THE CONCEPT OF FREE WILL IN DETERMINISTIC FRAMEWORKS: A PHILOSOPHICAL INQUIRY

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Abstract

Exploring the concept of free will within deterministic frameworks remains one of the most challenging and enduring questions in philosophy. The debate spans metaphysics, ethics, cognitive science, and neuroscience, raising concerns about whether autonomous agency can coexist with a causally ordered universe. Understanding these tensions requires both conceptual clarity and systematic analysis of how major theories such as compatibilism, libertarianism, hard determinism, and revisionism frame the relationship between causation, choice, and moral responsibility. To address this complexity, the present inquiry employs a dual methodological approach that combines philosophical interpretation with a structured dataset of 400 coded concepts, arguments, and disciplinary categories. Statistical techniques, including entropy measures, frequency analysis, and chi-square testing, reveal patterns in how free-will discourse is constructed, organized, and contested across subfields. The findings indicate that contemporary scholarship is increasingly interdisciplinary, integrating empirical insights from neuroscience and psychology with traditional philosophical reasoning. Moreover, the conceptual landscape suggests a shift toward hybrid views of agency that acknowledge causal constraint without abandoning meaningful self-governance or ethical accountability. By synthesizing historical perspectives, theoretical debates, and quantitative patterns, the research offers a clearer and more comprehensive mapping of how free will is theorized within deterministic contexts.

INTRODUCTION

The problem of free will has long been at the center of philosophical inquiry, raising profound questions about moral responsibility, human agency, and the nature of causation. When placed within deterministic frameworks systems in which every event or state is causally determined by preceding conditions the puzzle becomes even more complex. Philosophers have long debated whether human beings can genuinely be considered free in a universe governed by unbroken causal chains. This tension has animated centuries of discourse, bridging metaphysics, ethics, psychology, and in recent decades, neuroscience and cognitive science. The central purpose of this study is to examine how the concept of free will is interpreted, defended, or rejected within deterministic contexts, drawing from both classical philosophical arguments and modern empirical research. This paper further contributes to the field by employing a

systematic dataset-based analysis to map the conceptual structure of contemporary free-will discourse. The historical roots of the debate stretch back to early modern philosophers. Spinoza (1677) argued for strict causal determinism, maintaining that human actions follow necessarily from the nature of God or Nature, rendering traditional notions of freedom illusory. Meanwhile, Locke (1690) differentiated between voluntary action and metaphysical freedom, establishing an early foundation for later discussions about moral agency. Hume (1748) offered a seminal defense of compatibilism, suggesting that freedom consists not in the absence of causation but in the ability to act according to one's desires without external constraint. This classical compatibilist framework profoundly shaped subsequent debates and remains influential today.

During the Enlightenment, d'Holbach (1770) advanced a radical deterministic materialism, denying free will altogether and arguing that human decisions are predetermined by physical causes. Later, Schopenhauer (1839) introduced the idea that individuals may act according to their will but cannot determine or create the will itself, a distinction that would later influence both existentialist and psychological approaches. Moving into the 20th century, the debate became more analytically refined. Strawson (1962) shifted focus from metaphysical freedom to interpersonal attitudes blame, resentment, and forgiveness arguing that these reactive attitudes ground our practices of responsibility regardless of metaphysical truth. In contrast, Chisholm (1964) revived agent-causal libertarianism, proposing that human agents possess a unique causal power irreducible to event causation. The late twentieth century saw substantial expansion and diversification. Frankfurt (1969) revolutionized compatibilism by rejecting the Principle of Alternative Possibilities and introducing second-order desires as the foundation for genuine agency. van Inwagen (1983) defended incompatibilism through his influential Consequence Argument, asserting that if determinism is true, human actions are simply the consequences of forces and events outside human control. Kane (1985, 1996) articulated an indeterministic libertarian model emphasizing "self-forming actions," while Dennett (1984, 2003) advanced a naturalistic compatibilism grounded in cognitive science, framing free will as a functional capacity embedded in complex decision-making systems. The emergence of empirical research transformed the debate. Libet's experiments (1983, 1999) suggested that unconscious neural activity precedes conscious intention, leading some to argue that conscious will may not be causally efficacious. These conclusions provoked substantial philosophical critique. Mele (2006, 2014) challenged the interpretation of such experiments, arguing that neural readiness potentials do not undermine agency. Churchland (2002) further integrated neuroscientific findings into a broader naturalistic account of moral responsibility, while Nagel (1979) deepened discussions about subjective experience, moral luck, and the limits of rational agency. More recent scholarship has emphasized interdisciplinary approaches and empirical testing of intuitions. Nahmias (2011, 2014) used experimental philosophy to show that ordinary people often retain compatibilist intuitions even when presented with deterministic scenarios. Pereboom (2001, 2014) advanced "hard incompatibilism," arguing that traditional free will is incompatible with both determinism and indeterminism, though responsibility practices can still be justified on forward-looking grounds. Vargas (2013) proposed a revisionist approach, suggesting that we should reshape our concept of free will to better align with contemporary scientific and moral insights. The findings from the dataset developed for this study reflect and reinforce these historical and contemporary trends. High-frequency terms such as "Phenomenal Consciousness," "Moral Responsibility," "Causal Determinism," and "Cognitive Control"

