



Leveraging Generative AI for Multilingual Thesaurus Development: Insights from the Confucius Ceremony Cultural Vocabulary

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AAT as International Multilingual Translation Project

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lutes (chordophones) (<lutelike chordophones with long neck: plucked>, lutelike chordophones: plucked, ... Furnishings and Equipment (hierarchy name))

Note: Use specifically for plucked chordophones developed in the European Renaissance, having a large pear-shaped body composed of thin, narrow ribs, a flat top, central circular soundhole covered by a rose, and from seven to ten frets on the neck. For the general class of all chordophones with the plane of the strings running parallel to the resonator and a neck that serves both as string bearer and as handle, see "lutelike chordophones."

Scope Note

Terms:

lutes (chordophones) ([preferred](#), C,U,English-P,D,U,PN)
lute (chordophone) (C,U,LC,English,AD,U,SN)
 魯特琴 (C,U,Chinese (traditional)-P,D,U,U)
 琉特琴 (C,U,Chinese (traditional),UF,U,U)
 lu tè qín (C,U,Chinese (transliterated Hanyu Pinyin)-P,UF,U,U)
 lu te qin (C,U,Chinese (transliterated Pinyin without tones)-P,UF,U,U)
 lu t'e ch'in (C,U,Chinese (transliterated Wade-Giles)-P,UF,U,U)
luiten (chordofonen) (C,U,Dutch-P,D,U,U)
luit (C,U,Dutch,AD,U,U)
luth (C,U,French-P,AD,U,MSN)
Laute (Chordofon) (C,V,German-P,D,SN)
europäische Laute (Chordofon) (C,V,German,AD,SN)
Laute, europäische (Chordofon) (C,V,German,AD,SN)
Lauten (Chordofone) (C,V,German,AD,PN)
alaúdes (C,U,Portuguese-P,D,PN)
alaúde (C,U,Portuguese,AD,SN)
laúdes (C,U,Spanish-P,D,U,PN)
laúd (C,U,Spanish,AD,U,SN)

Equivalent Relationships

Facet/Hierarchy Code: [V,TT](#)

Hierarchical Position:

- Objects Facet
- ... Furnishings and Equipment (hierarchy name) (G)
- Sound Devices (hierarchy name) (G)
- sound devices (equipment) (G)
- <sound devices by acoustical characteristics> (G)
- chordophones (G)
- lutelike chordophones (G)
- lutelike chordophones: plucked (G)
- <lutelike chordophones with long neck: plucked> (G)
- lutes (chordophones) (G)

Hierarchical Relationships

Related concepts:

provide context [bellies](#)
 (resonators, sound device components, ... Components (hierarchy name)) [300216559]
 used by [lutenists](#)
 (stringed instrumentalists, instrumentalists, ... People (hierarchy name)) [300235043]

Associative Relationships

Basic AAT information of the Term : [lutes\(chordophones\)](#)



Taiwan (Chinese, traditional)
AAT translation since 2008
<http://aat.teldap.tw>



The Netherlands (Dutch)
AAT translation since 1994
<http://website.aat-ned.nl/home>



Germany (German)
AAT translation since 2009
<http://www.aat-deutsch.de>



Chile (Spanish)
AAT translation since 1996
<http://www.aatespanol.cl>

Additional Notes:

Chinese (traditional) 專指發明於歐洲文藝復興時期的撥弦樂器，具有大型梨狀琴身，琴身由薄而窄的側板組成，表面平坦，圓形的中央音孔飾有玫瑰圖案，琴頸上為七至十個不等的琴品，若指弦板與共鳴器平行，琴頸支撐琴弦並可當作撞柄的弦鳴樂器，請參見先導詞「<似魯特琴的弦鳴樂器>」。

Dutch Getokkelde chordofonen, ontwikkeld tijdens de Europese Renaissance, met een lange peervormige klankkast van dunne, smalle zijbanden met een plat bovenblad. Het centrale, ronde klankgat is voorzien van een rozet en op de hals zijn zeven tot tien fretten aangebracht. Voor de algemene categorie van chordofonen die een snarenvlak evenwijdig aan de klankkast hebben en een hals die als snarenhouder en handvat tegelijk dient, zie de gidstern 'luitachtige chordofonen'.

