

Applications of Generative AI

Collaboration with ChatGPT/Gemini

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What can Gen-AI do for me?



Tools ⇄ Applications

Chia-Feng Lu



Prompts 提詞/指令

What can Gen-AI do for me?

- 院長找我寫計畫，請幫我委婉拒絕，100字以內。
- English as a medium of instruction成功的要素有哪些？
 - What is the common pathology of gliomas?
 - What is the MRI technique for the diagnosis of ischemic stroke?
 - What is patient screening procedure for MRI exam?

Chia-Feng Lu



Chia-Feng Lu: 院長找我寫計畫，請幫我委婉拒絕，100字以內。

ChatGPT: 非常感謝院長信任我的能力，讓我參與計畫的機會。然而，目前工作已經相當繁忙，我需要專注於眼前的任務。希望能有機會在未來協助類似的計畫。再次感謝您的理解與支持。

Chia-Feng Lu: 請改為250字以內。

ChatGPT:

尊敬的院長：

感謝您對我的信任，邀請我撰寫此次計畫。這對我來說是一個很大的榮譽，也非常感謝您對我能力的肯定。然而，近期我手頭已有多個重要專案需要全力投入，時間和精力上較為緊張，恐難以在預期時間內完成高品質的計畫書。

為了確保計畫的質量和進度，我認為讓其他在這方面更有空間和經驗的同事來負責可能會更合適。當然，如果有其他需要我協助的地方，我非常樂意在能力範圍內提供支持。

再次感謝您的理解和支持，期望未來能有更多合作的機會。

Chia-Feng Lu

Prompt: What is patient screening procedure for MRI exam? Make a table, please.



Step	Procedure	Explanation		
1	Questionnaire	Patients complete a questionnaire providing their medical history, surgeries, implants, allergies, medications, and other relevant information.		
2	Metal Screening	5	Pregnancy Screening	Pregnant women discuss the possibility of the MRI with the healthcare provider; risks and benefits are assessed. Generally, MRI during the first trimester is avoided.
3	Health Conditions	6	Communication	Patients openly communicate any concerns or questions with the healthcare team during the screening process.
4	Contrast Agent	7	Preparation Instructions	Patients receive instructions on food, drink, and clothing requirements before the MRI exam. Loose-fitting clothing without metal is often recommended.
		8	Informing the Technologist	On the day of the exam, patients verbally communicate any changes in their medical history or condition to the MRI technologist. The technologist reviews the screening information.

Is it correct?

Chia-Feng Lu



Example #1

FDA to require mammogram reports include breast density information

By Janelle Chavez, CNN
Updated 1:16 PM EST, Fri March 10, 2023

“Newly updated US Food and Drug Administration regulations will require mammography facilities to notify patients about the density of their breasts. Women with dense breasts are at higher risk for breast cancer, and dense tissue can make cancer harder to detect in mammograms. Still, few women recognize dense breasts as a significant risk factor for cancer. The FDA update announced Thursday will also strengthen the agency’s oversight over mammogram facilities, allowing it to communicate directly with patients if a facility didn’t meet standards.”

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Importance of an informative prompt to guide ChatGPT

Please reorganize the following paragraph for a PowerPoint slide.

My prompt.

“Newly updated US Food and Drug Administration regulations will require mammography facilities to notify patients about the density of their breasts. Women with dense breasts are at higher risk for breast cancer, and dense tissue can make cancer harder to detect in mammograms. Still, few women recognize dense breasts as a significant risk factor for cancer. The FDA update announced Thursday will also strengthen the agency’s oversight over mammogram facilities, allowing it to communicate directly with patients if a facility didn’t meet standards.”

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Title: Updated FDA Regulations Enhance Patient Awareness and Facility Oversight in Mammography



Slide 1:

- Title: Updated FDA Regulations Enhance Patient Awareness and Facility Oversight in Mammography
- Introduction: In light of new regulations from the US Food and Drug Administration (FDA), mammography facilities are required to provide important information to patients regarding breast density.

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Slide 2:

- Title: Breast Density and Increased Cancer Risk
- Point 1: Women with dense breasts have a higher risk of developing breast cancer.
- Point 2: Dense breast tissue can make cancer detection more challenging during mammograms.
- Point 3: Unfortunately, the significance of dense breasts as a risk factor for cancer often goes unnoticed by women.

