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УНИВЕРЗИТЕТ НА ЈУГОИСТОЧНА ЕВРОПА
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Automatic Literature Review based on AI and ChatGPT (OpenAI)

Adrian Besimi , Nuhi Besimi

DAAD 2023 Workshop

The impact of pandemic years to informatics education: review and next steps

Shkodër, Albania, 3rd - 9th September 2023

Outline

- ▶ **Introduction**
 - ▶ From Research Problem
 - ▶ To Proposed Solutions
- ▶ **Experiments**
- ▶ **Results**
- ▶ **Discussion**
- ▶ **Conclusion**

PhD Research

***HELP RESEARCHERS FIND RELEVANT ARTICLES TO IDENTIFY EASIER
THE TREND TOPICS.***

EASE THE PROCESS OF LITERATURE REVIEW?



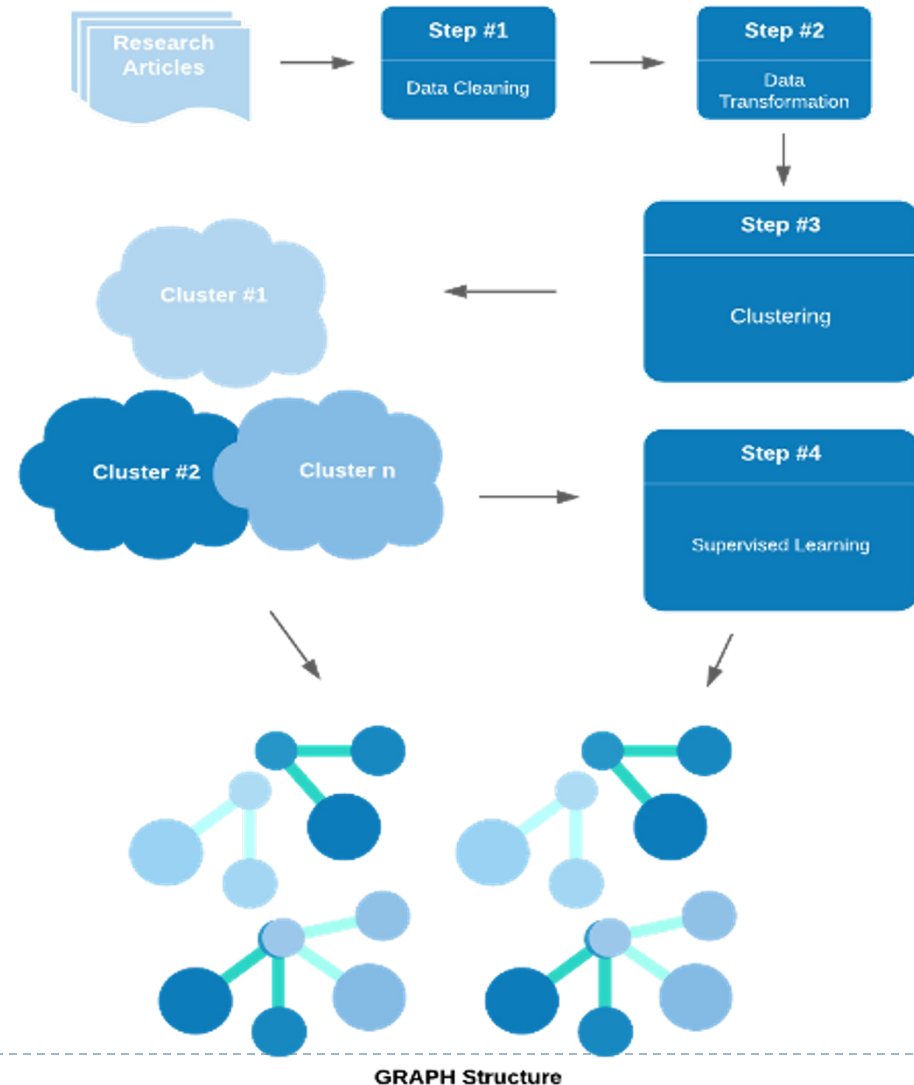
AI in Research

Automatic Literature Review based on Artificial Intelligence

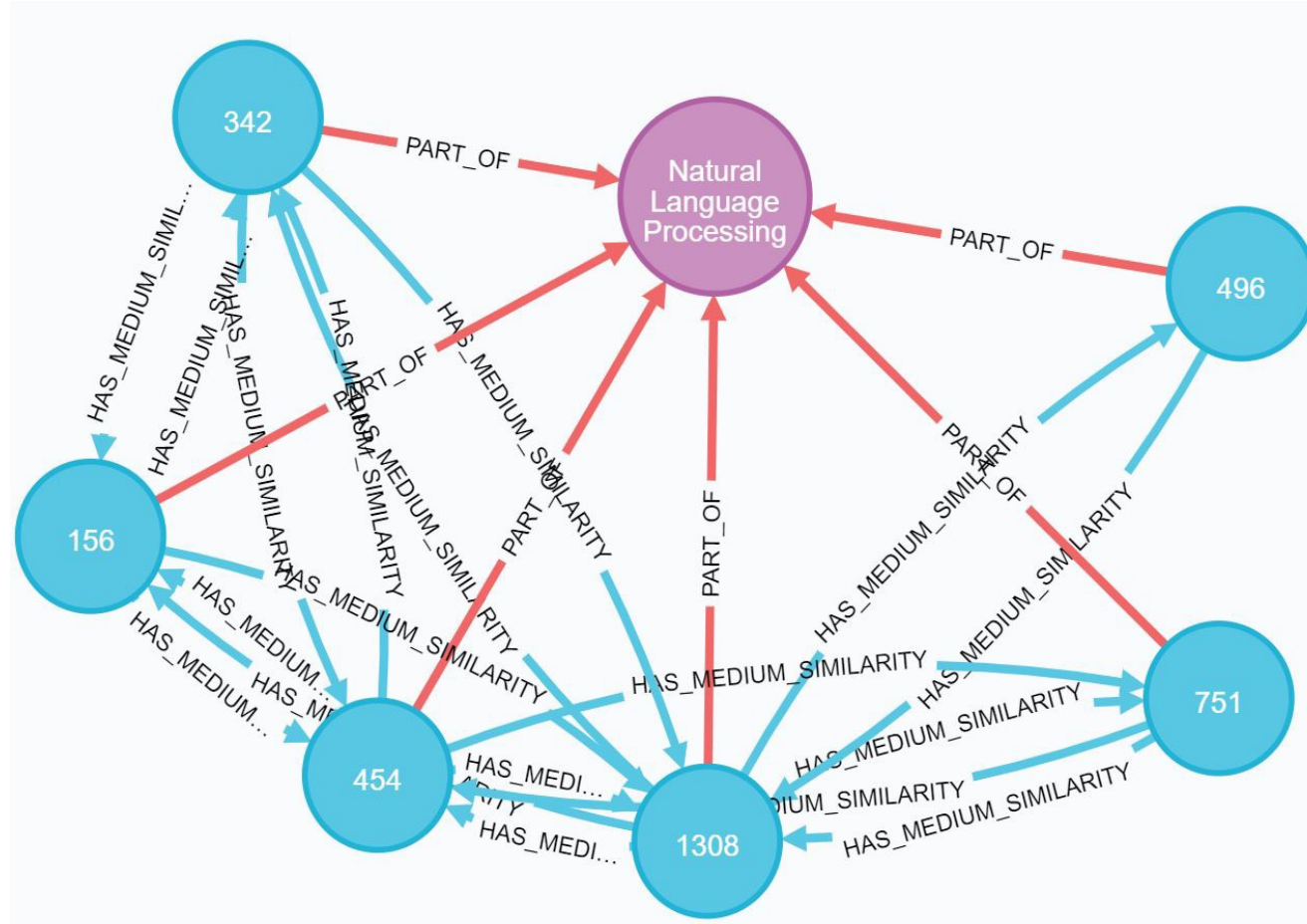


Solution #1 - Graph

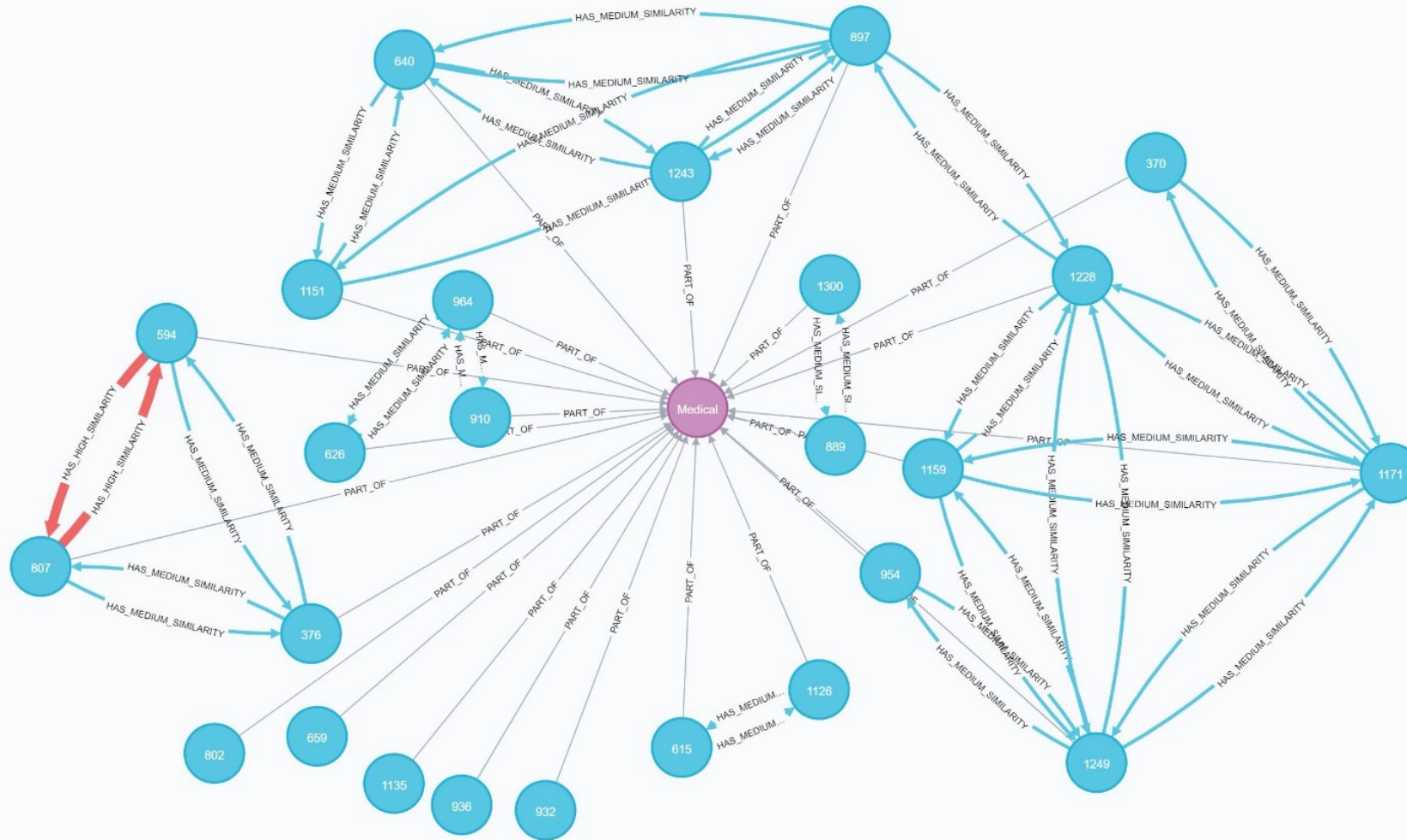
1. Collect Research Articles (unstructured data)
2. Cluster the articles based on the content and identify the best split
3. Generate a Graph Structure



