China Data Lab

HARVARD UNIVERSITY

Introduction to KNIME

https://chinadatalab.net

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Date: 2019-11-21

Outline

① 工作流软件KNIME简介

② 基于文本数据的文献分析案例

③ 基于企业数据的金融数据分析案例

④ 基于政府统计的高校教育时空分析案例

⑤ 基于机器学习的产业共聚分析案例

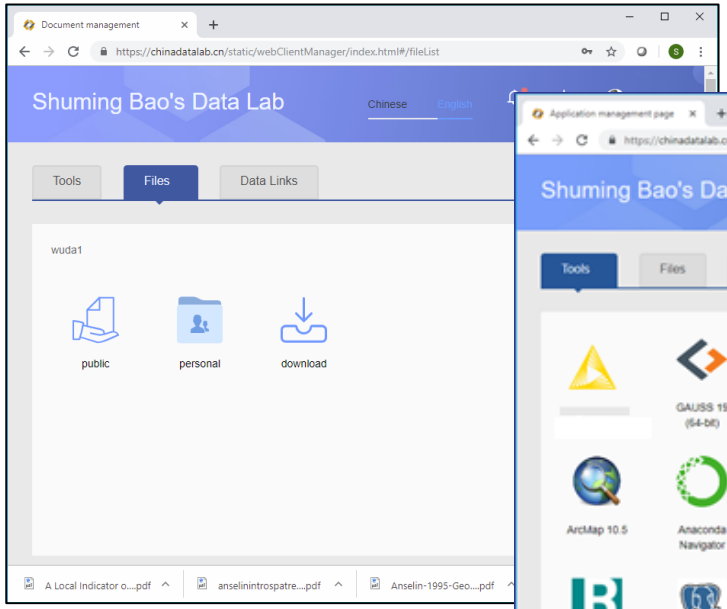
⑥ 工作流数据分析案例制作指南

科研与教学资源集成平台

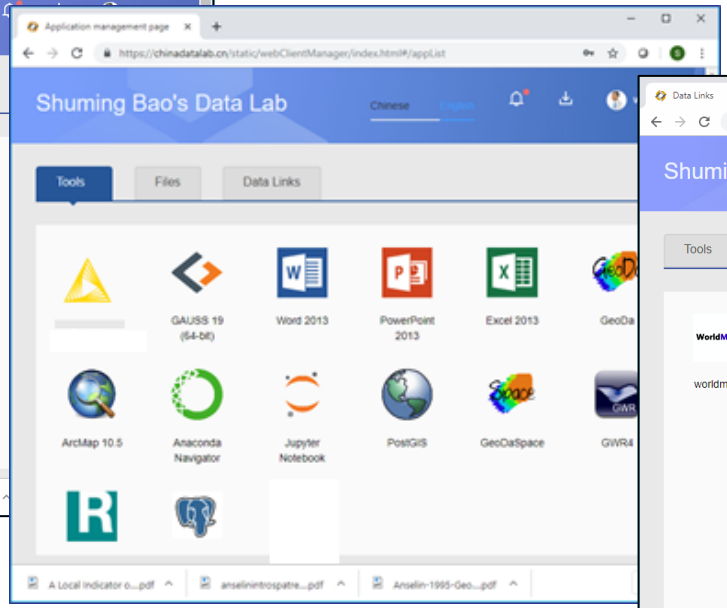
- **数据共享：**
  - 授权使用数据 Licensed data
  - 有限共享数据 Restricted data
  - 敏感数据 Sensitive data
  - 大数据 Large size data
  - 科研项目产生数据 Research data generated from different projects
- **软件共享：**
  - 免费与授权软件共享
  - 加强软件与数据结合
  - 解决硬软件兼容问题
  - 减少本地维护与更新成本
- **科研成果共享**
  - 科研（可重复、可复制、可扩展）
  - 教学 （适应不同专业兴趣与技能）
  - 其他应用（高效、易学、可扩展）

科研与教学资源集成平台

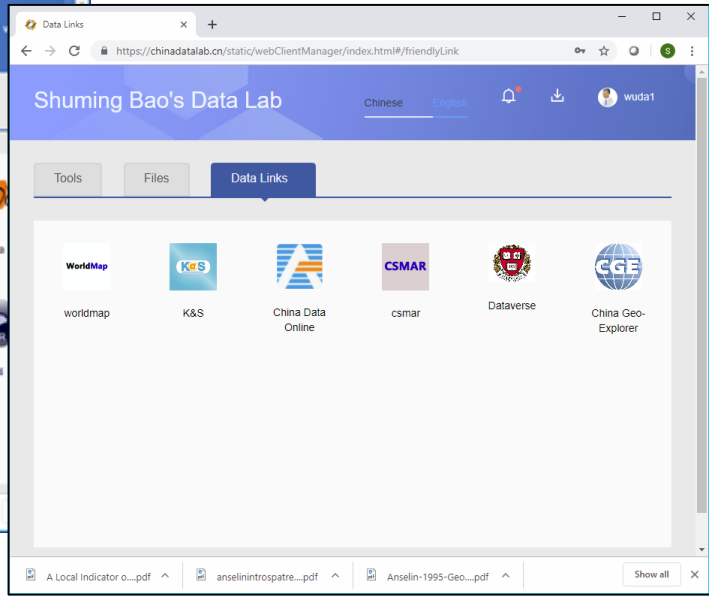
数据平台
Personal Data Center



应用平台
Application Center



信息共享平台
Data Sharing Center



工作流软件比较

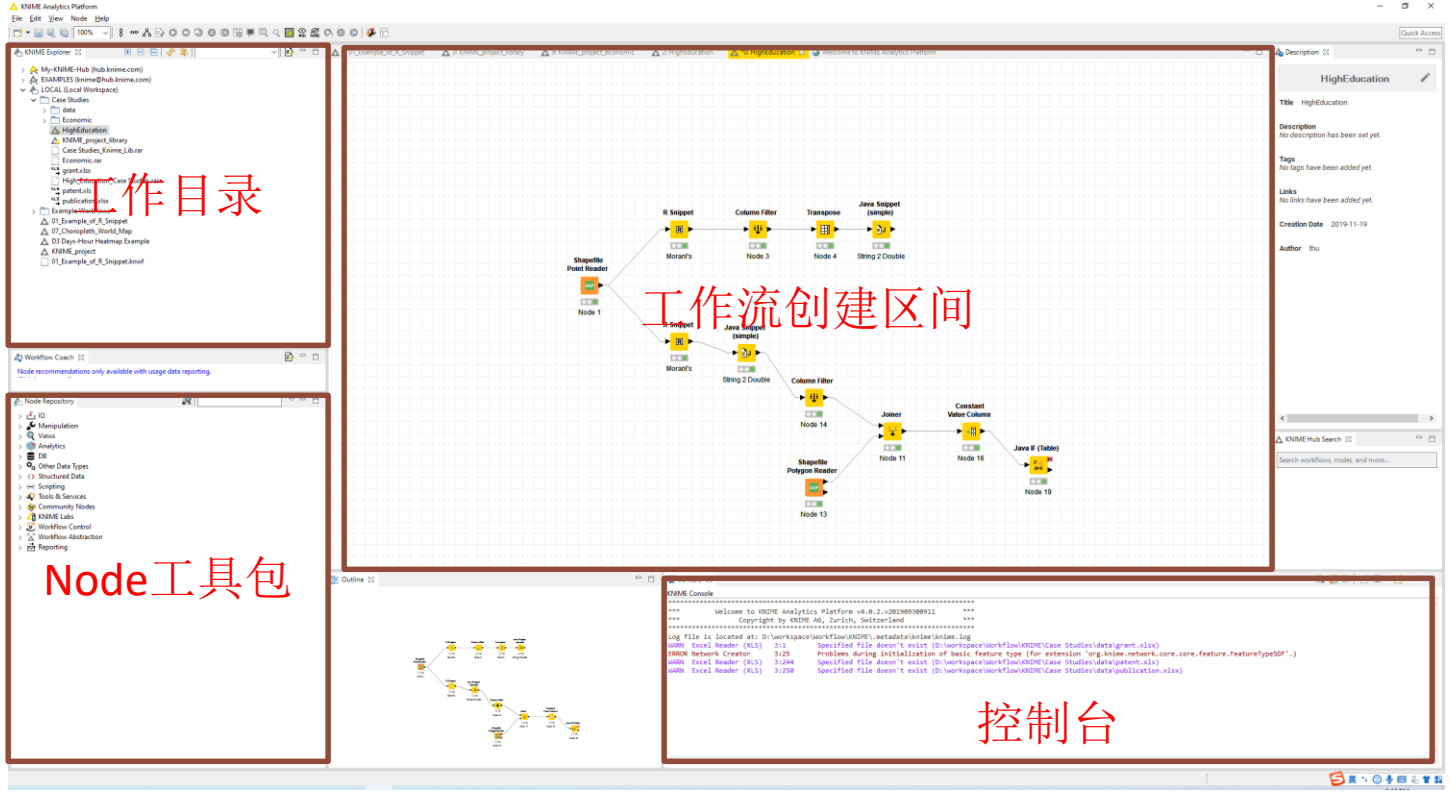
Name	Category	Free	Open Source	Education Licence	Popularity	Open source community	Latest version	Website
KNIME analytics	***Data analytics***	✔	✔	✔	✔✔	✔✔	***4.0.2 (2019)***	***https://www.knime.com***
Talend Open Studio	Data analytics	✔	✔	✔	✔✔✔	✔✔	7.3 (2019)	https://www.talend.com/products/talend-open-studio/
Pentaho Kettle	ETL	✔	✔	✔	✔✔	✔✔✔	8.3 (2019)	https://community.hitachivantara.com/s/article/data-integration-kettle
GeoKettle	Spatial ETL	✔	✔	✔			2.5 (2015)	http://www.spatialytics.org/
RapidMiner Studio	Data analytics	Limited		✔	✔✔✔		9.4 (2019)	https://rapidminer.com/
Tableau Prep	ETL			✔	✔✔✔		2019.3.2 (2019)	https://www.tableau.com/products/prep
Alteryx Designer	Data analytics			✔	✔✔✔		2019.3 (2019)	https://www.alteryx.com/
Dataiku DSS	Data analytics	Limited		✔	✔✔		5.1(2019)	https://www.dataiku.com/

工作流软件比较

Name	Data Input/Output	Data Manipulation	Spatial Processing	Regression Analysis	Machine Learning	R	Python	Charts	Reporting
KNIME analytics	***Tabular data, shapefile***	✔✔	✔	✔✔✔	✔✔✔	✔✔	✔✔	✔✔	✔✔
Talend Open Studio	Tabular data, shapefile	✔✔✔	✔	✔	✔✔✔	✔	✔	✔✔	✔✔
Pentaho Kettle	Tabular data, shapefile	✔✔✔	✔	✔	✔	✔	✔	✔✔	✔✔
GeoKettle	Tabular data, shapefile	✔	✔✔✔					✔	✔
RapidMiner Studio	Tabular data, shapefile	✔✔	✔	✔✔✔	✔✔✔	✔✔	✔✔	✔✔✔	✔✔
Tableau Prep	Tabular data	✔✔						✔	
Alteryx Designer	Tabular data, shapefile	✔✔✔	✔✔✔	✔✔	✔✔	✔✔	✔✔	✔✔	✔✔
Dataiku DSS	Tabular data, shapefile	✔✔✔	✔	✔✔✔	✔✔✔	✔✔	✔✔✔	✔✔✔	✔✔

KNIME 简介

https://www.knime.com



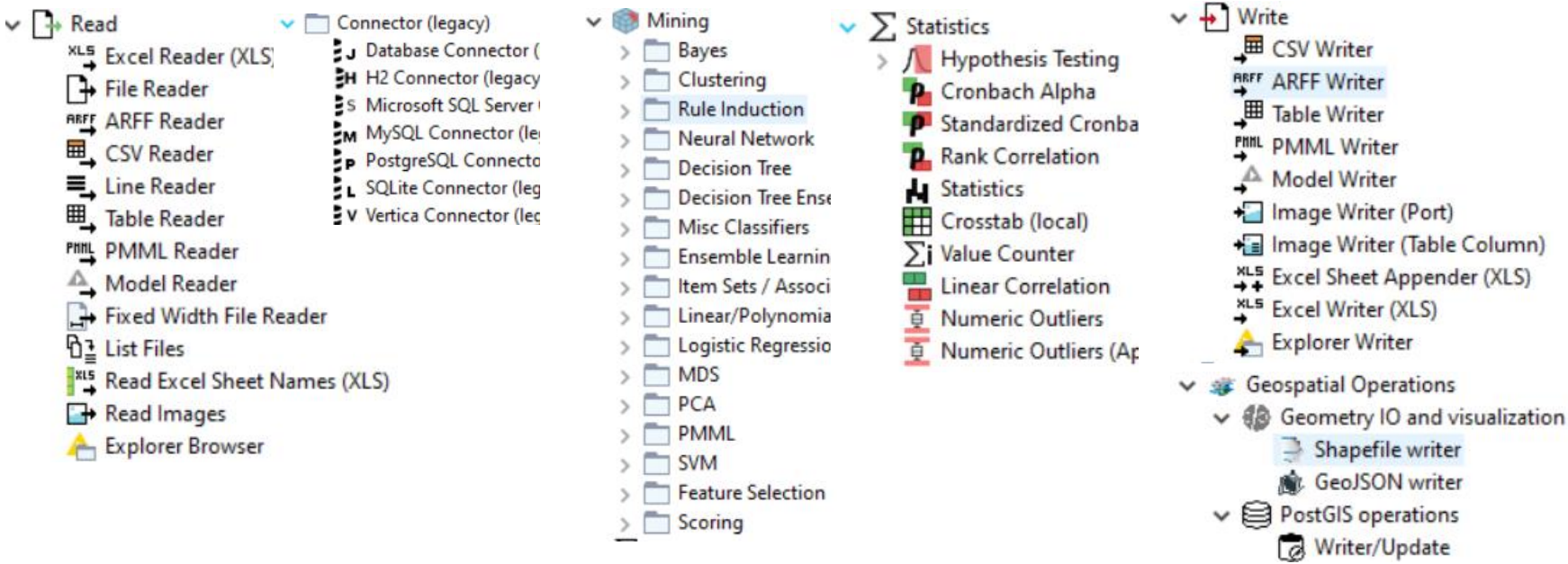
Input and Output

Input/Ouput	Category	Data Format
❑ Input Data	• Local File Reader	Excel; CSV; Table; PMML; Images; File; etc.
	• Database Connector	MySQL; SQLite; PostgreSQL; H2; SQL Server; etc.
	• Big Data Connector	HDFS; webHDFS; HttpFS; HDFS; Hive; etc.
	• Spatial Data Reader	Shapefile Point; Shapefile Polygon; GeoJSON; WFS Connector;
❑ Output Data	• Local File Writer	Excel; CSV; Table; PMML; Images; File; etc.
	• Database Connector	MySQL; SQLite; PostgreSQL; H2; SQL Server; etc.
	• Big Data Connector	HDFS; webHDFS; HttpFS; HDFS; Hive; etc.
	• Spatial Data Writer	Shapefile; GeoJSON; Map Viewer

