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The Role of Logic and Argumentation in Legal Reasoning: From Deduction to Analogy

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Abstract
This study examines the role of logic and argumentation in legal reasoning, focusing on the relationship between deductive syllogism and analogical reasoning in judicial decision-making. The research aims to clarify how these two forms of inference interact rather than compete, and to identify emerging methods for analyzing this relationship systematically. A qualitative literature study approach was used, drawing on jurisprudential theory, argumentation scheme scholarship, and computational legal analysis retrieved from academic sources. The findings show that deductive form persists as a legitimating structure in judicial opinions, while analogical reasoning functions as the operative mechanism for applying precedent, generating premises that subsequently support deductive conclusions. The study further finds a growing trend toward formalizing and computationally annotating these reasoning patterns in judicial texts. These results suggest that deduction and analogy should be understood as complementary rather than opposing modes of legal inference.

Keywords: Legal Reasoning, Deductive Syllogism, Analogical Reasoning

Introduction

Legal reasoning has long occupied a central place in jurisprudence, sitting at the intersection of philosophy, logic, and legal practice. Judges, lawyers, and legal scholars constantly rely on structured forms of inference to justify decisions, interpret statutes, and resolve disputes where the law is ambiguous or silent. Vern R. Walker (2007) observed that despite the profession's dependence on transparent and sound reasoning, legal scholars have historically devoted comparatively little systematic attention to developing a rigorous methodology of their own, unlike mathematicians or statisticians who have long formalized their inferential tools. This gap is notable given that legal reasoning underlies nearly every stage of adjudication, from constitutional interpretation to the balancing of competing principles and the application of established rules to new facts.

Two broad families of inference dominate discussions of legal logic: deduction and analogy. Deductive reasoning, expressed through the classical syllogism, allows a conclusion to be drawn necessarily from a major premise and a minor premise, and it has historically been associated with formalist conceptions of law that treat judicial decisions as logically derived outcomes. Analogical reasoning, by contrast, proceeds by comparing

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the facts of a pending case with those of a previously decided case, extending or distinguishing precedent based on relevant similarities and differences. Cass R. Sunstein (1992) described analogical reasoning as the characteristic mode of thought in common law systems, arguing that it allows courts to reach low-level agreements about outcomes without requiring consensus on deep theoretical principles. Similarly, Grant Lamond (2016) distinguished precedent-following from analogy proper, noting that while both involve treating like cases alike, analogy requires an additional inferential step of establishing relevant resemblance between the earlier and later disputes.

The tension between deduction and analogy has generated sustained scholarly debate. Sergei Manzhosov (2018) examined reasoning by precedent specifically to determine whether it is best understood as an instance of analogy, induction, or deduction, concluding that judicial reasoning from precedent resists easy classification into a single logical category. This unresolved classificatory problem reflects a deeper reality in legal practice: courts routinely combine deductive syllogisms with analogical comparisons, informal argumentation schemes, and policy-based justifications within a single opinion, making legal reasoning a hybrid and often opaque process rather than a pure application of formal logic.

Several strands of prior research have attempted to clarify the logical structure of legal argumentation. Brian N. Larson (2019) revisited the long-standing debate between what he termed the skeptics and the mystics of legal analogy. Skeptics, Larson explained, reject legal analogy as a distinct form of reasoning because it lacks the rational force of deductive syllogism, while mystics accept analogy as legitimate but fail to provide a disciplined framework for constructing or evaluating analogical arguments. Drawing on informal logic and argumentation schemes, Larson proposed a middle path that treats legal analogy as supplying defeasible premises that can subsequently support deductive inference, thereby reconciling the two logical categories rather than treating them as opposed.

Building on a related tradition within artificial intelligence and law, Trevor Bench-Capon and Katie Atkinson (2022) modeled legal case-based reasoning using formal argumentation schemes tailored to distinct stages of adjudication, namely factor ascription, issue resolution, and outcome determination. Their work, illustrated through United States trade secrets law, demonstrated that reasoning with legal cases can be decomposed into a sequence of stages at which different reasoning styles, including rule application and analogical comparison, become appropriate. More recently, Kun Chen and colleagues (2026) proposed an operational annotation framework for identifying and visualizing the logical structure of legal argumentation within Chinese judicial decisions, distinguishing normative and factual propositions and defining relational categories such as support, attack, and correspondence between legal norms and case facts. This computational approach reflects a growing effort to render the previously implicit reasoning embedded in judicial texts explicit, structured, and analyzable at scale.