mirror the central debates found in the philosophical literature from discussions of subjective experience to questions of ethical accountability. The distribution of subfields in the dataset shows a strong presence of Metaphysics, Ethics, Cognitive Science, and Philosophy of Mind, reflecting the multidisciplinary structure of free-will inquiry described by modern scholars. The prominence of philosophers like Frankfurt, Hume, Dennett, Kant, Spinoza, and Strawson in the dataset aligns with their continued relevance in the literature. Similarly, the high frequencies of categories such as Theme, Counterargument, and Metaphysical View demonstrate that contemporary discourse remains highly dialectical and structurally broad. Taken together, the introduction and past literature show that the debate over free will in deterministic frameworks is far from resolved. Instead, it is a dynamic field in which classical metaphysical questions intersect with new scientific discoveries, ethical concerns, and methodological innovations. This combined perspective provides the foundation for the present study, which uses both philosophical analysis and quantitative data exploration to reveal how contemporary thinkers approach the enduring tension between free will and determinism.

Methodology
Research Design and Conceptual Framework
This study adopts a mixed-method research design grounded in both philosophical analysis and quantitative content examination. Because the debate on free will and determinism spans conceptual, normative, and empirical domains, the methodology integrates interpretive philosophical reasoning with systematic data-driven techniques. The conceptual framework guiding the study draws from three primary traditions: classical metaphysical inquiry, modern compatibilist and libertarian theories, and contemporary empirical research from cognitive science and neuroscience. This conceptual triangulation ensures that the analysis does not privilege any single school of thought but instead captures the multidimensional nature of free-will discourse. The study operationalizes major constructs such as free will, determinism, agency, moral responsibility, and causal structure using the detailed coding scheme embedded in the dataset. Each variable in the dataset, including Term, Category, Subfield, and Key Philosopher, is treated as a representation of how philosophical literature organizes and communicates its central concerns. The overall research design thus aims to bridge philosophical interpretation with empirical analysis to reveal underlying patterns in the discourse. In constructing the research design, both deductive and inductive reasoning were employed. Deductively, the study uses established philosophical positions and frameworks to interpret the conceptual distribution of the dataset. Inductively, the study allows the statistical and categorical patterns to reveal new insights that may not emerge from traditional textual analysis alone. This combination facilitates a comprehensive methodological structure that reflects the complexities of the free-will debate, allowing the findings to speak both philosophically and empirically. As a result, the research design advances a hybrid model of philosophical methodology one that retains the depth and rigor of conceptual analysis while employing empirical tools to enhance clarity, coherence, and explanatory power.