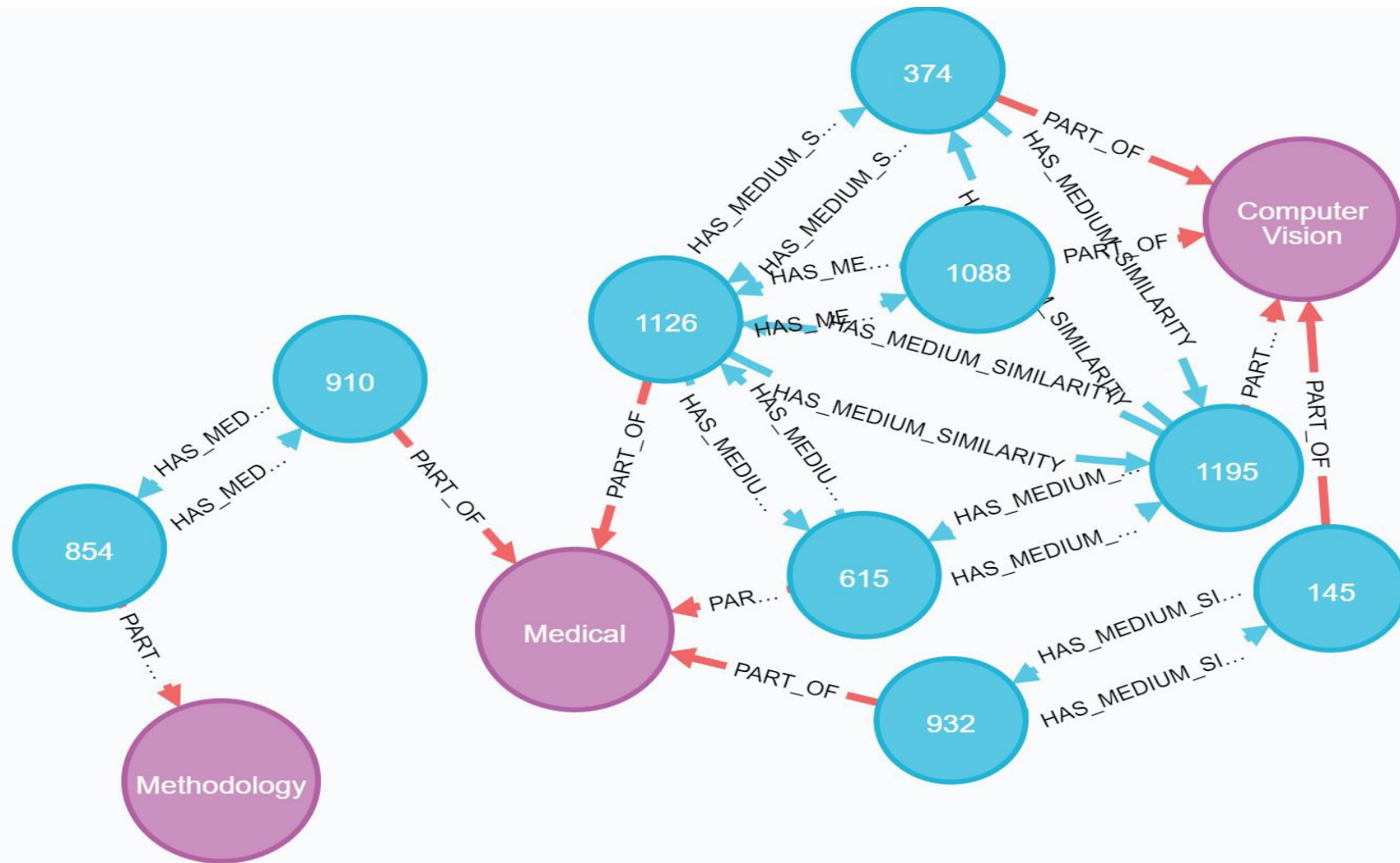
Graph Representation



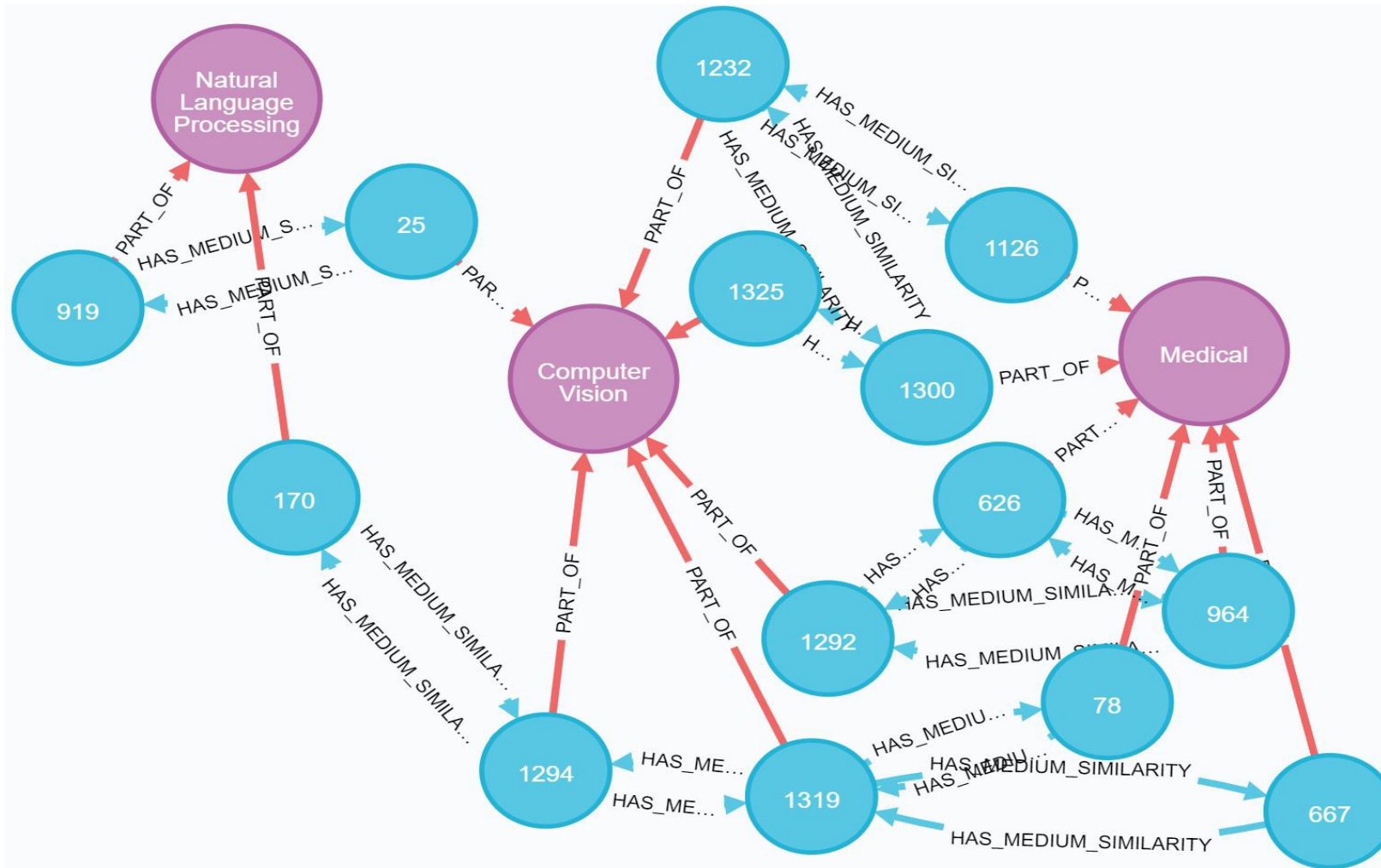
Graph Representation



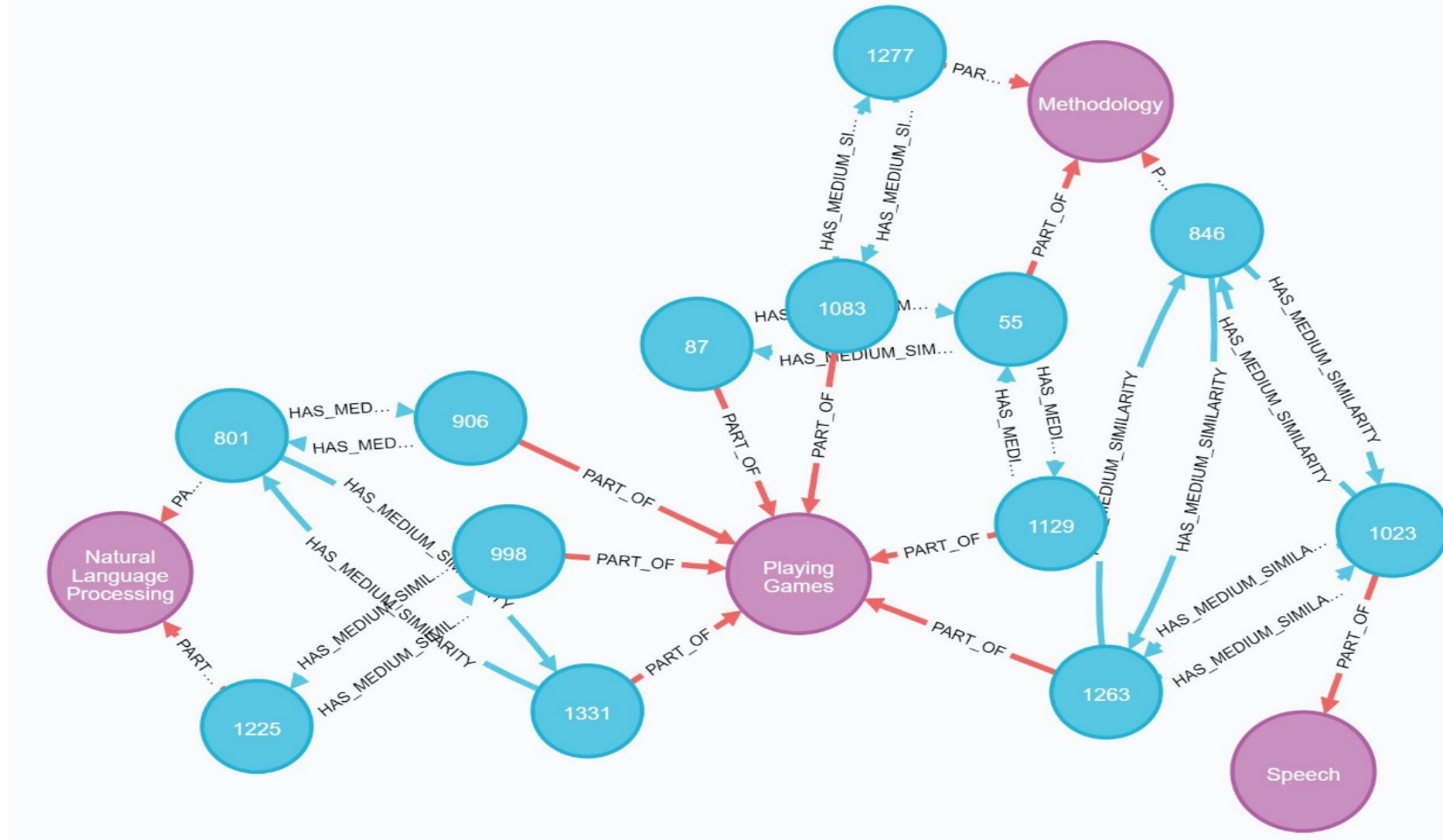
Graph Representation



Graph Representation



Graph Representation



Discussion

- ▶ **Graph representation of the research articles**
 - ▶ Find relevant articles easier
 - ▶ Find topics which are connected with each other (e.x. Computer Vision, and Medical)