Basically, ChatGPT simply breaks down sentences into three slides.

Slide 3:

- Title: Strengthening FDA Oversight
- Point 1: The recent FDA update announced on Thursday reinforces the agency's oversight over mammogram facilities.
- Point 2: The FDA now has the authority to directly communicate with patients if a facility fails to meet the required standards.
- Point 3: This measure ensures that patients receive quality care and timely information about their mammogram results.

Note: Remember to include relevant visuals, charts, or images to support the content on each slide.

Chia



Specify conditions

Prompts with language awareness & slide design.

(Teaching language)

Please use spoken English to simplify the following paragraph so that the reader with a TOEIC score of 500 can understand. Please use 5 (bullet points) and 8 (word limit) principle to organize it as PowerPoint slides.

(Slide design)

(English proficiency level)

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With proper prompts, ChatGPT can create suitable slide content for EMI!



ChatGPT

Slide 1:

- Title: FDA Regulations for Mammography Facilities and Breast Density
- Introduction: The FDA has new rules for mam

Slide 2:

- Title: Importance of Breast Density
- Point 1: Dense breasts increase breast cancer risk.
- Point 2: Cancer can be harder to spot in dense breasts.
- Point 3: Many women don't know dense breasts increase risk.

Slide 3:

- Title: Patient Notifications
- Point 1: Facilities must tell patients about their breast density.
- Point 2: This helps patients understand their own risk.
- Point 3: Early detection can improve outcomes.

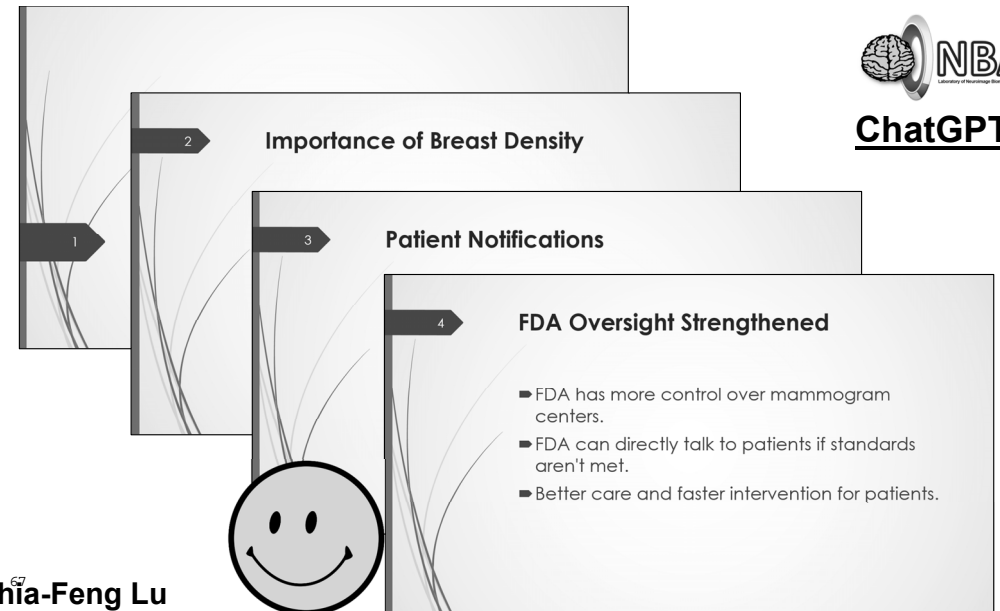
Slide 4:

- Title: FDA Oversight Strengthened
- Point 1: FDA has more control over mammogram centers.
- Point 2: FDA can directly talk to patients if standards aren't met.
- Point 3: Better care and faster intervention for patients.

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ChatGPT



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Step 1: What are key elements of “Materials & Methods” for an image analysis paper?