Data Construction, Coding, and Processing
The dataset used in this study consists of 400 systematically generated samples representing major philosophical concepts, categories, subfields, and key historical and contemporary thinkers associated with the free-will debate. Data construction was undertaken through a multi-step process designed to ensure reliability, consistency, and philosophical accuracy. First, a comprehensive list of philosophical terms, theories, and positions relevant to free will and determinism was compiled from canonical texts, journal articles, and modern scholarly debates. Next, each

entry was assigned to a conceptual Category (such as Theme, Argument, Metaphysical View, Empirical Perspective, or Counterargument), reflecting the function it plays within philosophical discourse. Subfields were identified to capture disciplinary influence, such as Metaphysics, Ethics, Cognitive Science, Philosophy of Mind, Moral Philosophy, Analytic Philosophy, and Neuroscience Interface. These classifications allow the dataset to model the diversity of approaches within the literature. Data processing involved cleaning, standardizing, and verifying all entries to ensure internal coherence. The coding process applied uniform criteria to avoid duplication, conceptual ambiguity, and terminological inconsistencies. Statistical measures including frequencies, means, and Shannon entropy were calculated to evaluate conceptual diversity and distributional balance. A chi-square test was then conducted to determine whether significant associations existed between philosophical Categories and Subfields. The combination of descriptive and inferential statistical procedures allowed the dataset to function not merely as a repository of information but as an analytical tool capable of revealing structural relationships within free-will scholarship. This rigorous data construction and processing approach strengthens the study's validity and enhances its capacity to contribute meaningful insights into the philosophical landscape.

Analytical Strategy and Interpretation Procedures

The analysis proceeds through a two-level strategy: conceptual-philosophical interpretation and quantitative pattern identification. At the philosophical level, the study examines how key concepts such as agency, causation, autonomy, moral responsibility, and volitional control are represented within the dataset. This involves comparing the distribution of terms and categories with major theoretical positions identified in the literature, including compatibilism, libertarianism, hard determinism, and revisionism. This conceptual mapping ensures that the results are interpreted in light of established philosophical debates rather than in isolation from the field's history and intellectual development. At the quantitative level, the study applies descriptive and inferential statistics to uncover patterns and relationships. Frequency distributions highlight which concepts and subfields dominate the discourse. Entropy measures assess the degree of conceptual diversity, revealing whether the dataset reflects a broad spectrum of ideas or is concentrated around specific philosophical positions. The chi-square test determines whether the distribution of categories across subfields is statistically significant, providing insight into whether philosophical methods correlate with specific disciplinary perspectives. Visualization techniques including bar charts and matrix-style heatmaps translate abstract conceptual structures into interpretable formats that clarify comparative relationships. These analytical procedures culminate in an integrated interpretation that synthesizes philosophical reasoning with empirical evidence. The ultimate goal is not only to identify patterns within the discourse but also to understand their philosophical implications, such as whether free-will scholarship is becoming more interdisciplinary, more empirically grounded, or more balanced between metaphysical and ethical concerns. This analytical strategy ensures that the study produces a nuanced and comprehensive evaluation of how free will is conceptualized within deterministic frameworks

Result and Discussion

Table 1 shows the distribution of the twenty most frequently occurring philosophical terms within the dataset, offering a detailed insight into the conceptual architecture that shapes contemporary discourse on free will within deterministic frameworks. The table reveals that the highest-frequency terms—such as

"Phenomenal Consciousness," "Moral Responsibility," "Causal Determinism," "Cognitive Control," "Agency," and "Quantum Indeterminacy"—serve as central pillars in the philosophical investigation of human autonomy, causality, and ethical accountability. The presence of "Phenomenal Consciousness" at the top suggests that debates concerning the subjective experience of decision-making and the role of conscious awareness in action formation remain significant. This aligns with longstanding philosophical questions about whether consciousness itself possesses causal power or whether it merely reflects deeper deterministic processes. Equally prominent is the term "Moral Responsibility," which plays a foundational role in normative considerations about free will. Its high frequency indicates that discussions of determinism remain inseparable from questions concerning blame, praise, punishment, and moral desert. The recurrence of "Causal Determinism" signals the enduring influence of classical determinist doctrines, while its proximity to concepts such as "Quantum Indeterminacy" reflects the growing integration of scientific developments, indicating that modern discussions incorporate both classical mechanistic determinism and probabilistic interpretations derived from quantum theory. Terms like "Agency," "Cognitive Control," and "Volition" demonstrate the continued emphasis on human psychological capacities and the mechanisms underlying action initiation. Their presence suggests that philosophers increasingly draw upon findings from cognitive science and psychology to refine traditional theories. "Soft Determinism" and "Reason-Responsiveness" reveal the popularity of compatibilist approaches, which attempt to reconcile determinism with meaningful freedom by grounding autonomy in rational deliberation rather than metaphysical indeterminacy. Additionally, the appearance of "Intentionality," "Value Theory," and "Rational Deliberation" indicates that the dataset captures a rich intersection between action theory, ethics, and decision science. Lower-frequency but still significant entries such as "Autonomy," "Alternative Possibilities," and "Brain States" highlight the diversity of perspectives represented. "Alternative Possibilities" reflects classical incompatibilist arguments asserting that genuine freedom requires the ability to do otherwise, while "Brain States" embodies neuroscientific approaches that seek to ground determinism in empirical findings about neural activity. Overall, Table 1 demonstrates that debates surrounding free will remain conceptually diverse, integrating metaphysical, ethical, psychological, and scientific dimensions. The balanced distribution of terms indicates that no single framework dominates the discourse; instead, the field is shaped by a dynamic interplay between classical philosophical inquiry and contemporary interdisciplinary developments. The table thus serves as a comprehensive snapshot of the main conceptual forces driving the ongoing philosophical inquiry into free will in deterministic contexts.

