

**The key to success in academic writing:
Discussing a connection between argumentation
and information in English journal articles from
the knowledge organization perspective**

**學術寫作的致勝關鍵—從知識組織探討英文期刊論文的
論證與資訊連結模式**

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Oct 19, 2023 @National Central Library, Taipei, Taiwan

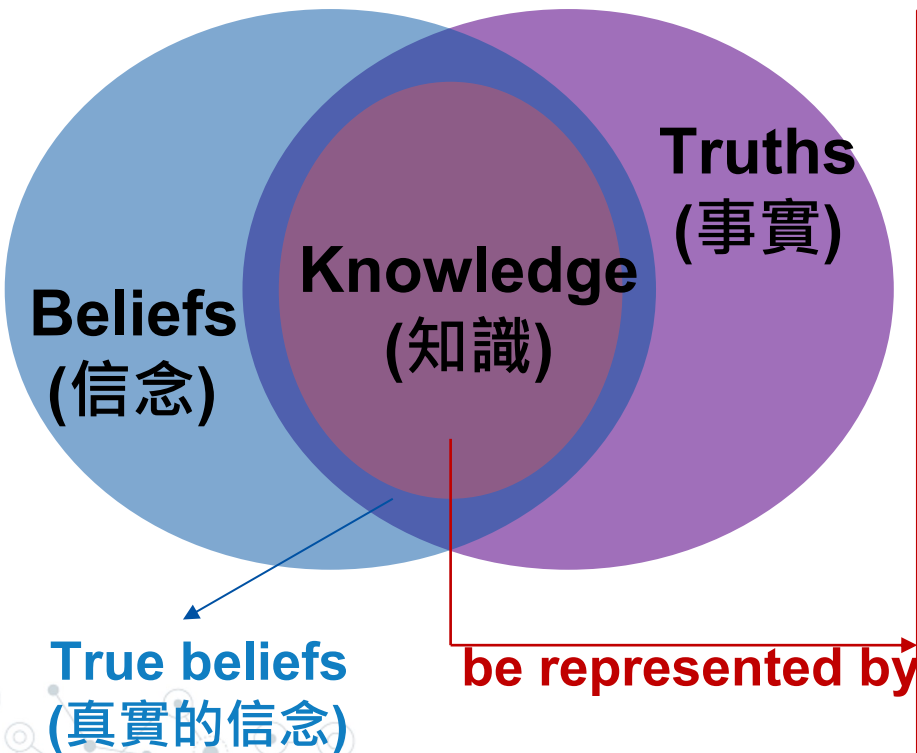
Overview

- **Introduction**
 - ✓ Ontology, argumentation & visualization
 - ✓ Knowledge graph (KG)
- **KG-based interface systems**
 - ✓ Digital heritage collections
 - ✓ Current research in Asia
 - ✓ Scientific KG-based platforms
 - ✓ KG-based book catalogues
- **KG-based systems in the future**



Introduction

Knowledge & its Representation



- Symbols & concepts (Syntax 句法)
- Agreement about the meaning (Semantics 語義)
- Concepts' categorization (Taxonomy 分類)
- Connections among concepts (Thesauri 索引典)
- **Rules specifying permissible relations (Ontology 本體論)**

What is an ontology?

➤ **Concept-Relation-Concept**

概念-關係-概念

➤ **Example:**



smoking causes diseases

smoking *-(cause)->* disease

In LIS...

➤ Traditional:

Describe and organize books and journal articles

➤ Recent:

Create networks of topics, authors & documents using **hyperlinks(超連結)**



➤ Future:

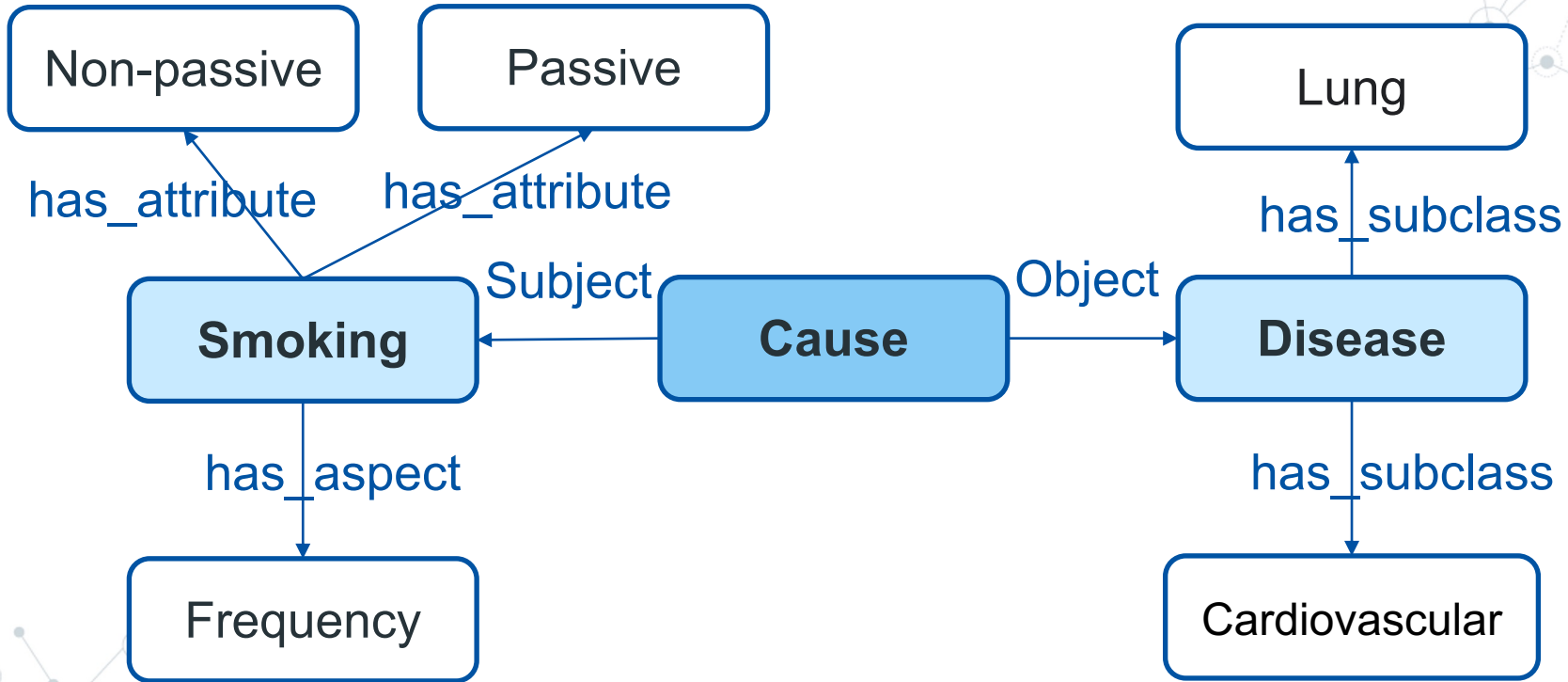
Describe and organize the **actual knowledge content in documents(文件中的知識內容)**, to support

- Linking of ideas/information
- Integration & synthesis of knowledge
- User learning

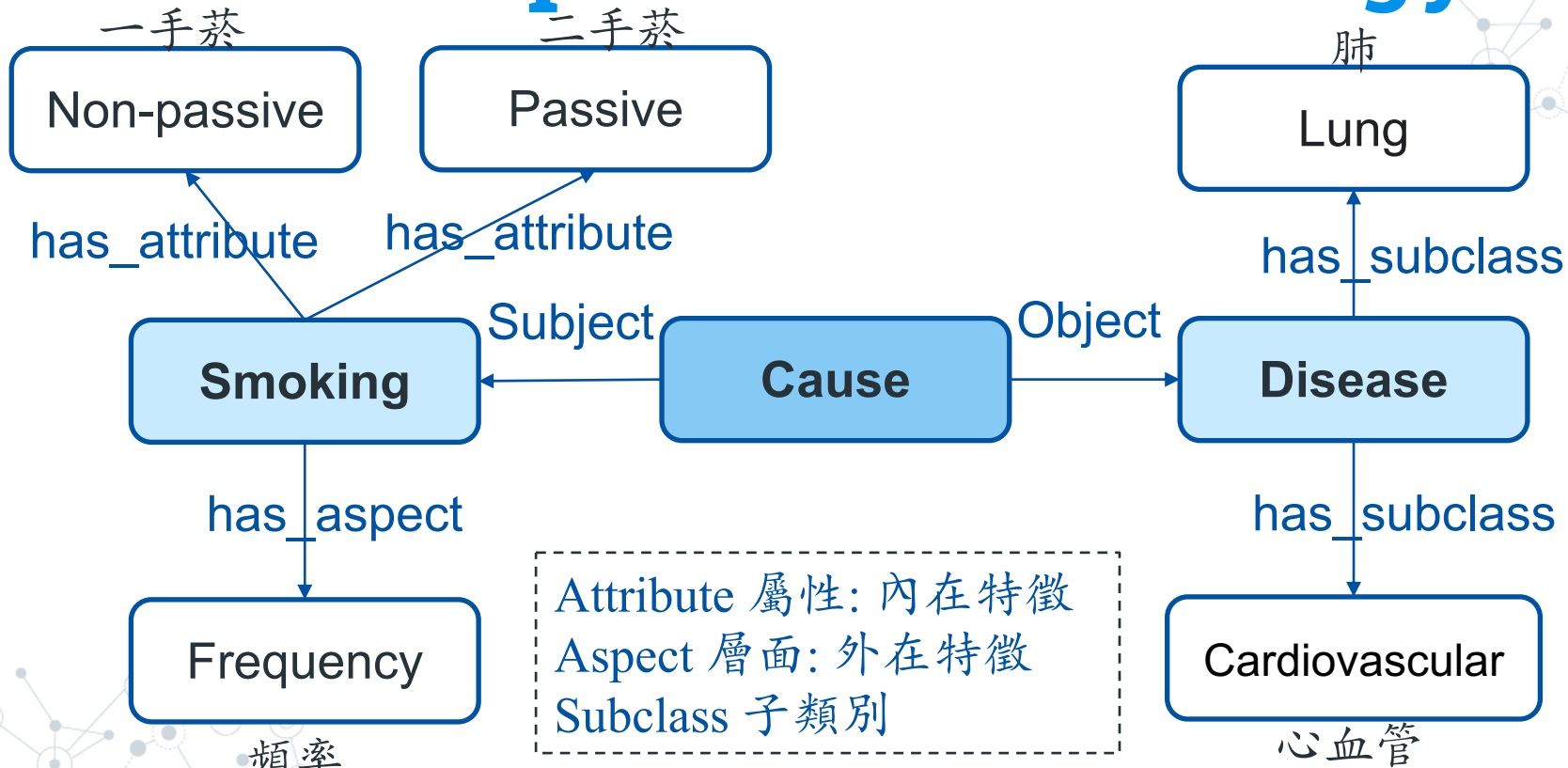
How to represent an ontology?



How to represent an ontology?



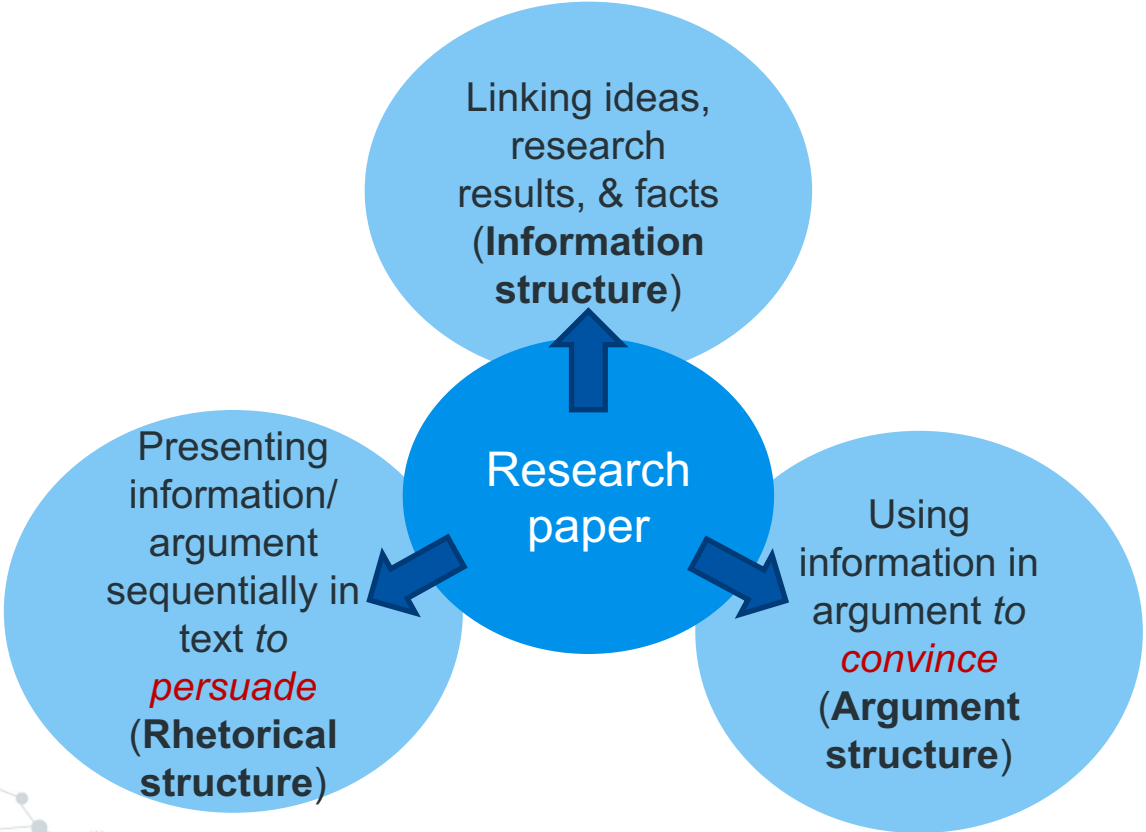
How to represent an ontology?



Academic writing?

- Covers a wide range of discursive writing by undergraduate and graduate students, researchers, and professors
 - essays, term papers, and theses
 - research papers for journal and conference publications
- It is difficult
 - for students to learn and do well
 - for teachers to teach
 - for new researchers and academics **in Asian countries (non-native English speakers)**

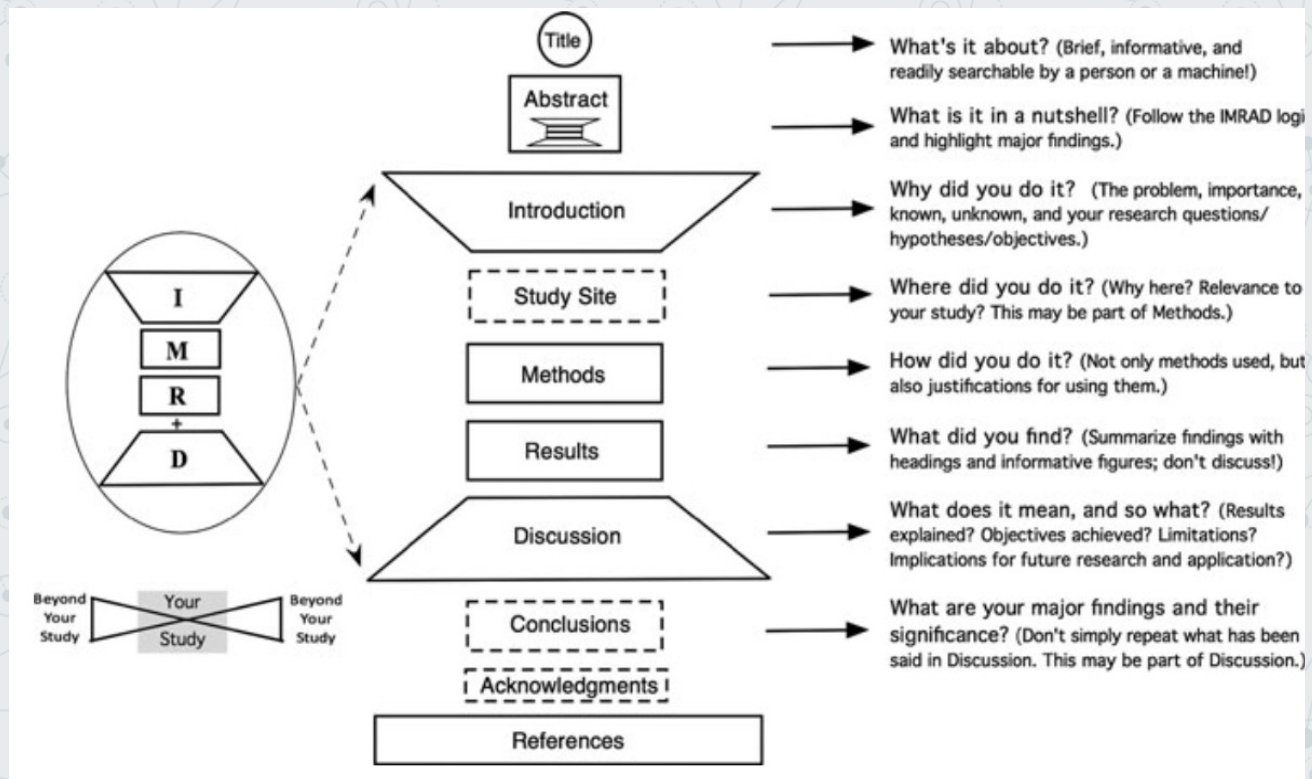
Args and info in research papers



Rhetorical structure (修辭結構)

Presenting information/argument sequentially in text to *persuade*

Research paper



The famous structure: Introduction, Method, Result, and Discussion (IMRAD)

Figure adapted from: Wu, J. (2011). Improving the writing of research papers: IMRAD and beyond. *Landscape Ecol*, (26), 1345-1349.

