



# Analysis of the Concept of Reasoning

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## ABSTRACT

- The concept of reason originated more than 2500 years ago in ancient Greece. The concept of "reasoning" dates back over 2500 years, beginning with the ancient Greeks, who studied reasoning processes; Aristotle introduced the term "logos," meaning reason, argument, and logic (Anton, 1997). The Romans followed with "ratiocinatio," signifying reasoning or conclusions. In the Middle Ages, Thomas Aquinas used "disputatio" and "argumentatio" (Hoenen, 1997) to discuss reasoning, which Renaissance and Enlightenment thinkers like Descartes, Locke, and Hume further explored (Descartes, 2019; Locke, 1847; Hume, 2000).
- In the twentieth century, Bertrand Russell and Ludwig Wittgenstein formalized logic (Russell & Whitehead, 1910-1913; Wittgenstein, 2023) as the basis for reasoning structures, while Alan Turing laid the groundwork for computing machines capable of reasoning, establishing reasoning as a core area in artificial intelligence research. In the 21st century, this concept is now used in areas such as artificial intelligence, machine learning, natural language processing, task planning, and more. It is also applied in cognitive sciences and neuropsychology.
- The concept of reasoning has become interdisciplinary and is used in various fields, from academic disciplines such as mathematics and logic to professional environments where critical thinking and innovative problem-solving are required.
- This research examines the concept of reasoning as a multifaceted cognitive structure, with particular emphasis on abstract reasoning as a critical cognitive skill that enables individuals and artificial systems to recognize patterns, solve complex problems, and understand complex concepts without relying on concrete experiences. In this research was conducted a bibliometric study to classify and summarise how the concept of reasoning has transformed over the past millennia, how it is currently applied, and its contribution to science, we used for this advanced bibliometric analysis an extensive Web of Science dataset (Zupic & Čater, 2015).
- This work contributes to a broader and comprehensive study aimed at providing a high-level conceptual overview of the concept of reasoning, encompassing various perspectives, methodologies, and innovative approaches.

## BIBLIOMETRIC ANALYSIS

**What is the meaning the concept “reasoning”?**

**Searching query for Web of Science digital database:**

("reasoning module\*" or "reasoning part\*" or "reasoning mechanism\*" or "reasoning\*" or "automated reasoning mechanism\*") and ("cognitive\*" or "decision-making\*" or "artificial intelligence system\*" or "cognitive computing system\*" or "cyber-physical system\*" or "ontology" or "cognitive graph\*" or "concept-cognitive learning\*")

## METHODS

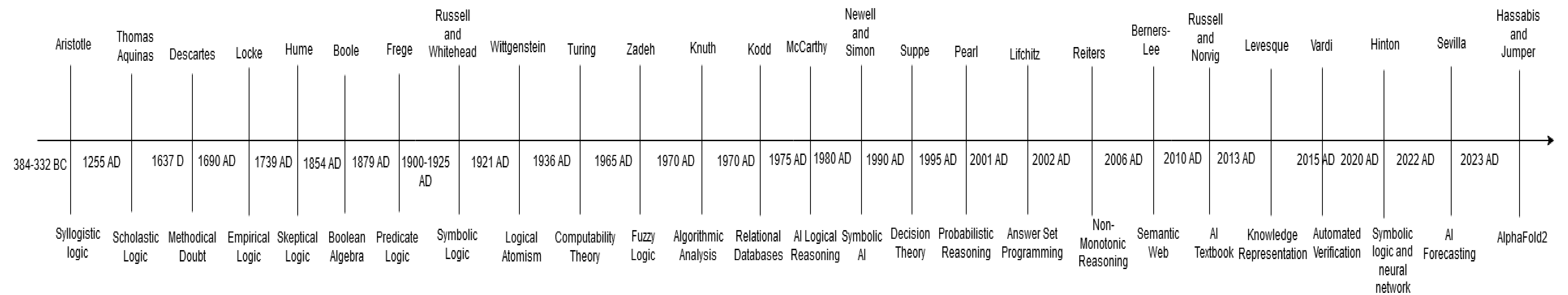
- Chronological occurrence analysis (CHOA)

*When and what types of logic used the concept of reasoning?*

- Bibliometric analysis (BibA)

