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# Construction of Cílin Lexical Database: Exploring Metaphor and Metonymy in Classical Chinese Vocabulary

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## Abstract

The Cílin Diǎnyì 詞林典故 is a vocabulary index of classical Chinese poetry, often combined with other similar literary materials into volumes, and it traditionally falls under the category of reference books in the field of traditional sinology. The format and content of Cílin Diǎnyì were standardized during the Qing Dynasty. Today, it is commonly used as a writing tool and receives limited attention in literary research. However, the examples within Cílin Diǎnyì represent, in essence, typical Chinese word constructions formed through the creative practices of numerous poets and the careful selection and classification by countless editors, all guided by the aesthetic principles of traditional metrics. As a result, Cílin Diǎnyì serves as an entry point for studying the mechanisms of classical vocabulary generation and a rare historical linguistic resource for Chinese semantics. However, accessing Cílin Diǎnyì for research requires a basic understanding of poetic metrics, allowing scholars to systematically identify examples based on principles of tonal patterns, semantic similarities, and distinctions, whether they are individual words, word groups, phrases, or fine sentences. To facilitate greater engagement of scholars in the study of Cílin Diǎnyì, the creation of a digital database for Cílin Diǎnyì is becoming increasingly necessary. This study conducted an exploration of Cílin Diǎnyì, resulting in the identification of three distinct usage requirements: 1) distinguishing Chinese characters within the structures of word examples that demarcate semantic categories, 2) recognizing Chinese characters with strong lexical derivation capabilities in the semantic network, and 3) identifying the typical distribution of each Chinese character within various word structures. In addition to highlighting the fundamental functionalities required for future Cílin Diǎnyì databases, this research also uncovered metaphors and metonymies generated through changes in the positions of Chinese characters within word structures during the exploration process. These findings are beneficial for scholars as they continue to uncover historical word construction patterns preserved in Cílin Diǎnyì and the concealed literary aesthetic principles within these word construction patterns.

**Keywords :** literary database, Cílin Diǎnyì, Chinese word construction, metonymy, metaphor

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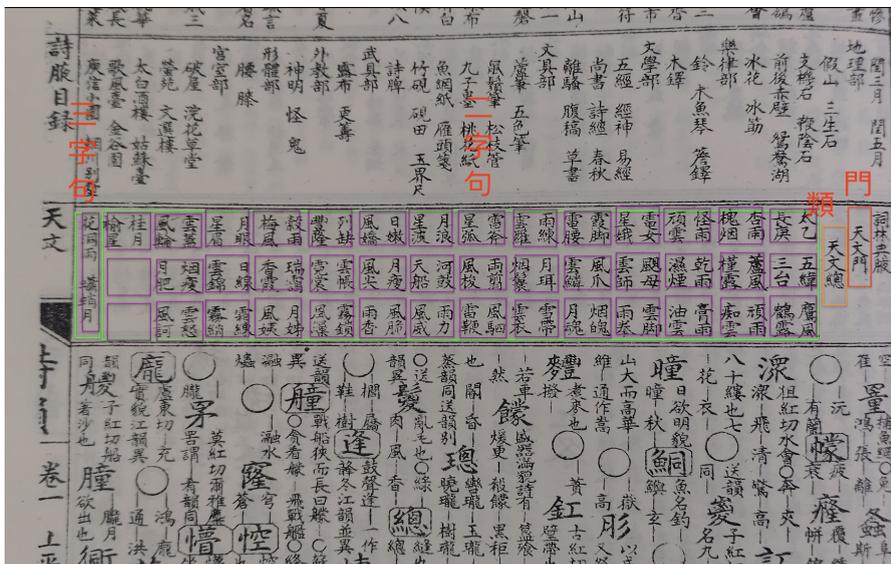
# Introduction

The Cílín Diǎnyì 詞林典腋 is often regarded as a teaching resource in classical literature or as a reference material for writing. Within the realm of traditional sinology, it falls under the category of reference books. Cílín Diǎnyì categorizes words, word groups, phrases, or fine sentences based on themes, juxtaposing them in pairs for easy reference. This systematic arrangement aids scholars in constructing words and forming sentences based on established patterns. The examples found within Cílín Diǎnyì have undergone repeated validation through the creative practices of countless poets, making them quintessential to classical Chinese poetry themes and word constructions. However, perhaps due to its primarily utilitarian nature, Cílín Diǎnyì is often relegated to the role of an instructional tool and receives limited attention from literary researchers. Its wealth of lexical constructions is often regarded merely as a collection of diverse, historical examples. This study aims to prepare a project for the construction of a relational database for Cílín Diǎnyì, with the goal of uncovering the inherent word construction patterns within Cílín Diǎnyì and the concealed literary aesthetic principles embedded within these patterns.

## Structure of Cílín Diǎnyì

For this study, contemporary linguistic data provided by Taiwanese linguist Hsu Chang-mo 許長謨 was electronically utilized for word associations and word construction annotations. The initial observations, experiments, and analyses were conducted using two-character words as the basis. Cílín Diǎnyì encompasses a total of 31 thematic categories and 625 subcategories, with word examples organized from shorter to longer character sequences. These examples are arranged in pairs or sentences, juxtaposed side by side, considering tonal patterns and bearing semantic similarities. Such characteristics facilitate the examination of the correctness of each example sentence, example pair, and example word.