Core Modules核心功能模块

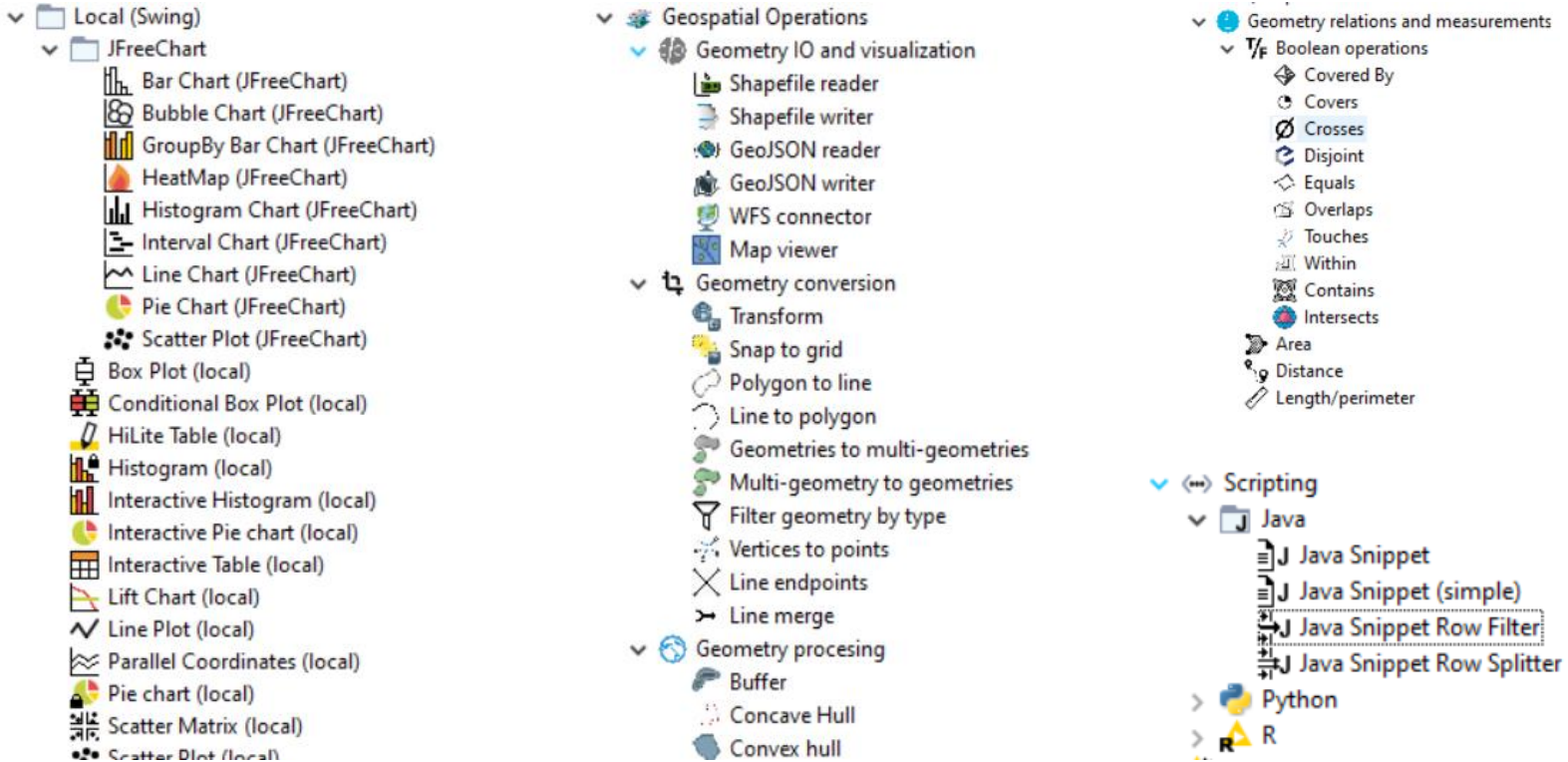
- **Node Repository节点工具包**

Input	Analysis	Output



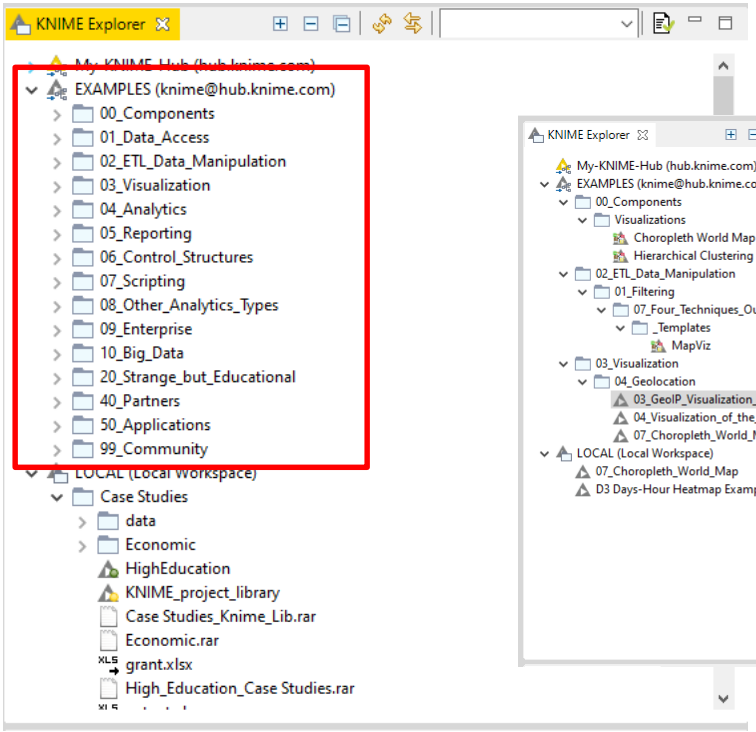
Core Modules核心功能模块

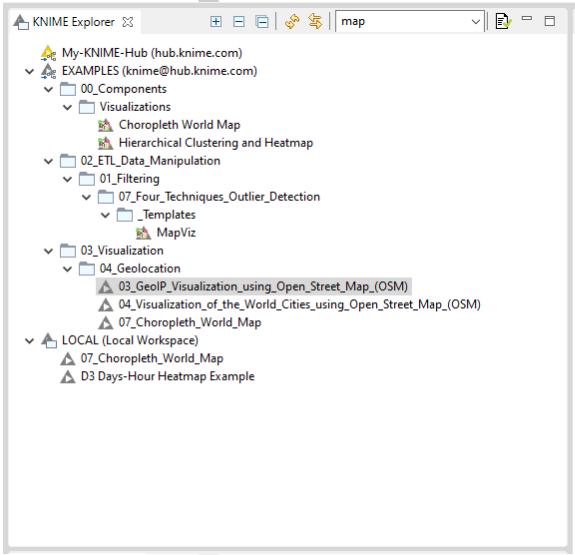
- **Other Nodes其他节点工具**

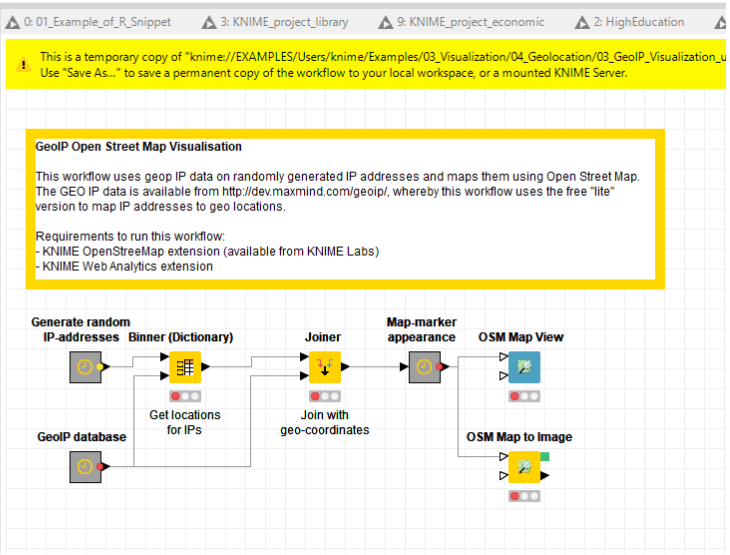


Core Modules核心功能模块

- **Examples工作流范例**

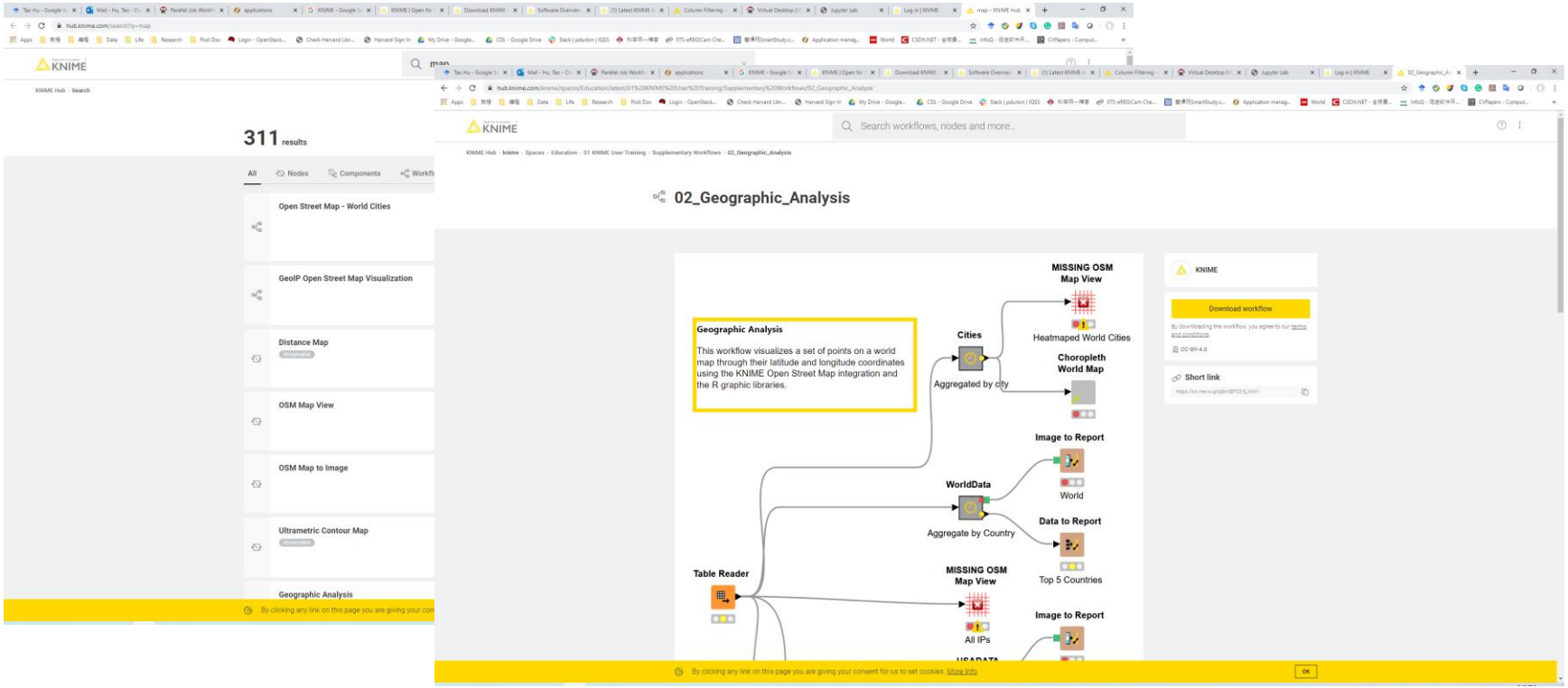






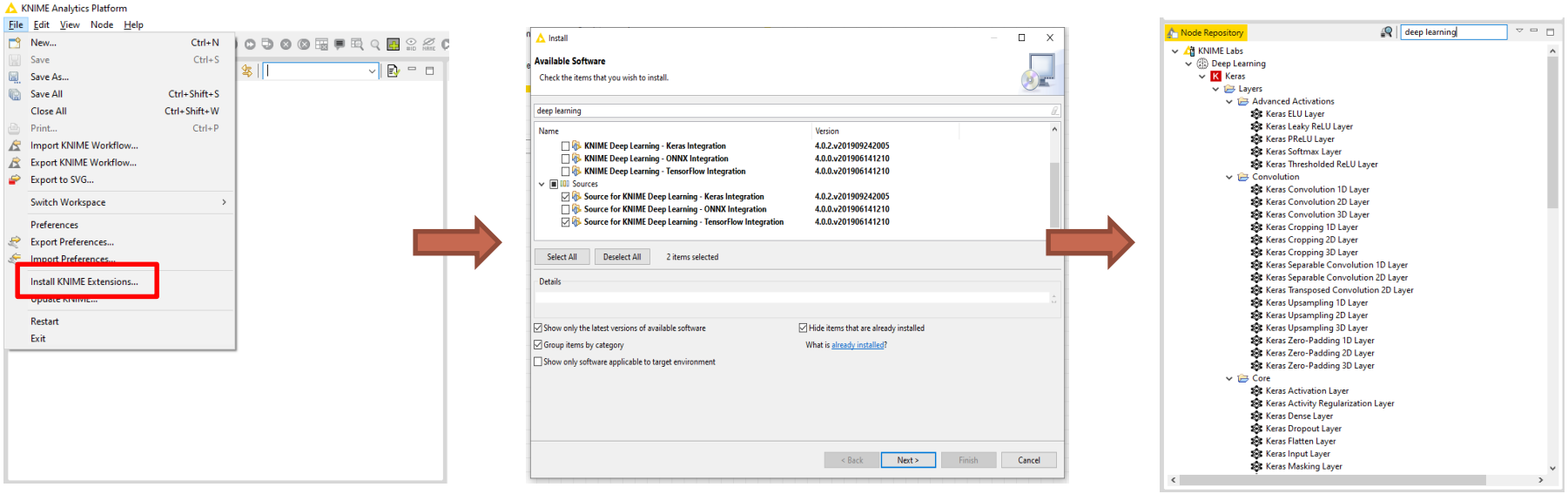
Core Modules核心功能模块

- **KNIME Hub交换中心**



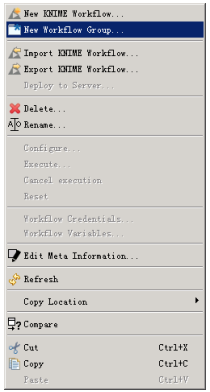
Core Modules核心功能模块

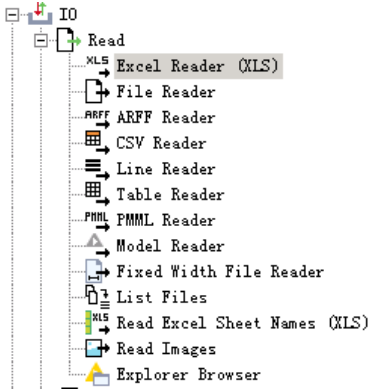
❑ KNIME Extension扩展

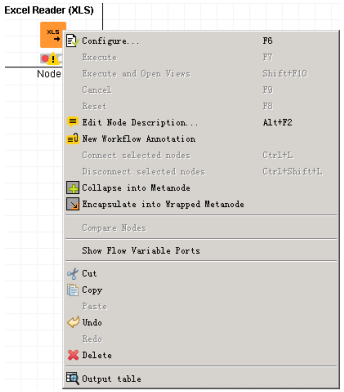


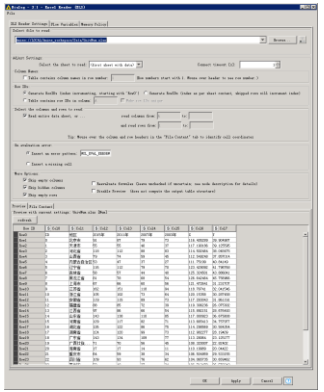
Create a Workflow工作流创建

①新建工作流 → ②选择输入node → ③配置node: 文件目录 →

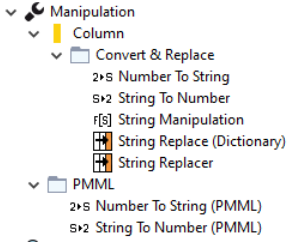


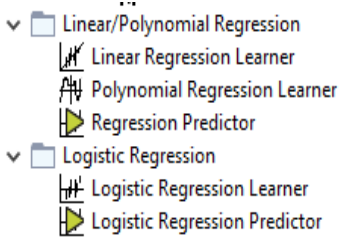


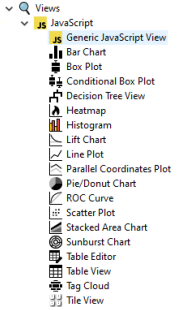


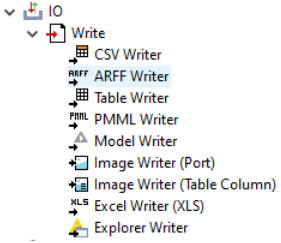


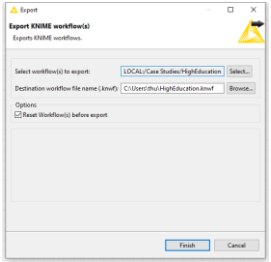
④数据操作或分析 → ⑤数据可视化 → ⑥数据导出 → ⑦导出工作流











Outline

① 工作流软件KNIME简介

② 基于文本数据的文献分析案例

③ 基于企业数据的金融数据分析案例

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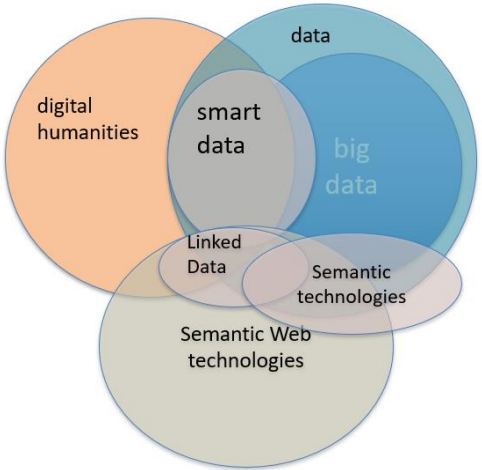
⑥ 工作流数据分析案例制作指南

基于KNIME的文献分析案例

- **Goal**: develop and demonstrate a network framework of the historical Innovation and Invention at the Liquid Crystal Institute, Kent State University (PI: Marcia Lei Zeng, et al.)