Argument structure?

Argument (論證):

➤ Claim (主張)

an assertion that the author seeks to **convince** the reader of

- A *Research objective* is worth investigating

➤ Support (支持)

supporting evidence (證據) or logical reasoning (邏輯推理)

- A *Research gap / Research motivation/justification*

Argument structure (論證結構)

Using information
in
argument
to *convince*

Research
paper

INTRODUCTION

Claim

[arg002:claim:literature-evaluate/critique():] Travel and tourism have been investigated in a substantial number of studies; however, the majority of these studies are limited to discussions of the reasons why people travel (e.g. , George 2004 , Lam and Hsu , 2006 March and Woodside , 2005 and Rittichainuwat , 2011 2006 ; Venkatesh , 2006) .

[arg003:claim:research_issue():] As asserted by Sönmez and Graefe (1998) , the reasons why travelers decide not to travel is as relevant to the study of travel decision-making as are the reasons why they choose to travel ; [arg004:claim:research_gap():] however , many conventional models do not pay attention to the latter .

[arg005:claim:topic_centrality():] Chon , Pizam and Mansfeld (2012) proposed that non-travelers represent an important marketing opportunity and argued that it is therefore essential that marketers seek to discover why people do not travel .

[arg006:claim:topic_centrality():] This need is especially critical , given the large number of non-travelers worldwide (Smith , Fralinger & Litvin , 2011) .

[arg006:support:cited_authors_claim/opinion():] McKercher (2009) , for example , found that 1 in 4 adults in the developed world had not taken an overnight pleasure trip; [arg006:support:cited_authors_claim/opinion():] furthermore , Litvin Smith , and Pitts (2013) reported that 1 in 5 Americans had not taken a trip during the period from 2004 to 2005 .

[arg008:claim:topic_centrality():] Such evidence regarding the number of non-travelers is not sufficient to more deeply understand non-travelers , which can , in turn , enable the conversion of non-travelers into tourists and increase the influx of " new money " into local/regional economies ,

Support

[arg008:claim:research_gap():] Evidence shows that previous research on travel decision-making has overwhelmingly focused on the reasons why people travel , but there is a marked dearth of scholarship investigating the reasons why people avoid traveling .

[arg009:claim:research_gap():] Only a few empirical research studies on non-travelers have appeared in the tourism literature ;

[arg010:claim:literature-summarize/generalize():] generally , these studies have reported that situational factors such as physical condition , economic constraints , and lack of time influence non-travel decisions (e.g. , Haukeland 1990 , Mansfield 1992 , McKercher 2009 , Nyaupane and Andereck , 2008 and Smith Carmichael , 2005) .

[arg011:claim:literature-counter_arg():cited other research to refute the Lit-generalize] However , Samdahl and Jekubovich (1997) argued that the classic model of leisure constraints does not accurately capture all of the factors that influence people 's behaviors .

For the coding scheme, see: Cheng, W.-N., & Khoo, C. S. G. (2022). Information and argument patterns in the Introduction sections of sociology research papers. *Ibérica*, (44), 127-154.

Information structure?

◎ An argument consists of pieces of *information* linked together:

Concept – (relation) -> Concept

○ Example

Social media *affect* traveler behavior



Social media – (*affect*) -> Traveler behavior

Concept-Relation-Concept triples

◎ ***Information structure***

Conceptual structure of argument content

Ontology: ~~Linking books~~ -> Linking **claims** & **supports** (apply in argumentation)

Information structure (資訊結構)

Linking ideas, research results & facts

Research paper

ABSTRACT

[arg001:claim:topic_centrality():Concept1] Considering the strong influence of social media on internet users , it is important to understand its role for hotel business . . . of lodg . . .

[arg002:claim:research_gap(cause concept relation effect concept)] . . . media . . . ry few s . . . on hotel . . .

[arg003:claim:research_objective(broad):] The main purpose of the current research is to examine the effectiveness of [FRR1: attri: :] embedded social media channels on [FRR1: concept1: :] hotel websites and their [FRR1: instance: :] influence on [FRR1: concept2: :] traveler behavior .

[arg004:claim:concept/theory/model-apply():] Applying the uses and gratifications (U & G) approach , [arg005:claim:research_objective(narrow):] we examined [FRR2: instance: :] relationships among [FRR2: concept1: : concepts] traveler gratifications , satisfaction and purchase intentions

[arg005:support:method():] by [FComp: instance: :] comparing [FMeasure: aspect: :] user experience with [FMeasure: target_entity: :] hotel websites that [FComp: attri: :] used embedded social media channels to those [FComp: attri2: :] without embedded social media channels .

[arg006:claim:result():] The results indicated that travelers exposed to [FRR3: concept1: :] the hotel website with [FRR3: attri: :] embedded social media channels [FRR3: instance: :] had [FRR3: polarity: positive: :] higher levels of [FRR4: concept1: :] [FRR3: concept2: :] perceived informativeness , perceived enjoyment , and perceived social interaction that directly [FRR4: instance: :] influenced [FRR4: concept2: :] traveler [FRR4: aspect2: :] satisfaction .

[arg007:claim:result(narrow):] In the context of [FRR5: context: :] embedded social media channels , [FRR5: concept1: :] the gratification factors , such as [FRR5: subclass1: :] perceived enjoyment and perceived social interaction , [FRR5: instance: :] directly influenced [FRR5: concept2: :] traveler satisfaction and purchase intentions , and [FRR6: D/I relation.indirect: :] indirectly [FRR6: instance: :] influenced [FRR6: concept2: :] purchase intentions through [FRR6: mediator: :] traveler satisfaction .

[arg008:claim:result():] Meanwhile , [FRR7: concept1: :] perceived informativeness [FRR7: modality: :] did not [FRR7: instance: :] influence [FRR7: concept2: :] purchase intentions directly in either sample , but it did [FRR8: instance: :] influence [FRR8: concept2: :] purchase intentions [FRR8: D/I relation.indirect: :] indirectly through [FRR8: mediator: :] travelers ' satisfaction .

[arg009:claim:result(neutral):] Furthermore , for the group who used [FRR9: context: :] the hotel website without embedded social media channels , [FRR9: concept1: :] perceived social interaction was found to have [FRR9: modality: :] no significant [FRR9: instance: :] effect on [FRR9: concept2: :] travelers' satisfaction and purchase intentions .

Types of research

Different types of research present different types of *arguments* using different types of *information*

1. Investigative research(調查研究)
 - Investigate a relation (i.e. cause-effect) between two concepts/entities, often by carrying out a survey
2. Descriptive research(論述研究)
3. Development and evaluation research (開發與評估研究)

Information Structure: Ontology



Each type of research has a **core semantic frame**(核心語義框架), presenting the main information

- Development and Evaluation frame
- Description frame
- Research-relation frame

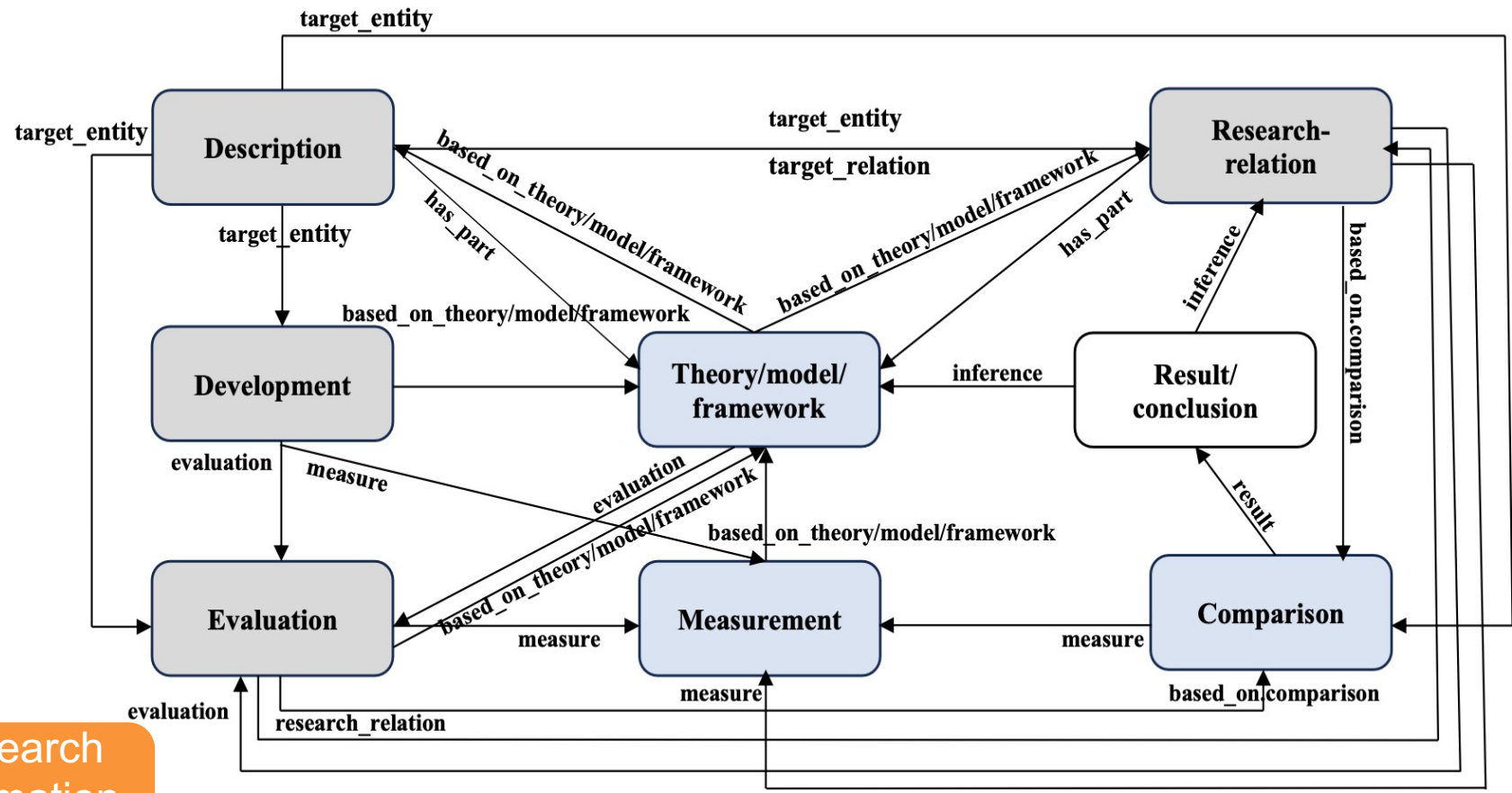


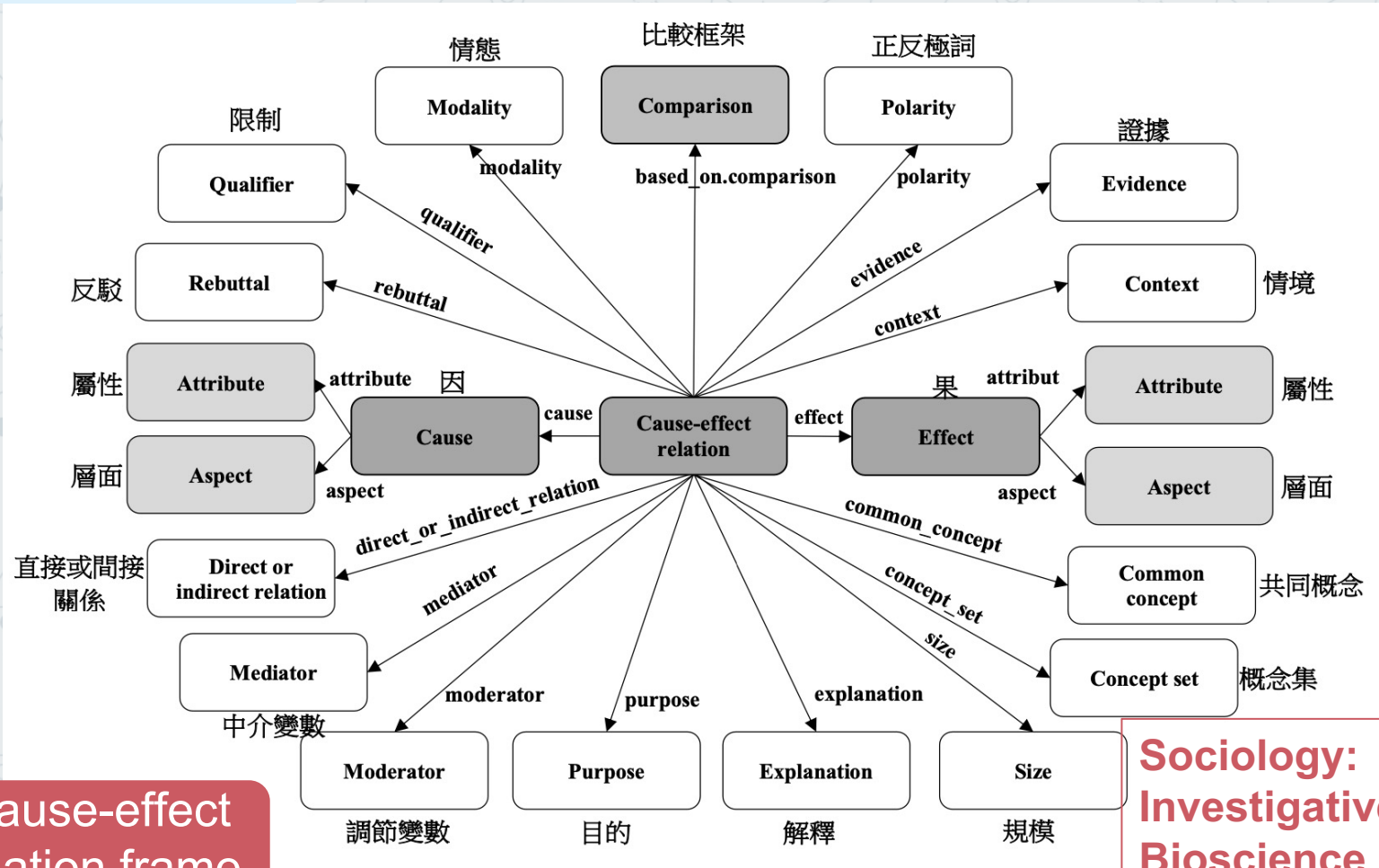
Common information types across the three types of research using **the other common semantic frames**

- Comparison frame
- Theory/model/framework frame
- Measurement frame

has subclass:

Cause-effect(因果), Prediction(預測), Correlation(相關),
Co-occurrence(共現), Association(關聯)