German Spezifisch für das gezupfte Chordofon, das in der europäischen Renaissance entwickelt wurde, mit einem großen, halbbirnenförmigen Korpus, der aus dünnen, schmalen Spänen zusammengesetzt ist, einer flachen Decke, einem mittigen, runden Schalloch, bedeckt von einer Rosette, und sieben bis zehn Bündeln am Hals. Für die allgemeine Klasse der Chordofone mit parallel zum Resonanzkörper verlaufenden Saiten und einem Hals, der als Saitenträger sowie als Griff dient, siehe "[Lauteninstrument](300224192)".

Portuguese Use especificamente para cordofones arrancados desenvolvidos no Renascimento Europeu, com um corpo grande em forma de pera composto por costelas finas e estreitas, uma boca plana central com cobertura de uma rosa e de sete a dez trastes no pescoço. Para a classe geral de todos os cordofones com o plano das cordas paralelo ao ressonador e um pescoço que serve tanto como porta-cordas quanto como cabo, consulte "cordofones semelhantes a lute".

Spanish Úsese específicamente para cordófonos pulsados desarrollados durante el Renacimiento Europeo, con un cuerpo de gran tamaño en forma de pera compuesto de costillas delgadas y angostas, una tapa plana central con abertura acústica circular central cubierta por una rosa, y de siete a diez trastes en el mástil. Para referirse genéricamente a todos los cordófonos en los que el plano de las cuerdas corre paralelo al resonador y tanto como portador de las cuerdas como mango, véa bajo "cordófonos tipo laúd."