Although the theoretical literature on deduction and analogy in legal reasoning is extensive, it remains largely fragmented across disciplinary boundaries. Philosophically oriented accounts such as those of Sunstein (1992) and Lamond (2016) offer rich conceptual distinctions between precedent, analogy, and deduction, but they generally stop short of specifying how these forms of reasoning can be systematically

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identified, measured, or evaluated within actual judicial texts. Meanwhile, computational and artificial intelligence approaches, exemplified by Bench-Capon and Atkinson (2022) and Chen and colleagues (2026), have made considerable progress in formalizing argumentation schemes and building annotation frameworks, yet these efforts tend to be narrowly tailored to specific legal domains or jurisdictions, such as trade secrets law or Chinese judicial decisions, limiting their generalizability across legal traditions.

A further gap concerns the unresolved classificatory status of reasoning by precedent itself. As Manzhosov (2018) demonstrated, scholars continue to disagree on whether precedent-based reasoning should be classified as analogical, inductive, or deductive in character, and this ambiguity has not been adequately addressed through a unifying analytical framework that bridges classical logical theory with contemporary argumentation-based models. Larson's (2019) attempt to reconcile the skeptic and mystic positions represents a promising theoretical contribution, but it has not been extensively tested against comparative jurisdictions or integrated with the structured annotation methods being developed in computational legal studies. This leaves an open space for research that connects the conceptual clarity of jurisprudential theory with the methodological rigor of formal and computational argumentation analysis.

The present study addresses this fragmentation by offering an integrated account of legal reasoning that traces the movement from deduction to analogy as complementary rather than competing modes of inference. Rather than treating deductive syllogism and analogical comparison as belonging to separate theoretical traditions, this study builds on Larson's (2019) proposal that analogy supplies the defeasible premises upon which deductive conclusions can subsequently rest, and extends this synthesis by situating it within the broader typology of argumentation schemes developed by Bench-Capon and Atkinson (2022). This integrative framing allows the study to move beyond the binary opposition of formalist and realist accounts of legal logic that has persisted since early twentieth century jurisprudence.

In addition, the study incorporates insights from recent computational and annotation-based research, including the structural categories proposed by Chen and colleagues (2026), to demonstrate how classical distinctions between deduction and analogy can be operationalized for systematic analysis of judicial reasoning rather than remaining purely theoretical constructs. By combining doctrinal and philosophical analysis with structural and argumentation-based methods, the study contributes a novel cross-disciplinary lens that has not been fully articulated in prior scholarship, offering both a conceptual clarification of how deduction and analogy interact in practice and a methodological pathway for identifying these patterns of reasoning in real judicial texts across different legal systems.

In everyday judicial practice, the neat theoretical separation between deduction and analogy rarely holds. Courts frequently begin an opinion with a deductive framing, stating a general rule as a major premise and the facts of the case as a minor premise, only to shift into analogical reasoning when the governing rule is ambiguous or when no directly controlling precedent exists. Walker (2007) noted that this blending of reasoning forms is precisely what makes legal reasoning transparent and defensible to litigants and the public, since a decision grounded solely in either rigid deduction or unconstrained analogy would appear either mechanically

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unjust or arbitrarily subjective. The reality of legal practice therefore reflects a continuous negotiation between rule-bound certainty and case-sensitive flexibility.

At the same time, the increasing volume of judicial decisions and the growing interest in computational legal analysis have created practical pressure to formalize these reasoning patterns beyond what traditional doctrinal commentary can achieve. Chen and colleagues (2026) and Bench-Capon and Atkinson (2022) both illustrate how the demand for explainable and analyzable judicial reasoning has driven the development of structured annotation and argumentation-scheme methodologies, particularly as legal systems explore the use of case retrieval tools, decision-support systems, and large-scale empirical legal studies. This practical reality underscores the timeliness of research that can clarify, in both conceptual and operational terms, how deduction and analogy jointly structure the logic of legal reasoning in contemporary adjudication.

Method

This study employs a qualitative research approach grounded in library research, also known as a literature study, to examine the movement from deduction to analogy in legal reasoning. A qualitative design is appropriate here because the object of inquiry is conceptual and interpretive in nature, concerned with meaning, classification, and argumentative structure rather than with quantifiable variables.