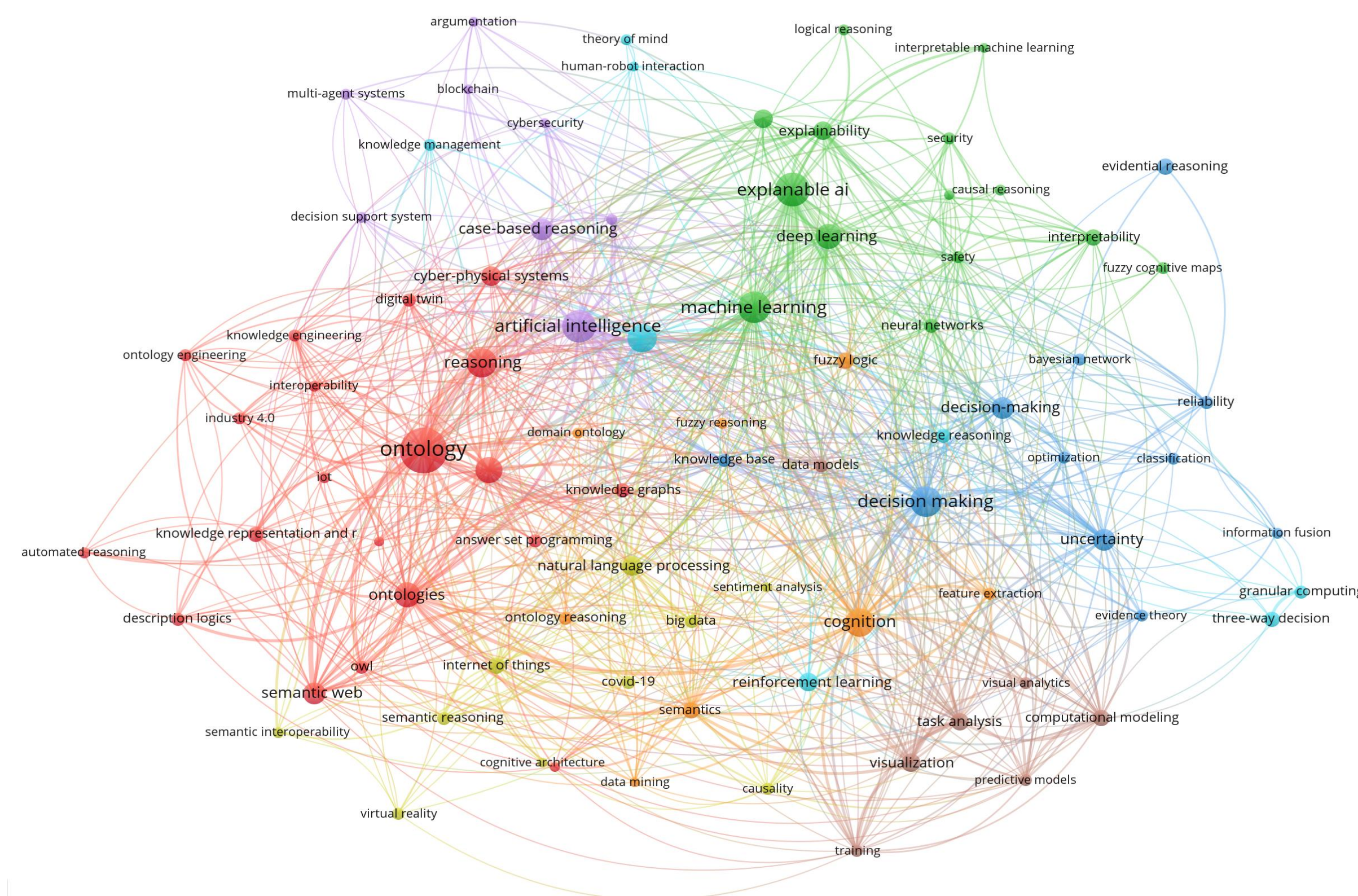
*What are the visible trends for the concept of reasoning and topics where this concept appears?*