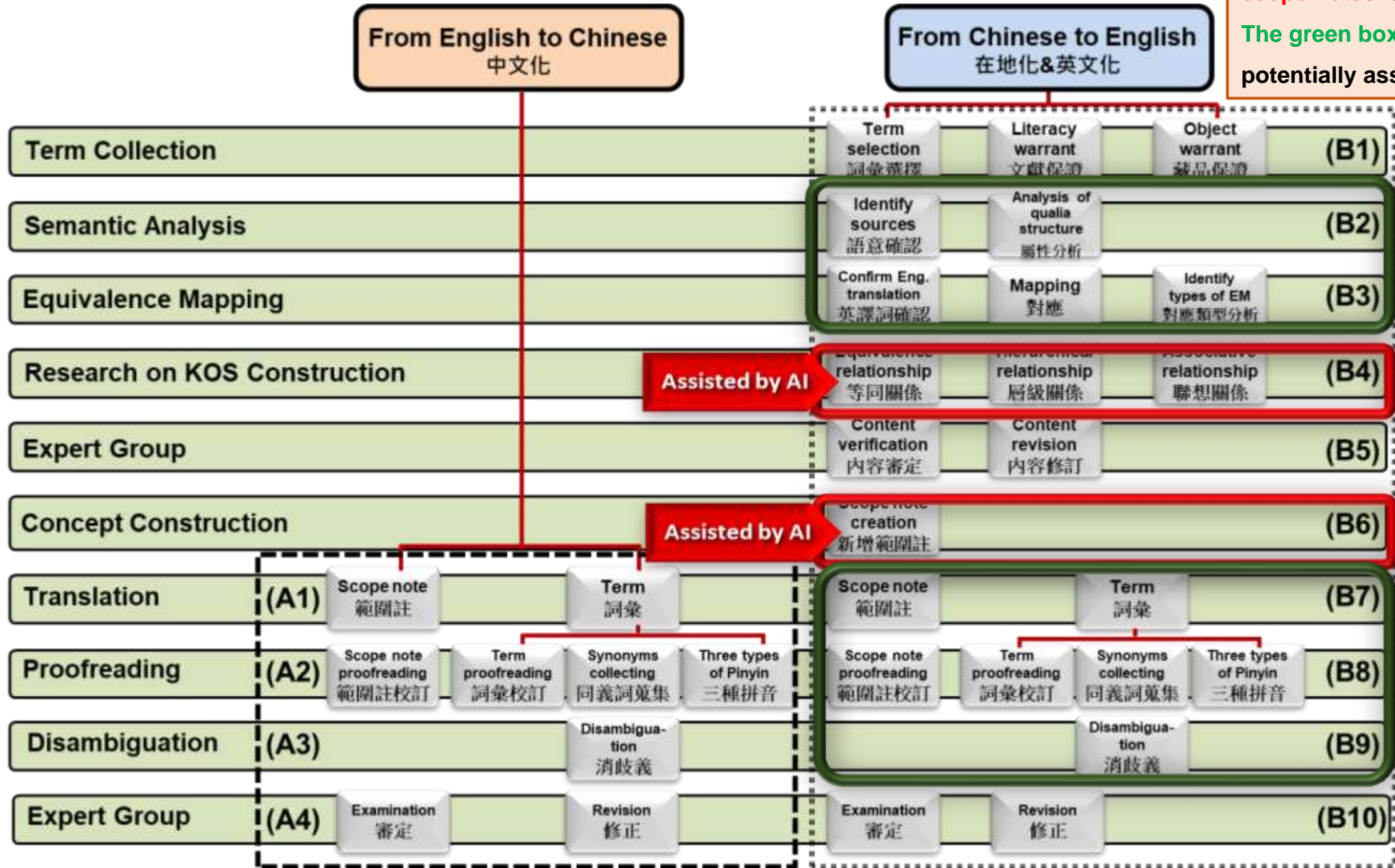
Multilingual Translation

Multilingual Translation of Art & Architecture Thesaurus (AAT)

Workflow of Chinese AAT Translation and Localization

The red boxes highlight the **core task** in AAT, where exploring **vocabulary relationships** and **scope notes** is a key focus of this study.

The green boxes indicate tasks where AI could potentially assist, with **future research** planned.



Steps of Translation in Chinese

- A1) 詞彙內容翻譯/ Translation
- A2) 詞彙內容校訂/ Proofreading
- A3) 詞彙消歧異/ Disambiguation
- A4) 專家審訂/ Expert Group

Steps of Term Localization

- B1) 詞彙蒐集/ Term collection
- B2) 語意分析/ Semantic analysis
- B3) 等同對應/ Equivalence mapping
- B4) 知識組織架構研究/ KOS construction research
- B5) 專家審訂/ Expert Group
- B6) 概念建構/ Concept construction
- B7) 詞彙內容翻譯/ Translation
- B8) 詞彙內容校訂/ Proofreading
- B9) 詞彙消歧異/ Disambiguation
- B10) 專家審訂/ Expert Group

The Term Group of Chinese Localization in AAT

Term Group of “ancient Chinese musical instruments” in the Confucius Ceremony (21 Terms)

E.g.: Jingu, Jiangu, Yinggu, Bofu, Tao, Bianzhong, Yongzhong, Tezhong, Bianqing, Teqing, Yu, Zhu...etc.



編鐘/ Bianzhong



Music Instruments at the Temple of Confucius, Jiang Yuanshu, 1776

Research Questions

- A **qualitative analysis** method, utilizing **ChatGPT-4o** (referred to as AI) to explore the application of AI in the construction of index terms and the writing of scope notes. The research aims to understand the phenomena and significance of human-AI interaction during this process.
- How can GAI support and enhance the contribution of localized vocabulary to a multilingual thesaurus using the conceptual vocabulary of objects in the **Confucius Ceremony** as an example?

RQ1: To what extent can GAI identify and suggest **equivalent, hierarchical, and associative relationships** among the vocabulary during the construction process?

RQ2: How can GAI support and enhance the **writing of scope notes** for localized vocabulary in a multilingual thesaurus?