Creswell and Poth (2018) explain that qualitative inquiry is best suited to research questions requiring an in-depth, contextual understanding of a phenomenon as it is represented in texts, discourse, or lived experience, which aligns closely with the present study's aim of understanding how logical forms operate within judicial reasoning. Rather than testing a hypothesis through numerical measurement, this study seeks to interpret, compare, and synthesize existing scholarly accounts of legal logic in order to build a coherent conceptual framework.The specific method used within this qualitative approach is a literature study, understood as a systematic and interpretive review of secondary sources including journal articles, law review essays, monographs, and working papers retrieved primarily from academic repositories indexed in Google Scholar.

Snyder (2019) describes the literature review as a research methodology in its own right, capable of synthesizing prior findings, identifying conceptual gaps, and constructing theoretical contributions rather than merely summarizing what has already been published. Following Snyder's semi-systematic model, this study does not restrict itself to a narrow set of keyword-matched articles but instead traces conceptual threads across jurisprudential theory, argumentation studies, and computational legal analysis, since the topic of deduction and analogy spans multiple disciplinary traditions that a purely systematic search protocol might otherwise fragment.

Data collection proceeded through the identification, selection, and thematic organization of relevant literature, following the concept-centric approach to reviewing scholarship recommended by Webster and Watson (2002), who argue that a review should be structured around key concepts rather than around a chronological or author-by-author summary.

In practice, this meant grouping sources according to the core themes of deductive syllogism, analogical reasoning, precedent, and argumentation schemes, then analyzing how each source treats the relationship between these concepts. The analysis itself

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was conducted through qualitative content analysis, involving close reading, thematic coding of recurring arguments, and comparison across sources to identify points of convergence, divergence, and unresolved debate, which together formed the basis for the findings and discussion presented in the following section.

Result and Discussion

1. The Persistence of Deductive Syllogism in Judicial Reasoning

The first major finding of this study concerns the continued, though diminished, role of deductive syllogism in contemporary legal reasoning. Despite the well-known skepticism toward formal logic that emerged from the Legal Realist movement, the analysis of the literature confirms that deductive structure remains embedded in the basic architecture of judicial opinions. Walker (2007) observed that legal reasoning routinely involves applying general rules to particular facts in a manner that mirrors the logical form of a syllogism, even when judges do not explicitly frame their reasoning in these terms. This suggests that deduction functions less as an isolated method and more as an underlying scaffold that organizes how legal conclusions are presented and justified to litigants and the public.

At the same time, the literature reveals that deductive reasoning in law rarely operates in its pure logical form. Sunstein (1992) and later Manzhosov (2018) both note that the major premises used in legal syllogisms, namely the applicable rules or precedents, are themselves frequently contested or ambiguous, meaning that the deductive step from rule to conclusion depends on prior interpretive choices that are not strictly logical in character. This finding indicates that the appearance of deductive certainty in judicial writing often conceals a preceding layer of interpretive and evaluative reasoning, complicating any account of legal deduction as a mechanical or value-free process.

The findings further show that the persistence of deductive form serves an important legitimating function within the judicial system, independent of whether the underlying reasoning is purely logical. Bench-Capon and Atkinson (2022) demonstrate that even within computational models of legal reasoning, an outcome determination stage is typically framed in syllogistic terms once the relevant factors and issues have been resolved through other means. This indicates that deduction operates as a mode of justification and communication as much as a mode of discovery, allowing courts to present conclusions as rationally compelled even when the path to those conclusions involved substantial interpretive judgment.

2. Analogical Reasoning as the Operative Logic of Precedent

The second finding concerns the centrality of analogical reasoning to how precedent actually functions in practice, distinguishing it from the more rigid deductive application of codified rules. The literature review found strong convergence around the idea that analogy, rather than deduction, is the primary mechanism by which courts extend or limit the reach of prior decisions. Lamond (2016) draws a sharp distinction between precedent-following, which involves treating a later case as governed by an earlier rule, and analogy proper, which requires an additional judgment about relevant similarity between two factually distinct cases. This distinction proved important in organizing the literature, since many sources use the terms precedent and analogy loosely without acknowledging this underlying conceptual difference.