参考文献：

- Li, H., Zeng, M., Zhang, Y., Ye, X., & Hu, T. (2017). Tackling Innovation Networks with Smart Data: A Case Study of the Liquid Crystal Institute at Kent State University. In DH.
- Zeng, M. L., Zhang, Y., Li, H., & Polyakov, S. (2015). Exploring Smart Data Approaches to the History of Innovation and Invention at Liquid Crystal Institute at Kent State University. In Digital Libraries: Providing Quality Information: The 17th International Conference on Asia-Pacific Digital Libraries, ICADL 2015, Seoul, Korea, December 9-12, 2015. Proceedings (Vol. 9469, p. 346). Springer.

Objectives 案例目标

- 复制分析流程 Replicate data analysis procedures using previous scientific literature data based on workflow;
- 扩展分析 Expanded data analysis based on publication, patent, and NSF grant data;
- 科研与教学应用 Applications of workflow for research and teaching related to network analysis based on publication, patent, grant data, as well as other data.

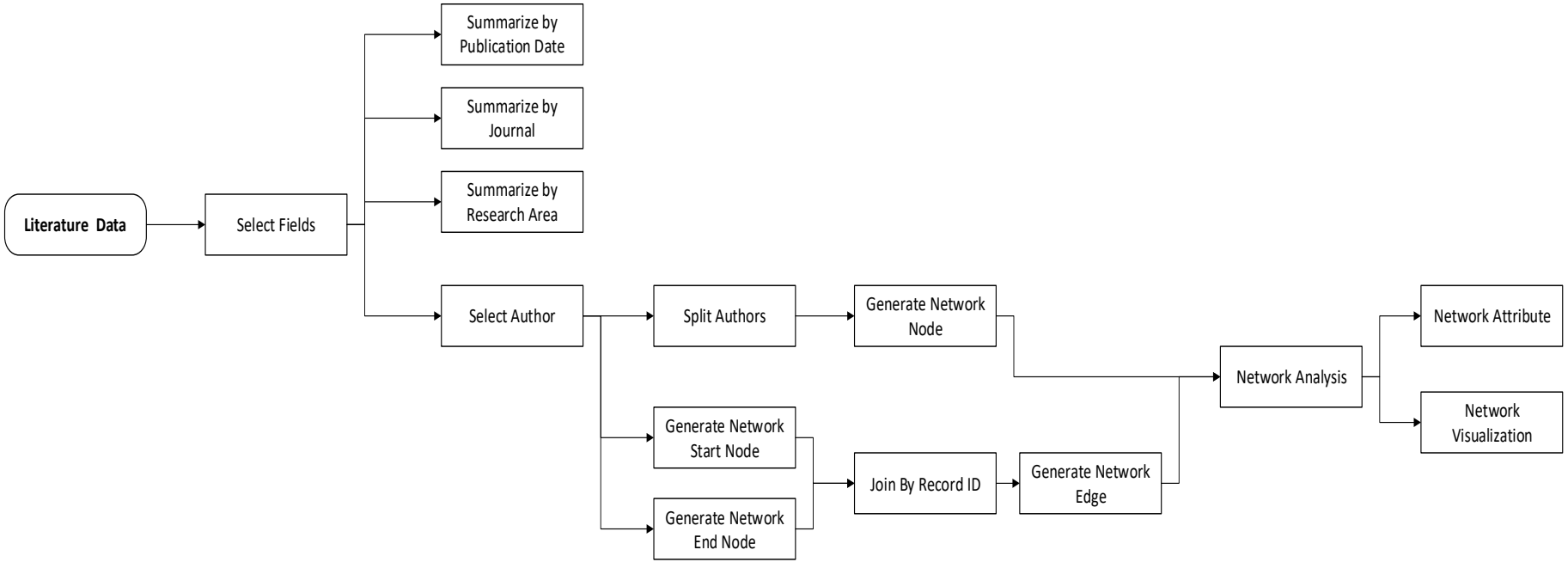
Data Sources 数据来源

- 文章Publication Data
  - Title
  - Author
  - Affiliation
  - Key words
  - Abstract
  - Publication Date
  - Journal
  - Volume
  - Issue
  - …
- 专利 Patent Data
  - Title
  - Inventor
  - Inventor Location
  - Publication Date
  - Assignee
  - Assignee Location
  - CPC
  - IPC
  - USPC
  - Abstract
  - …
- 基金项目Awarded Grants
  - Title
  - PI
  - Co-PI
  - Email Address
  - Institution
  - NSF Organization
  - Start Date
  - Expiration Date
  - Awarded Amount
  - NSF Directorate

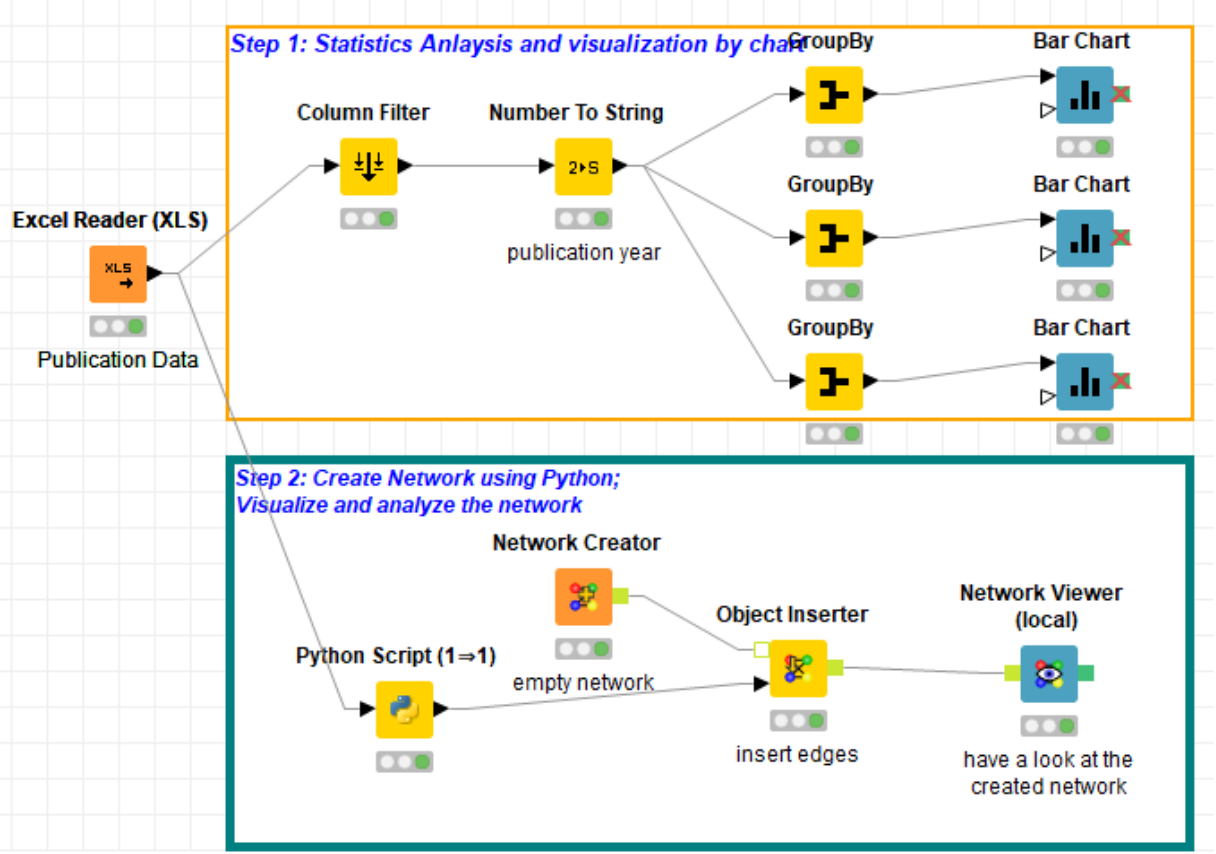
Data Input 输入数据

文件名	文件格式	数据描述
publication.xls 文章元数据	.xls	The sample of publication data collected from WoS (Web of Science).
patent.xls 专利元数据	.xls	The sample of paten data collected from ProQuest.
grant.xls 项目元数据	.xls	The sample of US NSF grant data collected from NSF website