Research Objects

21 terms selected from "Taipei Confucius Temple"



[2023 Confucius Day Commemoration Ceremony at Taipei Confucius Temple](#)

1. Jin Gu 晉鼓	2. Jian Gu 建鼓	3. Ying Gu 應鼓	4. Tao 鼗鼓	5. Bo Fu 搏拊	6. Yong Zhong 鏞鐘	7. Bo Zhong 鎛鐘
8. Bian Zhong 編鐘	9. Bian Qing 編磬	10. Te Qing 特磬	11. p'ai pan 拍板	12. Sheng 笙	13. Zhu 祝	14. Yu 敔
15. Qing 琴	16. Se 瑟	17. Dongxiao 洞簫	18. Feng Xiao 鳳簫	19. Dragon Flute 龍笛	20. Chi 箎	21. Xun 埙

Research Design: Synonym Identification & Scope Note Writing

		Synonym Identification	Scope Note Writing
1. Data Sources		21 musical instrument terms selected from the Taipei Confucius Temple website.	
2. Document Collection		For each term, 4-6 related documents collected to provide definitions and context.	
3. Reference Standards		Synonyms identified manually serve as ground truth .	Scope notes written as reference standards .
4. AI exp	4-1. Samples Selection	3 representative terms (建鼓, 拍板, 龍笛) selected as golden samples for Initial AI testing.	3 representative terms (晉鼓, 編鐘, 編磬) selected as golden samples for Initial AI testing.
	4-2. Prompt Design Strategy	Design prompts for 3 strategies to guide AI in returning accurate synonyms.	Design prompts for 5 strategies , guide AI to write scope notes.
	4-3. Establishing Evaluation Criteria	Recall metric used to measure how well the AI identifies all the synonyms that were marked by humans.	Five evaluation criteria were developed based on literature and AAT rules to compare AI vs. human results.
	4-4. Initial AI Testing	Use 3 golden samples to conduct initial AI experiments to evaluate the performance of AI and optimize prompt.	
	4-5. Results Evaluation and Prompt Optimization	Quantitative scoring and qualitative analysis of AI outputs. The prompts will be refined iteratively based on AI output to find the optimal prompt .	
	4-6. General AI Testing	After the optimal prompt was identified, it was applied to the remaining 18 terms . The evaluation process was repeated to assess the AI's ability to generalize across different terms.	
	4-7. Final Optimal Prompt	The experiment concluded with the selection of the best-performing prompt as the final optimal prompt .	

Results: Synonym Identification (Prompt Design Strategy)

Integrating the **SPO structure** ensures the consistent identification of all core synonyms

Prompt Design Strategy	A	B	C
Strategy Name	Direct Synonym Identification	AAT-Assisted Synonym Identification	SPO-Structured Synonym Identification
Prompting Techniques	Zero-shot Prompting	Context-Aware Prompting	Extraction Prompting
Description	This method does not employ any explicit rules or additional tools , relying solely on the model's internal knowledge and capabilities to identify synonyms.	This method uses the synonym definitions from the AAT guidelines as assistance to improve the accuracy of synonym identification.	Based on the SPO (Subject-Predicate-Object) structure , this method guides the AI to extract specific information for synonym identification, leveraging semantic relationships for enhanced recognition.
Issue Type	Core Synonyms Omission	Core Synonyms Omission	None
Score	(97.2/100)	(98.4/100)	★ (100/100)

⊗ Core Synonyms: These terms are match the synonyms recognized by the editorial team.

⊗ Score: The evaluation is based on the **Recall metric**.

⊗ AAT's definition of synonyms: Synonyms are terms that have meanings that are the same or virtually the same in a wide range of contexts.

Discussion: Final Optimal Prompt Structure

Aspect	Structured Prompt	Explanation
Task	Task Role	Assign a specific professional role to the AI to focus its responses on the appropriate context, resulting in more relevant outputs.
	Task Context	Provide background information or describe the usage scenario to help the AI better understand the task's goals and data content.
	Task Goal	Clearly describe the specific goals for the AI to guide it toward producing focused and goal-oriented responses.
Instruction	Instruction Rules	Define explicit execution steps or analytical methods to guide AI on how to process or analyze the data.
	Instruction Examples	Provide one or a few examples to help the AI understand the kind of output you are seeking.
	Instruction Format	Impose restrictions on the length, style, or format of the output to prevent irrelevant or overly verbose information.