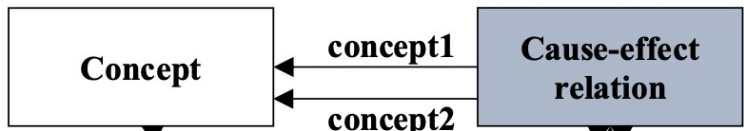


Cause-effect relation frame

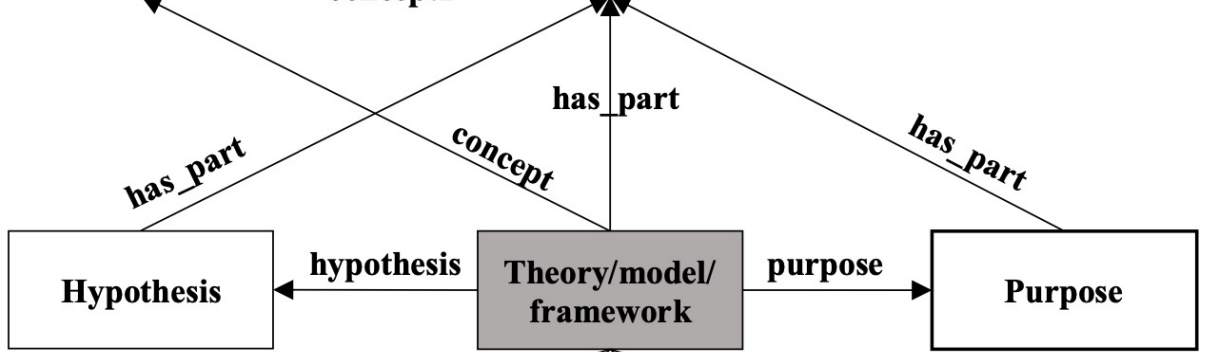
Sociology: Investigative research
Bioscience research

因果關係框架

概念

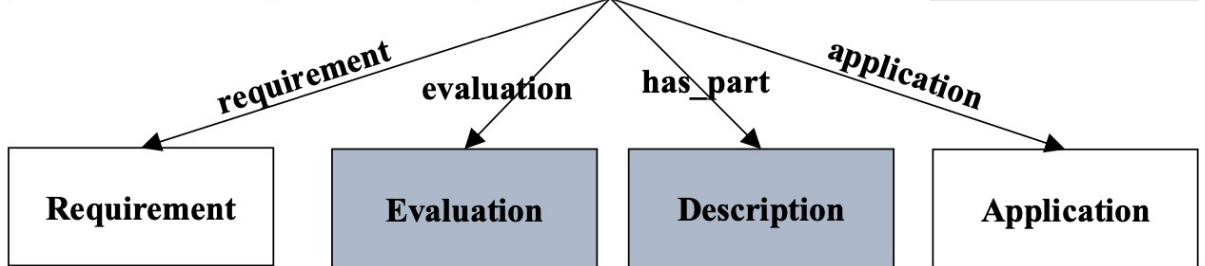


假設



目的

條件



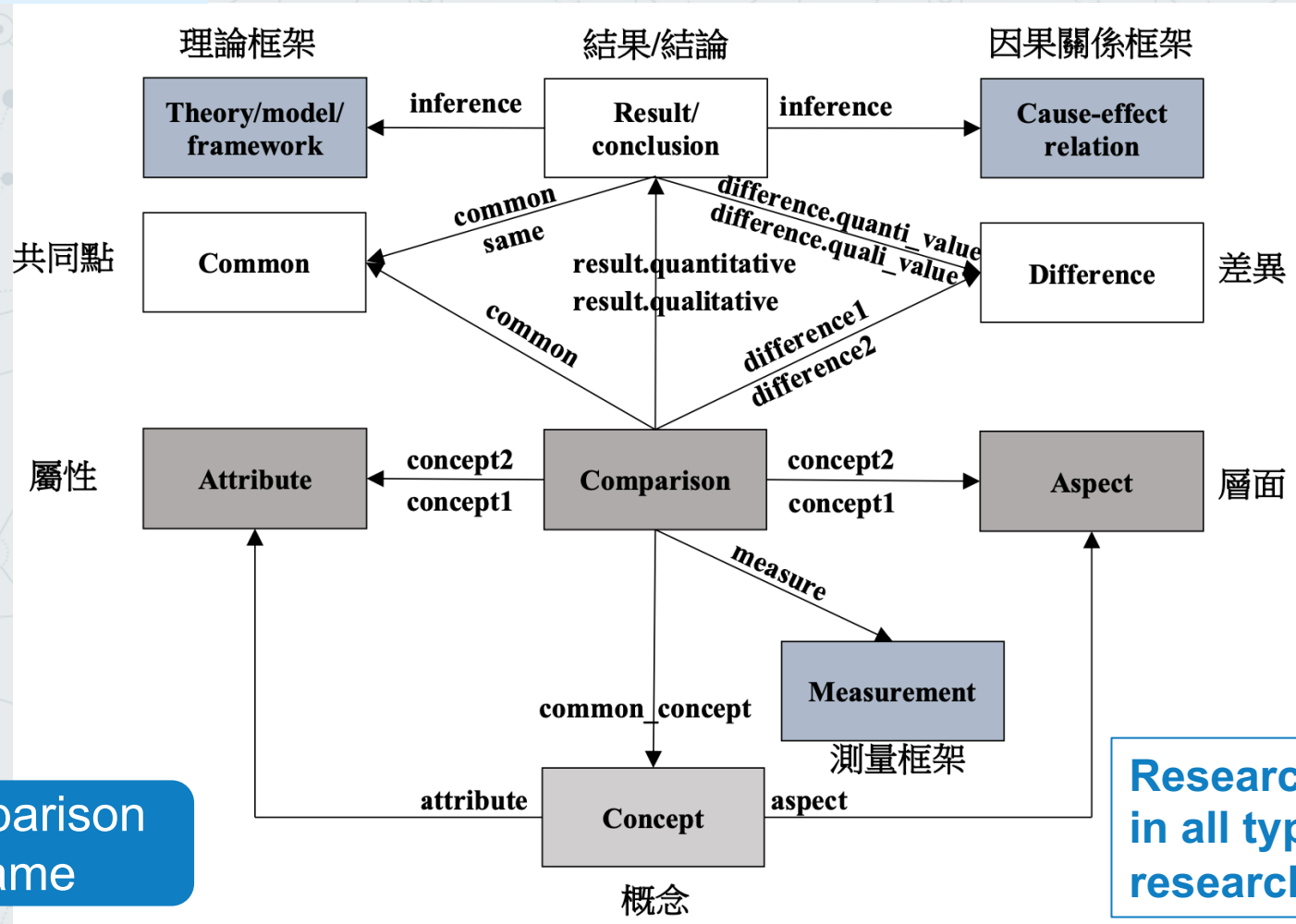
應用

評估框架

論述框架

Theory/model/
framework frame

Sociology: Development
and evaluation research
Mechanical engineering



Comparison frame

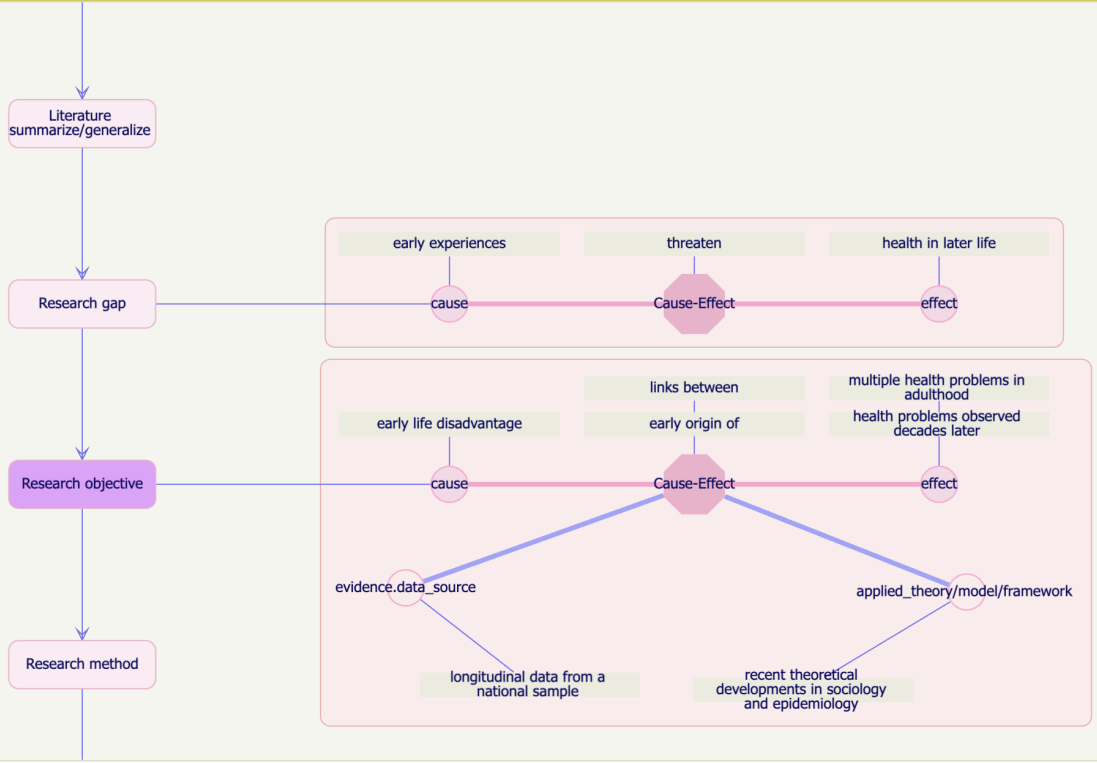
Research results in all types of research

Causal Argument Structure -- Ferraro, Schafer & Wilkinson (2016)

Click on a node to display text info, right-click to expand the node with neighbor nodes.

Graph layout actions: Re-layout graph Unlock fixed nodes Lock nodes in place Clear canvas Reset zoom Open fullscreen

M
E
N
U



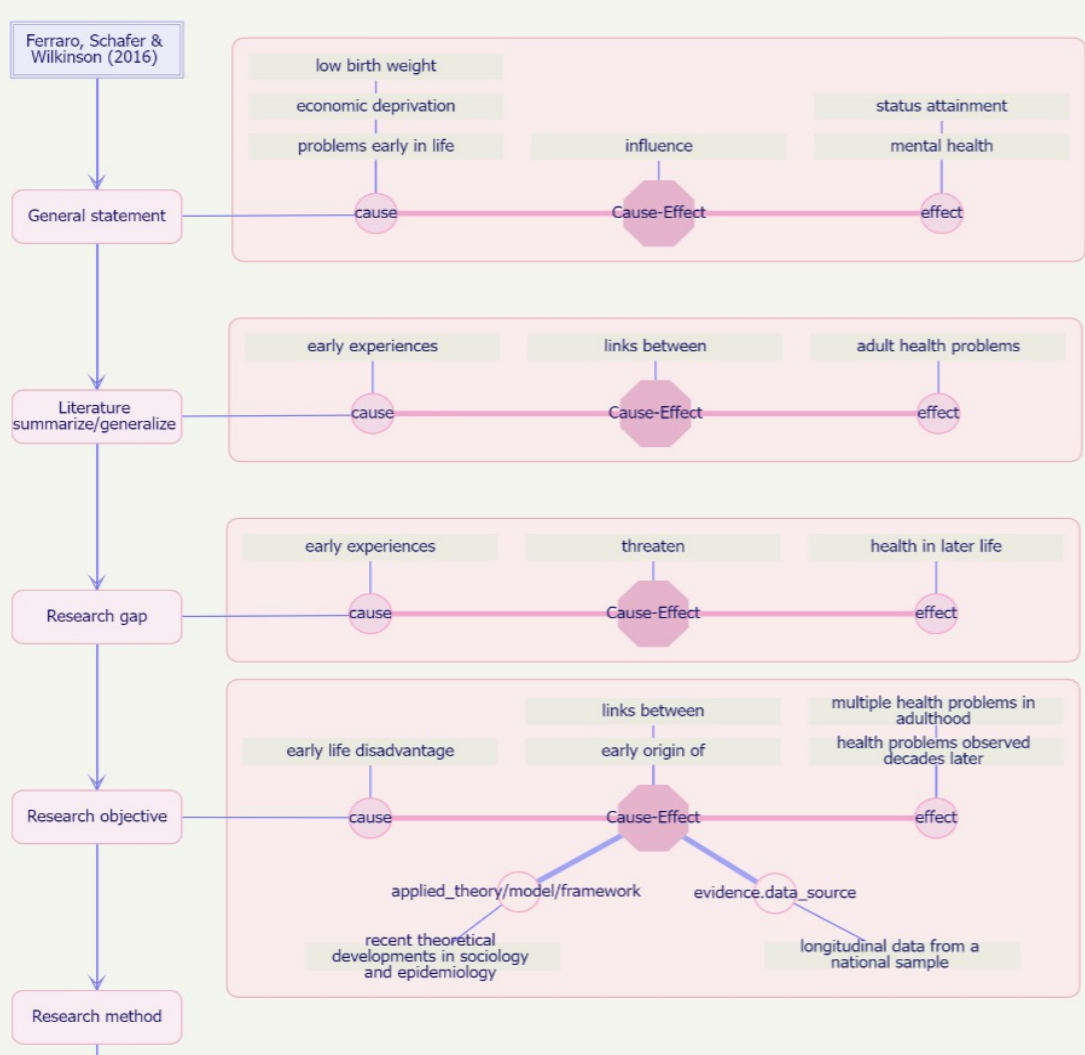
Info box Help

Research objective

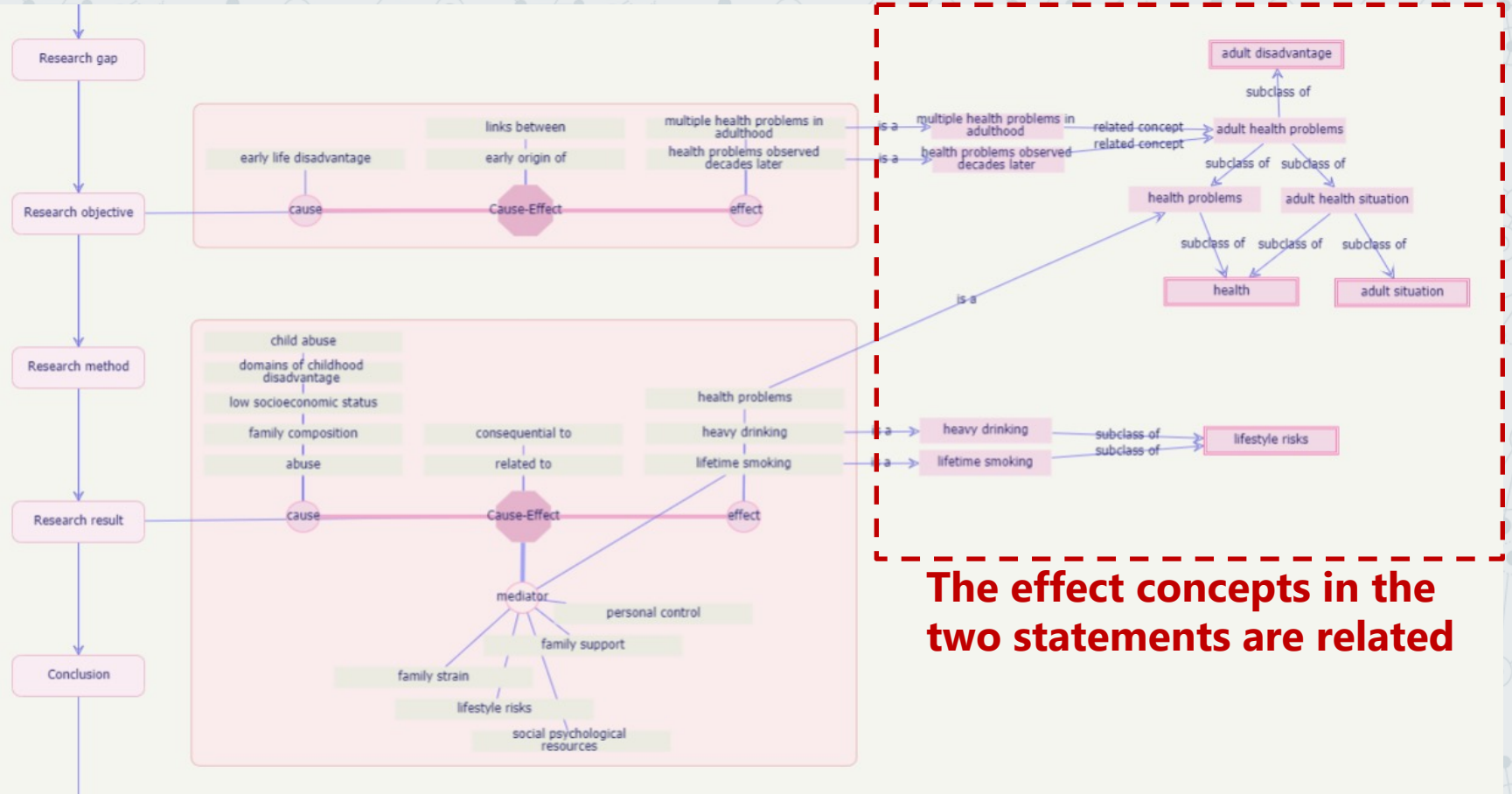
(Data for the selected node in the network display)
 id: P1RO1
 supertype: ArgElement
 type: Research objective
 cite: Ferraro, Schafer & Wilkinson (2016)
 text: First, we draw on [applied_theory/model/framework] recent theoretical developments in sociology and epidemiology to offer a conceptually integrated argument about the [cause-effect] early origins of [effect] health problems observed decades later. Second, and distinct from most prior studies, we use [evidence.data_source] longitudinal data from a national sample to examine [association] links between multiple forms of [cause] early life disadvantage and [effect] multiple health problems in adulthood.
 collection: sociology
 paperid: P1
 order: 4
 tag: main_thread

Expand node with related entities
Remove node from network Unlock a fixed node
Lock a node in place

Visualization of the argument and information structures in research papers



Visualization of the information structure for Research objective and Research result claims



The effect concepts in the two statements are related

KO and KG

- Knowledge Organization (KO): **organizing & describing**
- Knowledge Graph (KG): **representing**
 - ✓ Past: for system & machine
(from AI & machine learning fields)
 - ✓ Current: for user browsing, knowledge discovery, etc.
(from ontology, UX design & HCI)

What is KG?