Figure 1: Cílín Diǎnyì compiled and supplemented by TANG Wenlu 湯文璐 in the Qing Dynasty, included in the Augmented Compilation of Rhymes and Verses (Zēngbǔ Shīyùn Hébi 增補詩韻合璧)



The compilation logic can be summarized as follows:

				門
				類
Word Examples				
Sentence Pairs		Word Pairs		
Entry (Lower Pair - Starting Sentence) 11	Entry (Upper Pair - Starting Sentence) 9	Entry (Lower Pair) 2	Entry (Upper Pair) 1	
		Entry (Lower Pair) 4	Entry (Upper Pair) 3	
Entry (Lower Pair - Corresponding Sentence) 12	Entry (Upper Pair - Corresponding Sentence) 10	Entry (Lower Pair) 6	Entry (Upper Pair) 5	
		Entry (Lower Pair) 8	Entry (Upper Pair) 7	

In accordance with this, when examining the original text, “太乙|長庚” constitutes the first word pair with right-left parallelism, and “五緯|三台” forms the second word pair, both adhering to this pattern. When a right-left word pair parallelism results in the separation of sentences or word pairs across two pages, it is modified to upper and lower correspondences. For example, the first instance of a three-character word pair in the leftmost row of the column is considered an upper and lower correspondence. Sentence pairs are arranged below word pairs and continue downward. In the absence of sentence breaks, parallelism may appear, and sentence segmentation is determined based on the meaning or tonal patterns.

## Exploration Strategy

In the construction of the database, emphasis is placed not only on data completeness but also on data correlation and modeling, ensuring that real-world facts are well reflected in the structure of the database. Therefore, if we wish for the database to assist in the exploration of word construction patterns and aesthetic principles, rather than being a mere repository of data, we need to interpret and elaborate on the relationships within the original data and establish a model for queries and responses.

The word construction patterns and aesthetic principles investigated in this study are not explicitly recorded within the Chinese characters themselves. However, by objectifying the compilation and usage logic of word examples and clearly annotating the role and function of each character within this logic, it becomes possible to reconstruct the formalities of word construction and aesthetic standards. Hence, we have selected the following aspects for investigation:

1. The quantity and proportion of word construction types.
2. The differentiation power of word construction morphemes.
3. The network of nodes for word construction morphemes.
4. The function and position of word construction morphemes.

These investigations aim to reveal the underlying connections between vocabulary, structure, and categories.

## Exploration Methods

The specific exploration methods are as follows:

1. Word construction is categorized using Hsu's classification method, and the quantity and proportion of word constructions are tallied.
2. Chinese characters within word constructions are divided into central and non-central characters. The T-SNE (t-Distributed Stochastic Neighbor Embedding) method is then used to test the positions of characters that maximize the differentiation of categories in each word construction.<sup>2</sup>
3. Each pair of examples is considered as directional edges, with the characters contained in the example pair regarded as nodes, forming a node network. The number of connections in and out of each character node and their hierarchy is calculated.
4. The typical functions and positions of each character within the word construction are computed.

Each entry in Cílín Diǎnyì consists of two to nine Chinese characters, with most forming a single morpheme. Some entries have characters that cannot be separated and are composed of multiple characters, collectively forming a single morpheme. The labeling of characters follows these guidelines:

When extracting each character from the example:

1. Phonetic information is annotated, with tone distinctions converted to tonal patterns. If there are multiple pronunciations, they are separated by the "|" symbol.
2. The three-dimensional position of the character within the example (sentence pair or word pair) is marked. This includes the length of characters in the example, the upper-lower sequence of the entry (0 for upper, 1 for lower), and the character's position within the example (starting with 0 for the first character, 1 for the second, and so on).
3. The category of the example in which the character is located is noted.
4. The Hsu's word construction model<sup>3</sup> for the two pairs of entries in the example are labeled.

漢字	聲母	韻母	平仄	開合	等呼	上下對序	詞內字序	例對字長	詞門	詞類	詞例	詞構
太	透	泰	仄	開	一	0	0	4	【天文門】01TW	【天文總】01TW00	太乙 長庚	MH

<sup>2</sup> In the survey conducted, character positions within words were used to distinguish categories. This approach emphasizes the significance of character order in classifying words and reveals structural patterns and relationships within the dataset. t-SNE was employed to visualize how positional differences impact word distribution in a lower-dimensional space, providing valuable insights for linguistic analysis and category characterization based on character positions. This methodology uncovers hidden linguistic patterns, offering a deeper understanding of lexical organization.