 - ▶ Good visualization capabilities

- ▶ **Limitations**
 - ▶ Can't identify relevant topics for a given period
 - ▶ All topics are treated equally
 - ▶ Not able to automate the process of literature review

Solution #2



READ/SEARCH RESEARCH ARTICLES
ON A SPECIFIC TOPIC FROM IEEE
USING API (E.X. SENTIMENT
ANALYSIS, INFORMATION SECURITY)



CLUSTER THE ARTICLES OVER THE
YEARS



APPLY DATA ANALYSIS USING A
DATA VISUALIZATION TOOL



EXTRACT INSIGHTS FROM THE
RESEARCH ARTICLES AND VISUALIZE
THE RESULTS

Solution #2

1. Is the topic new (relevant) or researchers are working on it for years?
2. Is it still a trendy topic and worth checking it or interests have dropped over time?
3. Where does a PhD candidate need to focus?

Topic: Computer Science and Engineering

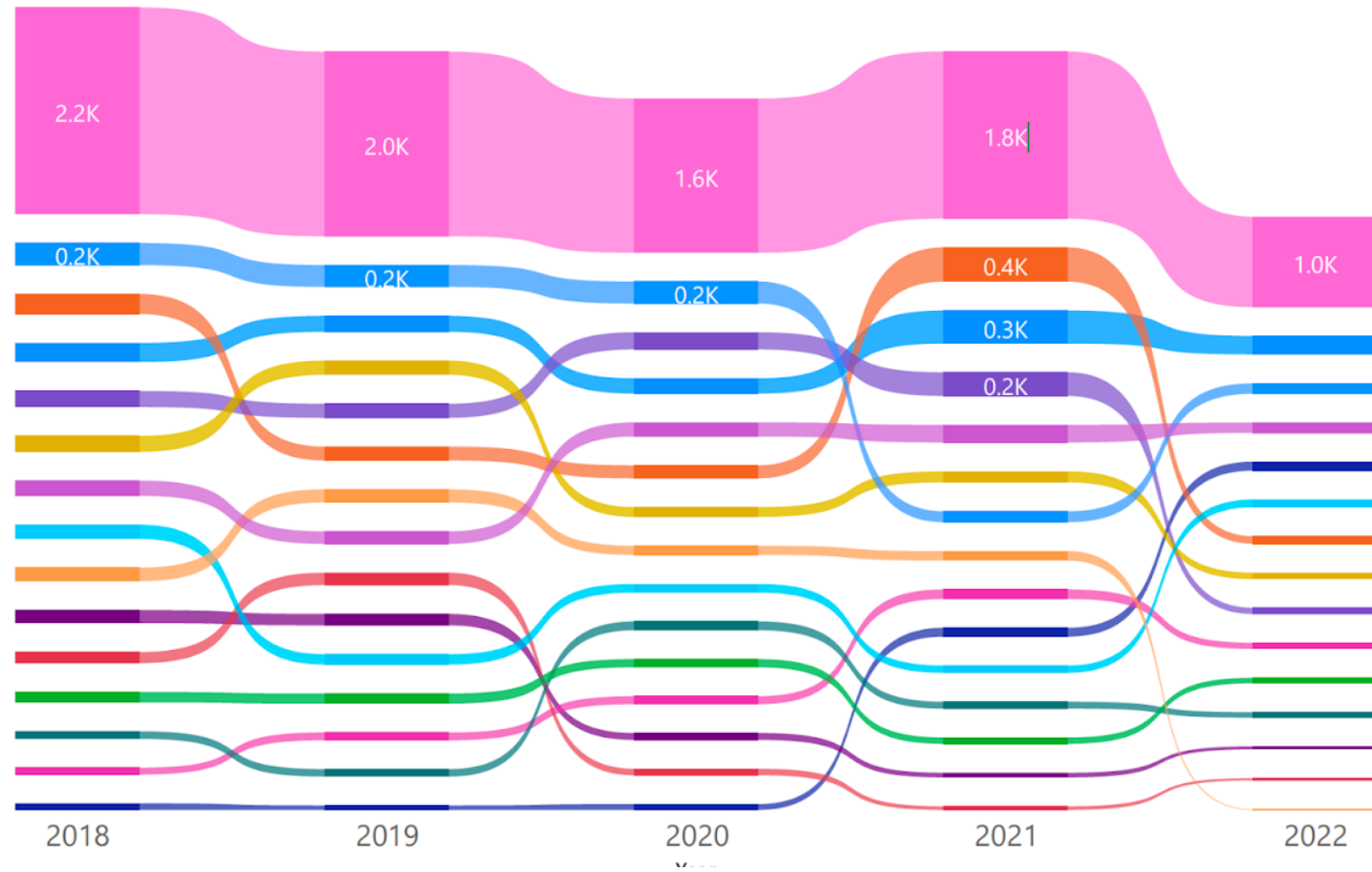
Treemap of clusters (excluding outliers)