➤ My (Dr. Cheng's) definition:

A semantic model representing **concepts** (as **nodes**), complex **relations** (as **edges**), and attributes on them that can be **machine-** and **human-**readable.

用來表示概念、複雜關係及概念與關係間屬性的語義模型

- ✓ 此語義模型不僅**機器可理解**，**人類也可理解**。
- ✓ **概念=節點**；**關係=邊**



KG-based interface systems: Digital heritage collections

Portraits of Modern Japanese Historical Figures

日本近代歴史人物
(developed by
National Diet Library,
Japan)

List of Names

Occupation, Status

Birthplace

Date of Birth

Birthplace : Tokyo

1-40 [143]

1 2 3 4 Next page ➡



A traditional way to display



Portrait of
SAKAKIBARA Kenkichi



Figure

SAKAKIBARA Kenkichi

Date of Birth and Death

December 19, 1830 – September 11, 1894

Birthplace (modern name)

Tokyo

Occupation, Status

Others

Pen name etc.


SAKAKIBARA Kenkichi

Description

Swordsman (Kenkaku). Born in Tokyo, the son of a vassal of the Shogun. When he was 13 years old, he came under the tutelage of Seiichiro Odani (Nobutomo) to learn the tutelage of Seiichiro Odani (Nobutomo) to learn *Jikishinkage-ryu kenjutsu* (swordplay) and master its secrets. When the *Kobusho* (martial arts school) was opened by the Edo Shogunate in 1856, Sakakibara became an assistant instructor at the school recommended by Odani. When the school was abolished in 1866, he served as the head of Yugekitai. He later opened a dojo training school in Shitaya Kurumasaka to instruct swordsmanship. After the Meiji Restoration in 1873, he organized the Gekikenkai to perform *Gekiken* (swords attack) shows with

Texts (listing)

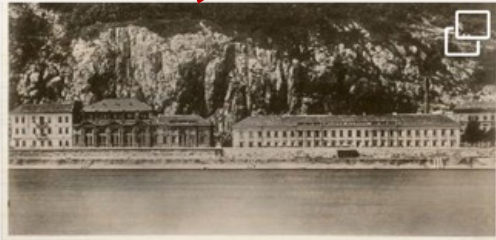


search in: search 

▼ all fields

There are 753 922 records and 13 500 683 metadata in our database

Figure



Bathing Culture

匈牙利國家數位檔案館
(Hungarian National Digital Archive)

Bathing is one of the former Pan-European customs that must have been practiced by even Christians used medicinal springs, and built cloisters and hospitals next to them, for example the healing place of the leper was Rudas Bath. But baths became really famous only later.

According to contemporary information, Rácz Bath was connected with the Royal Palace by a roofed corridor during the era of Matthias Rex. Baths did not decline either during the Ottoman rule; traces of the once vivid bathing culture can be found not only in Buda, but also in Pécs and Szeged.

RELATED MANDACORE ITEMS



Marvellous recoveries

When you study the emergence of baths, you usually bump into stories about herd boys with wounded feet. These boys experience marvellous recoveries after crossing gullies during grazing

Texts (listing)



Polyglot Medicine: 黄耆 0

Huang Qi

黄耆 (黃耆)

Polyglot Index: CDN05774

Permalink: <https://kgraph.sg/polyglot/?drug=CDN05774>

Name Status: 0

Provenance: 神农本草经 ⁱ

Provenance Date: -209 to 220

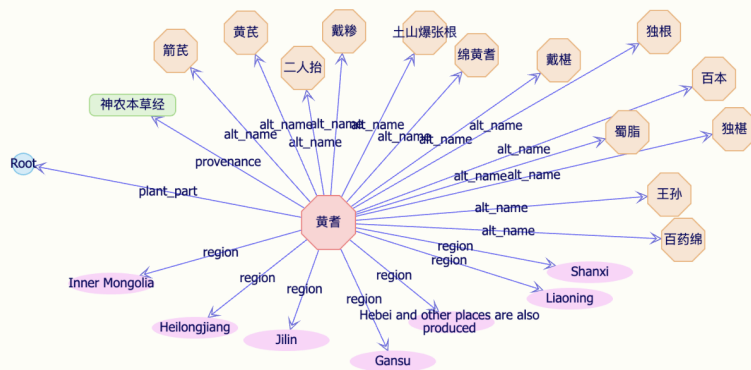
Region/Language: Shanxi; Gansu; Heilongjiang; Inner Mongolia; Liaoning; Jilin; Hebei and other places are also produced

Part of Organism: Root ⁱ

Adjust layout: Force-Cola Force-Cose Tree Concentric Spread-out graph Clear canvas - Reset zoom +

Open fullscreen

Filter nodes: Scientific name Provenance Part of organism Region/Language



More Alt name Provenance Plant part

Region Info box Help

More information

label: 黄耆

drug id: CDN05774

provenance date: -209 to 220

name status: 0

data source: 《中药大辞典》

Region: Hebei and other places are also produced, Shanxi, Jilin, Inner Mongolia, Gansu, Heilongjiang, Liaoning ⁱ

Region (Chinese): 山西;甘肃;黑龙江;内蒙古;辽宁;吉林;河北等地亦产, 河北;山西;江苏;安徽;江西;福建;湖北;湖南;广东等地;膨润土 为以蒙脱石为主要组分的粘土;参见“甘土”条, 亦有栽培者;黑龙江;吉林;辽宁;河北;山东;安徽;江苏;浙江;广东;广西;江西;湖南;湖北;四川;贵州;云南;陕西;甘肃等地;中国大部分地区多有, 亦有栽培者;黑龙江;吉林;辽宁;河北;山东;安徽;江苏;浙江;广东;广西;江西;湖南;湖北;四川;贵州;云南;陕西;甘肃等地;中国大部分地区多有 ⁱ

Links:

Majulah Singapura: Zubir said KG



Majulah Singapura

Zubir Said and the National Anthem

[The Long-Crooked Road](#)

[About](#)

[Knowledge Graph Visualizations](#) ▾

[Facebook Page](#)



- [Graph \(Network\) Visualization](#)
- [Text-Based Browse Interface](#)

[Zubir Said: Across Time and Space](#)

[Majulah Singapura as Anthem](#)

[Majulah Singapura as Composition](#)

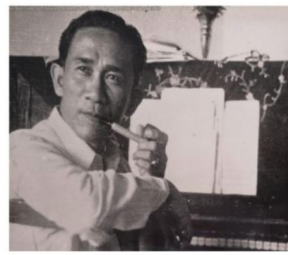
[Early Inspirations and Milestones](#)

[Controversies](#)

[Download Zubir Said Across Time and Space](#)

[Message from Dr Rohana Zubir, daughter of Zubir Said](#)

The Long-Crooked Road



Zubir with his favourite pipe

This is the story of the *Majulah Singapura* and its composer Zubir Said (1907-87), an immigrant who landed on the shores of Singapore in 1928. The difficult circumstances surrounding its composition and selection as anthem are unveiled, and complemented by a rich ontology of artefacts, interviews, media, photographs, personal and official letters.

But even as Zubir struggled to compose the *Majulah*, he held firm to a consciousness that it should be newly

Add a subgraph

3-min video tour

Browse by song

Select song ▾

Social network

People with links to Zubir Said

Browse by genre

Photos
Letters
Speeches
Documents

Commentary
Essays
News
Documentaries

Browse by topic

Topics

Keyword search

Enter keyword(s)
Search

Related sites

[Singapore pioneers](#)
social network

[Earlier no-icons](#)

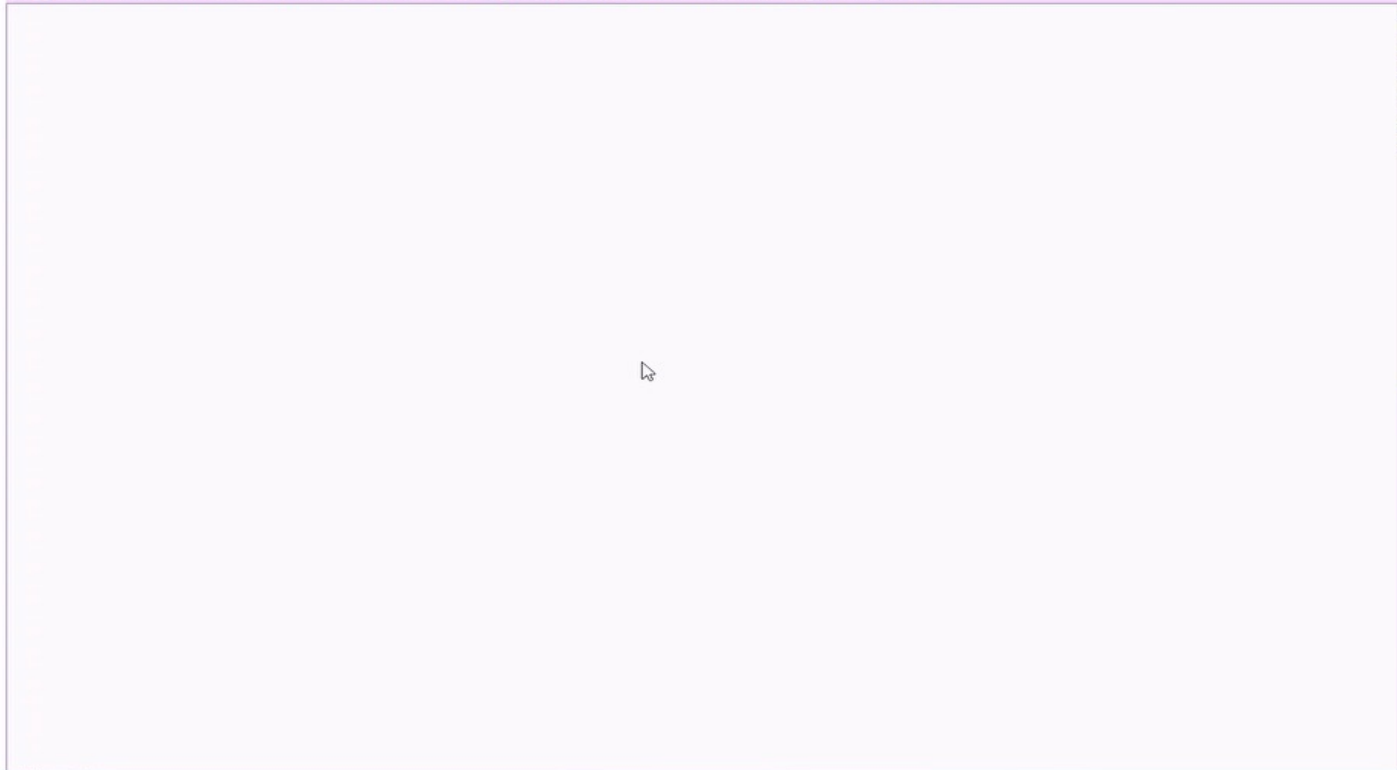
Zubir Said Knowledge Graph

Click on buttons on the left panel to add a subgraph to the display canvas below. Typical response time is 5 sec.

[Interactive graph \(network\) display](#) [Try the alternative text interface](#)

Change graph layout: [Tree](#) [Concentric](#) [Force-Cose](#) [Force-Cola \(default\)](#) [Spread-out graph](#) [Clear canvas](#) [-](#) [Reset zoom](#) [+](#) [Open fullscreen](#)

Suggestion: Click on a node or link to display metadata. Right-click to expand the node with neighboring nodes.



Different graph types



李鴻章 [详情>](#)

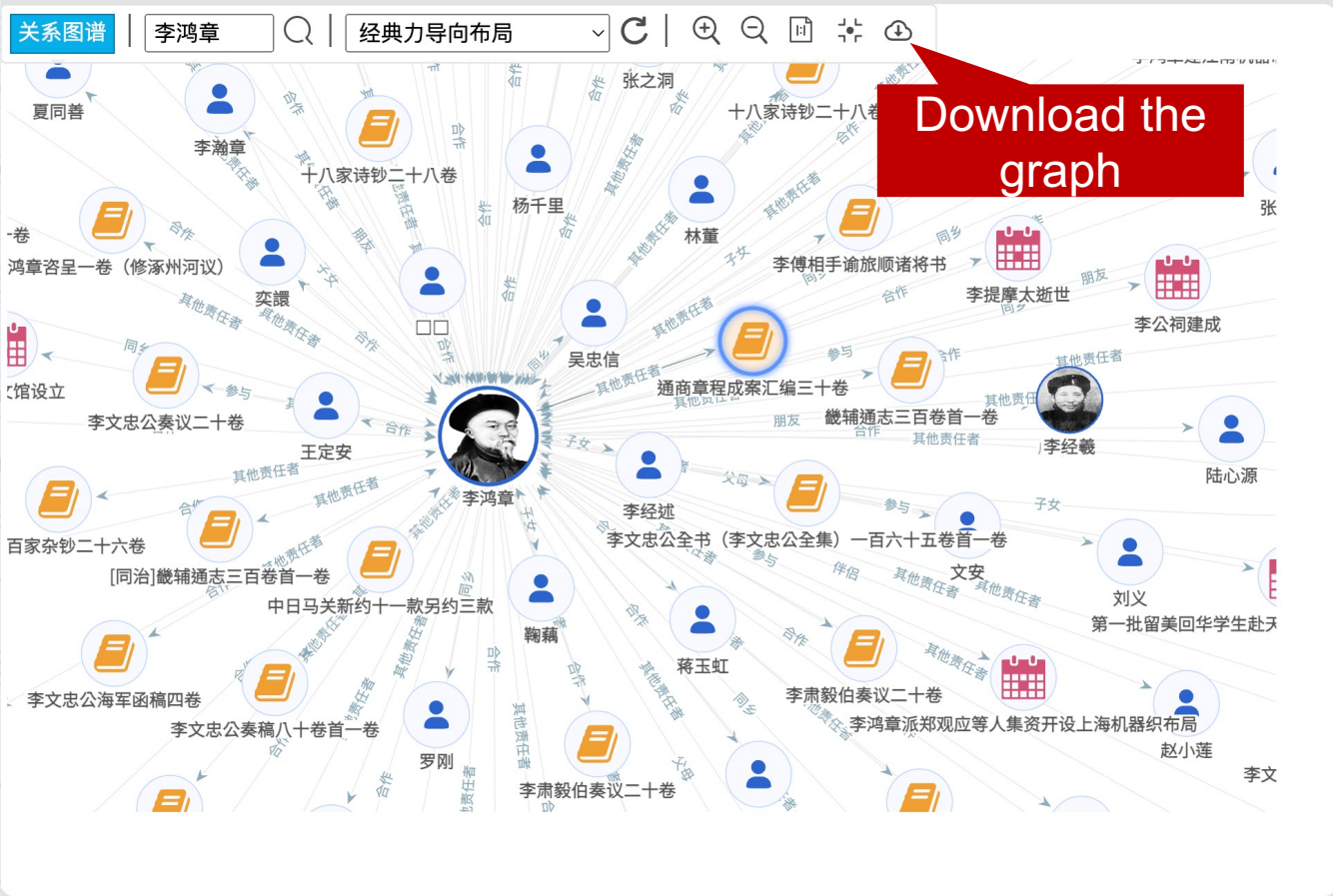
李鴻章 (1823年2月15日—1901年11月7日)，晚清名臣，洋务运动的主要领...