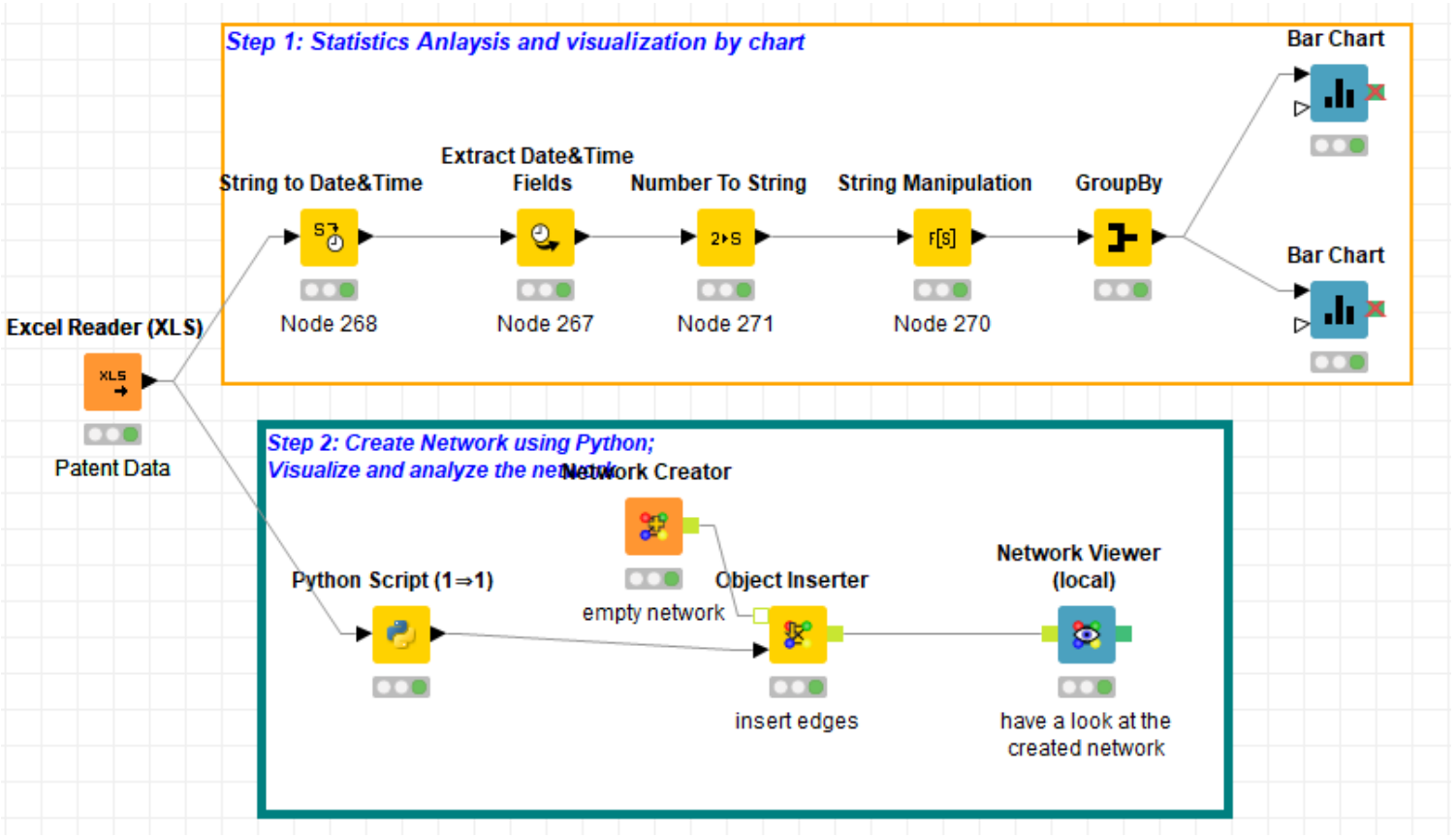
发表文章、专利数据、科研项目数据分析流程



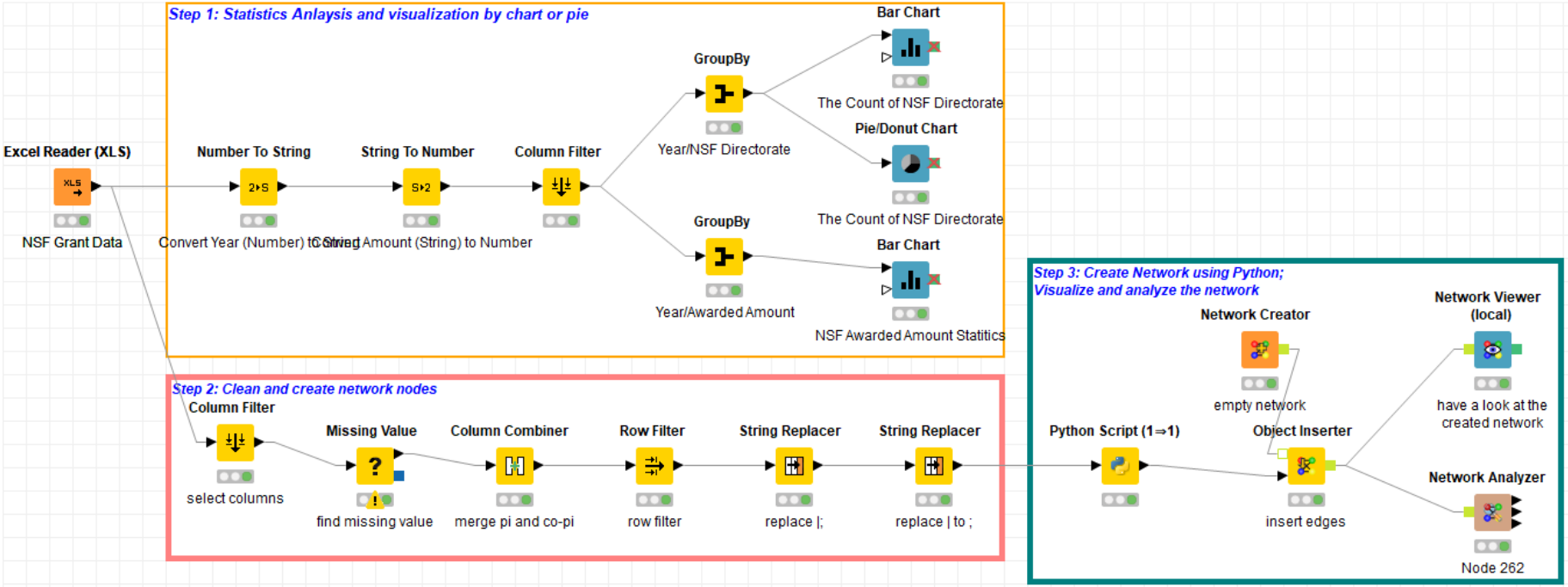
基于文本数据的文章分析工作流



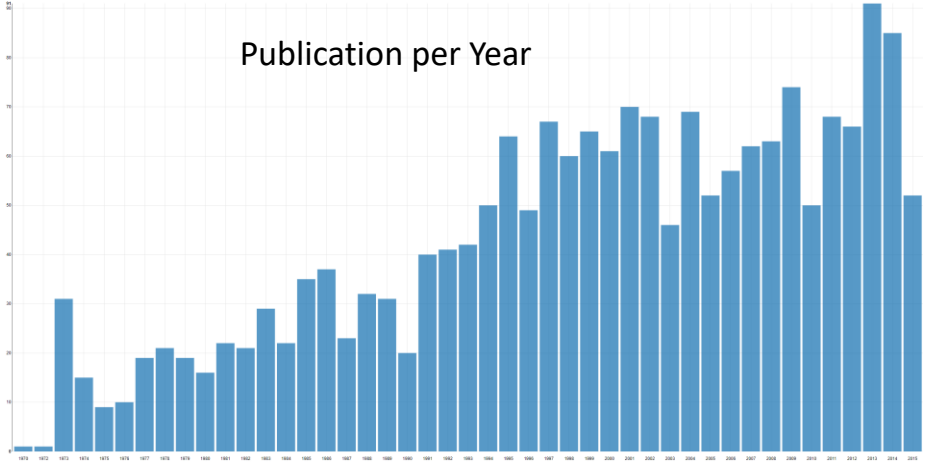
基于文本数据的专利分析工作流



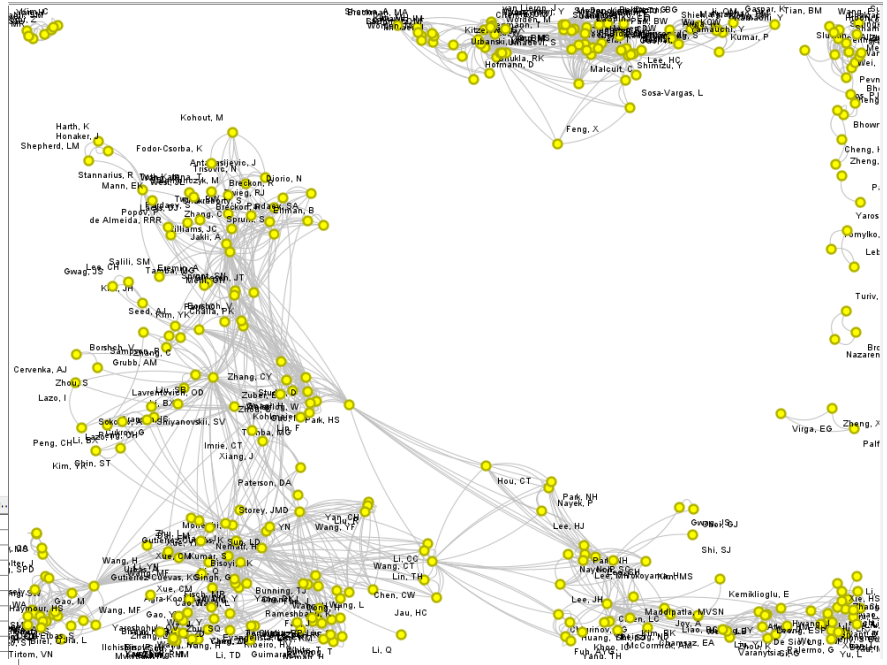
基于文本数据的基金项目分析工作流



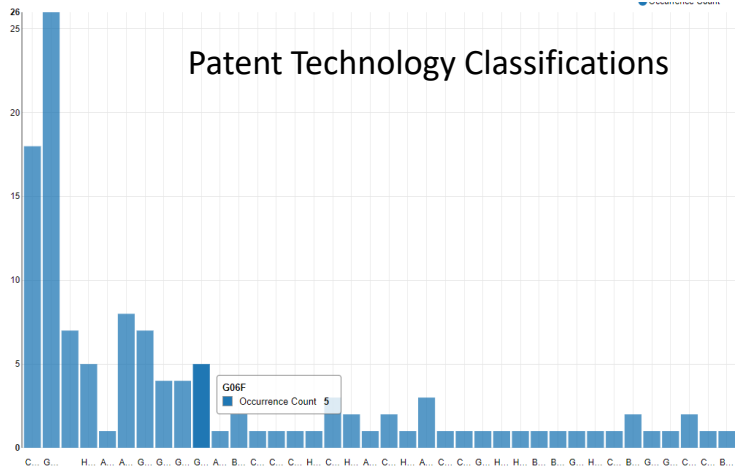
Publication Analysis 文章数据分析结果



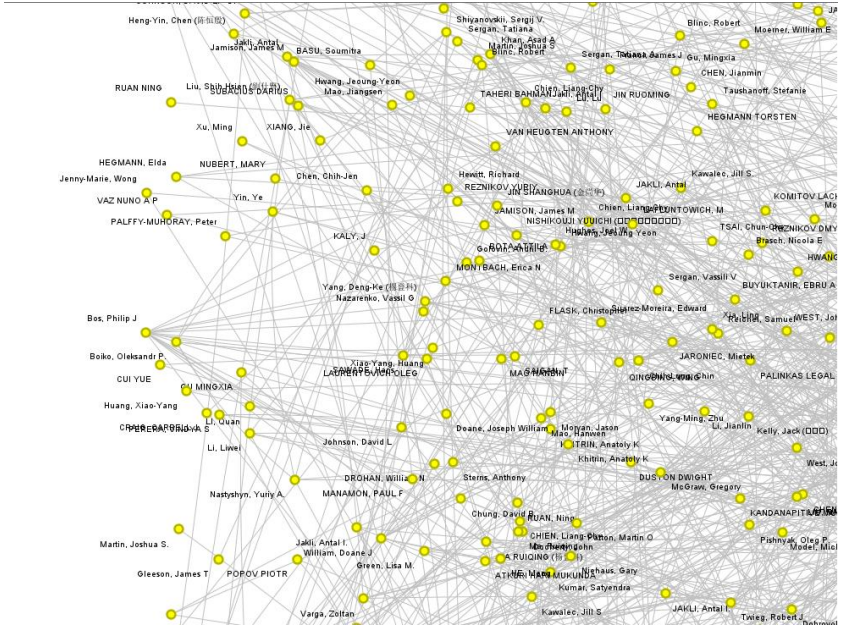
Object id	Node d...	Node d...	In degree	In degr...	Out de...	Out de...	Closen...	Node w...	Avg. n...	Clusteri...	Hub score	Authori...	Baryce...
Feng, X	5	0.326	5	0.326	5	0.326	0.483	5	1	1	0.069	0.069	0.008
Wang, F	5	0.326	5	0.326	5	0.326	0.621	5	1	1	0	0	0.04
Sharma, A	22	1.433	22	1.433	22	1.433	0.589	22	1	0.706	0.801	0.801	0.009
Yao, WH	8	0.521	8	0.521	8	0.521	0.292	8	1	1	0	0	0.001
Wang, MF	5	0.326	5	0.326	5	0.326	0.32	5	1	0.9	0	0	0.001
Lu, W	9	0.586	9	0.586	9	0.586	0.49	9	1	1	0.091	0.091	0.007
Wang, H	4	0.261	4	0.261	4	0.261	0.32	4	1	1	0	0	0.001
Antanasijev...	7	0.456	7	0.456	7	0.456	0.287	7	1	1	0	0	0.001
Reich, R	8	0.521	8	0.521	8	0.521	0.923	8	1	1	0	0	0.1
Lu, L	8	0.521	8	0.521	8	0.521	0.917	8	1	1	0	0	0.1
Lebovka, N	2	0.13	2	0.13	2	0.13	1	2	1	1	0	0	0.5
Ma, J	21	1.368	21	1.368	21	1.368	0.258	21	1	0.367	0	0	0.001
Malgras, V	7	0.456	7	0.456	7	0.456	0.375	7	1	1	0.01	0.01	0.006
Park, HS	23	1.498	23	1.498	23	1.498	0.405	23	1	0.526	0	0	0.002
Beltrano, G	18	1.173	18	1.173	18	1.173	0.517	18	1	1	0.776	0.776	0.008
Kohlmeier, A	15	0.977	15	0.977	15	0.977	0.363	15	1	1	0	0	0.002
Sampson, P	5	0.326	5	0.326	5	0.326	0.327	5	1	1	0	0	0.001
Umadevi, S	8	0.521	8	0.521	8	0.521	0.497	8	1	0.571	0.079	0.079	0.008
Moheghi, A	2	0.13	2	0.13	2	0.13	0.286	2	1	1	0	0	0.001



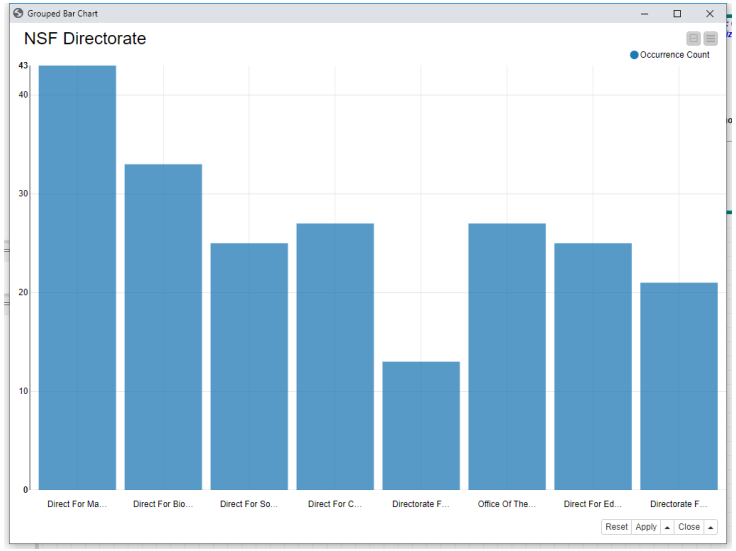
Patent Data Analysis 专利数据分析结果



Object id	Node d...	Node d...	In degree	In degr...	Out de...	Out de...	Node w...	Avg. n...
Chao-Chiun, Liang	9	0.771	9	0.771	9	0.771	9	1
SHOKOUHIMEH...	5	0.428	5	0.428	5	0.428	5	1
Nemati, Hossein ...	9	0.771	9	0.771	9	0.771	9	1
Hwang, Jeoung ...	3	0.257	3	0.257	3	0.257	3	1
QIAN LIANGQI (...	2	0.171	2	0.171	2	0.171	2	1
Soehnlen, Eric S...	8	0.686	8	0.686	8	0.686	8	1
Chen, Cheng	4	0.343	4	0.343	4	0.343	4	1
Osher, Lawrence	9	0.771	9	0.771	9	0.771	9	1
Nastyshyn, Yuri...	6	0.514	6	0.514	6	0.514	6	1
Bhowmik, Achint...	2	0.171	2	0.171	2	0.171	2	1
Gleeson, James T	1	0.086	1	0.086	1	0.086	1	1
Dobrovolskyy, A...	3	0.257	3	0.257	3	0.257	3	1
GLEESON, Jame...	3	0.257	3	0.257	3	0.257	3	1
Kelly, Jack (□□□)	4	0.343	4	0.343	4	0.343	4	1
Li, Liwei	5	0.428	5	0.428	5	0.428	5	1
Palffy-Muhoray,...	7	0.6	7	0.6	7	0.6	7	1
Tsai, Chen Chu (...	9	0.771	9	0.771	9	0.771	9	1



Grant Data Analysis 基金项目数据分析结果



Object id	Node d...	Node degree %	In degree	In degree %	Out degree	Out degree %	Node weigh...	Avg. n...
Genevieve Davis	1	0.787	1	0.787	1	0.787	1	1
Gerassimos Pe...	1	0.787	1	0.787	1	0.787	1	1
Xiaoyu Zheng	2	1.575	2	1.575	2	1.575	2	1
Noah FriedkinE...	1	0.787	1	0.787	1	0.787	1	1
William Kalkhoff	1	0.787	1	0.787	1	0.787	1	1
Robin Selinger	2	1.575	2	1.575	2	1.575	2	1
Paul Farrell	3	2.362	3	2.362	3	2.362	3	1
Joseph OrtizD...	1	0.787	1	0.787	1	0.787	1	1
Ben FinneyMar...	1	0.787	1	0.787	1	0.787	1	1

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⑤ 基于机器学习的产业共聚分析案例

⑥ 工作流数据分析案例制作指南

基于企业数据的金融数据分析案例

Going public in China: Reverse mergers versus IPOs

Aim: This study examines the decision to go public in China through an initial public offering (IPO) versus a reverse merger (RM) transaction.

ELSEVIER

Journal of Corporate Finance
Volume 58, October 2019, Pages 92-111

Going public in China: Reverse mergers versus IPOs ☆

Charles M.C. Lee [a], Yuanyu Qu [b], Tao Shen [c]

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Highlights

- We study firms' choice to go public through reverse mergers (RMs) versus initial public offerings (IPOs) in China.
- Pre-listing RM firms are larger, more profitable, and less politically-connected than pre-listing IPO firms.
- RM firms also have superior post-listing performance, both in terms of operations and stock returns.
- These results are in sharp contrast to the evidence on RMs from developed countries.

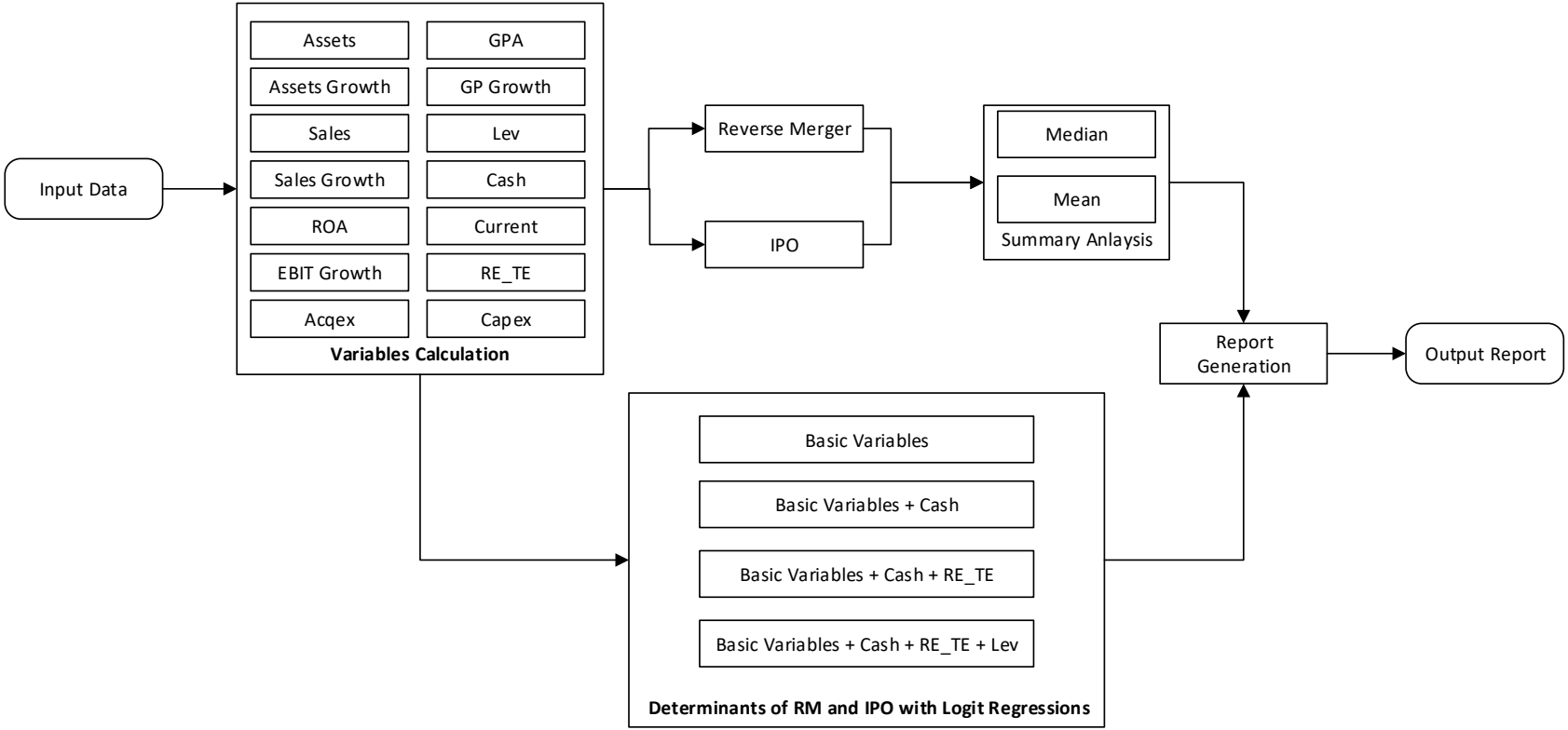
Abstract

We study firms that go public through reverse mergers (RMs) versus initial public offerings (IPOs) in China. Using a manually assembled data set, we show that pre-listing RM firms are larger, more profitable, and less politically connected than pre-listing IPO firms. Chinese RM firms also have superior post-listing performance, in terms of both operations and stock returns, compared to IPOs matched on industry and size. Unlike IPOs, RM firms do not underperform the market in the long run. These results are in sharp contrast to the evidence on RMs from developed countries. We trace these differences to China's stringent and potentially biased IPO policies, which appear to preclude even high-quality firms from accessing public markets.