<sup>3</sup> Hsu, C. -M. 許長謨 (2010). 詞彙與語義之義證. In 漢語語言結構義證 (p. 125). 里仁書局, 臺北. Categories are as follows: 1) Simple Words: 聯綿 (LM, lianmian/binome) and 狀聲 (ON, onomatopoeia); 2) Compound Words: 並列 (CO, coordination), 偏正 (MH, modifier-head), 主謂 (SP, subject-predicate), 動賓 (VO, verb-object), and 動補 (VC, verb-complement); 3) Complex Words: 重疊 (DP, duplication) and 衍生 (AF, affix/derivation) 4) Location (CL, location), Proper Noun (PN, proper noun), Verb-Verb (VV, verb-verb), and Pivotal/Embedded (BY, baoyun/pivotal/embedded).

An alternative approach is to employ a vocabulary management method using a relational database, with Chinese characters as the axis, creating a master table. Other information is organized in separate tables, with numerical references linking them to the master table. This approach can effectively maintain vocabulary consistency and optimize search efficiency.

漢字	聲母	韻母	平仄	開合	等呼	上下對序	詞內字序	例對字長	詞門	詞類	詞例	詞構
1	5	2422	1	0	1	0	0	4	1	1	1	4

By managing in this manner, it becomes possible to differentiate characters with the same font that, in fact, originate from different contextual backgrounds:

1. “Quantitative Features” can be used to investigate the grammatical functions of Chinese characters, such as the length of characters in examples, upper-lower sequence, and character order within words.
2. “Qualitative Features” can be employed to explore the semantic attributes of Chinese characters, including categories like word gates, word types, examples, word constructions, or phonetic patterns such as initials, finals, tonal patterns, and combinations of open and closed syllables.

Currently, this study only examines cases involving two-character words.

## Investigation Results

### 1. Variety of Word Examples

When categorizing word construction types based on the total number of examples, they are ranked in the following order: modifier-head, verb-object, subject-predicate, and coordination. The remaining word construction types have very few examples. The categories of word constructions under “器用門” (Craftsmanship Category), “地理門” (Geography Category), and “果品門” (Fruit Category) exhibit the highest diversity in word construction types.

Table 1: Word Construction Quantity in Each Category (Two-Character Words)

門類	MH	SP	VO	CO	DP	VC	LM	PN	VV	ON	詞構種類
【器用門】19QY	291	12	90	14	4	7	2	8	1	0	9
【地理門】03DL	193	56	90	19	4	2	2	1	0	0	8
【果品門】26GP	174	27	41	4	2	6	1	1	0	0	8
【天文門】01TW	130	71	88	9	6	2	1	0	0	0	7
【音樂門】08YY	67	8	31	2	1	0	1	2	0	0	7
【服飾門】20FS	209	8	51	16	1	12	0	11	0	0	7
【草木門】24CM	243	53	91	11	7	1	2	0	0	0	7
【百花門】25BH	312	59	102	20	5	4	0	4	0	0	7
【飛禽門】27FQ	137	22	95	7	4	8	0	0	0	1	7
【走獸門】28ZS	84	10	65	1	1	2	1	0	0	0	7
【昆蟲門】30KC	66	16	48	4	2	2	1	0	0	0	7
【人倫門】09RL	93	11	80	10	2	13	0	0	0	0	6
【形體門】12XT	68	24	40	12	3	11	0	0	0	0	6
【武備門】14WB	44	9	35	5	0	1	0	1	0	0	6

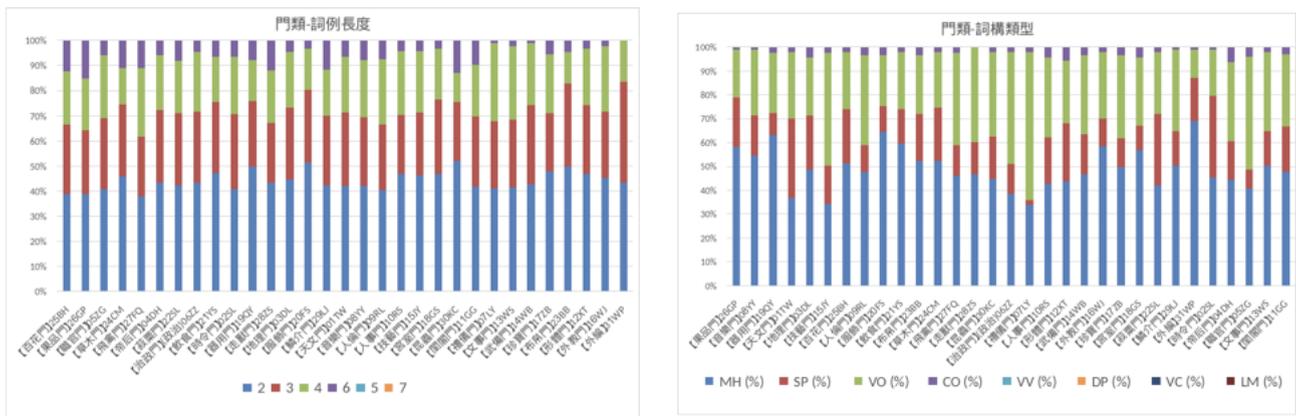
Table 1: Word Construction Quantity in Each Category (Two-Character Words)