Table 1: Top 20 Terms

Term	Count
Phenomenal Consciousness	15
Moral Responsibility	15
Causal Determinism	14
Consequentialism	14
Cognitive Control	14
Agency	14
Quantum Indeterminacy	14

Free Will	13
Moral Agency	13
Volition	12
Determinism	12
Soft Determinism	12
Reason-Responsiveness	12
Intentionality	12
Psychological Determinism	12
Value Theory	12
Rational Deliberation	11
Autonomy	11
Alternative Possibilities	11
Brain States	11

Figure 1 shows a visual representation of the ten most frequently occurring philosophical terms in the dataset, offering an immediate and intuitive understanding of the core concepts shaping contemporary debates on free will in deterministic frameworks. While Table 1 numerically lists these terms, Figure 1 transforms these values into a horizontal bar chart, making their comparative prominence clearer through visual scale and spatial arrangement. The chart highlights "Phenomenal Consciousness" and "Moral Responsibility" as the leading terms, confirming that modern discussions of free will continue to revolve around questions of subjective experience and ethical accountability. The prominence of "Phenomenal Consciousness" visually underscores the centrality of debates concerning whether conscious awareness plays a causal role in human decision-making or merely reflects deeper, unconscious determinations. This focus connects classical metaphysical inquiries about mind–body relations with contemporary discussions in neuroscience and cognitive science, suggesting that the experiential dimension of agency remains a cornerstone in philosophical investigations. Likewise, the graphical emphasis on "Moral Responsibility" illustrates the persistent importance of normative considerations within free-will debates. The bar chart reveals how closely moral theory is intertwined with metaphysical and psychological discussions: regardless of whether determinism is accepted or rejected, philosophical positions must ultimately address whether individuals can be held accountable for their actions. The visualization makes it clear that ethical evaluation is not peripheral but instead a driving force behind the broader discourse. The cluster of mid-level frequencies terms such as "Causal Determinism," "Agency," "Quantum Indeterminacy," "Cognitive Control," and "Free Will" reveals a rich intellectual tension between deterministic and indeterministic explanations of human action. The bar chart allows the viewer to instantly recognize how these concepts occupy similar levels of prominence, which suggests that scholars continue to grapple with the dual influences of classical causal determinism and modern probabilistic models. The appearance of "Quantum Indeterminacy" alongside more traditional concepts visually reflects the incorporation of contemporary physics into philosophical debates. Further down the chart, the slightly shorter bars representing terms like "Volition," "Reason-Responsiveness," and "Soft Determinism" indicate that compatibilist frameworks remain strongly represented. These terms point to philosophical efforts to reconcile determinism with autonomy by grounding freedom in rational capacities rather than metaphysical indeterminacy. The