(Professor ↔ students)



Example #2

Materials & Methods
(700~1000 words)

Reproducibility

- Description of IRB approval, informed consent form w/wo signature
- Data resources/acquisition
 - prospective/retrospective study
 - population, institutions/database
 - inclusion/exclusion criteria
 - imaging modality/scanner/sequences/parameters/spatial resolution/slice thickness
 - clinical data
- Experimental design
 - clinical trial
 - functional study
 - animal/preclinical study
- Processing Steps
 - Preprocessing of image (quality/uniformity)
 - key techniques (quantitative analysis/machine learning)
 - hardware/platform/environment for analysis
 - Workflow of data analysis (a Figure)
- Statistical analyses
 - Demographic analysis (baseline difference)
 - Technique comparison (superiority)
 - Identification of key features (association)
 - Therapeutic effect (change over time)

← Outputs

Chia

Step 2: What does ChatGPT suggest?

(Students ↔ ChatGPT)



Prompts for ChatGPT:

Considering I am writing an MR radiomics analysis for the prediction of outcome of glioma patients. Please generate the materials and methods sections including following subtitles: Description of IRB approval, Data resources/acquisition, Experimental design, Processing Steps, and Statistical analyses.

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Materials and Methods: Prediction of Outcome in Glioma Patients using MR Radiomics Analysis

I. Description of IRB Approval

II. Data Resources/Acquisition

- Data for this study were obtained from [Specify the source or database from where the data was collected].
- The dataset included [Specify the number of patients] patients diagnosed with glioma.

III. Experimental Design

- This study followed a retrospective/prospective [Choose one] design.
- Patient data, including clinical information and MR imaging data, were collected and analyzed.
- The study cohort was divided into two groups based on clinical outcome: [Specify the groups, e.g., "survivors" and "non-survivors"].

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IV. Processing Steps

- MR imaging data were preprocessed to ensure consistency and remove artifacts.
- Region of interest (ROI) segmentation was performed to extract tumor regions from MR images.

V. Statistical Analyses

- Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population.
- Univariate analysis (e.g., t-tests, chi-square tests) was conducted to evaluate the association between individual radiomic features and clinical outcome.
- Multivariate analysis (e.g., logistic regression, Cox regression) was performed to develop a predictive model incorporating multiple features.
- Cross-validation techniques (e.g., k-fold cross-validation) were employed to assess the performance and generalizability of the predictive model.
- Statistical significance was set at $p < 0.05$.

Step 3: Please compare the outputs from Human and ChatGPT. What do we get?

(Professor ↔ students ↔ ChatGPT)



Materials and Methods: Prediction of Outcome in Glioma Patients using MR Radiomics

Analysis

ChatGPT provides sentence structure.

I. Description of IRB Approval

The study protocol and data acquisition procedures were approved by the Institutional Review Board (IRB) [Insert name of the IRB] prior to initiation.

II. Data Resources/Acquisition

Data for this study were obtained from [Specify the source or database from where the data was collected].

The dataset included [Specify the number of patients] patients diagnosed with glioma.

Inclusion criteria: [Specify the criteria used for patient selection].

Exclusion criteria: [Specify the criteria used for patient exclusion, if applicable].

III. Experimental Design

This study followed a retrospective/prospective [Choose one] design.

Patient data, including clinical information and MR imaging data, were collected and analyzed.

The study cohort was divided into two groups based on clinical outcome: [Specify the groups, e.g., "survivors" and "non-survivors"].

Chia-Feng

- Description of IRB approval, informed consent form w/wo signature
- Data resources/acquisition
 - prospective/retrospective study
 - population, institutions/database
 - inclusion/exclusion criteria
 - imaging modality/scanner/sequences/parameters/spatial resolution/slice thickness
 - clinical data
- Experimental design
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 - key techniques (quantitative analysis/machine learning)
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 - Demographic analysis (baseline difference)
 - Technique comparison (superiority)
 - Identification of key features (association)
 - Therapeutic effect (change over time)

Step 4: It's time to write your own "Materials & Methods".

(Students ↔ Students)



miro English Writing Hour

Data resources/acquisition

Michael & Vivian

Subjects

A retrospective analysis was performed among group of patients diagnosed with glioma. Glioma was defined as World Health Organization (WHO) grading system, and patients were grade II glioma (astrocytoma, oligodendroglioma, mixed glioma) at least. All patients had at least 2 years of follow-up with 3 consecutive magnetic resonance (MR) imaging during the study interval. All patients underwent MRI exam from 2020 to 2023, and the data were collected from the Taipei Veterans General Hospital.