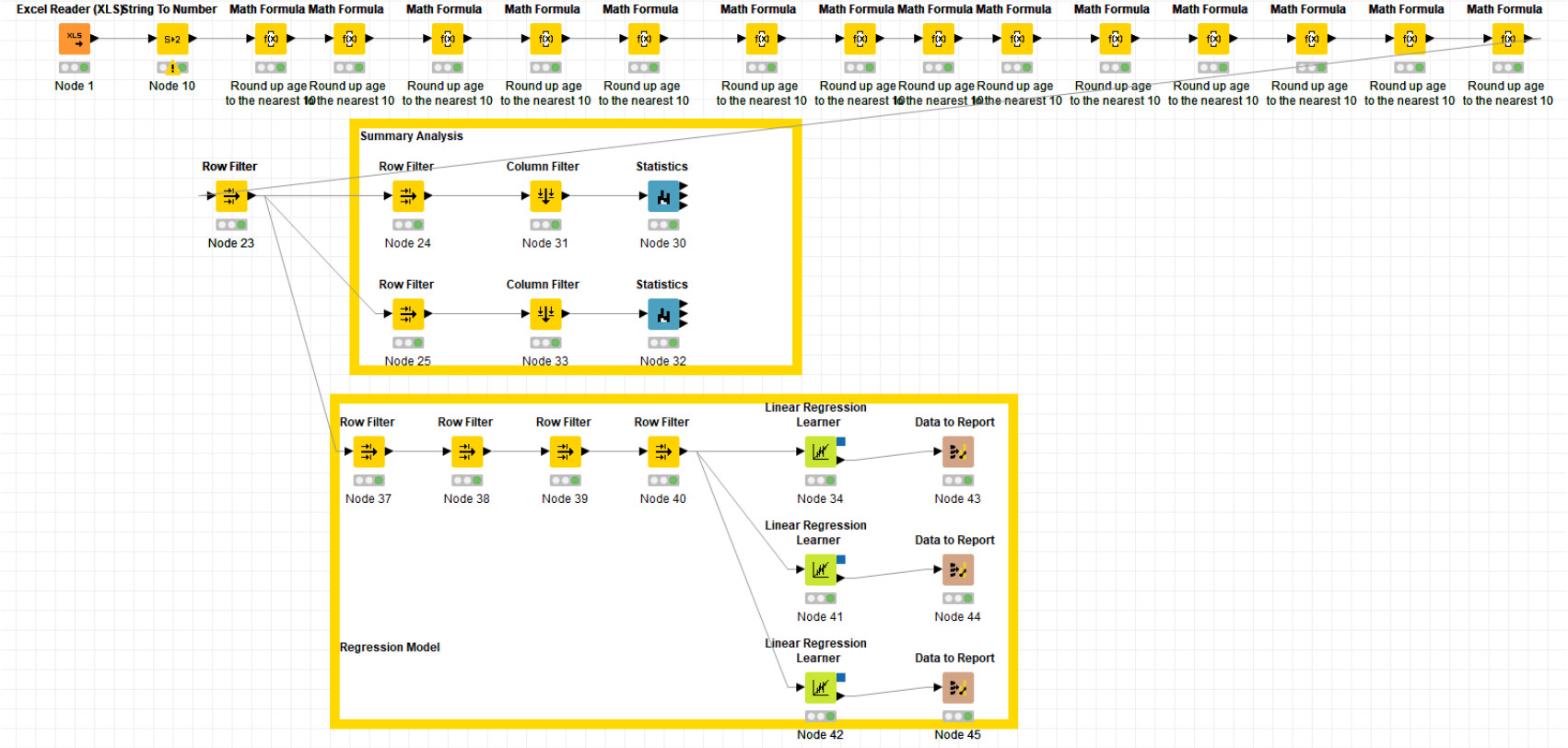
Data Sources 数据来源

Name	Format	Description
IPO.xlsx	xlsx	The financial and stock returns data of listed firms are from the China Stock Market and Accounting Research (CSMAR) Database
RM.xlsx	xlsx	The data is from the iFinD database provided by Tong Hua Shun (THS), a major financial data service company in China
Firm.xlsx	xlsx	The financial information on each RM proposal from www.cninfo.com.cn, a CSRC-authorized website that archives documents and filings for listed firms

Flow Chart 数据分析流程图

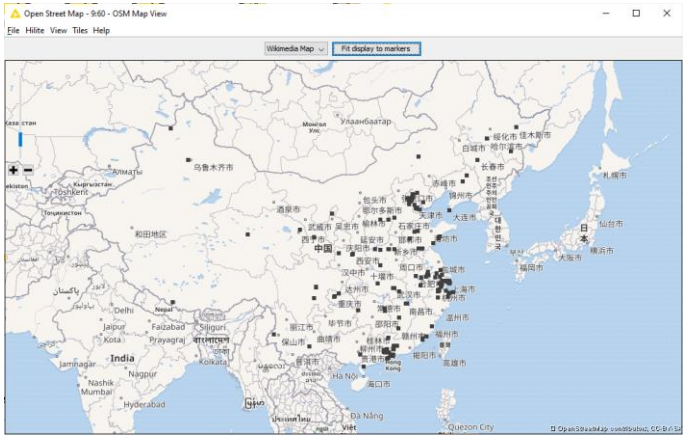


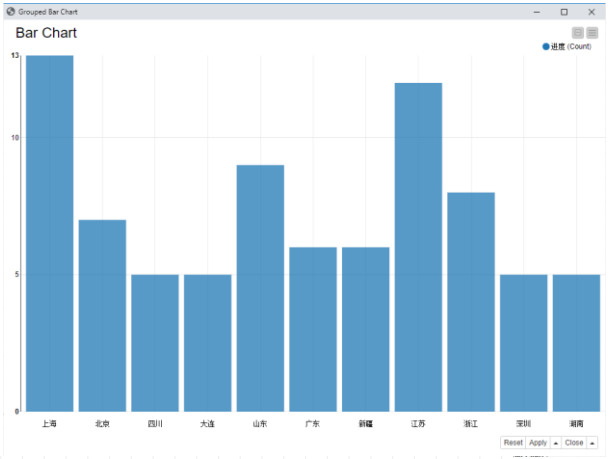
基于KNIME的工作流

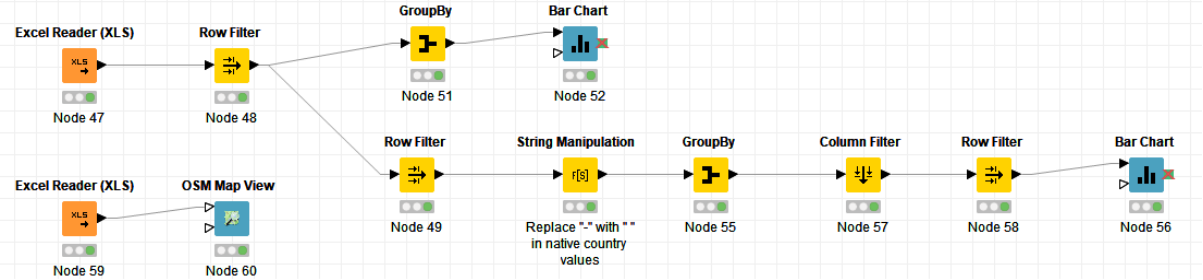


Results from Expanded Analysis 扩展分析结果

- **The RM firms Distribution.**

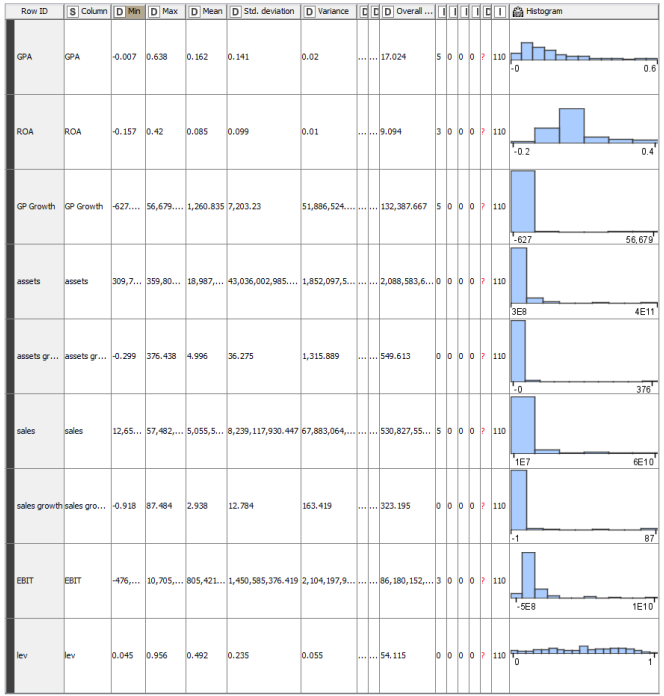






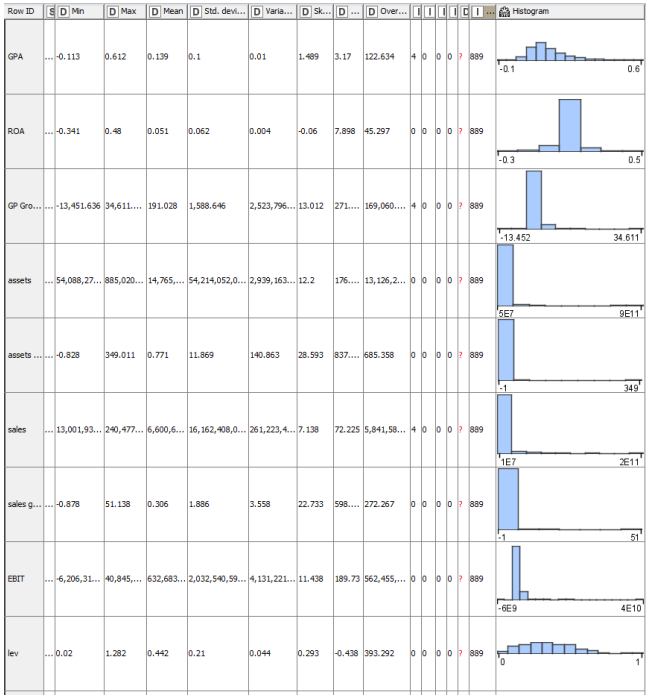
Analysis 数据分析结果

- **The summary of RM and IPO.**



Row ID	Column	Min	Max	Mean	Std. deviation	Variance	Overall ...	Histogram
GPA	GPA	-0.007	0.638	0.162	0.141	0.02	17.024	-0 0.6
ROA	ROA	-0.157	0.42	0.085	0.099	0.01	9.094	-0.2 0.4
GP Growth	GP Growth	-627....	56,679....	1,260.835	7,203.23	51,886,524....	132,387.667	-627 56,679
assets	assets	309,7...	359,80...	18,987,...	43,036,002,985....	1,852,097,5...	2,088,583,6...	3E8 4E11
assets gr...	assets gr...	-0.299	376.438	4.996	36.275	1,315.889	549.613	-0 376
sales	sales	12,65...	57,482,...	5,055,5...	8,239,117,930.447	67,883,064,...	530,827,55...	1E7 6E10
sales growth	sales gro...	-0.918	87.484	2.938	12.784	163.419	323.195	-1 87
EBIT	EBIT	-476,...	10,705,...	805,421...	1,450,585,376.419	2,104,197,9...	86,180,152,...	-5E8 1E10
lev	lev	0.045	0.956	0.492	0.235	0.055	54.115	0 1

The summary of RM



Row ID	Min	Max	Mean	Std. devi...	Varia...	Sk...	...	Over...	Histogram
GPA	-0.113	0.612	0.139	0.1	0.01	1.489	3.17	122.634	-0.1 0.6
ROA	-0.341	0.48	0.051	0.062	0.004	-0.06	7.898	45.297	-0.3 0.5
GP Gro...	-13,451.636	34,611....	191.028	1,588.646	2,523,796....	13.012	271....	169,060....	-13,452 34,611
assets	54,088,27...	885,020....	14,765,...	54,214,052,0...	2,939,163....	12.2	176....	13,126,2...	5E7 9E11
assets	-0.828	349.011	0.771	11.869	140.863	28.593	837....	685.358	-1 349
sales	13,001,93...	240,477....	6,600,6....	16,162,408,0...	261,223,4....	7.138	72.225	5,841,58....	1E7 2E11
sales g...	-0.878	51.138	0.306	1.886	3.558	22.733	598....	272.267	-1 51
EBIT	-6,206,31...	40,845,...	632,683....	2,032,540,59...	4,131,221....	11.438	189.73	562,455,...	-6E9 4E10
lev	0.02	1.282	0.442	0.21	0.044	0.293	-0.438	393.292	0 1

The summary of IPO

Analysis 数据分析结果

❑ Determinants of RM and IPO with Logit Regressions

Variable	Coeff.	Std. Err.	t-value	P>|t|
GPA	-0.113	0.115	-0.981	0.327
ROA	0.765	0.187	4.082	0
assets	0	0	0.92	0.358
assets growth	-0	0.001	-0.059	0.953
sales	0	0	0.116	0.908
sales growth	0.011	0.002	4.735	0
EBIT	-0	0	-0.355	0.723
current	-0.037	0.086	-0.437	0.662
acqex	-0	0	-0.657	0.511
capex	0	0	2.746	0.006
net payout	-0	0	-0.682	0.495
Intercept	0.083	0.02	4.165	0

Variable	Coeff.	Std. Err.	t-value	P>|t|
GPA	-0.197	0.117	-1.687	0.092
ROA	0.624	0.19	3.287	0.001
assets	0	0	1.458	0.145
assets growth	-0	0.001	-0.078	0.938
sales	0	0	0.12	0.905
sales growth	0.012	0.002	5.151	0
EBIT	-0	0	-0.792	0.428
current	-0.029	0.085	-0.336	0.737
re_te	0.018	0.005	3.762	0
acqex	-0	0	-0.604	0.546
capex	0	0	2.998	0.003
net payout	-0	0	-1.294	0.196
Intercept	0.08	0.02	4.044	0

Variable	Coeff.	Std. Err.	t-value	P>|t|
GPA	-0.165	0.117	-1.413	0.158
ROA	0.669	0.19	3.516	0
assets	0	0	0.849	0.396
assets growth	0	0.001	0.03	0.976
sales	-0	0	-0.088	0.93
sales growth	0.012	0.002	4.93	0
EBIT	-0	0	-0.745	0.456
lev	0.128	0.052	2.472	0.014
current	0.015	0.087	0.168	0.867
re_te	0.018	0.005	3.714	0
acqex	-0	0	-0.612	0.541
capex	0	0	2.78	0.006
net payout	-0	0	-0.645	0.519
Intercept	0.011	0.034	0.319	0.75

Variable	Coeff.	Std. Err.	t-value	P>|t|
GPA	-0.164	0.117	-1.403	0.161
ROA	0.67	0.19	3.519	0
assets	0	0	0.868	0.385
assets growth	0	0.001	0.056	0.955
sales	-0	0	-0.176	0.86
sales growth	0.012	0.002	4.927	0
EBIT	-0	0	-0.767	0.443
lev	0.129	0.052	2.477	0.013
current	0.014	0.087	0.159	0.873
re_te	0.018	0.005	3.707	0
acqex	-0	0	-0.445	0.657
capex	0	0	2.677	0.008
net payout	-0	0	-0.635	0.526
AO	0	0	0.186	0.852
Intercept	0.011	0.034	0.31	0.757

*0:保留三位小数

Output Files 输出文件

Name	Format	Description
RM_vs_IPO	.yxmd	The workflow file generated by Alteryx
RM_vs_IPO.	.knime	The workflow file generate by KNIME
workflow	. vsdx	The workflow for this study
RM_vs_IPO	.pdf	The results of summary analysis and regression analysis
Case_Study_Economics	.pptx	The description of case study

Outline

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② 基于文本数据的文献分析案例

③ 基于企业数据的金融数据分析案例

④ 基于政府统计的高校教育时空分析案例

⑤ 基于机器学习的产业共聚分析案例

⑥ 工作流数据分析案例制作指南

Background 背景

Aim: Study spatiotemporal distribution patterns and its changes of China's higher education resources by visualizing the education indicator and applying spatial autocorrelation analysis.