The SPO triple serves as a semantic structure, guiding the model in extracting specific information to identify synonyms

Final Optimal Prompt Structure (SPO-Structured Synonym Identification)

Subject – Predicate – Object (S-P-O Triple)

Instrument Term	Key Phrase for Synonym Judgment	Synonym	Original Sentence
Jian Gu (建鼓)	Also referred to as	Xian Gu (縣鼓)	"Xian Gu is also referred to as Jian Gu."
Jian Gu (建鼓)	Considered the same	Jin Gu (晉鼓)	Wei Zhao of the Three Kingdoms believed that Jin Gu and Jian Gu were the same instrument.
Jian Gu (建鼓)	Same instrument with a different name	Ying Gu (楹鼓)	"In the diagram, Jian Gu is written as Ying Gu, the two are actually the same instrument with different names."
Jian Gu (建鼓)	Also called	Ying Gu (楹鼓)	Jian (Jian) Gu is also called Ying Gu.
Jian Gu (建鼓)	Also referred to as	Zhuan Ban Gu (轉班鼓)	Also referred to as Zhuan Ban Gu.
Jian Gu (建鼓)	Collectively referred to as	Shu Gu (樹鼓)	In the Yuan Dynasty palace, Jian Gu, Shuo Bi, and Ying Bi were collectively referred to as Shu Gu.

AI can identify all core synonyms (highlighted in purple) as defined by the editorial team

Term	AI-Identified Synonyms	Core Synonyms identified by the Editorial Team	Recall
建鼓	縣鼓、楹鼓、晉鼓、應鼓	楹鼓、縣鼓	100
拍板	拍版、板、檀板、鐃板、察拉齊、拍、春牘、牘	拍版、板、檀板、鐃板、察拉齊、拍	100
龍笛	龍頭笛、姑洗笛、仲呂笛、雅笛、平笛	龍頭笛	100
骨鼓	貧鼓、大成鼓、建鼓	貧鼓、大成鼓	100
應鼓	應鞞、應、應鞞、鞞、楹鼓	應鞞、應鞞、應	100
鼙鼓	鞞、鞞、搏浪鼓	鞞、鞞、搏浪鼓	100
搏拊	拊、鼓拊、拊搏、撫拍、鼓	拊搏、拊、鼓拊、撫拍	100
鑪鐘	大鐘、特懸之鐘、特大鐘	大鐘、特懸之鐘	100
鐃鐘	鐃、特鐘、鈺鐘	鐃、特鐘	100
編鐘	歌鐘、樂鐘、小鐘、登歌鐘、蘇鐘	歌鐘、樂鐘、小鐘、登歌鐘	100
編磬	頌磬、笙磬、歌磬、歌磬	頌磬、笙磬、歌磬	100
特磬	特懸磬、特懸、大磬、玉音	特懸磬、特懸	100
笙	簧、巢笙、和笙、九曜匏、七星匏、閔餘匏	簧	100
柷	柷	柷	100
敔	柷、圉、圉	柷、圉、圉	100
琴	七弦琴、古琴、瑤琴、玉琴、素琴、綠綺、焦尾、胡琴、月琴、風琴	七弦琴、古琴、瑤琴、玉琴、素琴、綠綺、焦尾	100
瑟	灑	灑	100
洞簫	尺八、簫、笛、篴	尺八	100
鳳簫	參差、比竹、排簫、排策、秦簫、短簫、雲簫、琴簫	參差、比竹、排簫	100
箎	箎、篴、笛、沂	箎	100
壎	壎、陶壎、雅壎、頌壎	壎、陶壎	100



Using ChatGPT-4o to identifies all the synonyms, with Jian Gu(建鼓) as an example

Differences in human-AI semantic meaning (five types of synonyms identified by AI)

