材或學習資料若有引用自生成式 AI，教師也將在投影片或口頭標注。

## 課程主題

		<b>Topic</b>
1	9/03	Course introduction
2	9/10	Overview on new literacies, content analysis and generation
3	9/17	中秋節
4	9/24	Overview on new literacies, content analysis and generation
5	10/1	Content analysis: Text mining & Image Understanding
6	10/8	Content generation: Generative AI and LLM
7	10/15	Content analysis and generation: Prompting, RAG
8	10/22	專題演講與實作
9	10/29	Image generation and creativity
10	11/5	ChatGPT: Application in learning- Activities design
11	11/12	ChatGPT: Application in learning- Empirical studies
12	11/19	ChatGPT: Application in healthcare
13	11/26	ChatGPT: Application in storytelling
14	12/3	專題演講與實作
15	12/10	Final project presentation
16	12/17	Final project presentation

## 週次進度及論文選單

### **Week 2 (9/10)**

#### **Overview on new literacies, content analysis and generation**

### **Week 4 (9/24)**

#### **Overview on new literacies, content analysis and generation**

### **Week 5 (10/1)**

#### **Content analysis: Text mining & Image Understanding**

1. Haque, M. U., Dharmadasa, I., Sworna, Z. T., Rajapakse, R. N., & Ahmad, H. (2022). " I think this is the most disruptive technology": Exploring Sentiments of ChatGPT Early Adopters using Twitter Data. arXiv preprint arXiv:2212.05856.
2. Taecharunroj, V. (2023). "What Can ChatGPT Do?" Analyzing Early Reactions to the Innovative AI Chatbot on Twitter. *Big Data and Cognitive Computing*, 7(1), 35.
3. Cetinic, E., & She, J. (2022). Understanding and creating art with AI: review and outlook. *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, 18(2), 1-22.
4. Zhang, J., Miao, Y., & Yu, J. (2021). A Comprehensive Survey on Computational Aesthetic Evaluation of Visual Art Images: Metrics and Challenges. *IEEE Access*

### **Week 6 (10/8)**

#### **Content generation: Generative AI and LLM**

5. Gozalo-Brizuela, R., & Garrido-Merchan, E. C. (2023). ChatGPT is not all you need. A State of the Art Review of large Generative AI models. arXiv preprint arXiv:2301.04655.
6. Shi, J., Jain, R., Doh, H., Suzuki, R., & Ramani, K. (2023). An HCI-Centric Survey and Taxonomy of Human-Generative-AI Interactions. arXiv preprint arXiv:2310.07127.
7. Hadi, M. U., Qureshi, R., Shah, A., Irfan, M., Zafar, A., Shaikh, M. B., ... & Mirjalili, S. (2023). A survey on large language models: Applications, challenges, limitations, and

practical usage. TechRxiv.

8. Wu, T., He, S., Liu, J., Sun, S., Liu, K., Han, Q. L., & Tang, Y. (2023). A brief overview of ChatGPT: The history, status quo and potential future development. *IEEE/CAA Journal of Automatica Sinica*, 10(5), 1122-1136.

### **Week 7 (10/15)**

#### **Content analysis and generation: Prompting, RAG**

9. White, J., Fu, Q., Hays, S., Sandborn, M., Olea, C., Gilbert, H., ... & Schmidt, D. C. (2023). A Prompt Pattern Catalog to Enhance Prompt Engineering with ChatGPT. arXiv preprint arXiv:2302.11382.
10. Oppenlaender, J., Linder, R., & Silvennoinen, J. (2023). Prompting ai art: An investigation into the creative skill of prompt engineering. arXiv preprint arXiv:2303.13534.
11. Lee, U., Han, A., Lee, J., Lee, E., Kim, J., Kim, H., & Lim, C. (2023). Prompt Aloud!: Incorporating image-generative AI into STEAM class with learning analytics using prompt data. *Education and Information Technologies*, 1-31.
12. Hutson, J., & Cotroneo, P. (2023). Generative AI tools in art education: Exploring prompt engineering and iterative processes for enhanced creativity. *Metaverse*, 4(1).
13. Dehouche, N., & Dehouche, K. (2023). What's in a text-to-image prompt? The potential of stable diffusion in visual arts education. *Heliyon*
14. Sanchez, T. (2023, June). Examining the Text-to-Image Community of Practice: Why and How do People Prompt Generative AIs?. In *Proceedings of the 15th Conference on Creativity and Cognition* (pp. 43-61).
15. Gao, Y., Xiong, Y., Gao, X., Jia, K., Pan, J., Bi, Y., ... & Wang, H. (2023). Retrieval-augmented generation for large language models: A survey. arXiv preprint arXiv:2312.10997.
16. Xiong, G., Jin, Q., Lu, Z., & Zhang, A. (2024). Benchmarking retrieval-augmented generation for medicine. arXiv preprint arXiv:2402.13178.
17. Hu, E. J., Shen, Y., Wallis, P., Allen-Zhu, Z., Li, Y., Wang, S., ... & Chen, W. (2021). Lora: Low-rank adaptation of large language models. arXiv preprint arXiv:2106.09685.