Image acquisition

MR images were acquired using 3.0-T MRI equipped with a 6-channel head coil. The imaging modalities used in this study included T1-weighted, T2-weighted, and FLAIR.

Processing Steps

Frank & Elizabeth

Processing Steps

a) Preprocessing:

Prior to feature extraction, the MR images underwent preprocessing steps, including bias field correction, normalization, resampling, and image registration to enhance the quality and consistency of the data.

b) Radiomic Feature Extraction:

Radiomic features were extracted from the MR images. The region of interest (ROI) was manually delineated by an experienced radiologist on each MR sequence to ensure accurate feature extraction. A total of 1178 radiomic features, including the gray-scale intensity patterns, lesion shape/size geometry, and texture features were extracted from the ROIs.

c) Feature Selection:

To reduce the dimensionality and identify the most relevant features, a feature selection process was performed. N-way analysis of variance (N-way ANOVA) was performed to extract the significantly different features ($p < 0.05$).

d) Model Development:

A predictive model was developed using the selected radiomic features. A logical regression model was trained using the selected features to predict the glioma outcome.

e) Software:

We performed the abovementioned steps on MPA v5 in Matlab 2023a.

f) workflow:

Data acquisition → data preprocessing → feature extraction → feature selection → statistical analysis → extremes prediction

Statistical analyses

Avery & Jim

Statistical Analyses

Descriptive statistics were calculated to summarize the demographic and clinical variables, as well as the extracted radiomic features. Continuous variables were presented as mean ± standard deviation (SD), while categorical variables were reported as frequencies and percentages. Two-sample t-tests were conducted to explore the association between clinical characteristics and outcome for continuous variables. Chi-square tests were performed for categorical variables to investigate their association with outcome.

The predictive performance of developed model was evaluated by calculating accuracy, sensitivity, specificity, and the area under receiver operating characteristics (AUC). These measures were utilized to determine the model's ability to accurately predict the outcome of glioma patients.

In this study, statistical significance was defined as $p < 0.05$, and statistical power was only provided for significant results ($p < 0.05$). The aforementioned statistical analyses were conducted using the statistics toolbox in MATLAB R2023a.

C

Focusing on **medical imaging/ radiotherapy/bioengineering/ physical therapy/rehabilitation** issues, please think about potential applications/benefits of collaborating with Gen-AI.

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- Assistance in Image Analysis
- Patient Communication
- Education and Training
- Workflow Optimization
- Rehabilitation Support
- Decision Support System
- Natural Language Interface for Radiology Software
- Remote Consultations

The deployment of AI must adhere to ethical guidelines, data security standards, and regulatory requirements to ensure patient safety and privacy. AI should always complement, rather than replace, the expertise of healthcare professionals.

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The way using ChatGPT: 3 How

- How to...
construct informative prompts?
- How to...
improve the Gen-AI's output quality?
- How to...
verify the accuracy of information?

⁷⁶
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How to construct informative prompts?

- Be Specific
- Add Context (background/scene)
- Ask for Step-by-Step Explanations
- Request Comparisons
- Seek Clarifications
- Specify the Depth of Information
- Frame as a Conversation

⁷⁷
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#Instructions:

You are an American professional English teacher.
Please output your best correction based on the following constraints and input sentences.

#Constraints:

The number of characters is about 200.
The text should be easy to understand for a TOEIC score of 575.
Keep sentences concise.
Correct any grammatical errors or more appropriate expressions.
Give the reason for the correction.

#Input:

Dear Diary,

Today I go to my old school and it brought back lots of memories. I walked and remembered all the fun things I did there. I saw some of my old teachers, and they were happy to see me. It made me think how much I've grown up since then. I'm so thankful for my school and all the chances it gave me to learn. It was great to visit, and I want to go back soon.

That's all for today.

⁷⁸
Chia-Feng Lu

<https://tinyurl.com/2mtrgld2>



"Today I go to my old school and it brought back lots of memories."

Correction: "Today, I went to my old school, and it brought back many memories."

Reason: Changed "go" to "went" for correct verb tense. Changed "lots of" to "many" for better grammar.