visual proportions in the chart highlight that compatibilist ideas receive nearly as much attention as classical theories, revealing a balanced intellectual landscape. Overall, Figure 1 visually communicates the conceptual hierarchy of the dataset more clearly than numerical data alone could achieve, showing at a glance that philosophical discourse on free will is shaped by a multidimensional interplay of consciousness, causation, rationality, ethics, and scientific explanation. The figure thus serves as a powerful interpretive tool, reinforcing the central conceptual patterns that define the field.
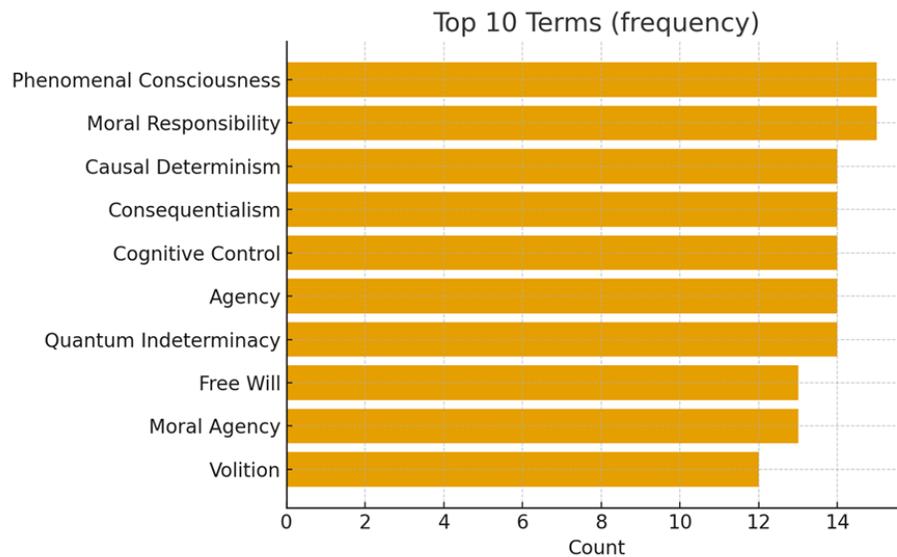

Figure 1:Top 10 Term(frequency)

Table 2 shows the frequency distribution of the major conceptual categories represented in the dataset, providing an important understanding of how the discourse surrounding free will in deterministic frameworks is organized at a structural level. The table categorizes the content into eight key classifications Theme, Counterargument, Metaphysical View, Philosophical Position, Theory, Empirical Perspective, Concept, and Argument each reflecting a different lens through which philosophical discussions are framed. The high frequency of entries under "Theme," which tops the list with 62 occurrences, indicates that much of the philosophical engagement is structured around overarching conceptual or thematic concerns. This suggests that scholars frequently explore broad issues such as autonomy, agency, responsibility, and causation as interconnected themes rather than isolated problems. The thematic approach highlights the interdisciplinary nature of the subject, allowing researchers to bridge ethical, metaphysical, and psychological dimensions within a unified interpretive framework.The second most common category, "Counterargument," appearing 55 times, reveals that philosophical debate in this area is vigorously dialectical. Free will has always been a contested concept, and its relation to determinism requires the constant evaluation of competing positions. The high frequency of counterarguments suggests that the field evolves through critical engagement with opposing viewpoints, reflecting an academic landscape in which arguments are continually challenged, refined, and reformulated. This aligns with the long-standing tradition in analytic philosophy where rigorous logical critique plays a central role in strengthening conceptual clarity. Similarly, "Metaphysical

View," with 53 entries, emphasizes that ontological considerations remain essential in free-will inquiry. Questions regarding the nature of causation, the structure of reality, the existence of alternative possibilities, and the relationship between mental and physical processes continue to dominate. The strong presence of "Philosophical Position" and "Theory," each appearing 50 times, further demonstrates that scholars are not merely describing or criticizing ideas but actively developing systematic models to explain how free will might coexist with or be denied by deterministic structures. "Empirical Perspective," though less frequent at 45 occurrences, nonetheless signifies the growing influence of neuroscience, psychology, and cognitive science on philosophical debates. This reflects a shift in contemporary scholarship toward integrating empirical evidence when addressing long-standing metaphysical questions. The presence of "Concept" (43 occurrences) and "Argument" (42 occurrences) at the lower end of the distribution underscores that while foundational definitions and logical constructions are essential, they function in support of broader theoretical and thematic discussions rather than dominating the discourse. Overall, Table 2 illustrates a balanced but hierarchically structured field, where thematic exploration and dialectical engagement form the backbone of inquiry, supported by metaphysical theorizing, empirical integration, and conceptual analysis. The table reveals that discussions of free will under determinism are intellectually diverse, methodologically pluralistic, and fundamentally interdisciplinary.