姓名 李鴻章
 生卒 1823.2.15 ~ 1901.11.7
 籍贯 合肥
 性别 男
 民族 汉族



人物

- 伴侣
- 父母
- 合作
- 子女
- 朋友
- 同乡



李鴻章 [详情>](#)

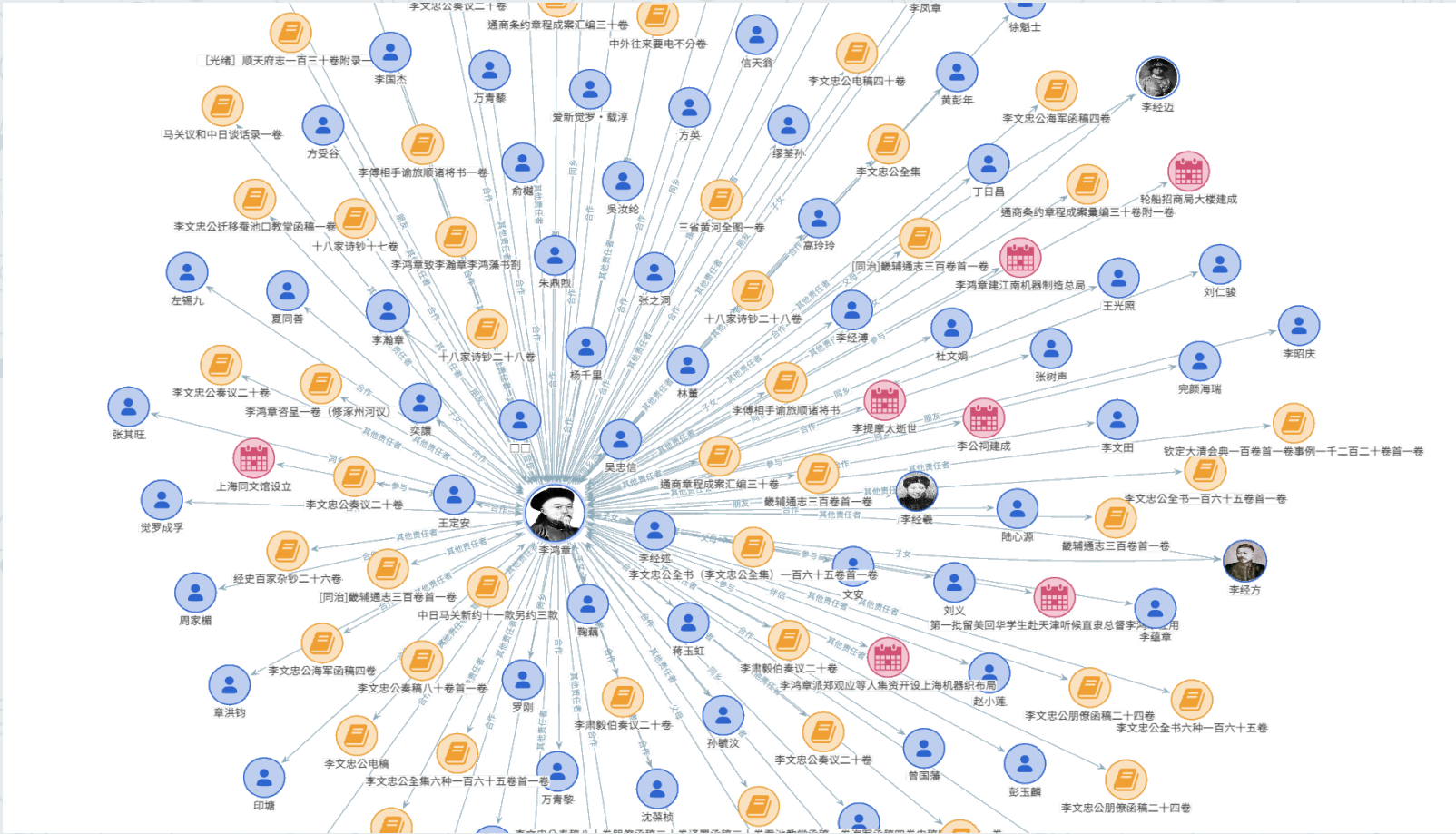
李鴻章 (1823年2月15日—1901年11月7日)，晚清名臣，洋务运动的主要领...

姓名	李鴻章
生卒	1823.2.15 ~ 1901.11.7
籍贯	合肥
性别	男
民族	汉族
.....	

文献

撰写 其他责任者

歷史人文大數據平台





历史人文大数据平台

Digital Humanities Platform of Shanghai Library

高级搜索 知识检索 人文地图 关系图谱 故事场景 注册/登录

所有筛选 > 李鸿章 X

结果导出
结果可视化
GIS分析

以“李鸿章”检索 **人名规范库** 得到 **5** 个结果

李鸿章

刘秉璋

李经义



李鸿章（1823年2月15日—1901年11月7日），晚清名臣，洋务运动的主要领袖……

姓名	李鸿章
生卒	1823.2.15-1901.11.7
籍贯	合肥
性别	男
民族	汉族
朝代	清
字号	仪叟 仪斋
...	

找到 2357 个结果 | 用时 0.471 秒

家谱

以“李鸿章”检索 **中国家谱知识服务平台** 得到 **2** 个结果

- 李鸿章家族（安徽省合肥市）
- 李鸿章家族碑碣一卷（安徽省合肥市）

查看全部

古籍

以“李鸿章”检索 **中文古籍联合目录及循证平台** 得到 **139** 个结果

- 李鸿章函牘不分卷
- 李鸿章奏稿不分卷
- 李鸿章信稿不分卷

展开搜索结果 查看全部

盛档

以“李鸿章”检索 **盛宣怀档案知识库** 得到 **2216** 个结果

- 李鸿章批
- 李鸿章批
- 李鸿章批

展开搜索结果 查看全部

报刊

以“李鸿章”检索 **近代报刊资源库** 得到 **0** 个结果

近代报刊资源库有512种报纸。依托上海图书馆珍贵馆藏资源，将近代出版的名类报纸悉数囊括。社情百态、一库尽揽，为专业、全面地展示近代历史，提供了完整的史料依据。大报视野广阔、报道及时、内容丰富，对海内外重要事

上海历史文化事件知识库有7481种事件。

“上海历史文化年谱”以时间为线索，收录了近代上海开埠至新中国建立期间，新闻出版、戏剧、戏曲、电影、音乐、舞蹈、美术、建筑、宗教、教育、文物博物馆、图书馆等文化领域内重要事件、人物、机构、出版物的相关信息。按照资源的重要性和资源情况，分为大、中、小条目，希望籍此能将上海图书馆近年来开发完成的历史文献专题资源库、专题库整合起来，成为一个综合性资源总库，为读者提供较为完整、系统的检索和浏览。

查看

以“李鸿章”检索 **上海历史文化事件知识库** 得到 **31** 个结果

- 1900 >
 - 李鸿章建江南机器制造总局
 - ▶ 1865-12-31至1865-12-31
 - 李鸿章在美租界买下美商旗记机器
- 1890 > 展开详情
- 1880 >
- 1870 >
 - 《万国公报》连载孙中山“上李鸿章书”
 - ▶ 1894-10-31至1894-10-31

人物详情
关系图谱

主页

遥读

精读

语义检索

关于

宋元学案知识图谱

宋代学术史再发现

输入想要了解的时间、地点、人物、著作

搜索



人物



地点



时间



著作

semantic search



语义检索

关系发现

安定学案包含的人



① 安定学案 包含 的人

查询图

编辑查询图

查询

查询结果



请点击"查询"开始检索



A background pattern of a network diagram with nodes and connecting lines, rendered in light gray and blue tones. The nodes are represented by small circles, some solid and some hollow, connected by thin lines of varying thickness and style (solid and dashed).

KG-based interface systems: DHC-Current research in Asia

Current research in Asia

- **Semantic Knowledge Management of Herbal Medicine for Primary Health Care**
Dr Nattapong Kaewboonma, Rajamangala University of Technology Srivijaya, Thailand
- **Current State of Herbal Medicine Knowledge Management in Thailand**
Dr. Panupong Puttarak, Prince of Songkla University, Thailand
- **Knowledge Graphs for New Species in the Greater Mekong Subregion**
Dr Yuttana Jaroenruen, Walailak University, Thailand
- **Thai Cultural Knowledge Graph Based on Wikipedia Data**
Dr Wirapong Chansanam, Khon Kaen University, Thailand

Semantic Knowledge Management of Herbal Medicine for Primary Health Care

➤ Research objective [First step]:

develop an ontology based herbal usage recommendations (e.g., using the right herbal for a particular disease)

➤ Results:

The Concepts of Herbal Medicines classes can be divided into 6:

Habit, UseTheRightParts, Taste, HealthProblem, MethodForPreparation, and PartsUsed.

Semantic Knowledge Management of Herbal Medicine for Primary Health Care

➤ Next step for the research project:

Use **the developed ontology** (i.e. result) to build an **ontology-based recommendation system** for semantic knowledge of herbs

Thai Cultural Knowledge Graph Based on Wikipedia Data

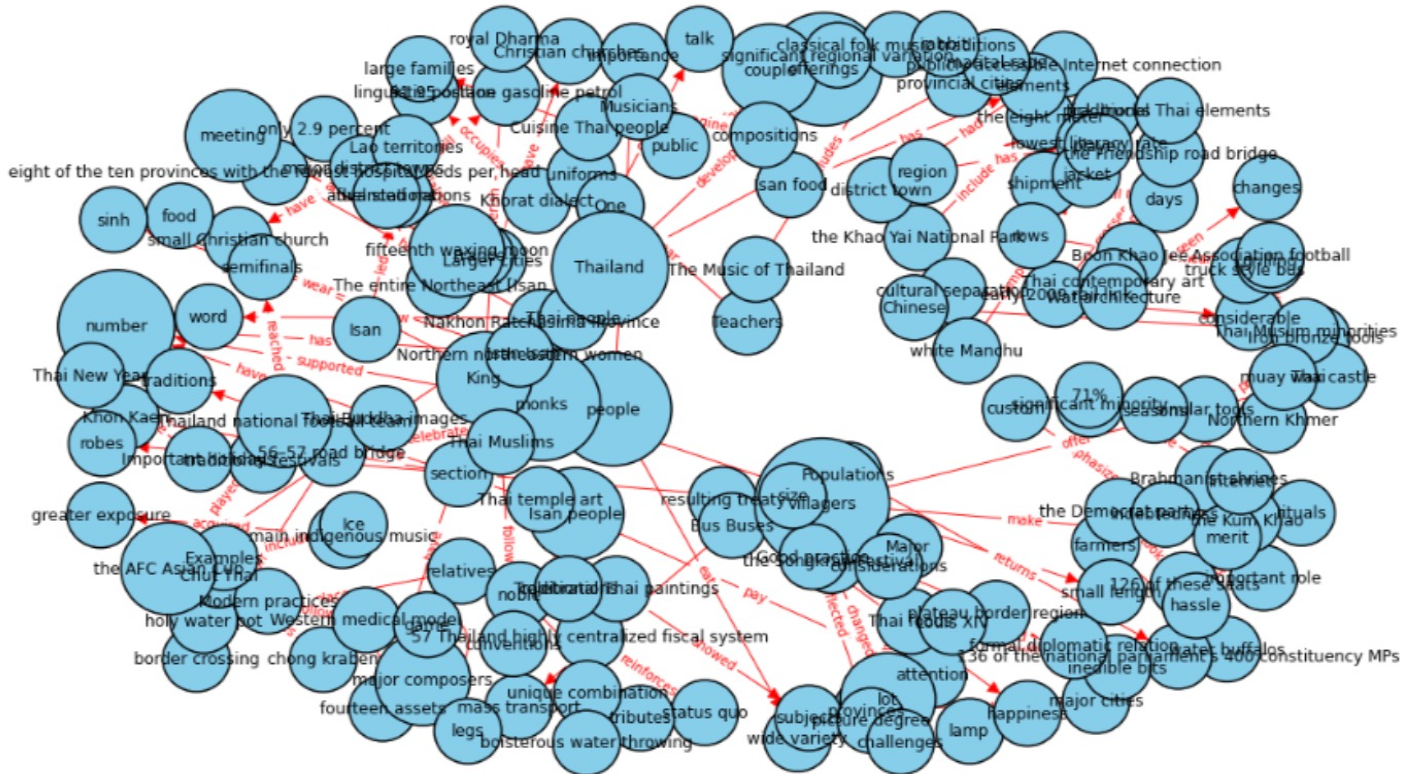
- How to use entity & relation extractions from Wikipedia to generate a knowledge graph representing Thai culture

Thai Cultural Knowledge Graph Based on Wikipedia Data

1. Collect data from Wikipedia data(收集數據資料)
2. Extract information(擷取資訊)
3. Pre-process text data(預先處理文字資料)
4. Named entity recognition(命名實體辨識)
5. Entity resolution(實體解析)
6. Relationship extraction(關係抽取)
7. Graph database (選擇圖資料庫)
8. Build the knowledge graph(建立知識圖譜)
9. Query and visualization(查詢與視覺化)
10. **Continual updating(持續更新與維護)**

Digital heritage collections: an ongoing project—Dr. Chansanam

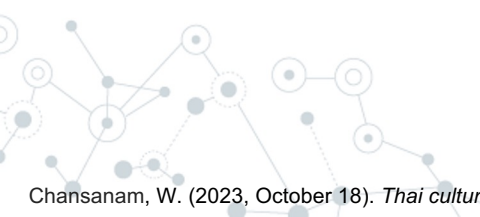
draw_kg(pairs)





Source code:

https://colab.research.google.com/drive/1EWZkQOk61z_oztQrD_vofns-qiYFuUef?usp=sharing



The background of the slide is a complex network diagram. It consists of numerous nodes, represented by small circles of varying shades of gray and blue, connected by thin, light gray lines. Some nodes are highlighted with a dashed border. The overall pattern is dense and interconnected, suggesting a large-scale network or data structure.