"I walked and remembered all the fun things I did there."

Correction: "I walked around and recollected all the enjoyable things I did there."

Reason: Added "around" for a more complete picture of the action. Replaced "remembered" with "recollected" for a stronger and more specific verb. Changed "fun" to "enjoyable" for more precise vocabulary.

"I saw some of my old teachers, and they were happy to see me."

Correction: "I met some of my former teachers, and their happiness at seeing me was evident."

Reason: Replaced "saw" with "met" for a more precise verb choice. Added "former" to maintain consistency in referring to past relationships. Added "their happiness at seeing me was evident" to provide a clearer description of the teachers' reaction.

"It made me think how much I've grown up since then."

Correction: "This experience made me contemplate how much I've matured since then."

Reason: Replaced "It made me think" with "This experience made me contemplate" for a more specific description of the thought process. Changed "grown up" to "matured" for a more sophisticated term.

"I'm so thankful for my school and all the chances it gave me to learn."

Correction: "I'm immensely grateful for my school and the numerous opportunities it provided me to learn."

Reason: Replaced "thankful" with "immensely grateful" for a stronger expression of gratitude. Changed "chances" to "numerous opportunities" for more variety and precision.

"It was great to visit, and I want to go back soon."

Correction: "The visit was fantastic, and I'm eager to return soon."

Reason: Expanded the sentence for clarity and detail. Changed "great" to "fantastic" for a more descriptive term. Replaced "want to" with "eager to" for a more enthusiastic expression.

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Chia-Feng Lu





How to improve the Gen-AI's output quality?

Engage in **continuous dialogue** or **follow-up with details**.

- Please provide a concrete example of using ChatGPT in "Assistance in Image Analysis".
- Based on the example "Querying for Clarifications" you provided, may you generate a full scenario including radiologist's request and your response. The conversation may include several times of question and answer.

Please refer to [ChatGPTusages.pdf](#)

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How to verify the accuracy of information?

- Ask for **evidence** or **research-based** responses.
- Ask for (academic) **sources**.
- Cross-validate the results by **YOU**.

"Can you provide insights into recent studies comparing the diagnostic accuracy of PET-CT and PET-MRI in oncology?"

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Summary of Key Messages

- Giving precise (with specific conditions/constraints) prompts can help Gen-AI generate the most helpful response.
- Understanding your requirement and converting it to conditions/constraints are highly related to critical thinking.
- Conducting consecutive chat with Gen-AI can further improve the quality of response.
- The value of Gen-AI highly relies on human's intention and creation.
- Do not fully trust the response given by Gen-AI. Validate its responses!

Chia-Feng Lu



10:57

ChatGPT >

明白了，謝謝您的解釋。那檢查過程大概會持續多久呢？我需要空腹或停止服用任何藥物嗎？

您今天要做的檢查是一個腦部的MRI，不需要進行任何空腹，所以您可以以正常的飲食。檢查時間大概是在20到30分鐘左右，我們會幫您施打一個對比劑，來確認腦部裡面可能有一些病灶的位置。

了解了，謝謝您。那請問打對比劑會有什麼副作用嗎？我需要特別注意什麼嗎？

好的，我準備好了。您好，我是一位要接受MRI檢查的患者。我對這個檢查有很多不清楚的地方，可以請您幫我解答嗎？

首先，我想知道，MRI檢查是怎麼進行的？需要做什麼準備嗎？

MRI的整個檢查過程，您只需要配合保持姿勢的不動。在檢查前，我們會先請您檢查一下身上的物品。原則上，我們希望您能更換我們的檢查服，然後將身上的相關物品都放置到我們的籃子裡面。檢查過程中，希望您能維持姿勢的不移動。我們會逐步的給您指令，您只需要放鬆心情。