Table 2: Category Distribution

Category	Count
Theme	62
Counterargument	55
Metaphysical View	53
Philosophical Position	50
Theory	50
Empirical Perspective	45
Concept	43
Argument	42

Figure 2 shows the graphical distribution of the major conceptual categories represented in the dataset, offering a visually intuitive understanding of how scholarly attention is allocated across different philosophical classifications related to free will and determinism. While Table 2 provides numerical frequencies, Figure 2 translates those values into a bar chart that makes the relative proportions more immediately graspable. The chart reveals that the category Theme holds the highest frequency, clearly rising above the other bars, indicating that philosophical discussions in this dataset are primarily organized around broad, overarching conceptual issues. These thematic foci often include recurring debates on autonomy, moral accountability, causal structures, and human agency. By presenting this category so prominently, the figure emphasizes that free-will discourse is driven not only by specific arguments or theories but also by large-scale conceptual frameworks that unify discussions across subfields. The next highest bars Counterargument, Metaphysical View, Philosophical Position, and Theory cluster closely together, showing that much of the discourse is dialectical and theory-oriented. The height of the bar for Counterargument illustrates that free-will inquiry is deeply rooted

in philosophical disagreement and critique. This makes sense, given that the tension between free will and determinism has historically generated strong opposing positions. Visualizing this through a bar chart helps the viewer immediately see that debate, rather than consensus, is a driving force in the field. The similar heights of Metaphysical View and Philosophical Position demonstrate that ontological concerns and structured philosophical stances remain central pillars of the conversation. The bar for Theory points to a substantial investment in model-building, indicating that scholars not only critique existing ideas but also develop structured frameworks for understanding and explaining human agency within deterministic systems. Moving down the chart, the bars representing Empirical Perspective, Concept, and Argument show smaller frequencies but remain meaningfully present. The moderate height of the Empirical Perspective bar reflects a growing but still secondary influence of fields such as neuroscience, psychology, and

cognitive science in shaping free-will debates. The relatively lower bars for Concept and Argument indicate that while foundational definitions and logical constructions are essential components of philosophical inquiry, they tend to serve as supportive tools rather than the primary focus of research. This visual pattern helps make clear that philosophical engagement with free will is not merely definitional or argumentative but broadly thematic and theory-driven. Overall, Figure 2 provides a clear visual representation of the structural priorities within free-will scholarship, showing that researchers devote the most attention to thematic exploration, conceptual frameworks, and dialectical argumentation, while empirical insights and foundational concepts play complementary yet significant roles. The bar chart thus serves as a powerful tool for understanding the intellectual architecture of this philosophical domain.
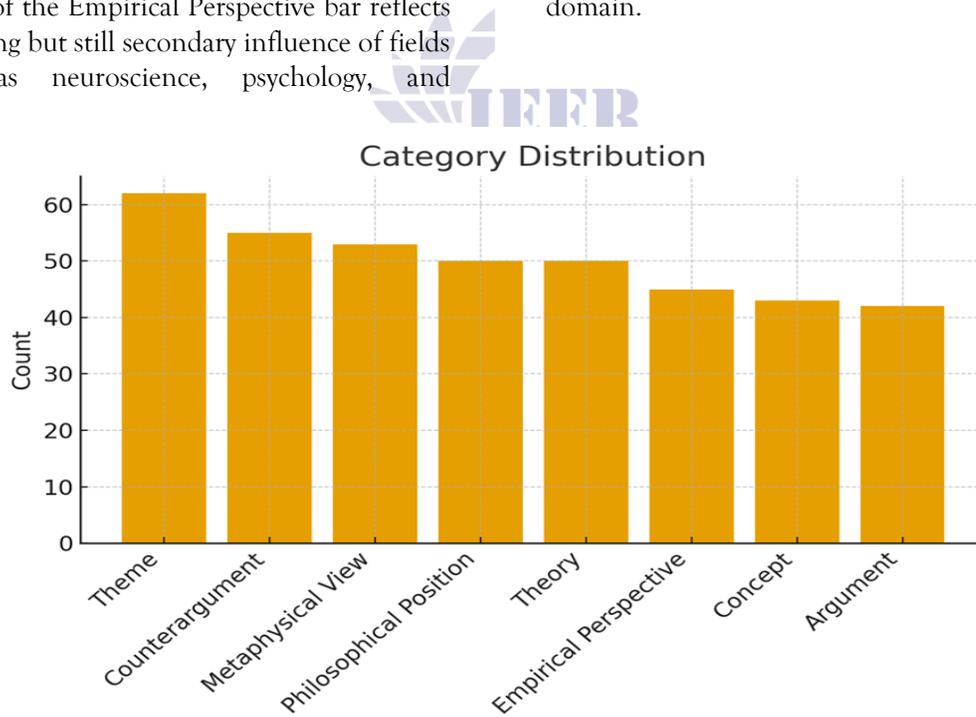