Related work from previous studies:

- ➢Mainly focus on single indicator to analysis
- ➢Basically use mathematical statistics methods

Expansion by this study：

- ✓Multiple indicators involved
- ✓Spatial statistics analysis

Study Area:

- ✓All universities in China.

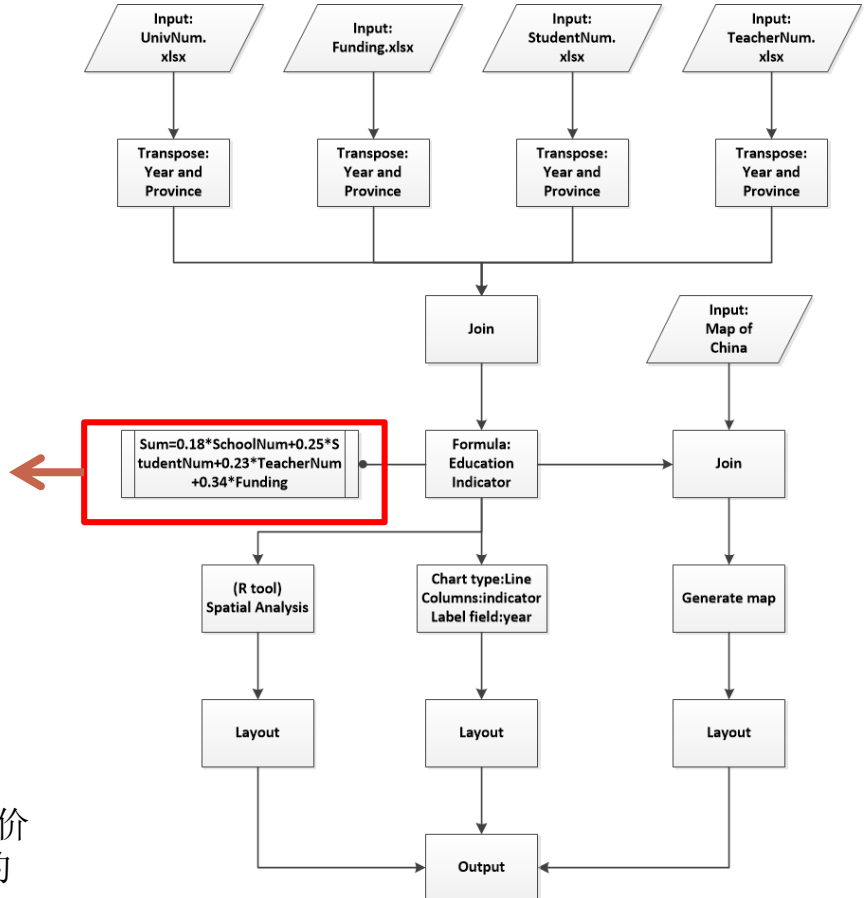
Data Sources 数据来源

Data Category	Data Description		Data Source	Software
High education resources of each province	Number of universities	2003、2007、2011、2015	China statistical yearbook	Excel
	Education funding			
	Number of students			
	Number of full-time teachers			
Map of China	With province boundary		Public data	ArcGIS

Flow Chart 数据分析流程图

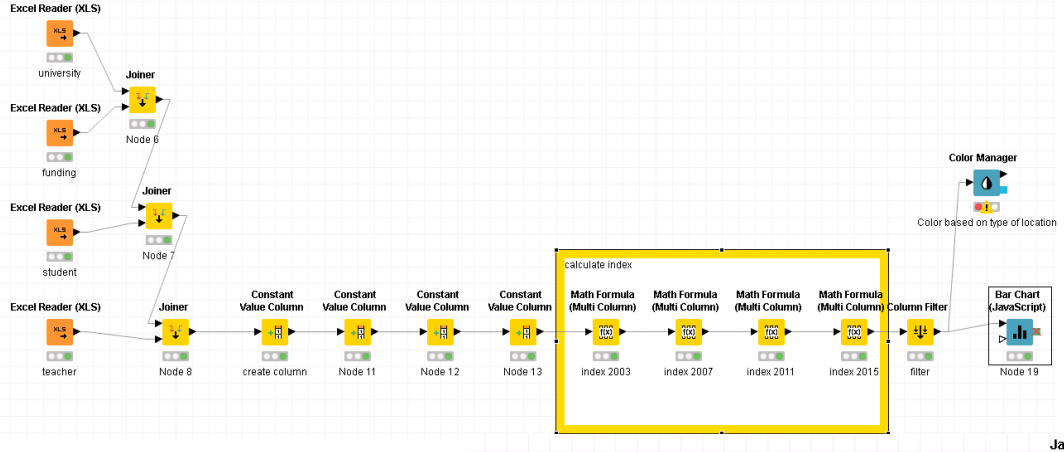
To calculate the Education Indicator：

According to paper[1], we get weights of 4 single indicators of 4 years. The average value of weights in 4 years will be the final weight for each single indicator.



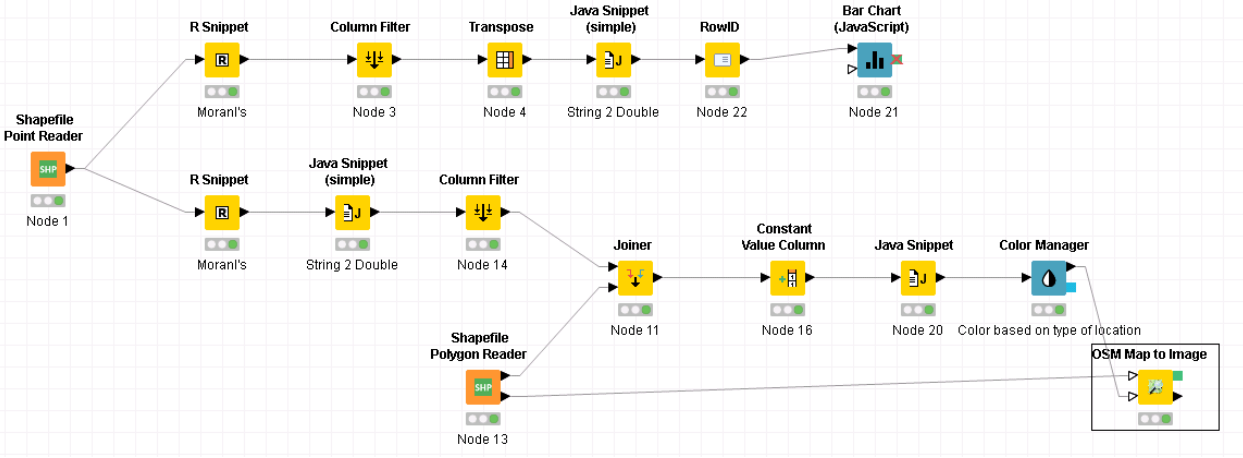
[1]邹志红，孙靖南，任广平．模糊评价因子的熵权法赋权及其在水质评价中的

Workflow 工作流

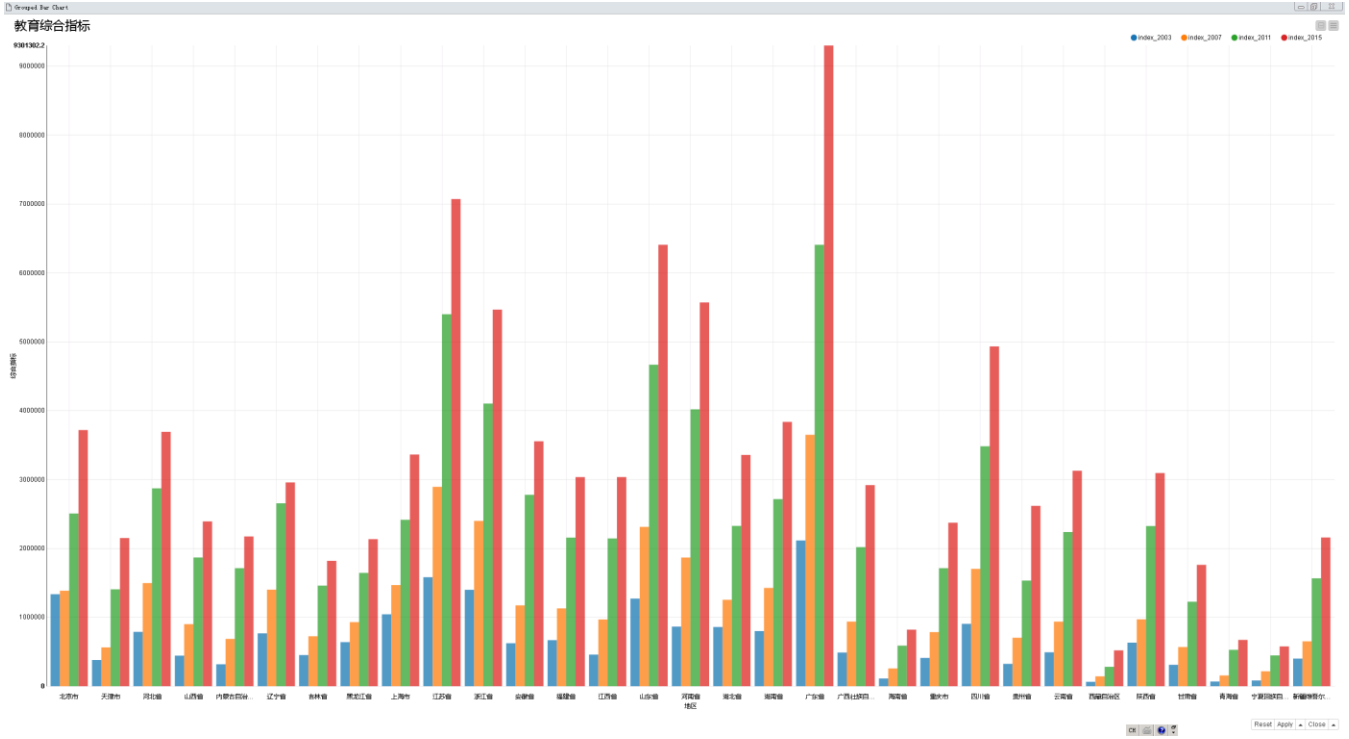


Index Calculation

Moran I and G Index

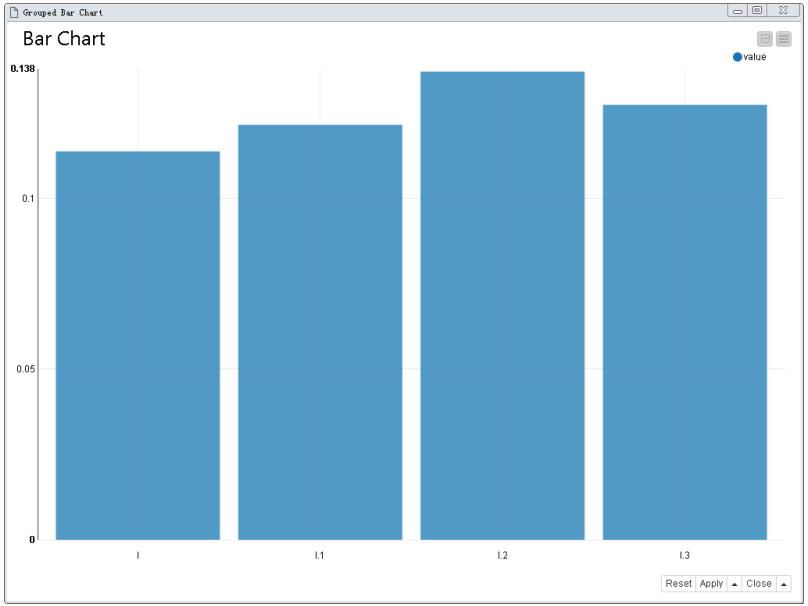


Analysis 数据分析结果

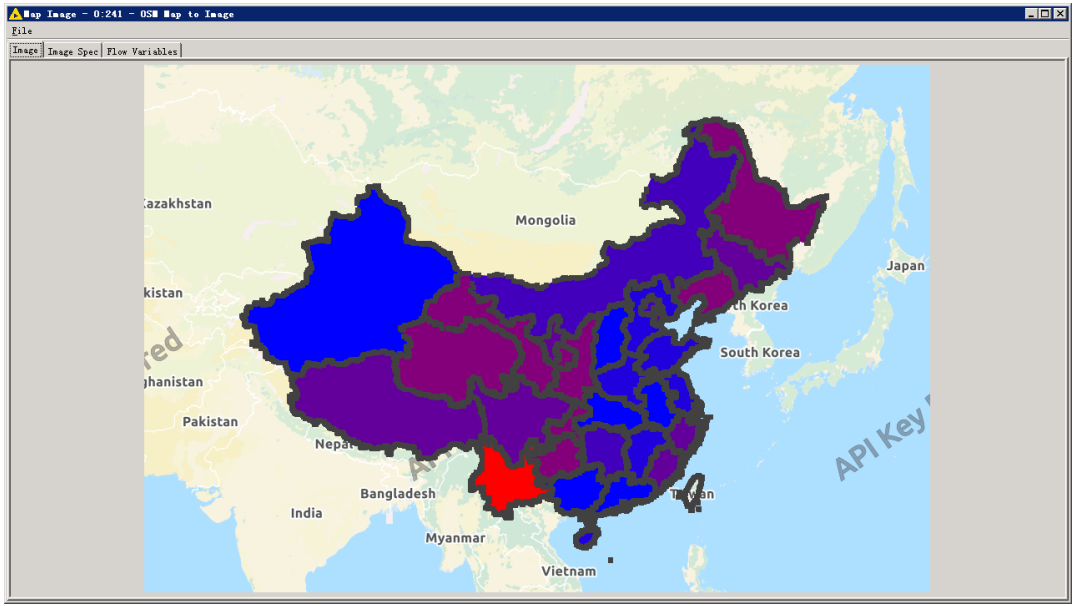


Analysis 数据分析结果

Moran's I of 4 years



Local Geary of 2015



Output Data 输出数据

Documents	Description	File
Case study reference	PDF file	HighEducation_paper.pdf
Case study presentation	Presentation file	HighEducation_case.pptx
KNIME module	KNIME workflow	HighEduCase Spatial autocorrelation
Technical output	Output file generated by KNIME workflow module	output file

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⑤ **基于机器学习的产业共聚分析案例**

⑥ 工作流数据分析案例制作指南

Objectives 目标

❑ Research Background

As an important form of industrial spatial distribution, it is an urgent and challenging problem to study the measurement and influencing factors of industrial co-agglomeration, especially at the level of urban cluster.

❑ Research Aim

Accurate measurement of industrial co-agglomeration index, especially the direction of industrial co-agglomeration.

Definitions

- **Definition of Industrial Co-agglomeration**

  Industry locate near one another OR agglomeration across industries as a whole(Ellison et al.,2010)

- **The peculiarity of industrial co-agglomeration: Directionality Based on Ecology Theory**
- **Commensalism**: a long-term biological interaction (symbiosis) in which members of one species gain benefits while those of the other species neither benefit nor are harmed.
- **Protocooperation**: a form of mutualism, but the cooperating species do not depend on each other for survival.
- **Mutualism**: the ecological interaction between two or more species where each species has a net benefit.