10:57

ChatGPT >

我以前沒有打過對比劑，所以不太清楚自己會不會過敏。那如果過敏的話，通常會有哪些症狀呢？

好，那這個部分其實不用太過擔心，因為一般這個過敏劑過敏的機率不是太高。那您等一下可以在施打過程中觀察一下自己的施打部位，一般如果正常的話，只會感覺到有一點熱熱的，那可能後面頭會有一些癢癢的，沒有關係。那通常的過敏反應也不會太嚴重，但一樣如果您有任何不舒服的情況，就隨時告訴我們。那這個對比劑我們主要會先確認一下，就是您前兩天在醫院的這個腎功能檢查的情況，只要您的腎功能是正常的，這個對比劑我們就會進行施打。檢查完之後呢，您可以正常的就是喝水、飲水，那透過排尿的方式想要排出即可。

了解了，非常感謝您的詳細解說。那檢查過程中，機器的聲音會很大嗎？我會需要戴耳塞嗎？

如您所說，這個MRI確實是一個會產生聲音的機器，那因為這個聲音非常大，所以等一下我們會給您一副耳塞，要請您務必把它正確地塞到您的耳道裡面。那只要塞上這個耳塞，其實這個聲音就不會太過吵雜，那就可以讓您順利地配合我們的這個檢查流程完成檢查。

明白了，我會按照指示做好準備。那在MRI檢查過程中，有什麼需要特別注意的事情嗎？比如說，我需要保持某種特定的姿勢嗎？

今天因為是頭部的檢查，所以其實您只需要躺平，那等一下我們會用這個軟墊把你頭部的姿勢做一個固定，所以就麻煩您在整個散熱過程中不要有過大的一個動作，比如說手腳移動或者是這個用力的咳嗽，那如果您有任何不舒服的地方都可以告訴我們，過程中眼睛可以張開也可以閉起來，那您也可以正常吞口水都沒有問題。

Ask ChatGPT to be a simulated patient.

Final Team Project

1. **Set up an application scene (“real-world problem”)**
(Goal, context/background → prompts with conditions)
2. **Complete Gen-AI outputs through continuous dialogue**
(for at least 4 follow-ups)
3. **Verify the outputs from Gen-AI**
(by checking information sources)
4. **Your own critiques/comments on Gen-AI performance**
(pros & cons; wish list to improve Gen-AI)

Please provide a **work distribution table** (分工表).

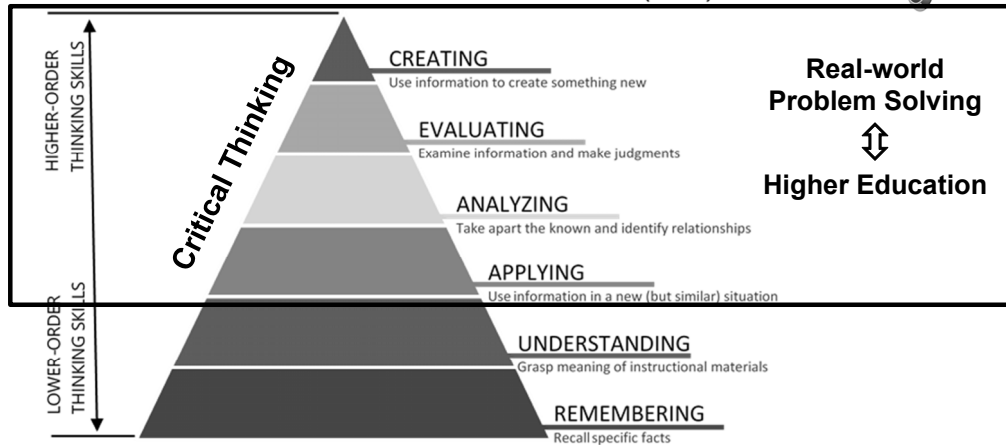
^{7a}
Chia-Feng Lu

Assessment

1. **English Oral Presentation (10 min)**
Covering above-mentioned points.
Each member must present a part of slides (show your face clearly).
Do not read from the script. (不可照稿唸)
Upload slide file and video link (Youtube) to the E3 system
before 12/12 23:59.
2. **Question & Answer**
3. **Key points**
Creation, critical thinking, AI-human collaboration, critiques, and engagement

^{8b}
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BLOOM'S TAXONOMY – COGNITIVE DOMAIN (2001)



^{8c}
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<https://citt.ufl.edu/resources/the-learning-process/designing-the-learning-experience/blooms-taxonomy/blooms-taxonomy-graphic-description/>

THE END

Together (human + AI), We Make it Better.
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