Results

Clusters

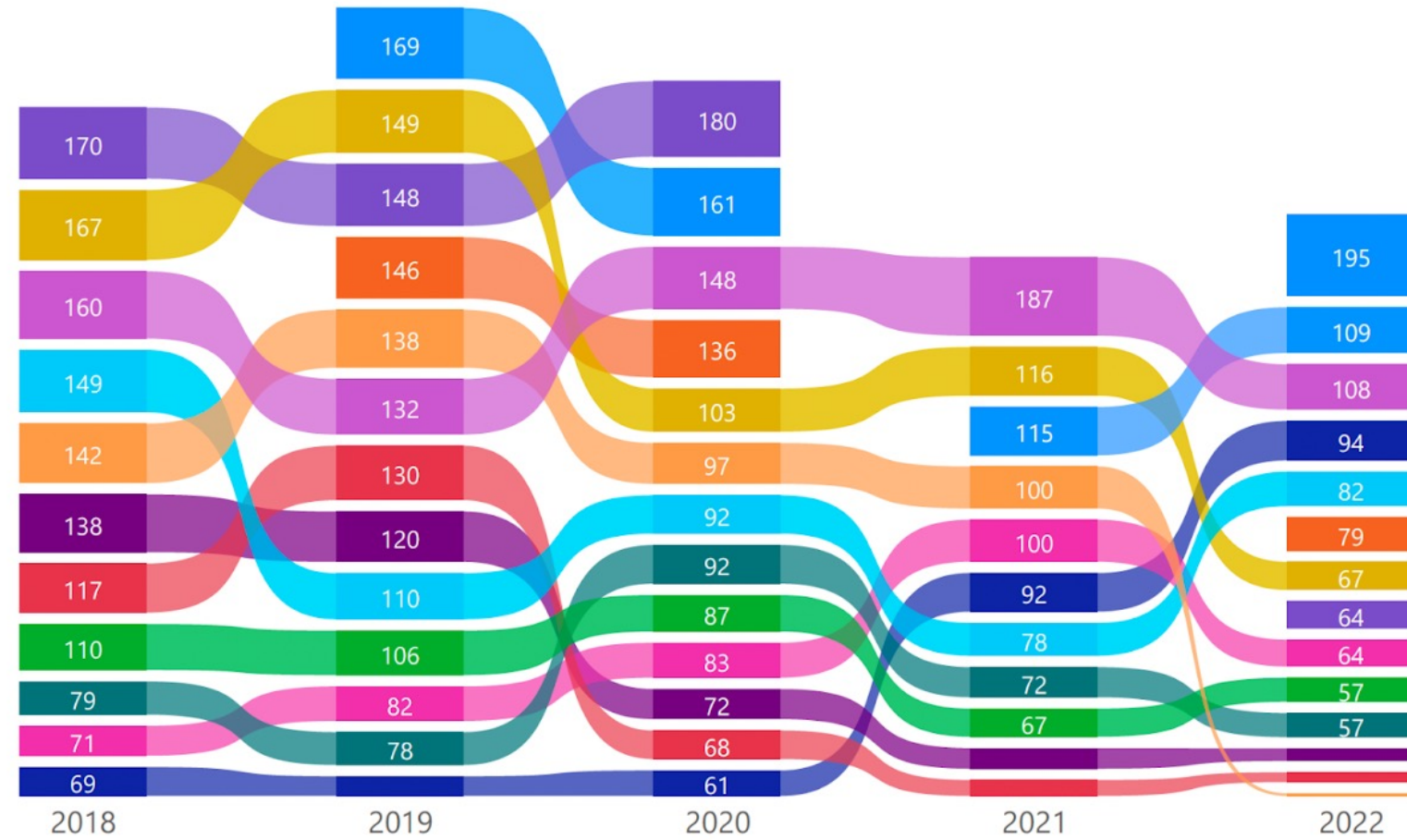
- Computational modeling
- Computer architecture
- Computer science
- Conferences
- Data mining
- Data models
- Education
- Feature extraction
- Indexes
- Machine learning
- Optimization
- Software
- Task analysis
- Tools
- Training



Results

Clusters

- Computational modeling
- Computer architecture
- Conferences
- Data mining
- Data models
- Education
- Feature extraction
- Indexes
- Machine learning
- Optimization
- Software
- Task analysis
- Tools
- Training



Discussion

- ▶ These results clearly show that a combination of data analytics and visualization and the AI model can help in further solving various problems in the education domain, such as identifying trends and potential gaps in defining research topics.
- ▶ In this part, after processing the data from articles of IEEE database, through visualization and data analytics we showed that there is a potential on identifying trends and patterns on research publications that can help PhD students to focus on their research topic.

Solution #3

1. Read/Search research articles on a specific topic from IEEE using API (e.x. Sentiment Analysis)
2. Cluster the articles based on keywords, and identify top 5 clusters
3. Summarize top 5 articles (with most references) from each cluster and write the text including citations.

IEEE
Xplore[®]
Digital Library



- ▶ Experiments:
 - ▶ Artificial Intelligence, Sentiment Analysis, Text Mining, Natural Language Processing, Information Security

Results

Artificial intelligence in the literature

This paper will analyze recent published articles in the field of Artificial Intelligence. In order to dig deep into the literature review, we have selected recent 200 papers published in IEEE in period 2013-2023. These papers are organized into 5 main clusters, i.e.: Artificial intelligence, Learning (artificial intelligence), Deep learning, Computational modeling and others.