Data Sources 数据来源

- 2013 China industrial enterprise database
- Use the Baidu API to get enterprise geographic latitude and longitude
- Classified according to Chinese urban clusters

Name	Format	Description
Enterprise data	csv	Enterprise longitude Enterprise latitude Industry code Cluster code
Selected industry list	csv	The selected industries code

Steps of Data Analysis 数据分析步骤

Step1: Calculate the Wasserstein Distance of spatial distribution between two industries

$$W_{j,k} = \left(\inf_{\gamma \in \Gamma(f_j, f_k)} \int_{\mathbb{R}^2 \times \mathbb{R}^2} d(x,y)^2 d\gamma(x,y) \right)^{1/2}$$

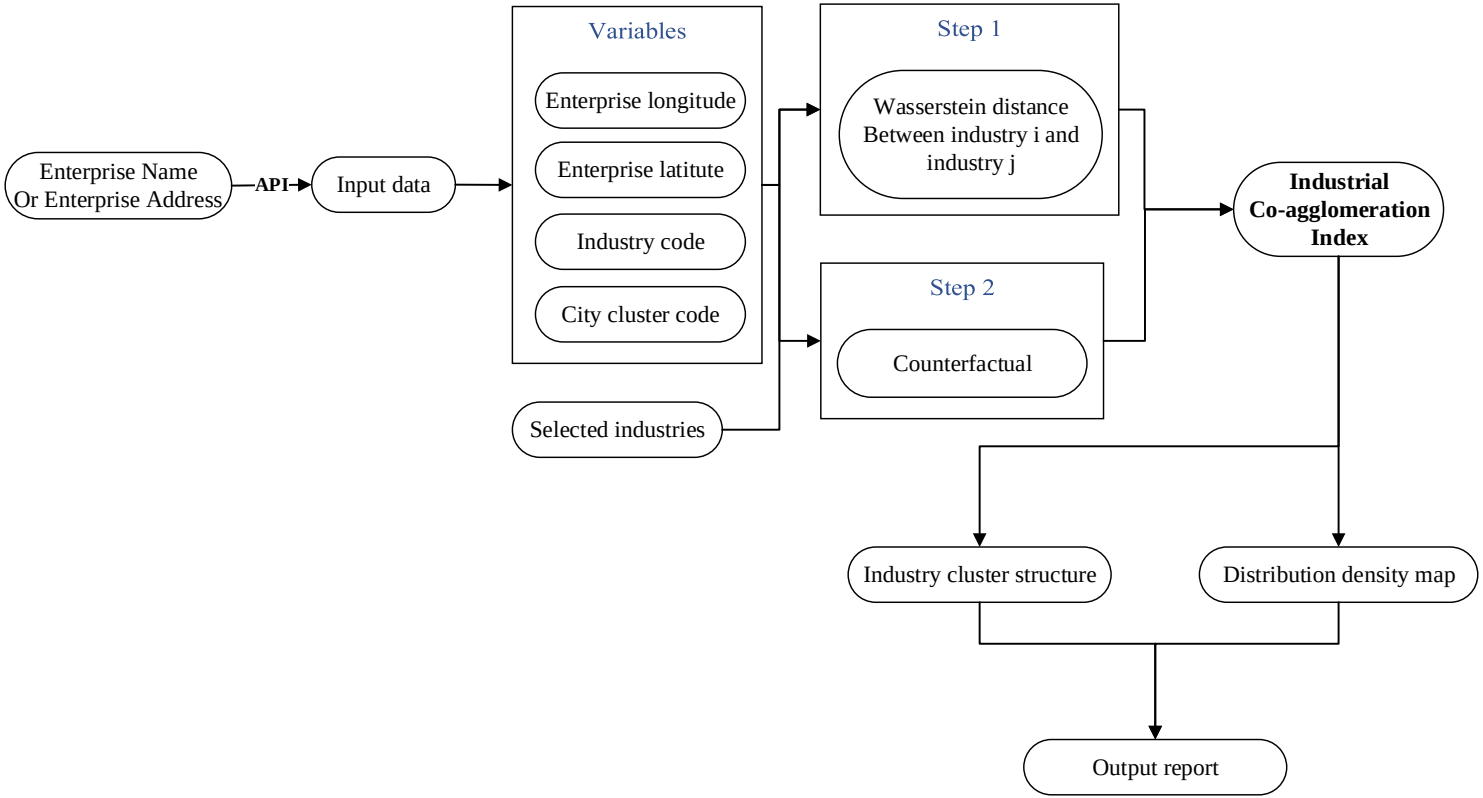
Step2: construct our counterfactual of randomly located (pseudo) industries

Null hypothesis: no spatial similarity between industry j and industry k conditional on the spatial density of industry j

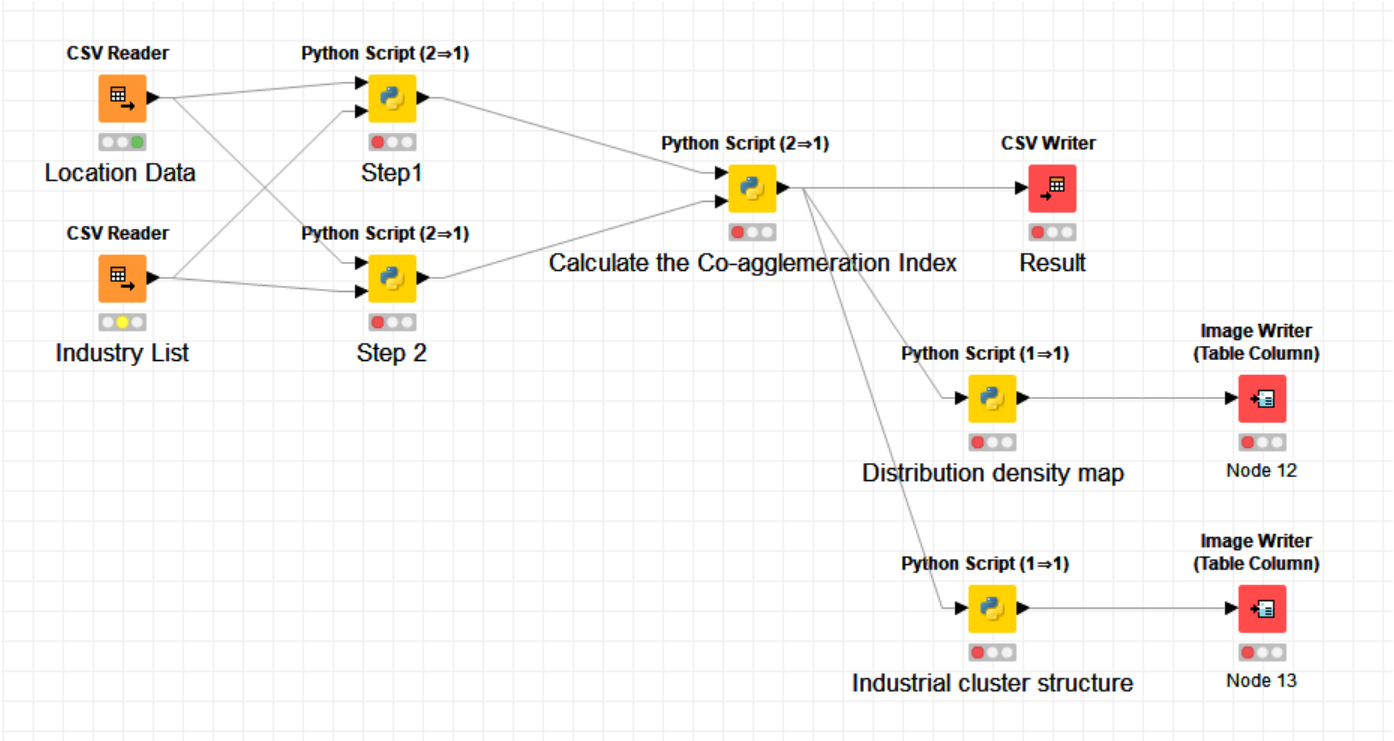
1000 pseudo industries to generate an empirical null distribution for colocalization of industry j to pseudo industry . $\hat{k}$

We construct our colocalization index by determining the number of pseudo industries for which $W_{j,k}$ is less than $W_{j,\hat{k}}$

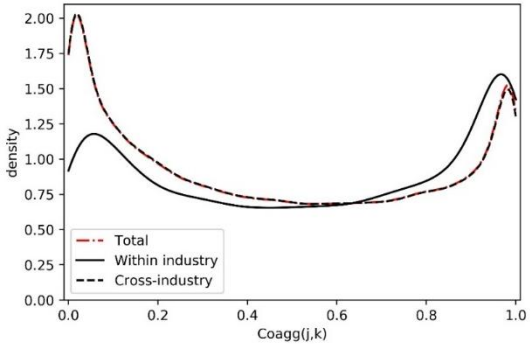
Flow Chart 数据分析流程图



Workflow 基于Knime的工作流



Analysis 数据分析结果



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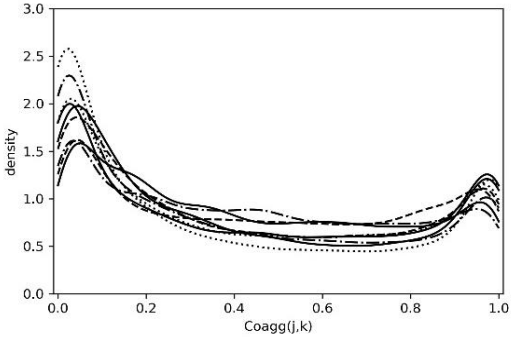
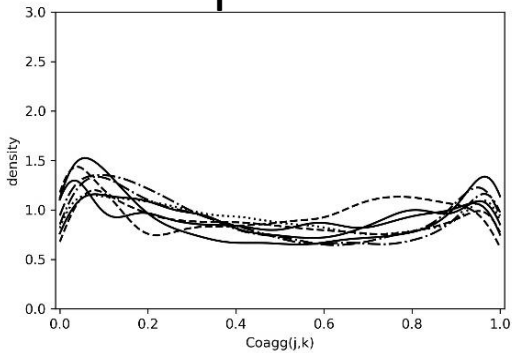
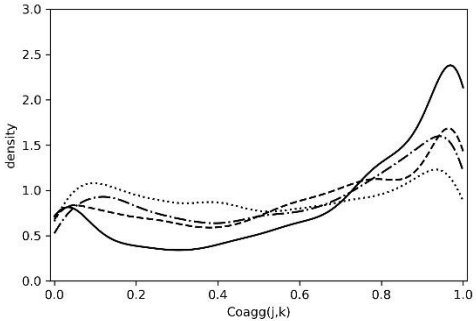


Model 1



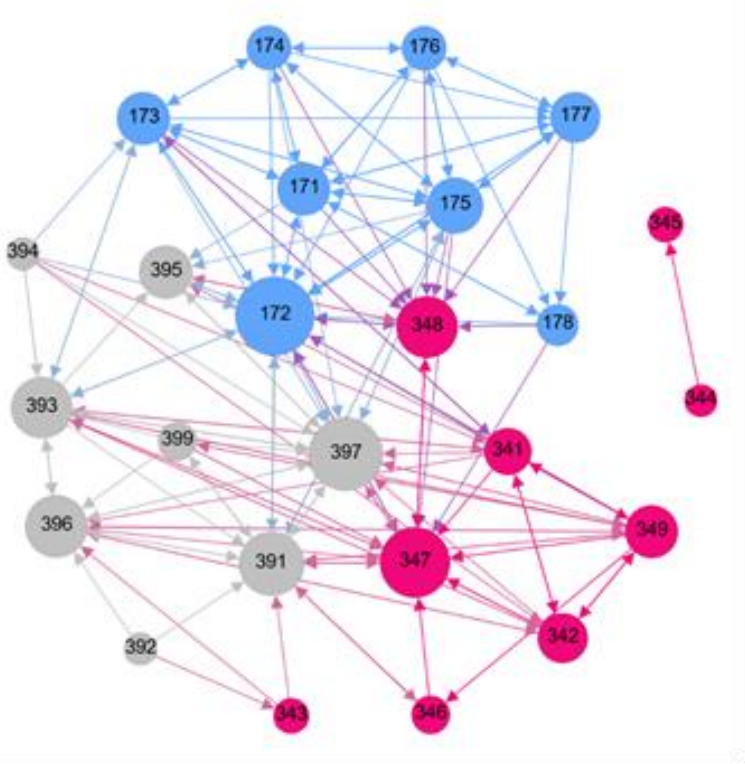
Model 2



Model 3

Analysis 数据分析结果

- Map: Part of the Industrial cluster structure of Yangtze river delta city cluster



171 棉纺织及印染精加工
172 毛纺织及染整精加工
173 麻纺织及染整精加工
174 丝绢纺织及印染精加工
175 化纤织造及印染精加工
176 针织或钩针编织物及其制品制造
177 家用纺织制成品制造
178 产业用纺织制成品制造
341 锅炉及原动设备制造
342 金属加工机械制造
343 物料搬运设备制造
344 泵、阀门、压缩机及类似机械制造
345 轴承、齿轮和传动部件制造
346 烘炉、风机、包装等设备制造
347 文化、办公用机械制造
348 通用零部件制造
349 其他通用设备制造业
391 计算机制造
392 通信设备制造
393 广播电视设备制造
394 雷达及配套设备制造
395 非专业视听设备制造
396 智能消费设备制造
397 电子器件制造
399 其他电子设备制造

Output Data 输出数据

ID	Name	Format
1.	The industrial co-agglomeration index between selected industries in 2013	csv table
2.	Map of industrial co-agglomeration index distribution density map	Chart
3.	the Industrial cluster structure of the selected industries within selected city cluster	Map

The Guideline
for
Case Studies in Data Analysis
工作流数据分析案例研发指南

Outline

① 工作流软件KNIME简介

② 基于文本数据的文献分析案例

③ 基于企业数据的金融数据分析案例

④ 基于政府统计的高校教育时空分析案例

⑤ 基于机器学习的产业共聚分析案例

⑥ 工作流数据分析案例制作指南

Objectives 案例目标

- ❑ Cultivate professional data analysis
- ❑ Improve the efficiency of data analysis
- ❑ Promote knowledge and information sharing
- ❑ Promote research collaborations
- ❑ Promote data applications in research and education

Data Sources 数据来源

- Government Statistics （Province, City, County)
- Population Census
- Economic Census
- Survey Data
- Establishments
- Geography and Environment (Land Use, Night-Time)
- Base Maps (Census Maps, Yearly Administrative Maps)
- GRID Data
- Remote Sensed Data
- Local databases
- Special databases
- Big Data Sources (Twitter, Weibo, QQ, ….)
- Research References

Case Study Report 数据案例报告

- Title
- Key words
- Abstract
- Background (hypothesis, debates from literature)
- Data
- Methodology
- Results of the Analysis
- Conclusions and Discussions
- Acknowledgements
- References
- Diagram of the workflow for data analysis

Tool Selection 案例工具选择

1. ArcGIS
2. GeoDa
3. GAUSS
4. Jupyter
5. KNIME
6. R AnalyticFlow
7. Alteryx

样本案例：基于工作流的数据案例

Religious Diversity and Regional Development

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China Economic Review

Volume 46, December 2017, Pages 1-9

ELSEVIER

Religious diversity and regional development in China

Zheng Ying [a, b], Shibao Liu [c], Shuming Bao [d, *], Jianbo Zhou [a]

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Highlights

- Identify possible impacts of religious diversity on regional development at province level under the same political regime
- Apply fragmentation and polarization indices as measures of religious diversity
- Solve the endogeneity issue with the fixed-effect two-stage regression

Abstract

This paper investigates possible impacts of religious diversity on regional development in China. We developed the religious fragmentation and polarization indices as measurements for the religious diversity by using the religious site data from the 2004 economic Census data in China. The results from the panel data regressions within national coverage suggest that the religious diversity has positive and significant impacts on regional development in general. The results from the panel data regressions within regional coverage also suggest that religious fragmentation has a positive and significant association with the economic development in the eastern region of China while religious polarization has a positive and significant association with the economic development in the central and western regions of China.