KG-based interface systems: Scientific KG-based platforms

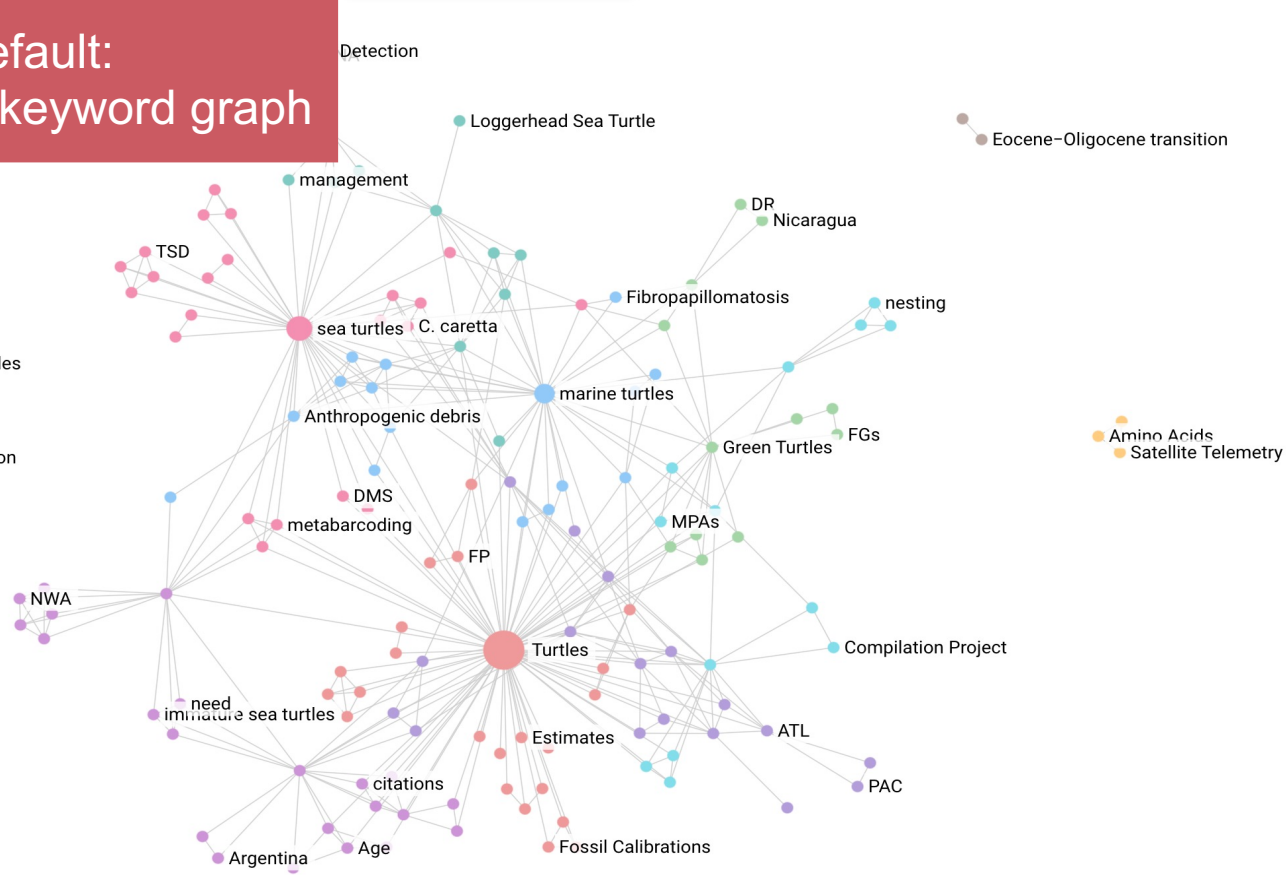
Summit Keyword Graph



Default: turtles' (龜) keyword graph

Listing research papers

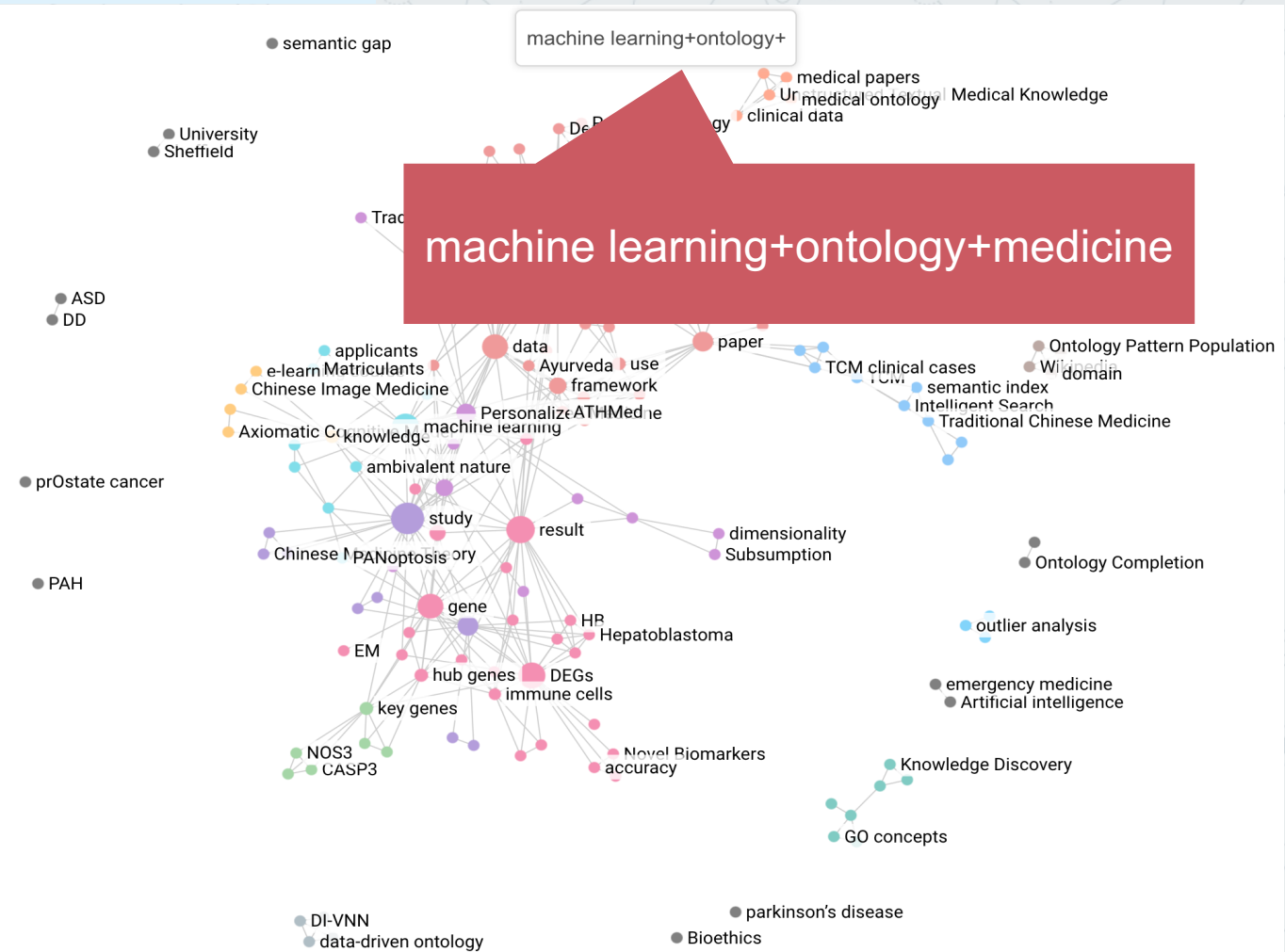
turtles




Sci KG-based platform: Example 1



machine learning+ontology+medicine



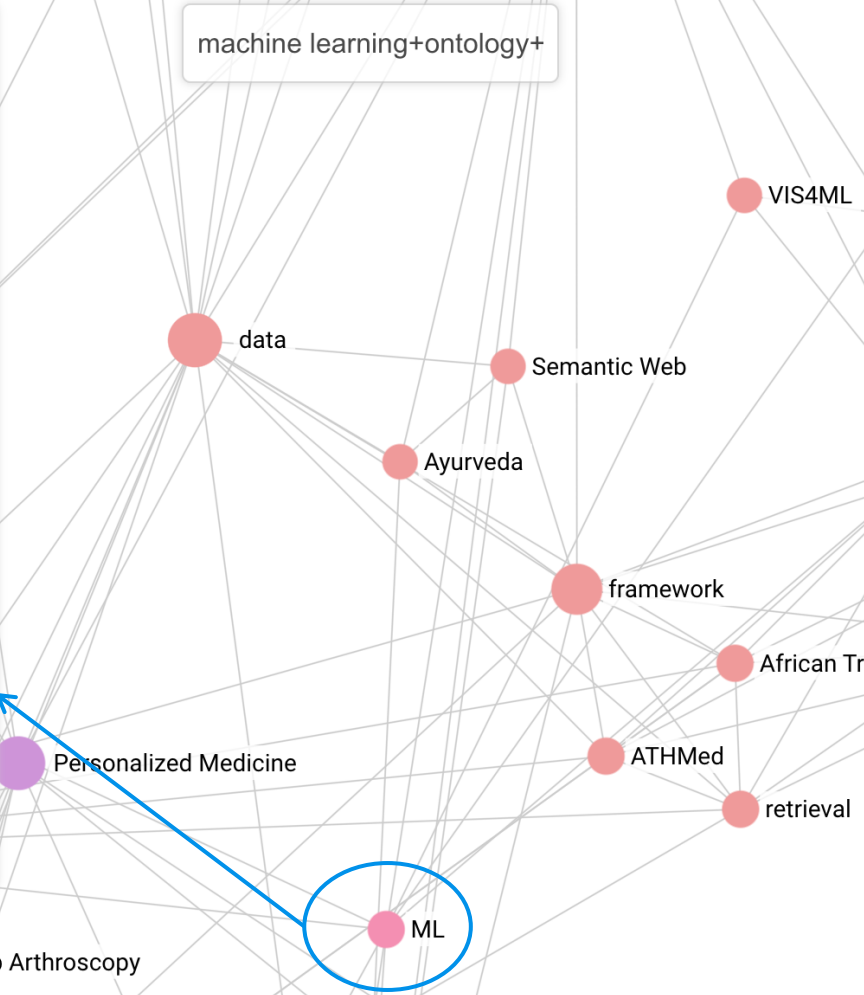
Sci KG-based platform: Example 1

▼ 

ML

▼ Documents

- [VIS4ML: An Ontology for Visual Analytics Assisted Machine Learning](#)
- [The Use and Utility of Machine Learning in Achieving Precision Medicine in Systemic Sclerosis: A Narrative Review](#)
- [Machine Learning-Based Technique for the Severity Classification of Sublingual Varices according to Traditional Chinese Medicine](#)
- [Individualized Diagnosis and Prescription in Traditional Medicine: Decision-Making Process Analysis and Machine Learning-Based Analysis Tool Development.](#)
- [The Missing Link of Machine Learning in Healthcare](#)
- [WGCNA combined with machine learning algorithms for analyzing key genes and immune cell infiltration in heart failure due to ischemic cardiomyopathy](#)



knowledge

machine learning+ontology+



ML

▼ Documents

- [VIS4ML: An Ontology for Visual Machine Learning](#)
- [The Use and Utility of Machine Precision Medicine in Systemic Review](#)
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- [The Missing Link of Machine Learning in Precision Medicine](#)
- [WGCNA combined with machine learning for analyzing key genes and immune response failure due to ischemic cardiomyopathy](#)

knowledge

ambivalent nature

VIS4ML: An Ontology for Visual Analytics Assisted Machine Learning

While many VA workflows make use of machine-learned models to support analytical tasks, VA workflows have become increasingly important in understanding and improving Machine Learning (ML) processes. In this paper, we propose an ontology (VIS4ML) for a subarea of VA, namely "VA-assisted ML". The purpose of VIS4ML is to describe and understand existing VA workflows used in ML as well as to detect gaps in ML processes and the potential of introducing advanced VA techniques to such processes. Ontologies have been widely used to map out the scope of a topic in biology, medicine, and many other disciplines. We adopt the scholarly methodologies for constructing VIS4ML, including the specification, conceptualization, formalization, implementation, and validation of ontologies. In particular, we reinterpret the traditional VA pipeline to encompass model-development workflows. We introduce necessary definitions, rules, syntaxes, and visual notations for formulating VIS4ML and make use of semantic web technologies for implementing it in the Web Ontology Language (OWL). VIS4ML captures the high-level knowledge about previous workflows where VA is used to assist in ML. It is consistent with the established VA concepts and will continue to evolve along with the future developments in VA and ML. While this ontology is an effort for building the theoretical foundation of VA, it can be used by practitioners in real-world applications to optimize model-development workflows by systematically examining the potential benefits that can be brought about by either machine or human capabilities. Meanwhile, VIS4ML is intended to be extensible and will continue to be updated to reflect future advancements in using VA for building high-quality data-analytical models or for building such models rapidly.

[Link to paper](#)




preservation
medicine

Sci KG-based platform: Example 1


machine learning+ontology+

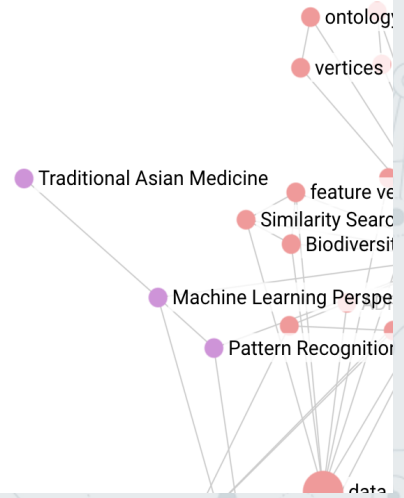
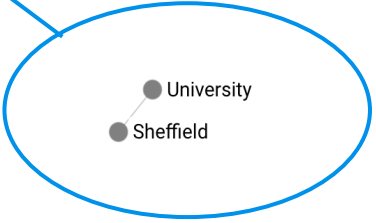
● semantic gap

▼ 

University

▼ Documents

- [Understanding and interpreting artificial intelligence, machine learning and deep learning in Emergency Medicine](#) 



Understanding and interpreting artificial intelligence, machine learning and deep learning in Emergency Medicine

To cite: Ramlakhan S, Saatchi R, Sabir L, et al. Emerg Med J 2022;39:380–385. Handling editor Katie Walker Emergency Department, Sheffield Children's Hospital, Sheffield, UK Electronics and Computer Engineering Research Institute, Sheffield Hallam University, Sheffield, UK Department of Clinical Surgical Sciences, Faculty of Medical Sciences, The University of the West Indies, St Augustine, Trinidad and Tobago Simulation and Modelling Unit, Advanced Forming Research Centre, University of Strathclyde, Sheffield, UK

[Link to paper](#) 

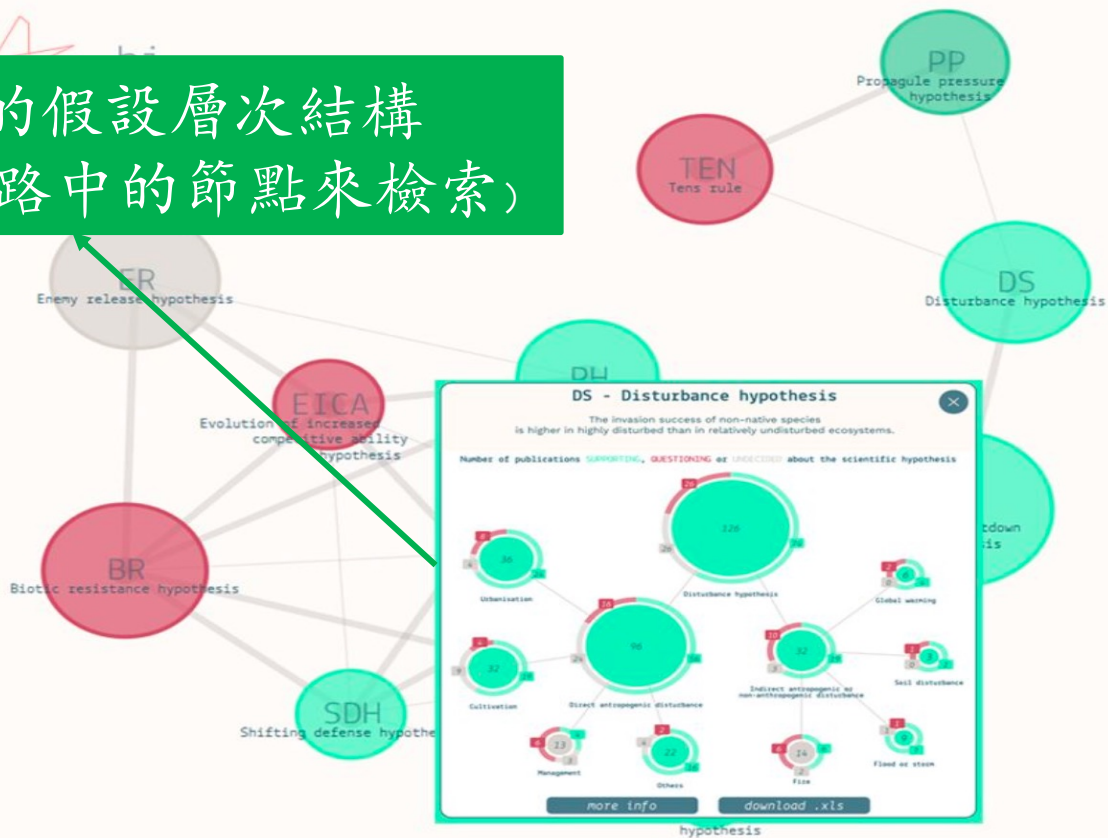
INAS

➤ Interactive Argumentation Support (INAS)

- ✓ Heger et al. (2022) aim to develop an academic writing & thinking system for researchers to develop their own argument by following ongoing argumentation in research papers.
- ✓ Focusing on invasion biology (入侵生物學)
- ✓ First step: develop **a core ontology**
 - Collaborating with ontology experts!