【技藝門】15JY	55	10	70	5	2	6	0	0	0	0	6
【珍寶門】17ZB	40	3	26	4	0	3	0	2	0	0	6
【宮室門】18GS	166	10	67	12	0	4	0	1	0	0	6
【飲食門】21YS	178	13	63	8	2	0	0	4	0	0	6
【布帛門】23BB	45	7	17	4	0	0	1	2	0	0	6
【外編】31WP	90	13	20	4	4	10	0	0	0	0	6
【時令門】02SL	145	53	66	3	0	1	0	0	0	0	5
【帝后門】04DH	43	8	21	8	1	0	0	0	0	0	5
【職官門】05ZG	68	6	47	9	0	0	0	1	0	0	5
【治政門】06ZZ	29	6	30	2	0	1	0	0	0	0	5
【禮儀門】07LY	19	1	29	2	0	0	0	0	1	0	5
【人事門】10RS	105	29	86	15	0	2	0	0	0	0	5
【文事門】13WS	76	14	32	4	0	2	0	0	0	0	5
【外教門】16WJ	66	7	30	3	0	0	0	2	0	0	5
【菽粟門】22SL	72	19	33	4	4	0	0	0	0	0	5
【鱗介門】29LJ	57	4	35	1	0	1	0	0	0	0	5
【閨閣門】11GG	37	8	27	3	0	0	0	0	0	0	4
Total Quantity	3402	597	1646	225	55	101	12	40	2	1	
Total Percentage (%)	55.94	9.82	27.07	3.7	0.9	1.66	0.2	0.66	0.03	0.02	

“百花門”, “果品門” and “職官門” exhibit the most diverse word example lengths. In each category, two-character, three-character, and four-character word examples are predominant, with a fair representation of six-character examples. Five-character, seven-character, and other parallel structures are also present.

In terms of word constructions, apart from “技藝門” (Art Category), “禮儀門” (Etiquette Category), and “職官門” (Official Category), which contain a substantial number of verb-object structures in their examples, the remaining categories are primarily composed of modifier-head structures in their word examples.

Figure 2: Diversity of Word Examples



The table for the constituent components of each category is as follows :

Table 2: Word Construction Ratios in Each Category (Two-Character Words)

門類	MH (%)	SP (%)	VO (%)	CO (%)	DP (%)	VC (%)	LM (%)	PN (%)	VV (%)	ON (%)
【天文門】01TW	42.35	23.13	28.66	2.93	1.95	0.65	0.33	0	0	0
【時令門】02SL	54.1	19.78	24.63	1.12	0	0.37	0	0	0	0
【地理門】03DL	52.59	15.26	24.52	5.18	1.09	0.54	0.54	0.27	0	0
【帝后門】04DH	53.09	9.88	25.93	9.88	1.23	0	0	0	0	0
【職官門】05ZG	51.91	4.58	35.88	6.87	0	0	0	0.76	0	0
【治政門】(政治)06ZZ	42.65	8.82	44.12	2.94	0	1.47	0	0	0	0
【禮儀門】07LY	36.54	1.92	55.77	3.85	0	0	0	0	1.92	0
【音樂門】08YY	59.82	7.14	27.68	1.79	0.89	0	0.89	1.79	0	0
【人倫門】09RL	44.5	5.26	38.28	4.78	0.96	6.22	0	0	0	0
【人事門】10RS	44.3	12.24	36.29	6.33	0	0.84	0	0	0	0
【閨閣門】11GG	49.33	10.67	36	4	0	0	0	0	0	0
【形體門】12XT	43.04	15.19	25.32	7.59	1.9	6.96	0	0	0	0
【文事門】13WS	59.38	10.94	25	3.12	0	1.56	0	0	0	0
【武備門】14WB	46.32	9.47	36.84	5.26	0	1.05	0	1.05	0	0
【技藝門】15JY	37.16	6.76	47.3	3.38	1.35	4.05	0	0	0	0
【外教門】16WJ	61.11	6.48	27.78	2.78	0	0	0	1.85	0	0
【珍寶門】17ZB	51.28	3.85	33.33	5.13	0	3.85	0	2.56	0	0
【宮室門】18GS	63.85	3.85	25.77	4.62	0	1.54	0	0.38	0	0
【器用門】19QY	67.83	2.8	20.98	3.26	0.93	1.63	0.47	1.86	0.23	0
【服飾門】20FS	67.86	2.6	16.56	5.19	0.32	3.9	0	3.57	0	0
【飲食門】21YS	66.42	4.85	23.51	2.99	0.75	0	0	1.49	0	0
【菽粟門】22SL	54.55	14.39	25	3.03	3.03	0	0	0	0	0
【布帛門】23BB	59.21	9.21	22.37	5.26	0	0	1.32	2.63	0	0
【草木門】24CM	59.56	12.99	22.3	2.7	1.72	0.25	0.49	0	0	0
【百花門】25BH	61.66	11.66	20.16	3.95	0.99	0.79	0	0.79	0	0
【果品門】26GP	67.97	10.55	16.02	1.56	0.78	2.34	0.39	0.39	0	0
【飛禽門】27FQ	50	8.03	34.67	2.55	1.46	2.92	0	0	0	0.36
【走獸門】28ZS	51.22	6.1	39.63	0.61	0.61	1.22	0.61	0	0	0
【鱗介門】29LJ	58.16	4.08	35.71	1.02	0	1.02	0	0	0	0
【昆蟲門】30KC	47.48	11.51	34.53	2.88	1.44	1.44	0.72	0	0	0
【外編】31WP	63.83	9.22	14.18	2.84	2.84	7.09	0	0	0	0