## RQ1: CHRONOLOGICAL ANALYSIS OF THE “REASONING” CONCEPT

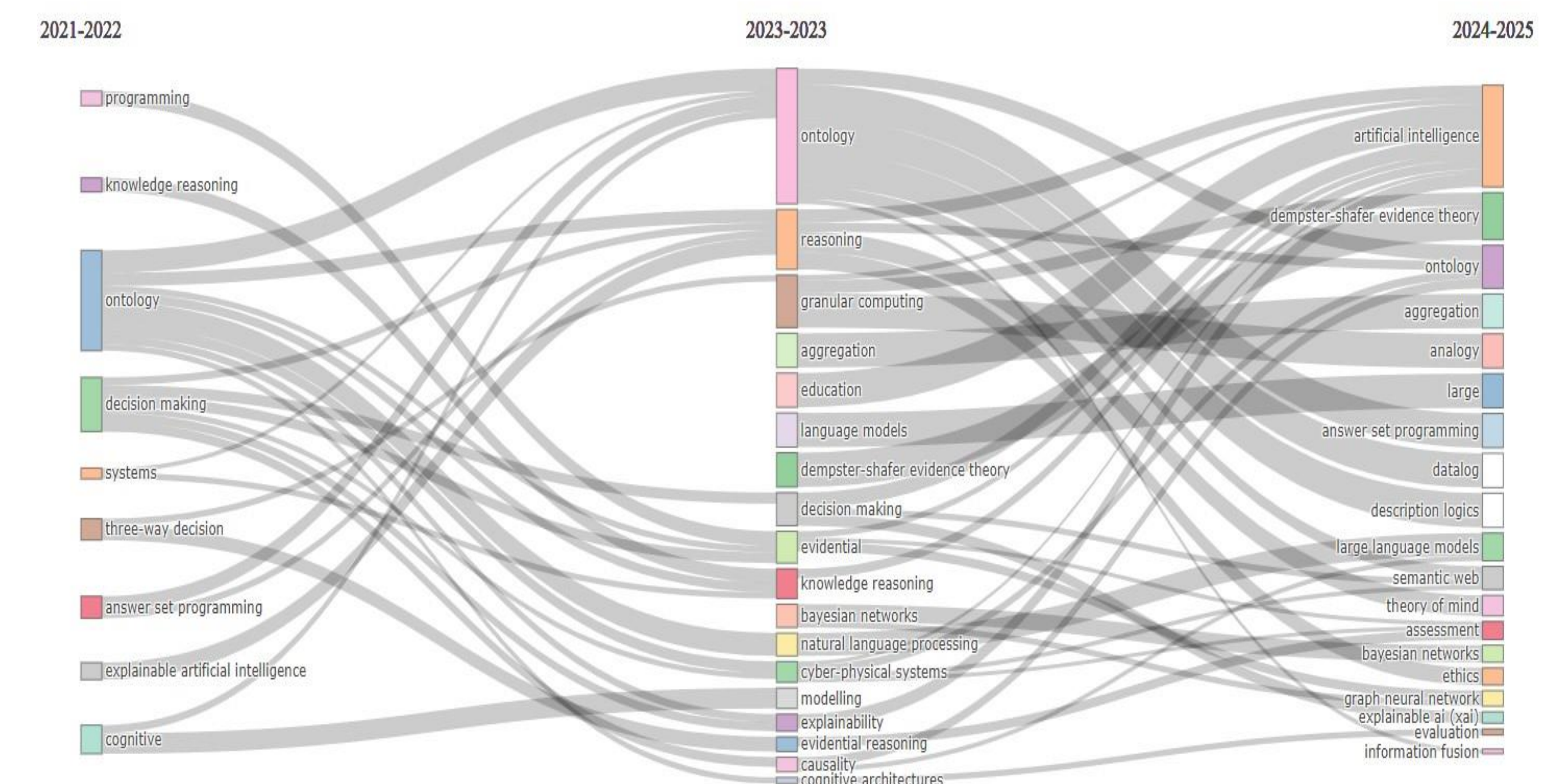


**Figure 1.** Chronological study of the chronology of logic in which the concept of reasoning was conceived

## RQ2: WHAT ARE THE MAIN TOPICS IN “REASONING”



**Figure 2.** Keyword map of the “reasoning” concept



**Figure 3.** The changed topics over time of the found publications

## CONCLUSIONS

- The bibliometric analysis of the reasoning concept shows a trend of topics where the reasoning concept has appeared in the last four years [2021 – 21st November of 2024].
- The keyword map shows what topics are popular for the last four years
- Chronological analysis of the concept of reasoning shows where this concept is used in various logics from different periods shows that reasoning is important in the study of artificial intelligence and cognitive systems

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