Results

Authors Longbing Cao et al (Longbing Cao, 2022) in their paper discuss the A New Age of AI: Features and Futures. This article provides a comprehensive review of the last 70 years of artificial intelligence (AI), focusing on the changes in paradigms from the pre-2000s era to the current age of AI. The authors explore the features and AI thinking of different generations and paradigms during these two ages of AI and summarize several AI formulas from various perspectives. The article highlights significant areas of development for future AI, such as bridging the gap between human, natural, and social AI, and developing sustainable, actionable, and human-like/level AI. Additionally, the authors encourage deep thinking about the potential futures of AI.

The term Artificial Intelligence (AI) encompasses computer programming and development that trains machines to perform tasks and simulate human behavior and cognitive characteristics related to consciousness. However, limited research exists on new interaction techniques and human cooperation theories, posing challenges in the application of artificial reasoning to solve complex mental health problems. This paper explores the relationship between AI and human reasoning, or AI reasoning, and how it can be applied to improve mental health. The study focuses on using AI reasoning to solve problems and find solutions for mental health issue (Janmanchi Harika et al, 2022).

Discussion

- ▶ To generate a summary (10-14 pages) on a given topic it takes from couple of seconds up to 10 mins
 - ▶ Number of articles
 - ▶ The summary technique used
- ▶ The generated summary can generate a plagiarized text **~20%**

Summary

Flagged passages	26	21%
Cited/quoted passages	4	1%

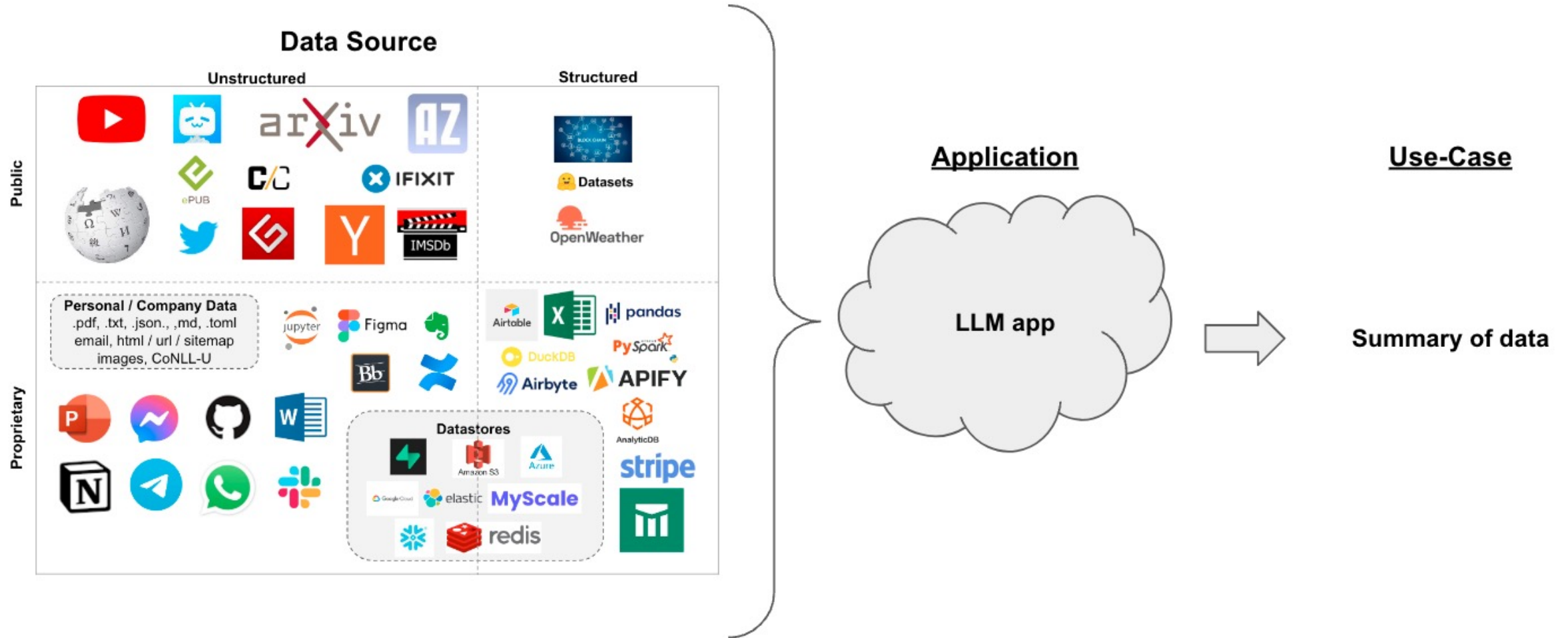
Web matches

ieee.org	15	14%
researchgate.net	7	3%
osti.gov	1	2%
poloclub.github.io	2	0.6%
semanticscholar.org	1	0.6%
europa.eu	1	0.5%
arxiv.org	1	0.4%
mmu.ac.uk	1	0.3%
xai4se.github.io	1	0.2%

Discussion

- ▶ **Reviewer 1:** The paper contains significant information adequate to justify the paper title
- ▶ **Reviewer 2:** This paper seems original and the paper demonstrates an adequate understanding of the relevant literature in the field and cites an appropriate range of literature sources.
- ▶ **Reviewer 3:** Article satisfies all appropriate bases of theory, concepts, or other ideas. Methods that are employed are appropriate.