### **Week 8 (10/22)**

#### **專題演講與實作**

### **Week 9 (10/29)**

#### **Image generation and creativity**

18. Oppenlaender, J. (2022, November). The creativity of text-to-image generation. In *Proceedings of the 25th International Academic Mindtrek Conference* (pp. 192-202).
19. Zhou, E., & Lee, D. (2024). Generative artificial intelligence, human creativity, and art. *PNAS nexus*, 3(3), pgae052.
20. Tigre Moura, F., Castrucci, C., & Hindley, C. (2023). Artificial intelligence creates art? An experimental investigation of value and creativity perceptions. *The Journal of Creative Behavior*, 57(4), 534-549.

### **Week 10 (11/5)**

#### **ChatGPT: Application in learning- Activities design**

21. Chiu, T. K. (2023). The impact of Generative AI (GenAI) on practices, policies and research direction in education: a case of ChatGPT and Midjourney. *Interactive Learning Environments*, 1-17.
22. Chiu, T. K. (2024). A classification tool to foster self-regulated learning with generative

- artificial intelligence by applying self-determination theory: a case of ChatGPT. *Educational technology research and development*, 1-16
23. Rachmann, A. (2024). Six Thinking Chatbots: A Creativity Technique deployed via a Large Language Model.
  24. Martha, K. (2023). Improving Critical Thinking in Written Assignments: Human vs. ChatGPT Tutor in Socratic Questioning Intervention.
  25. Wu, Y. (2024). Critical Thinking Pedagogics Design in an Era of ChatGPT and Other AI Tools—Shifting From Teaching “What” to Teaching “Why” and “How”. *Journal of Education and Development*, 8(1), 1.

### **Week 11 (11/12)**

#### **ChatGPT: Application in learning- Empirical studies**

26. Jauhiainen, J. S., & Guerra, A. G. (2023). Generative AI and ChatGPT in School Children’s Education: Evidence from a School Lesson. *Sustainability*, 15 (18): 14025.
27. Liao, J., Zhong, L., Zhe, L., Xu, H., Liu, M., & Xie, T. (2024). Scaffolding Computational Thinking with ChatGPT. *IEEE Transactions on Learning Technologies*..
28. Wu, T. T., Lee, H. Y., Li, P. H., Huang, C. N., & Huang, Y. M. (2024). Promoting self-regulation progress and knowledge construction in blended learning via ChatGPT-based learning aid. *Journal of Educational Computing Research*, 61(8), 3-31.
29. Lee, H. Y., Chen, P. H., Wang, W. S., Huang, Y. M., & Wu, T. T. (2024). Empowering ChatGPT with guidance mechanism in blended learning: effect of self-regulated learning, higher-order thinking skills, and knowledge construction. *International Journal of Educational Technology in Higher Education*, 21(1), 1-28.

### **Week 12 (11/19)**

#### **ChatGPT: Application in healthcare**

30. Kung, T. H., Cheatham, M., Medenilla, A., Sillos, C., De Leon, L., Elepaño, C., ... & Tseng, V. (2023). Performance of ChatGPT on USMLE: Potential for AI-assisted medical education using large language models. *PLoS digital health*, 2(2), e0000198.
31. Wang, D. Q., Feng, L. Y., Ye, J. G., Zou, J. G., & Zheng, Y. F. (2023). Accelerating the integration of ChatGPT and other large-scale AI models into biomedical research and healthcare. *MedComm—Future Medicine*, 2(2), e43
32. Cheng, S. W., Chang, C. W., Chang, W. J., Wang, H. W., Liang, C. S., Kishimoto, T., ... & Su, K. P. (2023). The Now and Future of ChatGPT and GPT in Psychiatry. *Psychiatry and Clinical Neurosciences*.
33. Kumar, H., Wang, Y., Shi, J., Musabirov, I., Farb, N. A., & Williams, J. J. (2023, April). Exploring the use of large language models for improving the awareness of mindfulness. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems* (pp. 1-7).
34. Seo, W., Yang, C., & Kim, Y. H. (2023). ChaCha: Leveraging Large Language Models to Prompt Children to Share Their Emotions about Personal Events. *arXiv preprint arXiv:2309.12244*.

### **Week 13 (11/26)**

#### **ChatGPT: Application in storytelling**

35. Gursesli, M. C., Taveekitworachai, P., Abdullah, F., Dewantoro, M. F., Lanata, A., Guazzini, A., ... & Thawonmas, R. (2023, October). The Chronicles of ChatGPT: Generating and Evaluating Visual Novel Narratives on Climate Change Through ChatGPT. In *International Conference on Interactive Digital Storytelling* (pp. 181-194). Cham: Springer Nature Switzerland.

36. Chu, H., & Liu, S. (2023). Can AI tell good stories? Narrative Transportation and Persuasion with ChatGPT.
37. Zhang, C., Liu, X., Ziska, K., Jeon, S., Yu, C. L., & Xu, Y. (2024). Mathemyths: Leveraging Large Language Models to Teach Mathematical Language through Child-AI Co-Creative Storytelling. arXiv preprint arXiv:2402.01927.2

**Week 14 (12/3)**

專題演講與實作

**Week 15 (12/10)**

**Final Project Presentation**

**Week 16 (12/17)**

**Final Project Presentation**

**評量配置**

1. Attendance and participation 20%
2. Select 3 articles from the above class reading (self-selected articles are also welcome!) and conduct Paper Presentations 45 %
  - \* Will discuss article selections on the second week
  - \* Please turn in your PPT by Sunday midnight before your presentations
  - \* Each presentation is 50 minutes, including PPT presentation and activities/leading discussion)
3. Final team or individual project 35%