## 2. Category Differentiation

Each category is treated as a collected sample, with the word examples within the category serving as features. Subsequently, the characters contained in the examples are divided into two groups: the first character in one group and the second character in another. Based on TF-IDF (Term Frequency-Inverse Document Frequency) normalized word frequency, the distances between samples are calculated using the t-SNE (t-Distributed Stochastic Neighbor Embedding) algorithm, and then projected into a two-dimensional plane. Finally, the concentration and dispersion of sample data points in the analyzed graph are observed.

The higher the Silhouette Score, indicating more concentration of data points within the same category, and the lower the Davies-Bouldin Index, signifying greater dispersion of data points between different categories, the more balanced the differentiation of characters' positions. This is reflected in a higher Quality Ratio.

In the following, "C" represents "Chinese character," lowercase "q" represents the "first character," and lowercase "h" represents the "second character." The critical positions that differentiate characters based on "category" and "subcategory" for various word constructions are as follows:

Table 3: Testing of Chinese Character Category Differentiation Positions

Type	Pos.	Silhouette Score (SS, range from -1 to 1)			Davies-Bouldin Index (DBI, range from 0 to 1)			Quality Ratio (SS/DBI)		
		Cat	Sub-cat	Difference	Cat	Sub-cat	Difference	Cat	Sub-cat	Difference
MH	Cq	0,08	0,49	5,13	0,63	0,75	-0,88	0,12	0,65	4,42
	Ch	0,29	0,64	1,21	0,33	0,64	-0,73	0,87	1	0,15
SP	Cq	0,1	0,61	5,10	0,51	0,64	-0,90	0,19	0,95	4,00
	Ch	0,47	0,73	0,55	0,13	0,59	-0,77	3,7	1,24	-0,66
VO	Cq	0,28	0,72	1,57	0,32	0,55	-0,80	0,86	1,32	0,53
	Ch	0,05	0,62	11,40	0,52	0,7	-0,95	0,1	0,89	7,90
CO	Cq	0,28	0,91	2,25	0,44	0,43	-0,80	0,63	2,12	2,37
	Ch	0,31	0,86	1,77	0,38	0,53	-0,79	0,84	1,62	0,93

In summary, for both “category” and “subcategory”, the key positions for differentiation are as follows: the second character is key in subject-predicate (SP) and modifier-head (MH); the first character is key in verb-object (VO). In coordination (CO) structures, the second character distinguishes "category," while the first character distinguishes "subcategory."

When shifting analysis from “category” to “subcategory” within the same word construction and at the same character position, notable differences in clustering strength (Silhouette Score) are observed. For instance, in modifier-head (MH), the clustering strength for "modifier (Cq)" increased by 5.13%, whereas "head (Ch)" only increased by 1.21%.

In summary, characters originally considered key positions in “category” tend to weaken their clustering function when transitioning to "subcategory" within the same word construction, and these characters are integrated into "subcategory" by characters that were originally non-key positions.

For example, in subject-predicate, “subject” in subject-predicate, “modifier” in modifier-head, “object” in verb-object, and the “second character” in coordination, while they cannot govern “category”, can integrate “subcategory”.

Additionally, the Davies-Bouldin Index values, which represent the interval between Chinese characters' clustering, also exhibit corresponding changes during the transition to a different “subcategory”.

It is important to note that the testing results are most reliable for modifier-head (55.94%) and verb-object (27.07%) based on the ratio of subcategory word construction quantity to the total quantity.

### 3. Chinese Characters Semantic Network

In this section, we delve into the construction of a network using Chinese characters as nodes. Each Chinese character, along with its quantitative characteristics (including its position in a word pair,