生物入侵潛在原因的十二種假設之間的關係

干擾假設的假設層次結構
(可以點擊網路中的節點來檢索)

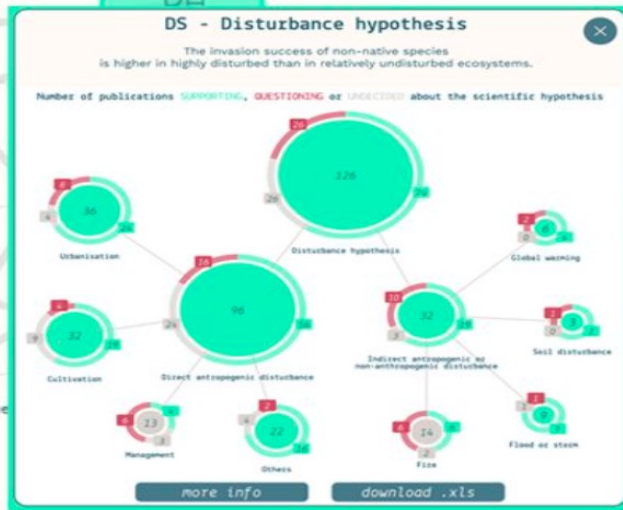
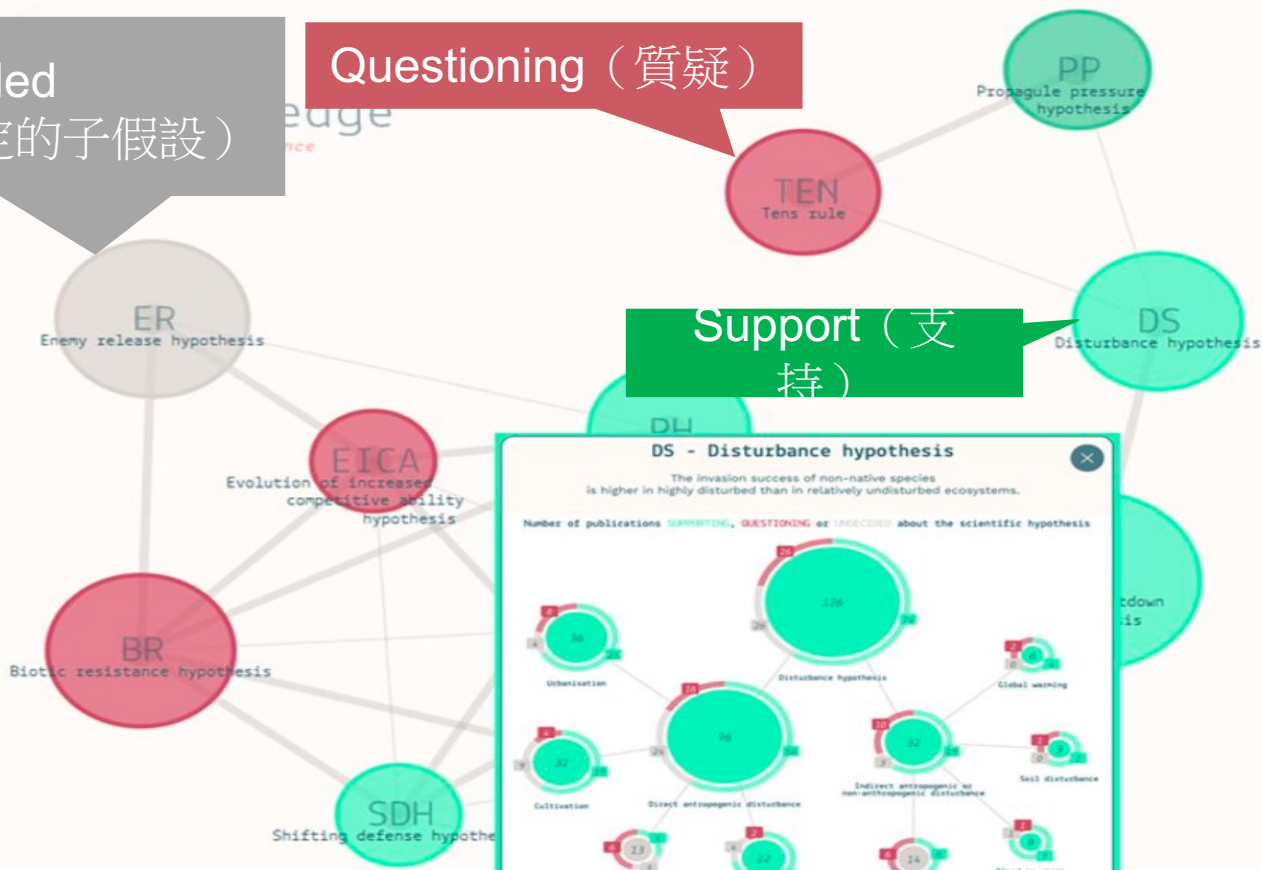


Sci KG-based platform: Example 2

Undecided
(對假設尚未確定的子假設)

Questioning (質疑)

Support (支持)



Heger, T., Zarriß, S., Alergawy, A., Jeschke, J. M., König-Ries, B. (2022). INAS: Interactive argumentation support for the scientific domain of invasion biology. *Research Ideas and Outcomes*, 8.

VISAR

- **Visual Interactive System for Argumentative writing with Rapid draft prototyping (VISAR)**
 - ✓ An AI-enabled writing assistant system to help students write well-formed argumentative papers (Zhang et al. 2023)
 - revising their own writing context(可在系統上修改文稿內容)
 - by organizing the argument structure through “synchronized text editing and visual programming (系統提供文字編輯及視覺化編輯同步功能)”

Educational institutions should actively encourage their students to choose fields of study that will prepare them for lucrative careers.

While it is important for educational institutions to encourage their students to pursue fields that will lead to financial success, it is equally important to consider the role of job satisfaction in career choice. One compelling reason to consider the role of job satisfaction in career choice is the potential for financial stability to increase job satisfaction. While financial success is undoubtedly an important consideration when choosing a career, it is not the only one. Research shows that people who feel financially secure are more likely to feel satisfied with their jobs, regardless of their income level. This is because financial stability can reduce stress and anxiety, allowing individuals to focus on other aspects of their work that bring them fulfillment. Therefore, educational institutions should not only encourage students to pursue high-paying fields but also emphasize the importance of finding a career that provides financial stability and job satisfaction. By doing so, they can help their students make informed and fulfilling career choices.

The argument that financial stability can increase job satisfaction overlooks the reality of economic inequality. While it may be true that financial security can reduce stress and anxiety, not all individuals have equal access to financial stability. In fact, many individuals may be forced to choose careers based solely on financial necessity, rather than their personal interests or passions. This can lead to job dissatisfaction and a lack of fulfillment in their chosen career path. Furthermore, the emphasis on high-paying fields can perpetuate economic inequality and limit opportunities for those who may excel in other areas but are not compensated as highly. Therefore, educational institutions should not only encourage financial stability but also address and combat economic inequality to ensure that all individuals have the opportunity to pursue fulfilling and satisfying career paths.

From the perspective of graduate employability, it is essential for educational institutions to prioritize programs that equip students with the necessary skills and knowledge to secure high-paying jobs upon graduation. The value of a degree that leads to a high-paying job cannot be overstated, especially in today's highly competitive job market. As such, educational institutions must prioritize programs that equip students with the necessary skills and knowledge to secure such jobs upon graduation. A degree that leads to a high-paying job not only provides financial security but also enhances an individual's social status and economic mobility. It is, therefore, imperative for educational institutions to focus on programs that not only provide theoretical knowledge but also practical skills that are relevant to the job market. This will help ensure that graduates are well-prepared to meet the demands of the job market and are equipped with the skills that employers require. By prioritizing such programs, educational institutions can help students achieve their career goals, enhance their earning potential, and contribute to the development of the economy.

Employment statistics provide compelling evidence for the importance of educational institutions prioritizing programs that lead to high-paying jobs. According to a 2020 report by the Bureau of Labor Statistics, individuals with a bachelor's degree earn, on average, 80% more than those with only a high school diploma. Furthermore, the report states that jobs requiring a bachelor's degree are projected to grow at a faster rate than those that do not require one. This highlights the crucial role that a degree plays in securing a high-paying job in today's job market. Educational institutions must, therefore, prioritize programs that provide students with the necessary skills and knowledge to succeed in these jobs. By doing so, they can help ensure that graduates are well-equipped to meet the demands of the job market and contribute to the growth of the economy.

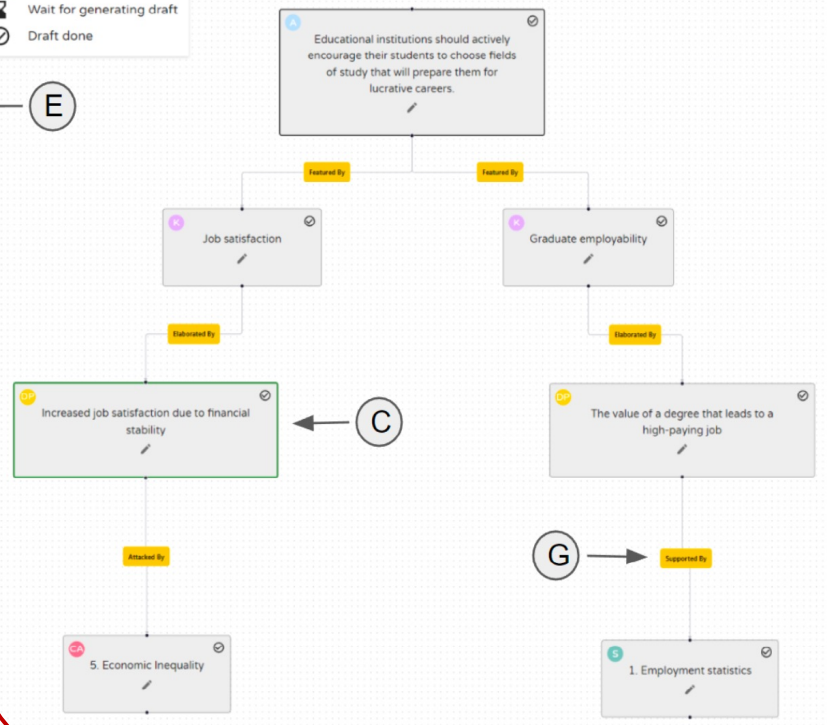
文字編輯

A

- Main argument
- Key point
- Supporting evidence
- Discussion point
- Counter argument
- Wait for generating draft
- Draft done

D → Lazy update

E ←



← C

G →

視覺化介面

視覺化介面
(縮圖)



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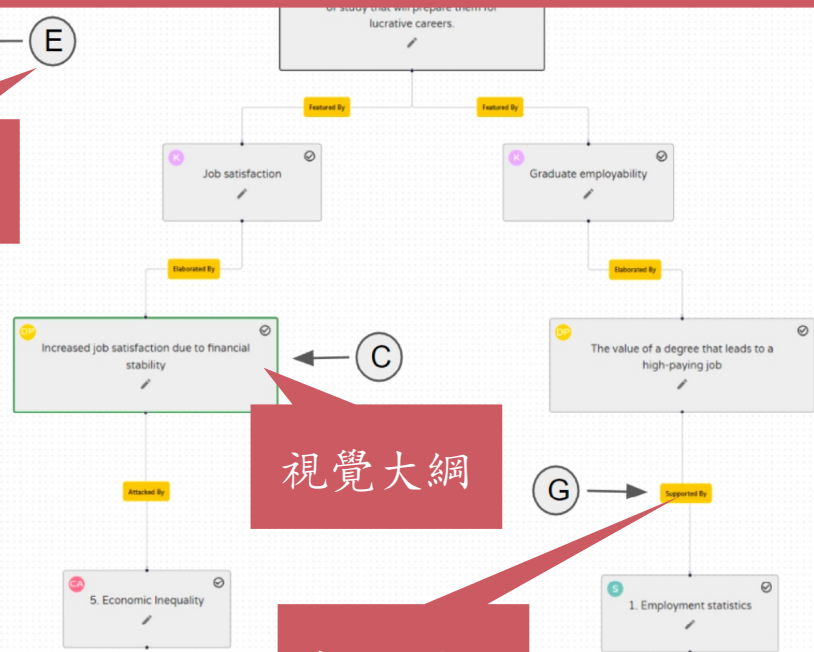
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Lazy mode: 決定在規畫何時產生草稿原型

書寫項目

視覺大綱

提示項目



D → Lazy update

E ←

← C

G →

+ ← F

B

A



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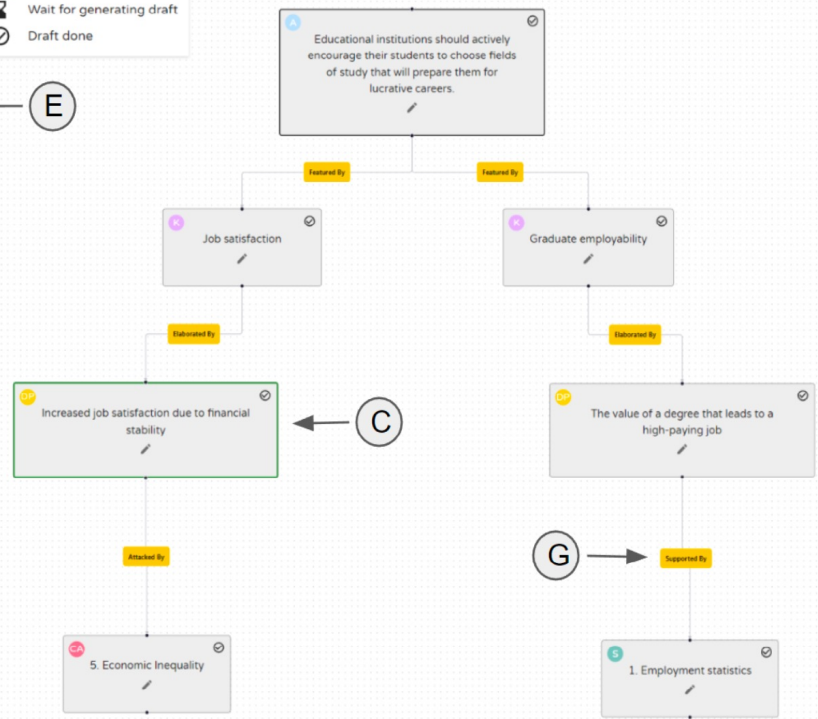
1. 可透過文字編輯器 (A) 或視覺介面 (B) 編輯寫作大綱
2. 系統同步文字編輯器 & 視覺介面，方便使用者將編輯器中的書寫項目 (E) 與視覺大綱中的節點相對應 (C)
3. 可在多個提示項目間選擇是否要添加編輯 (G)
4. 可將新的提示項目 (G) 加到視覺大綱 (C) 產生新草稿 (F)

with only a high school diploma. Furthermore, the report states that jobs requiring a bachelor's degree are projected to grow at a faster rate than those that do not require one. This highlights the crucial role that a degree plays in securing a high-paying job in today's job market. Educational institutions must, therefore, prioritize programs that provide students with the necessary skills and knowledge to succeed in these jobs. By doing so, they can help ensure that graduates are well-equipped to meet the demands of the job market and contribute to the growth of the economy.