Solution #4



Solution #4 - LLMs

1. Create a dataset (unstructured) with research articles we are interested in.
2. Using OpenAI API train an LLM
 - ▶ **ChatGPT 3.5 Turbo vs. ChatGPT 4**
3. Start a discussion with the LLM after the training is finished and try to identify:
 - ▶ Summary of the article
 - ▶ Authors of the article and their background
 - ▶ Is there any potential research GAP
 - ▶ Propose articles that might be relevant to this topic
 - ▶ Write a research topic, and research plan based on the findings.

Results

N. Besimi, A. Besimi and B. Çiço, "Artificial Intelligence in Education and Learning (AI in Research)," 2022 11th Mediterranean Conference on Embedded Computing (MECO), Budva, Montenegro, 2022, pp. 1-6, doi: 10.1109/MECO55406.2022.9797216.

This research paper discusses the growing interest and importance of Artificial Intelligence (AI) in education and learning. It explores various applications of AI in education, such as digital lessons, AI tutoring, testing systems, and research. The paper also presents a proposed model for using AI in research to improve the quality and efficiency of research processes. The authors highlight the potential benefits of AI in education and learning, but also acknowledge the challenges in terms of resources and infrastructure. Overall, the paper emphasizes the role of AI in enhancing the quality of education and learning.

Results

A. Besimi, N. Besimi and A. Chaushi, "Identifying trends in recent publications using Data Visualization and Analytics," 2022 International Conference on Artificial Intelligence of Things (ICAIoT), Istanbul, Turkey, 2022, pp. 1-5, doi: 10.1109/ICAIoT57170.2022.10121862.

This paper discusses the use of data visualization and analytics to identify trends in recent publications, specifically in the field of computer science education. The authors propose that combining these techniques can help PhD students find and focus on the right research topic more efficiently. They collected data from recent articles in the IEEE Xplore research database and processed it to identify clusters of related papers. They analyzed the top 50 clusters and identified trends based on the number of articles in each cluster over the past five years. The results showed both increasing and decreasing trends in various clusters, providing insights into current research interests. The authors suggest that this approach can assist researchers in identifying new and trendy topics for their studies.

Results

Prompt: Who is Nuhi Besimi?

Nuhi Besimi is an author and a member of the faculty of Contemporary Sciences and Technologies at the South East European University in Tetovo, North Macedonia.

Prompt: What did he write?

The content of the writing is focused on the use of machine learning techniques in conducting a literature review for research purposes. The experiment aims to evaluate the effectiveness of these techniques in recommending relevant and high-quality articles to researchers. The results of the experiment, including the overall performance in execution time, are also presented. The writing discusses the implications of these results for the future of AI in education and learning, as well as the potential challenges that may arise.

Prompt: What is the title of the article?

The title of Nuhi Besimi's article is "Artificial Intelligence in Education and Learning (AI in Research)."

Prompt: Who are the co-authors?

The co-authors of the article "Artificial Intelligence in Education and Learning (AI in Research)" by Nuhi Besimi are Adrian Besimi and Betim Çiço.

Results

Prompt: What are some similar research articles on the same field published recently?

Based on the provided context, here are some recently published research articles in the field:

1. "Research on the Disciplinary Evolution of Deep Learning and the Educational Revelation" by X. Wang, H. He, P. Li, and L. Zhang. Published in the 2019 14th International Conference on Computer Science & Education (ICCSE).
2. "Using Distributed Raspberry Pis to Enable Low-Cost Energy-Efficient Machine Learning Algorithms for Scientific Articles Recommendation" by N. Besimi, B. Çiço, A. Besimi, and V. Shehu. Published in Microprocessors and Microsystems in 2020.
3. "Evaluation of Machine Learning Techniques for Research Articles Recommendation" by N. Besimi, B. Çiço, V. Shehu, and A. Besimi. Published in the International Journal on Information Technologies and Security (IJITS) in 2020.

Please note that these are the articles mentioned in the provided context, and there may be other recently published articles in the field that are not included here.



Discussion

- ▶ AI is getting closer and easier to integrate for various domains.
- ▶ What is going to be the impact of AI in Research?
- ▶ How we are going to prevent/identify research articles written by AI?
- ▶ Can we see AI as a tool for helping researchers in order to generate more qualitative work?
 - ▶ AI as your research mentor?
 - ▶ AI as your research assistant?

AI in Google Scholar

"As an AI language model"



About 526 results (0.03 sec)

AI and clinicians

[A Raj](#), [D Sybil](#), [PK Shrivastava](#) - British Dental Journal, 2023 - nature.com

... We put this exact question to ChatGPT and the response was: '**As an AI language model**, I am designed to generate text based on the patterns and relationships that I have learned from ...

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OpenAssistant Conversations--Democratizing Large Language Model Alignment

[PDF] arxiv.org

[A Köpf](#), [Y Kilcher](#), [D von Rütte](#), [S Anagnostidis](#)... - arXiv preprint arXiv ..., 2023 - arxiv.org

... **As an AI language model**, I do not have personal opinions or beliefs. However, based on available statistics, the pain relief effect of Novalgine can vary depending on the individual and ...

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ChatGPT and the generation of digitally born "knowledge": how does a generative AI language model interpret cultural heritage values?

[PDF] preprints.org

[DHR Spennemann](#) - 2023 - preprints.org

... **As an AI language model**, my responses are generated based on a mixture of licensed data, data created by human trainers, and publicly available data. I have not been trained directly ...

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Simulating HP Lovecraft horror literature with the ChatGPT large language model

[PDF] arxiv.org

[EC Garrido-Merchán](#), [JL Arroyo-Barrigüete](#)... - arXiv preprint arXiv ..., 2023 - arxiv.org

... Keep in mind that this score is subjective and based on my analysis **as an AI language model**, but it does suggest that the text does a good job of emulating Lovecraft's style. ...

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QUESTIONS & DISCUSSIONS

??!