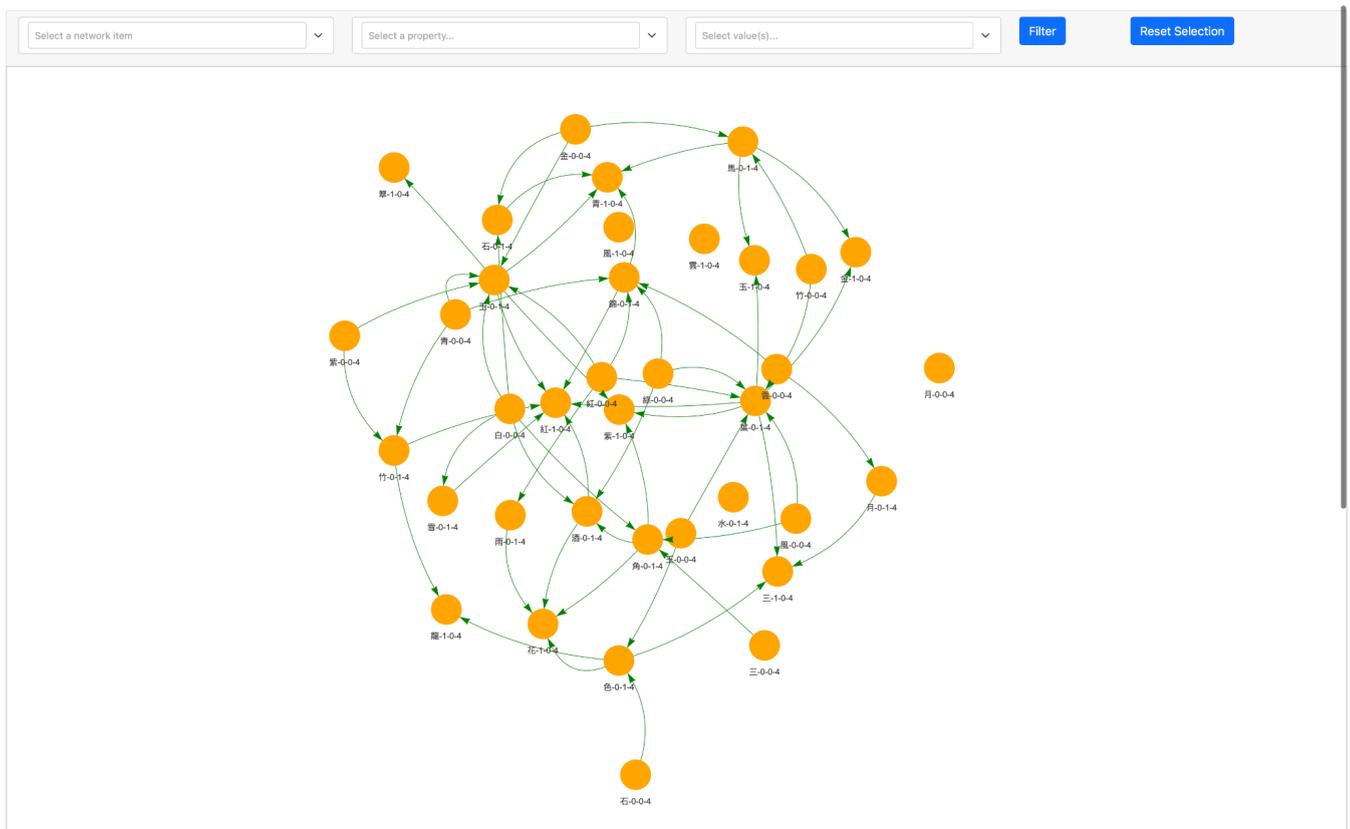
the pair's sequence, and the character's length within examples), becomes a network "node." The connections, or "directed edges," between nodes are determined by the order of characters in word examples. For example, in the word pair “太乙|長庚”, the directed edges connect characters in this sequence: “太—乙—長—庚”.

Positional information for each character is recorded to keep track of where they appear within different word pairs or sentence pairs. This information ensures that each character's connections are unique to their specific context.

We calculate the number of nodes that can function as "previous characters" and those that can serve as "subsequent characters." Additionally, we assess the level at which they can extend to form complete words. This analysis helps us understand the connection capabilities of each node within the network.

The top ten characters with the most generative capacity and their respective word construction positions are as follows: “三-1-0-4”, “雨-0-1-4”, “月-0-0-4”, “風-1-0-4”, “雲-1-0-4”, “風-0-0-4”, “雲-0-0-4”, “月-0-1-4”, “石-0-1-4”, and “玉-0-0-4”. These characters play a significant role in forming various word structures within the network.

Figure 4. Chinese Characters with More than Thirty Layers of Sequential Node Connections



#### 4. Distribution of Chinese Characters' Functions and Positions within Word Constructions

Building upon the analyses conducted earlier, we've identified the crucial positions that differentiate categories within each word construction, such as the "second character" in modifier-head structures. Additionally, based on the second analysis, we've pinpointed potential nodes that facilitate the generation of additional word entries within each word construction. For example, nodes like “風-0-0-4”, “雲-0-0-4”, or “月-0-1-4” within the node network.

For Chinese characters with stronger connectivity, we delve deeper to examine their distribution ratios across various positions within each word construction, corresponding categories, and semantic classes. This allows us to understand the typical distribution and category correspondence for each character within word constructions. For instance, an investigation into the distribution of the character “風” across different word constructions reveals that “風” can be used across various word constructions, particularly in modifier-head (MH), verb-object (VO), and subject-predicate (SV) structures. In modifier-head structures, it predominantly occupies the lower pair and frequently serves as the "second character" in categories with strong differentiation. In verb-object structures, it also tends to be in the lower pair and often serves as the "second character" in categories with weaker differentiation. In subject-predicate structures, it mainly appears as the "first character" and does not play a role as the “second character”, with weaker category differentiation. In summary, despite its widespread usage across various word constructions, “風” primarily assumes a non-central role within the word construction:

條件:('風', 'VO', 1, 1, 4), 數量: 33, 比率: 18.97%, 詞條: 逐雨|追風.....  
條件:('風', 'VO', 0, 1, 4), 數量: 13, 比率: 7.47%, 詞條: 因風|伴月 占風|觀日.....  
條件:('風', 'VC', 1, 0, 4), 數量: 1, 比率: 0.57%, 詞條: 雨折|風掀  
條件:('風', 'SP', 1, 0, 4), 數量: 27, 比率: 15.52%, 詞條: 雨剪|風梭 日嫩|風嬌.....  
條件:('風', 'SP', 0, 0, 4), 數量: 16, 比率: 9.20%, 詞條: 風脆|雨香 風勁|雲濃.....  
條件:('風', 'MH', 1, 1, 4), 數量: 32, 比率: 18.39%, 詞條: 穀雨|梅風 十雨|五風.....  
條件:('風', 'MH', 1, 0, 4), 數量: 21, 比率: 12.07%, 詞條: 月姐|風姨 清白|風流.....  
條件:('風', 'MH', 0, 0, 4), 數量: 18, 比率: 10.34%, 詞條: 風腳|雨拳 風馴|雷鞭.....  
條件:('風', 'MH', 0, 1, 4), 數量: 9, 比率: 5.17%, 詞條: 鷹風|鶴雲 濕風|陰雲.....  
條件:('風', 'CO', 1, 0, 4), 數量: 2, 比率: 1.15%, 詞條: 儒雅|風神 富貴|風流  
條件:('風', 'CO', 0, 0, 4), 數量: 2, 比率: 1.15%, 詞條: 風流|搖曳 風渙|隨雷

For example, let's consider the character “龜” as the subject of investigation, limiting the focus to four-character word examples:

條件:('龜', 'VO', 1, 1, 4), 數量: 1, 比率: 5.88%, 例對: 棲鵲|麗龜  
條件:('龜', 'SP', 1, 0, 4), 數量: 1, 比率: 5.88%, 例對: 魚戲|龜遊  
條件:('龜', 'MH', 1, 0, 4), 數量: 6, 比率: 35.29%, 例對: 龜石|龜山 椿算|龜齡 鶴眼|龜文 鳳彩|龜文 貝錦|龜紗 馬蹄|龜背  
條件:('龜', 'MH', 0, 0, 4), 數量: 5, 比率: 29.41%, 例對: 龜齡|馬齒 龜甲|蛛絲 龜殼|蒲頭 龜甲|鶴文 龜甲|龍文  
條件:('龜', 'MH', 1, 1, 4), 數量: 2, 比率: 11.76%, 例對: 砥柱|寶龜 銅鶴|神龜  
條件:('龜', 'MH', 0, 1, 4), 數量: 1, 比率: 5.88%, 例對: 洛龜|岡鳳  
條件:('龜', 'CO', 1, 0, 4), 數量: 1, 比率: 5.88%, 例對: 熊虎|龜蛇

It is evident that the character “龜” most frequently appears as a modifier in the "four-character modifier-head pairs" in the "upper part" (35.29%) and as a modifier in the "complement sentence" (29.41%). It is relatively less common for “龜” to function as the headword in modifier-head pairs, with occurrences of 11.76% and 5.88%, respectively. Additionally, “龜” is observed in structures containing verbs, specifically in subject-predicate and verb-object structures, appearing only in the lower part of these structures and serving as the subject or object. Earlier, using the T-SNE method,

it was verified that subject-predicate and verb-object structures, with “謂” (predicate) and “動” (verb) as central characters, have a higher discriminative power in terms of categories. Consequently, in structures containing verbs, “龜” does not exhibit strong category-differentiating power.

In summary, “龜” has not functioned as a verb and is mostly employed as a modifier in modifier-head structures. While the central role in these structures is not its strength, it is not insignificant either. Therefore, innovating by changing the position of “龜” in modifier-head structures is not easy. Conversely, in subject-predicate or verb-object structures, successfully altering “龜” grammatical roles can yield unique effects. For example, using “龜” as a verb implies "to hide," resulting in the derived word “龜著” (to hide) in the affix/derivation structure. An example usage might be: “When he got scared, he would ‘龜著’ and run back home. (他一害怕就跑回家「龜著」。)”

This investigation clarifies the similar and distinct conditions required for generating new words and creating new meanings. Phonetics can also be used as search criteria to explore new words or meanings generated from similar phonetic structures, investigating analogies or logical connections between new words or meanings and phonetic patterns.

## Conclusion and Discussions

This article extensively explores the intricate relationship between Chinese lexical constructions and themes, emphasizing the dynamic nature of language. It particularly highlights how Chinese characters, as morphemic components, exhibit variations in their positions, functions, meanings, and poetic nuances within different word constructions.

In conclusion, the results of this investigation reveal that when isolated from their word constructions, Chinese characters represent mere morphemes or partial components of morphemes and do not inherently define their parts of speech.