- A Main argument
- K Key point
- S Supporting evidence
- DP Discussion point
- CA Counter argument
- Wait for generating draft
- Draft done

D → Lazy update

← E



(A)

+ ← (F)

(B)

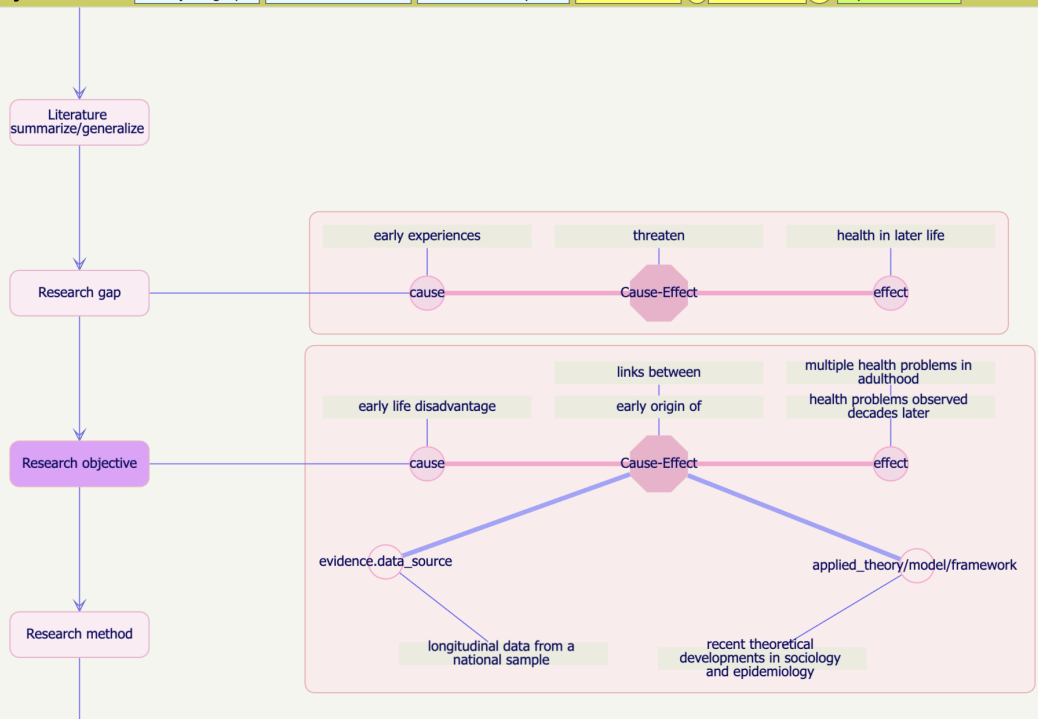


KG-based academic writing system

Causal Argument Structure -- Ferraro, Schafer & Wilkinson (2016)

Click on a node to display text info, right-click to expand the node with neighbor nodes.

Graph layout actions: Re-layout graph | Unlock fixed nodes | Lock nodes in place | Clear canvas | Reset zoom | Open fullscreen



Info box Help

Research objective

(Data for the selected node in the network display)

id: P1RO1

supertype: ArgElement

type: Research objective

cite: Ferraro, Schafer & Wilkinson (2016)

text: First, we draw on [applied_theory/model/framework]recent theoretical developments in sociology and epidemiology to offer a conceptually integrated argument about the [cause-effect]early origins of [effect]health problems observed decades later. Second, and distinct from most prior studies, we use [evidence.data_source]longitudinal data from a national sample to examine [association]links between multiple forms of [cause]early life disadvantage and [effect]multiple health problems in adulthood.

collection: sociology

paperid: P1

order: 4

tag: main_thread

- Expand node with related entities
- Remove node from network
- Lock a node in place
- Unlock a fixed node

KG-based academic writing system

➤ Visualization

- ✓ argument structure of research papers
- ✓ research results summarized in literature reviews

➤ Challenge

More precise placement of nodes (i.e. arguments) to help researchers understand the **argument structure** and **compare research results across different papers.**

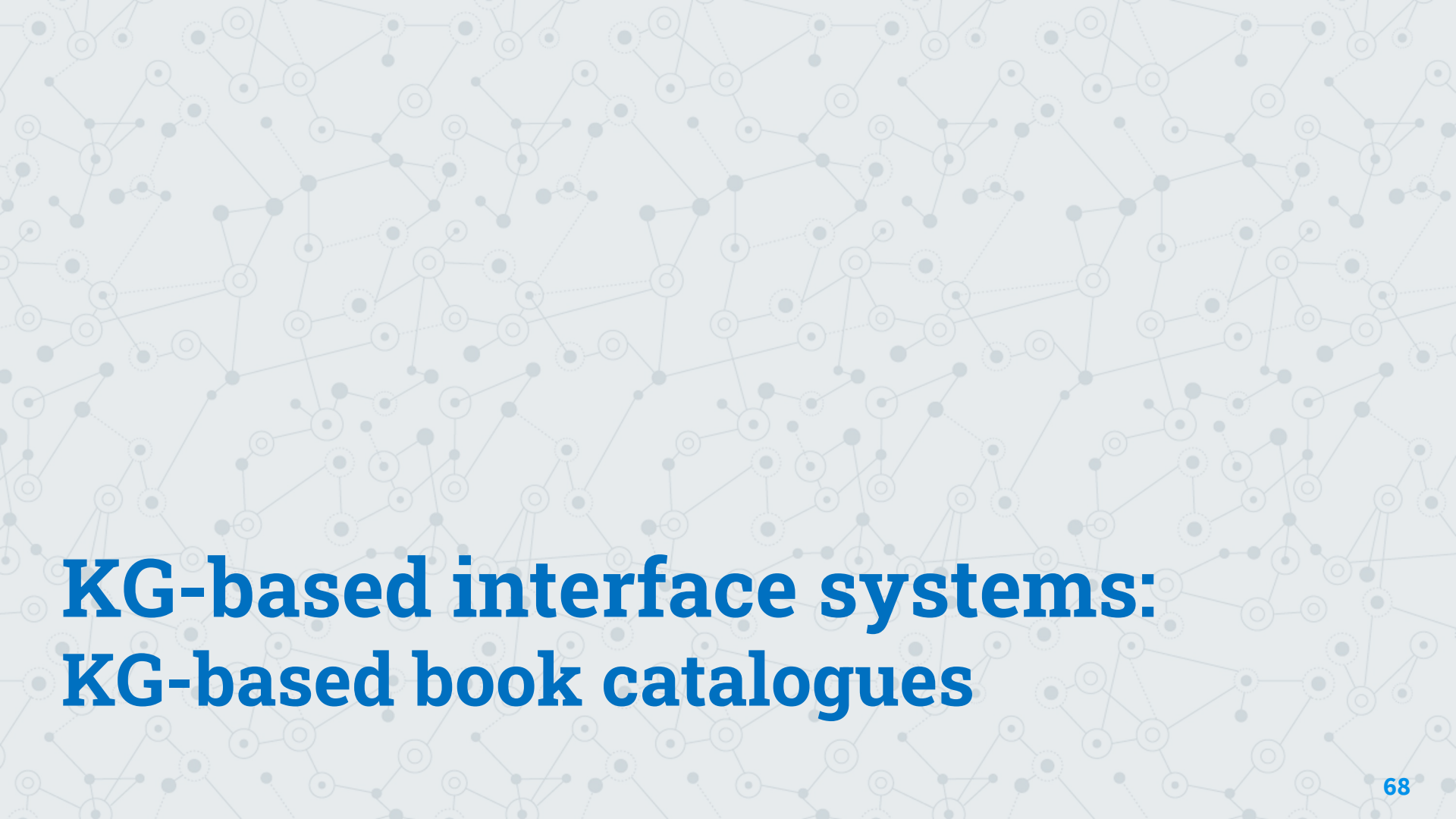
KG-based academic writing system

➤ Disciplines:

- ✓ Sociology
- ✓ Biological science
- ✓ Mechanical engineering
- ✓ Medical science

➤ Languages:

- ✓ English
- ✓ Chinese



KG-based interface systems: KG-based book catalogues

ARCA system

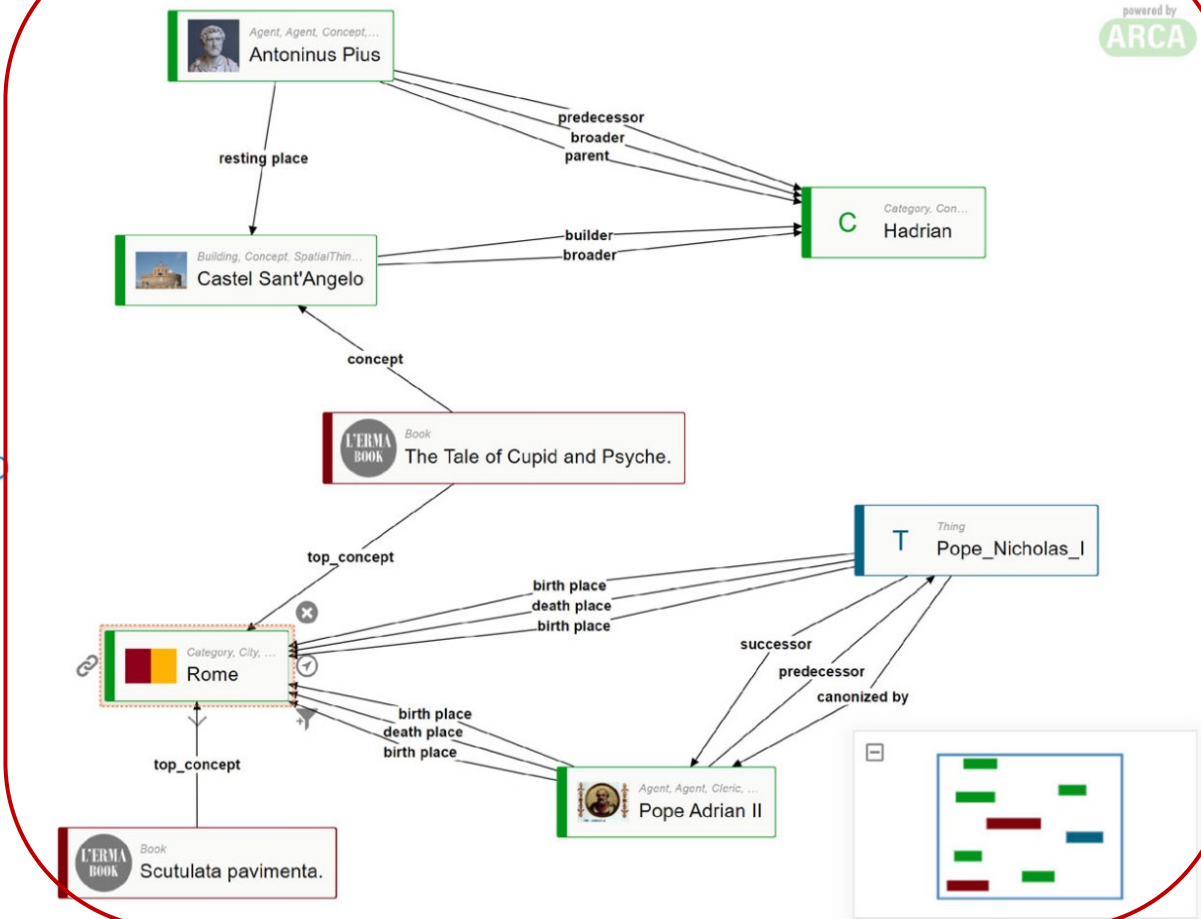
- Bernasconi et al. (2023) started developing a KG-based system that enables semantic search & exploration
- Help users discover new books effectively

ARCA system

- Important requirements for the system:
 - ✓ See the relevant books from each entity (i.e. a book)
 - ✓ Navigate among entities—discovering new books!
 - following the edges/patterns (i.e. relations)
 - ✓ Access the basic information of books
 - ✓ Know how to obtain the book (e.g., from a bookstore or a library)
 - ✓ Realize how to use the platform **by themselves** easily
 - **without any instructions**
 - following established interaction patterns and metaphors

KG-based book catalogues

- Rome
- Roma
 - Ancient Rome
 - Lingua romana
 - Patrician (ancient Rome)
 - Religione romana
 - Public Portents in Republican Rome.
 - Sexuality in ancient Rome
 - The Temples of Mid-Republican Rome and Their Historical and Topographical Context



powered by ARCA

YEAR REL

RELEVANCE

<p>CORPVS SPECVLORVM ETRVSCORVM</p> <p>FRANZ PARIS - MUSÉE DU LOUVRE</p> <p>Corpus Speculorum Etr...</p>	<p>MEMORIE</p> <p>LA PONTIFICIA ACCADEMIA ROMANA DI ARCHEOLOGIA</p> <p>Pontificia Accademia R...</p>
<p>LA COLLEZIONE EPIGRAFICA DEI MUSEI CAPITOLINI</p> <p>Collezione epigrafica d...</p>	<p>SCUTULATA PAVIMENTA</p> <p>Scutulata pavimenta</p>
<p>Immagine non disponibile</p> <p>Antichità Casali.</p>	<p>Le lucerne paleocristiane</p>
<p>PAINTED TOMBS IN ETRURIA</p> <p>Painted Tombs in Etrun...</p>	<p>Le urne cinerarie di età ellenistica</p> <p>Urne cinerarie di età ell...</p>



KG-based systems in the future

Conclusions & Suggestions

A well-formed KG-based interface is needed!

- for end users to understand relations across types of resources (e.g., images) and their structures.

Conclusions & Suggestions

A well-formed KG-based interface is needed!

- for end users to understand relations across types of resources (e.g., images) and their structures.

- Various graph types (e.g., spread-out) with **texts**
- How to manage huge data (e.g., storage & modeling)
- User studies: colors, labeling, and an instruction?
- The platform/system has to be supported by:
 - ✓ data, KO, and the full-stack of technology

Conclusions & Suggestions

- Various graph types (e.g., spread-out) with **texts**
- How to manage huge data (e.g., storage & modeling)
- User studies: colors, labeling, and an instruction?
- The platform/system has to be supported by:
 - ✓ data, KO, and the full-stack of technology

Experts(e.g., LIS & ML)+Funding+Time(develop & maintain)

Long-term **fight** or Short-term **fun**?

Future research trends & applications

- **KG systems development**
[ontology + machine learning]
 - A well-formed ontology to represent
 - Algorithms/models to manage & analyze big data
- **KG-based interface design**
 - Visualizing complex relations of nodes & edges
- **Information behavior**

Future research trends & applications

For various systems/platforms:

- **academic writing & teaching systems**
 - ✓ advanced “Grammarly”
- **literature databases**
 - ✓ info-arg-aspected rather than citation-aspected
- **digital/cultural heritage collections**
- **healthcare platforms**
 - ✓ clinical decision support
- ✓ **enterprise information systems**
 - ✓ human resources

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Links to the relevant platforms/systems

➤ Digital heritage collections

- ✓ 日本國立國會圖書館:日本近代歷史人物

<https://www.ndl.go.jp/portrait/e/>

- ✓ Hungarian National Digital Archive

<https://en.mandadb.hu/>

- ✓ Polyglot Medicine

<https://kgraph.sg/polyglot/?drug>

- ✓ Majulah Singapura: Zubir Said Knowledge graph

<https://zubirsaid.sg/ZS.graph.html>

<https://www.facebook.com/ZubirSaid.info>

- ✓ 歷史人文大數據平台

<https://dhc.library.sh.cn/>

- ✓ 宋元學案知識圖譜

<https://syxa.pkudh.org/>

Links to the relevant platforms/systems

- **Scientific KG-based platforms**

- ✓ Summit Keyword Graph

<https://keywords.groundedai.company/>

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(Dr. Shin-Jye Lee & Dr. Wei-Ning Cheng, NYCU, Taiwan)

- **The Research Information Model: Using semantic frames to represent scientific knowledge in sociology research papers**

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(Dr. Wei-Ning Cheng, NYCU, Taiwan)

Questions?

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