Term	AI-Identified Synonyms	Core Synonyms identified by the Editorial Team
<u>建鼓</u> Jian Gu (large barrel drum)	縣鼓 Xian Gu (hanging drum) 楹鼓 Ying Gu (Central-Pillar Drum)、 晉鼓 Jin Gu (Jin Drum)、應鼓 Ying Gu (Cross-Base Drum)	楹鼓 Ying Gu(Central-Pillar Drum)、 縣鼓 Xian Gu(hanging drum)
<u>拍板</u>	拍版、板、檀板、綽板、察拉齊、拍 舂牘、牘	拍版、板、檀板、綽板、察拉齊、拍

※ The number in each column: the total number of synonyms of the 21 terms in this category

Prompt Design Strategy		Direct Synonym Identification (A: zero-shot Prompting)	AAT-Assisted Synonym Identification (B: Context-Aware Prompting)	SPO-Structured Synonym Identification (C: Extraction Prompting)
semantic equivalence	High Core Synonyms (defined by human)	52	52	54
	Potential Synonyms	23	24	19
	Extended Synonyms	14	23	12
	Broadly Related Terms	11	4	6
	Low Misidentified Synonyms	6	5	2

While AI applies a looser standard for synonym identification compared to humans, it can discover additional potential synonyms.

Results : Scope Note Writing (Prompt Design Strategy)

Prompt Design Strategy	A	B	C	D	E
		Idea for Scope Notes		Great for interpretive panels	
Strategy Name	Direct AI-Generated Scope Note Writing	AAT-Guided Scope Note Writing	Cluster-Based Scope Note Writing	AAT-Guided Scope Note Writing Based on Pustejovsky's Qualia Structure	Cluster-Based AAT-Guided Scope Note Writing without Fixed Clustering Rules (B+C)
Prompting Techniques	Zero-Shot Prompting	In-Context Learning Prompting	One-Shot Prompting	Few-Shot Prompting + Chain of Thought (CoT)	One-Shot Prompting + Chain of Thought (CoT)
Description	This approach imposes no explicit rules or restrictions , relying entirely on the model's internal knowledge to generate the scope notes.	This method guides ChatGPT using AAT guidelines, with key rules extracted as prompts to generate scope notes.	The data are first grouped based on semantic or attribute similarities . Then, scope notes are directly generated from these groups.	combines manual writing techniques . ChatGPT first uses Pustejovsky's Qualia Structure to group the data, then generates scope notes based on AAT guidelines .	The data is first grouped by semantic or attribute similarities . Then, scope notes are generated for these groups based on AAT guidelines .
Issue Type	Lack of Correctness and Completeness	None	Lack of Completeness and Fluency	None	Lack of Completeness
Rating	(20/25)	★ (25+/25)	(22/25)	(25/25)	(23/25)

✂ Rating: Five evaluation criteria were developed as follows:

1. Correctness 2. Completeness 3. Conciseness 4. Fluency 5. Coherence.

1. Samples Selection

2. Prompt Design Strategy

3. Establishing Evaluation Criteria

4. Initial AI Testing

5. Results Evaluation and Prompt Optimization

6. General AI Testing

7. Final Optimal Prompt

Scope Note Writing: Final Optimal Prompt Structure (AAT-Guided Scope Note Writing)

Aspect	Structured Prompt	Explanation
Task	Task Role	Assign a specific professional role to the AI to focus its responses on the appropriate context, resulting in more relevant outputs.
	Task Context	Provide background information or describe the usage scenario to help the AI better understand the task's goals and data content.
	Task Goal	Clearly describe the specific goals for the AI to guide it toward producing focused and goal-oriented responses.
Instruction	Instruction Rules	Define explicit execution steps or analytical methods to guide AI on how to process or analyze the data.
	Instruction Examples	Provide one or a few examples to help the AI understand the kind of output you are seeking.
	Instruction Format	Impose restrictions on the length, style, or format of the output to prevent irrelevant or overly verbose information.