Analyzing the distribution of the same character on either side of a central word's core is essentially an analysis of the ability to create metaphoric transformations within morphemes or morphemic components. For instance, in modifier-head structures, characters that can be interchanged (i.e., functionally interchangeable) to form words of different categories provide an example of such associations<sup>4</sup>. This kind of association stems from everyday experiences and corresponds to a poet's ability to employ metaphors to *touch* (chùwù 觸物) things. Analyzing within word constructions,

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<sup>4</sup> By altering the node settings and removing directional information from the nodes while filtering for the situation where the last character in the upper pair can be exchanged with the first character in the lower pair, you can identify all the Chinese characters whose upper and lower character positions can be interchanged: 三-重, 雲-鶴, 別-鶴, 梅-欺, 槐-綠, 市-槐, 清-香, 月-落, 明-月, 月-桂, 夜-月, 纈-風, 吹-風, 搖-風, 從-風, 星-流, 星-繁, 星-編, 停-雲, 雲-飛, 暖-風, 綺-霞, 日-觀, 滴-雨, 煙-磨, 洞-雲, 天-行, 管-絃, 弓-張, 賓-鴻, 紫-蓋, 飛-高, 花-黃, 銀-黃, 合-璧, 振-玉, 玉-碎, 屑-玉, 玉-縷, 玉-白, 烏-金, 紫-金, 楓-江, 燕-玉, 飛-龍, 山-飛, 飛-鸞, 破-鏡, 珠-連, 垂-珠, 寶-珠, 國-香, 雪-香, 珠-綴, 散-珠, 文-龍, 織-蒲, 翔-鸞, 盤-龍, 作-解, 凝-烟, 簪-花, 白-花, 吟-秋, 木-落, 沙-眠, 濃-陰, 紫-苔, 戀-蝶, 戲-蝶, 盤-鴉, 水-面, 梅-熟, 化-女, 化-雀, 紅-蓼, 殘-紅, 紅-醉, 帶-露, 三-春, 祖-竹, 嘯-竹, 乳-花, 柳-舒, 柳-細, 柳-穿, 紅-輕, 流-翠, 丹-書, 埋-雪, 草-黃, 新-詩, 冰-彈, 綠-葉, 紅-苞, 寒-燈, 舞-鶴, 停-針, 白-蘿, 立-竹, 塢-竹, 毛-竹, 徂-暑, 交-衣, 薦-酒, 吟-蛩, 密-葉, 子-白, 駕-鶴, 怨-鶴, 炭-獸, 奔-崖, 中-虛, 馬-馳, 衣-錦, 孫-桐, 化-魚, 狐-疑, 丹-心, 池-鳳, 棲-鳳, 調-鼎, 調-鹽, 勁-節, 批-鱗, 細-腰, 螭-蟠, 身-輕, 心-虛, 翅-薄.

when the same position, morpheme, or morphemic component can be replaced while maintaining the same word category, it delves into the metaphorical structure of a word. The example pairs in the word forest highlight the metaphoric logic behind words within the same theme. Such analogies arise from rational analysis and correspond to the poet's ability to *comprehend* (yuánlǎn 圓覽) in poetic metaphors. Viewing a poet's approach to word formation from this perspective helps understand how in poetry, *despite being from different backgrounds* (wù suī hú yuè 物雖胡越), *things can eventually harmonize* (hé zé gān dǎn 合則肝膽)<sup>5</sup>.

Under the constraints of classical metrics, classical Chinese poetry is actually required to be created at least on the level below phrases. Therefore, it's challenging for poetry to have a strict sense of sentence structure: we simply use the concept of everyday sentences to interpret the formal sentences in poetry as a temporary measure. In fact, a complete sentence in poetry, a paragraph defined by a self-contained meaning and distinct from other meanings, often spans several formal sentences. Moreover, throughout the entire poem, it's as if the entire poem is a single word, and all the Chinese characters are morphemes, like a series of language gestures to pass over different semantic categories within a poetic body<sup>6</sup>. The word construction pattern is thus the key to access a poem's vision.<sup>7</sup>

Since poetic parallelism also relies on the compositional structure of classical verse, the question arises whether the combination of phonetics and the metaphorical structure of example pairs can generate "analogical relationships." Can the pronunciation's place and manner of articulation of phonemes be related to the metaphoric structure of morphemes or morphemic components within word constructions to produce such wide-ranging yet nuanced connections? As we continue to build the word forest database based on the reconstructed model of classical morphemic relationships, these questions, accompanied by the analysis process, will gradually lead us to systematic explanations.

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<sup>5</sup> These four terms are used by Liu Xie [劉勰] (465-521) in his famous work *Wénxīn Diāolóng* 文心雕龍 to create a concluding envoi at the end of the *Bǐ-Xīng* 比興 chapter, which explains how the metaphoric and metonymic forms encompass semantic categories.

<sup>6</sup> Zheng, Y.-Y. [鄭毓瑜]. (2017). *姿與言: 詩國革命新論* (p. 16). 麥田出版, 臺北. The author emphasizes the categorical association of words organized like functional organisms within one poetic body, including the universe, nature, people, the environment, and all physiological activities of a poet when they pronounce words.

<sup>7</sup> In the abstract of Liu, C.-L. [劉昭麟], Chang, W.-T., Chu, C.-T., & Zheng, T.-Y. (2023), "Machine learning and data analysis for word segmentation of classical Chinese poems: Illustrations with Tang and Song examples", published in *Digital Scholarship in the Humanities*, the authors discuss the word's crucial role in accessing a Chinese classical poem.

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