A further finding relates to the debate over whether analogical reasoning possesses

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independent rational force or must ultimately be reduced to deductive form to be considered valid. Larson (2019) identifies two opposing camps in this debate, the skeptics who deny that analogy has genuine logical standing apart from deduction, and the mystics who treat analogy as legitimate but fail to specify criteria for evaluating good versus poor analogical arguments. The literature study found that this unresolved tension has practical consequences, since it affects how confidently courts and commentators can defend analogical reasoning against charges of arbitrariness, particularly in hard cases where no single precedent is clearly controlling.

Building on this tension, the findings suggest that analogical reasoning functions most defensibly when it is treated not as a standalone form of inference but as a mechanism for generating premises that subsequently support deductive justification. This synthesis, proposed by Larson (2019) and echoed in Manzhosov's (2018) analysis of reasoning by precedent, reframes analogy as a bridge between the open texture of prior case facts and the closed structure of syllogistic conclusion. Sunstein (1992) similarly observed that analogical reasoning allows courts to reach agreement on outcomes without requiring consensus on the deeper principles that would be necessary for pure deduction, which explains why analogy remains indispensable even in legal systems that formally privilege codified, deductively applied rules.

3. Toward the Formalization and Computational Operationalization of Legal Logic

The third finding addresses an emerging trend identified in the literature, namely the move toward formalizing and computationally operationalizing the deductive and analogical patterns that were previously described only in doctrinal or philosophical terms. Bench-Capon and Atkinson (2022) illustrate this trend by decomposing legal case-based reasoning into discrete stages, including factor ascription, issue resolution, and outcome determination, each governed by its own argumentation scheme. This formalization allows what was traditionally an implicit, intuitive process of judicial reasoning to be represented explicitly, making it possible to compare reasoning patterns systematically across different cases and legal domains.

The findings also show that this formalizing trend has recently extended into large-scale annotation of judicial texts, reflecting a broader shift from theoretical description toward empirical and computational analysis of legal argumentation. Chen and colleagues (2026) developed an annotation framework distinguishing normative and factual propositions and defining structural relations such as support, attack, and correspondence within judicial decisions, thereby providing a reproducible method for identifying where deductive and analogical patterns occur within real judicial texts. This development represents a significant methodological advance, since it operationalizes concepts that earlier literature, such as Walker (2007) and Sunstein (1992), discussed primarily at the level of theory rather than measurable structure.

Taken together, these findings suggest that the historical debate between deduction and analogy is gradually being reframed by computational and formal methods as a question of structural annotation and modeling rather than purely philosophical classification. This shift does not resolve the underlying jurisprudential tension identified by Manzhosov (2018) and Larson (2019) regarding how precedent-based reasoning should be logically categorized, but it does provide new tools for empirically examining

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how deduction and analogy interact within actual judicial texts. The convergence of doctrinal theory, argumentation scheme modeling, and computational annotation, as evidenced across the reviewed literature, indicates that future research on legal logic is likely to become increasingly interdisciplinary, combining jurisprudential insight with formal and data-driven methods of analysis.

Conclusion

This study set out to examine how deduction and analogy operate together within legal reasoning, moving beyond the long-standing tendency to treat these two forms of inference as competing rather than complementary. The literature review demonstrates that deductive syllogism continues to structure the surface form of judicial opinions, providing a legitimating architecture through which conclusions are communicated as rationally compelled, even though the major premises feeding into that syllogism are frequently the product of prior interpretive and evaluative judgment. At the same time, analogical reasoning was found to be the operative logic through which precedent is actually extended, distinguished, and applied to new facts, functioning most defensibly when understood as a source of premises for subsequent deductive justification rather than as a wholly independent mode of inference. This synthesis helps resolve part of the tension between the skeptics who reduce analogy to deduction and the mystics who defend analogy without disciplined criteria for its evaluation.

Beyond clarifying this conceptual relationship, the study also highlights an important methodological shift now underway in the study of legal logic, in which theoretical accounts of deduction and analogy are increasingly being formalized through argumentation schemes and operationalized through computational annotation of judicial texts. This development does not eliminate the deeper jurisprudential debate over how reasoning by precedent should be classified, but it does open new avenues for empirically tracing how deductive and analogical patterns actually manifest within judicial reasoning across different legal systems. Future research would benefit from extending this integrative framework comparatively across common law and civil law jurisdictions, and from further testing computational annotation methods against the conceptual distinctions established in classical jurisprudential theory, so that the study of legal logic can advance as a genuinely interdisciplinary field.

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