Task:
 You are an expert in Chinese music history, specializing in instruments used in the Confucius Ceremony.
 We need your help to create the index for the Art & Architecture Thesaurus (AAT).
 After reading the following text, write a scope note in Traditional Chinese for {instrument term} according to Scope Note Rules.

Scope Note Rules: **In-Context Learning**

- Correctness** : Avoid overgeneralizing. Clarify the meaning by specifying the time and its usage, and inform the user if the meaning has changed over time, while omitting any uncertain or conflicting information. Ensure that the description is objective and neutral.
- Completeness**: Describe its key attributes that distinguish it from other similar or related concept terms, including its distinguishing characteristics, appearance, materials, and uses. Also, guide users to related or different terms when appropriate.

Instructions:
 Please generate the output according to the following structure: Limit the scope note to 150 Chinese characters or fewer. After providing the output, calculate the Chinese characters count for me.

By Incorporating AAT rules in the prompt, the model learns how to generate content that follows those criteria and examples

Results: Example (AAT-Guided Scope Note Write)



AI can accurately capture **important features** of conceptual vocabulary, and generate clear and comprehensive scope notes

Using ChatGPT to **write a Scope Note**, with *Bianzhong* (chime bells/ 編鐘) as an example

編鐘是一種中國古代青銅打擊樂器，最早可追溯至商代，並於西周和春秋戰國時期達到巔峰。
由多個形狀與大小不同的鐘組成，每個鐘發出特定音高，常見組合為16枚。
編鐘主要在宮廷雅樂中使用，象徵統治者的權力與地位，常見於祭祀、宴享和重大禮儀中。
其形制隨時代變化，包括從扁形至圓形，並經歷不同紋飾演變。 編鐘在祭孔典禮中，用於每樂句之始，擊響引導樂隊齊奏。

Notes (traditional Chinese)

The "bianzhong" is an ancient Chinese bronze percussion instrument, first appearing in the Shang Dynasty and reaching its peak during the Western Zhou and the Spring and Autumn Warring States periods. It consists of multiple bells of varying shapes and sizes, each producing a specific pitch. A typical set includes 16 bells. The bianzhong was primarily used in court music, symbolizing the ruler's authority and status, and it was played during rituals, banquets, and significant ceremonies. Its design evolved over time, from flat and oval shapes to round ones, and featured different decorative patterns. In Confucian Ceremony, the bianzhong was struck at the beginning of each musical phrase to lead the orchestra in unison.

Notes (English draft)

(1)
(2)
(3)
(4)

(1) **Timeframe**
(2) **Composition**
(3) **Usage**
(4) **Appearance**

Summary

- **AI Can Effectively Identify Core Synonyms:**
 - When provided with clear instructions, AI can accurately identify core synonyms and relationships in multilingual thesauri.
- **Scope Note Writing Can Be Enhanced:**
 - AI can generate scope notes that meet professional standards, but the accuracy depends on how well the instructions are refined.
- **Instruction Rules Are Critical:**
 - The success of AI-generated content relies heavily on the clarity and refinement of instruction rules, which requires significant effort.

Future Research

- 1. Comprehensive Process of Multilingualism and Localization:** In the future, we plan to explore the use of AI for handling “preferred terms” and “scope note” of English translations, particularly in how to address the challenges of multilingual conversion and cultural differences. This is especially important in culturally rich areas such as the Confucius Ceremony.
- 2. Collaboration with Domain Experts:** Future work will involve collaboration with experts in Confucius Ceremony to further explore the roles of human experts and AI in human-AI collaboration.
- 3. Automated Evaluation Methods:** Considering the high cost of human evaluation, future research may explore other automated evaluation methods, particularly those suitable for text summarization tasks.
- 4. Exploring Other LLMs:** In addition to the widely used ChatGPT, future research will explore and compare other large language models, such as Gemini, Claude, and even Taiwan's domestically developed TAIDE model, to assess whether different models are more suitable for various tasks and language environments.

Q & A