Aim: Test the impacts of religious diversity on regional development in China

Findings from previous studies: Religious diversity may have positive or negative impacts on economic development

Background of this study: Test the impacts of religious diversity on regional development under the same political regime at sub-national level (province) in a peaceful environment

Data Sources 数据来源

Name	Format	Description
Data_religion.xlsx	xlsx	The number of religion sites of different types at different provinces from 1987 to 2004
Data_statistics.xlsx	xlsx	variables included in the regression analysis, including real income per capita, average education attainment, investment in physical capital, policy variable, Growth rate of labor & tech, dep.
province_boundary.shp	shp	the boundaries of provinces in mainland China

Methodology 方法

Measurements of religious diversity: fragmentation and polarization indices

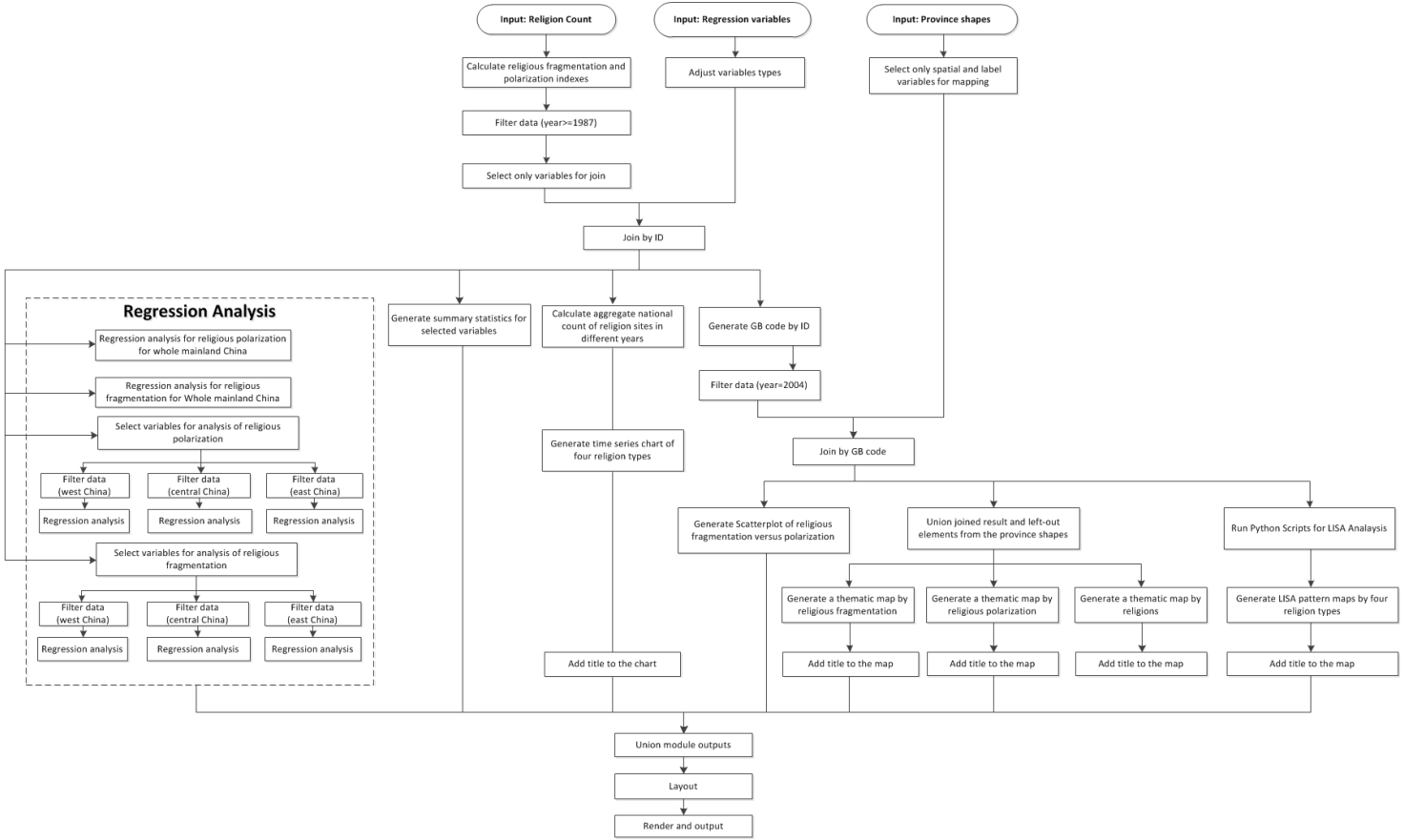
Fragmentation: $FRAG_i = 1 - \sum_{j=1}^{J} \left(\frac{n_{ij}}{N_i}\right)^2$

Polarization: $POL_i = 1 - \sum_{j=1}^{J} \left(\frac{0.5 - \pi_{ij}}{0.5}\right)^2 \pi_{ij}$

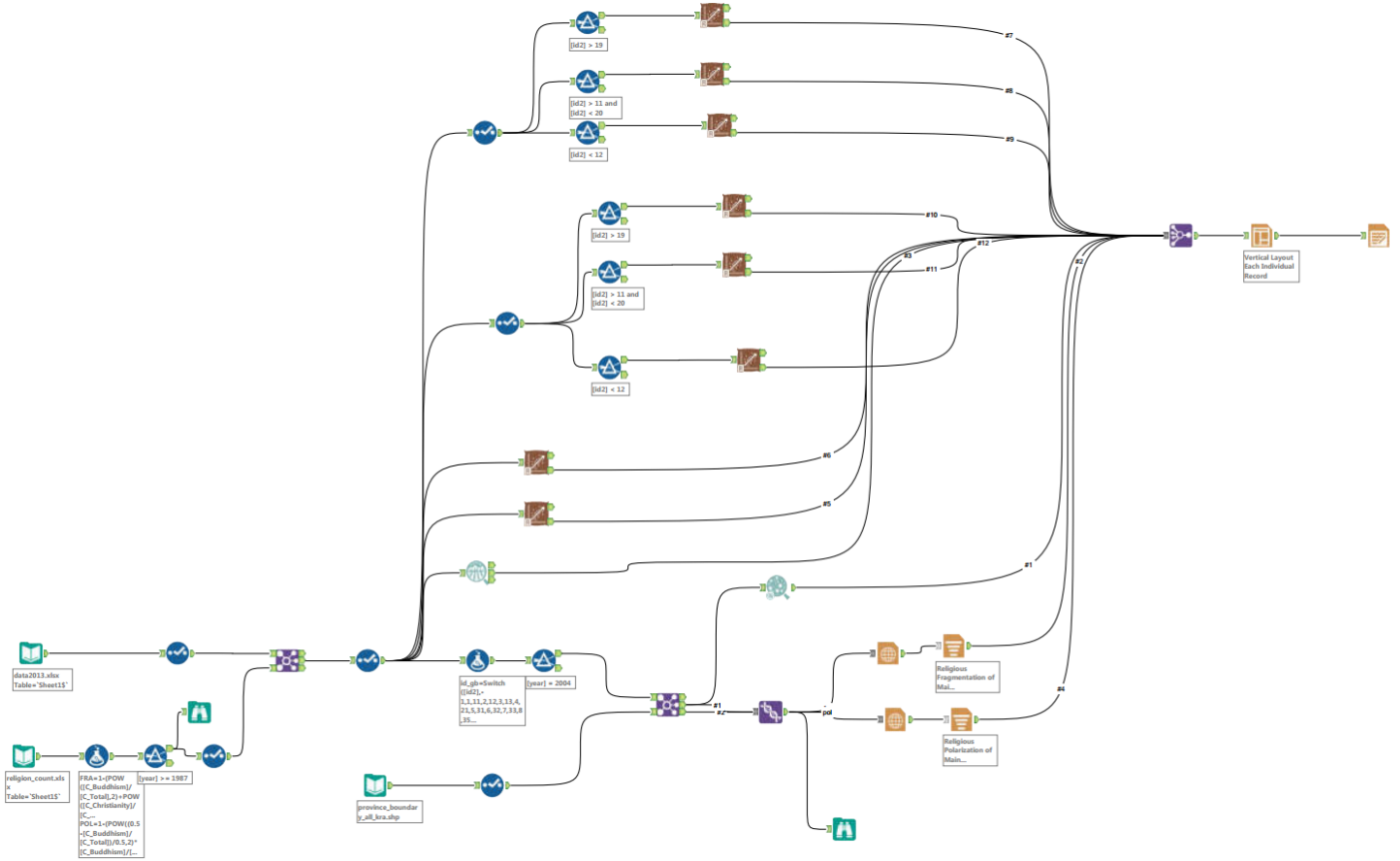
Regression: $ln\frac{Y(t)}{L(t)} = \beta_0 + \beta_1 lns_k + \beta_2 lns_h + \beta_3(n + g + \delta) + u$

Moran I test for spatial autocorrelation: $I(d) = \frac{\sum_{i}^{n}\sum_{j\neq i}^{n} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{S^2 \sum_{i}^{n}\sum_{j\neq i}^{n} w_{ij}}$

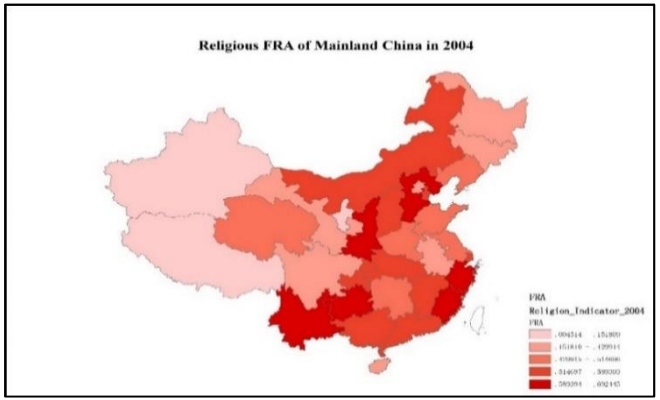
数据分析流程图

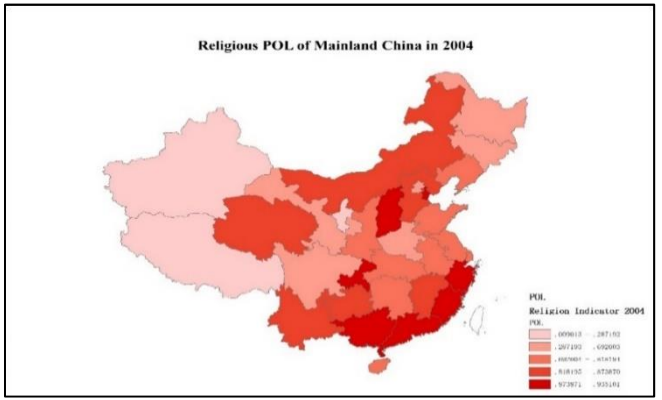

Input: Religion Count
Input: Regression variables
Input: Province shapes
Calculate religious fragmentation and polarization indexes
Adjust variables types
Select only spatial and label variables for mapping
Filter data (year>=1987)
Select only variables for join
Join by ID
Regression Analysis
Regression analysis for religious polarization for whole mainland China
Regression analysis for religious fragmentation for Whole mainland China
Select variables for analysis of religious polarization
Filter data (west China)
Filter data (central China)
Filter data (east China)
Regression analysis
Regression analysis
Regression analysis
Select variables for analysis of religious fragmentation
Filter data (west China)
Filter data (central China)
Filter data (east China)
Regression analysis
Regression analysis
Regression analysis
Generate summary statistics for selected variables
Calculate aggregate national count of religion sites in different years
Generate GB code by ID
Filter data (year=2004)
Generate time series chart of four religion types
Join by GB code
Generate Scatterplot of religious fragmentation versus polarization
Union joined result and left-out elements from the province shapes
Run Python Scripts for LISA Analaysis
Generate a thematic map by religious fragmentation
Generate a thematic map by religious polarization
Generate a thematic map by religions
Generate LISA pattern maps by four religion types
Add title to the chart
Add title to the map
Add title to the map
Add title to the map
Add title to the map
Union module outputs
Layout
Render and output

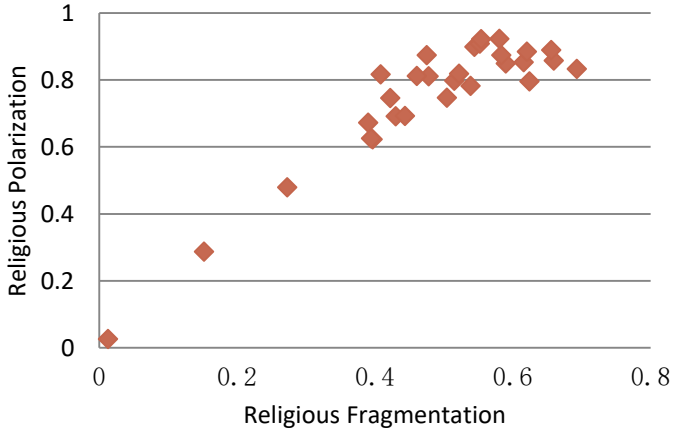
基于Alteryx的工作流



Analysis 数据分析结果







	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Whole	East	Central	West	Whole	East	Central	West
frag	0.482***	0.550***	0.0433	-0.243				
	(4.31)	(3.89)	(0.44)	(-0.88)				
(n+g+δ)	-0.00281	-0.00185	-0.0169*	-0.0484***	-0.00286	-0.00271	-0.0178*	-0.0458***
	(-0.54)	(-0.36)	(-1.71)	(-3.58)	(-0.54)	(-0.51)	(-1.81)	(-3.37)
lnedu	-0.415***	0.221	0.213	-0.565***	-0.402***	0.202	0.203	-0.580***
	(-2.91)	(0.89)	(1.08)	(-3.63)	(-2.77)	(0.77)	(1.03)	(-3.77)
lncap	0.0198	0.227***	0.0638**	0.0990**	0.0275	0.235***	0.0734**	0.0919**
	(0.67)	(5.30)	(1.99)	(2.22)	(0.91)	(5.21)	(2.27)	(2.08)
lnpub	-0.119***	-0.281***	0.0840	-0.128**	-0.131***	-0.308***	0.0880	-0.108*
	(-2.84)	(-5.49)	(1.53)	(-2.00)	(-3.08)	(-5.81)	(1.60)	(-1.69)
pol					0.141	0.165	-0.0408	0.417*
					(1.52)	(1.29)	(-0.50)	(1.69)
_cons	6.967***	6.089***	6.469***	7.690***	7.067***	6.233***	6.570***	7.333***
	(24.91)	(13.18)	(15.20)	(23.02)	(24.19)	(12.04)	(15.32)	(20.27)
N	504	180	144	180	504	180	144	180
R^2	0.972	0.987	0.994	0.982	0.971	0.986	0.994	0.982
A-R^2	0.969	0.984	0.992	0.978	0.968	0.983	0.992	0.978
F Sta.	727.2	503.6	794.4	363.0	701.5	461.6	794.8	368.3

Conclusions and Discussions 结论和讨论

- The results from the panel data regressions within national coverage suggest that the religious diversity has positive and significant impacts on regional development in general.
- The results from the panel data regressions within regional coverage suggest that religious fragmentation has a positive and significant association with the economic development in the eastern region of China while religious polarization has a positive and significant association with the economic development in the central and western regions of China.

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List of Documents 数据案例文件列表

Documents	Description	File
Alteryx workfows	Alteryx workflow files	*.yxmd
Flowcharts	The flowchart of workflows	*.doc
Case study report	Word or PDF file	Religion_study.docx
Case study presentation	Presentation file	Religion_case.pptx
Data	Religious data table in Excel	Data_religion.xlsx
	Statistical table in Excel	Data_statistics.xslx
	Province map in Shape file	Province_boundary.shp
Output files	Output files	Output_religion.pdf

Output Files 结果输出文件

Description	Format
Map of Religious Fragmentation by Province in 2004	Map
Map of Religious Polarization by Province in 2004	Map
Scatterplot of Religious fragmentation versus Religious polarization in 2004	Chart
Summary statistics of regression variables	Text
Regression analysis (Residual table, coefficient table, ANOVA Analysis, Basic Diagnostic Plots)	Text

The Cloud Based Platform for Research and Teaching

❑Research ❑Tool Development ❑Data Case Studies ❑Training

Participated by

- China Data Institute (chinadatacenter.net)
- All China Marketing Research (www.acmr.com.cn)
- Center for Geographic Analysis, Harvard University (gis.Harvard.edu)
- China Consortium for Finance and Economics Education (knowledgeatshare.cn)
- Geo-computation Center for Social Sciences, Wuhan University (www.lmars.whu.edu.cn/gcss)
- Business School, East China University of Sciences and Technology (https://bs.ecust.edu.cn）
- Spatiotemporal Innovation Center (www.iucrc.org/center/spatiotemporal-thinking-computing-and-

案例学习与研发流程

- Step 1: Get familiar with the workflow tool
- Step 2: Practice with the sample work of case studies
- Step 3: Find a published paper and define the flowchart of data analysis
- Step 4: Develop the workflow with tool
- Step 5: Prepare the PPT report
- Step 6: Make the presentation
- Step 7: Finalize the case study

Related Web Sites

China Data Lab

http://chinadatalab.net

China Data Lab on the Cloud

http://chinadatalab.cn

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