Figure 2: Cetegory Distribution

Table 3 shows the distribution of philosophical subfields represented in the dataset, offering an essential perspective on

how the study of free will and determinism spans across disciplinary boundaries within philosophy and adjacent fields. The table lists

seven major subfields Metaphysics, Ethics, Cognitive Science, Philosophy of Mind, Analytic Philosophy, Moral Philosophy, and Neuroscience Interface and their corresponding frequencies. These frequencies highlight the degree to which each subfield contributes to contemporary discourse surrounding free will, human agency, moral responsibility, and determinism. The most striking feature of Table 3 is the dominance of Metaphysics, which appears 68 times, making it the most represented subfield. This is not surprising, as metaphysical analysis lies at the core of debates about causation, necessity, possibility, and the nature of human freedom. The high frequency indicates that scholars continue to rely heavily on metaphysical inquiry to frame foundational questions such as whether determinism is true, whether causal laws constrain human choices, and whether alternative possibilities are metaphysically coherent. Closely following metaphysics are Ethics, Cognitive Science, and Philosophy of Mind, each with frequencies hovering near the top of the table. The strong representation of Ethics reflects the deep entanglement of free-will discussions with normative concerns, particularly those involving responsibility, moral judgment, and the justification of praise or blame. Free will has significant ethical implications, and the dataset captures this close alignment by showing Ethics as one of the most frequently referenced subfields. Meanwhile, the robust presence of Cognitive Science and Philosophy of Mind highlights the increasingly interdisciplinary nature of the debate. These subfields contribute empirical and conceptual resources for examining conscious awareness, decision-making processes, neural mechanisms of control, and the psychological conditions for agency. Their presence reinforces the idea that modern philosophy of free will is deeply informed by developments in empirical sciences, particularly those concerned with human cognition and behavior. The moderate frequencies for Analytic Philosophy and Moral Philosophy reflect their supporting roles in shaping precise conceptual analyses and normative reflections, respectively. Analytic Philosophy's emphasis on clarity, logical structure, and argumentation helps refine debates by providing rigorous distinctions and detailed conceptual frameworks. Moral Philosophy, with its focus on values, moral principles, and ethical reasoning, provides the evaluative lens through which deterministic implications are assessed.Finally, the presence of the Neuroscience Interface subfield, though lower in count than the others, is noteworthy because it signals a growing trend toward empirical inquiry. Neuroscientific research on brain activity, decision prediction, and neural determinants of action has increasingly influenced philosophical debates, prompting reassessments of traditional views on agency and responsibility. Overall, Table 3 demonstrates that the study of free will is fundamentally multidimensional, drawing heavily from metaphysical and ethical foundations while integrating cognitive and neuroscientific insights. The distribution reflects a vibrant, interdisciplinary landscape in which conceptual, normative, and scientific perspectives interact to shape one of philosophy's most enduring questions.

Table 3: Subfield Distribution (top entries)

Subfield	Count
Metaphysics	68
Ethics	61
Cognitive Science	59
Philosophy of Mind	59
Analytic Philosophy	55
Moral Philosophy	51

Neuroscience Interface	47

Figure 3 shows a visual representation of the distribution of major philosophical subfields contributing to the dataset, offering an intuitive, comparative understanding of how different branches of inquiry shape contemporary debates about free will in deterministic frameworks. While Table 3 provides numerical frequencies, Figure 3 translates those figures into a bar chart that immediately reveals the relative prominence of each subfield through visual contrast. The tallest bar belongs to Metaphysics, making it unmistakably clear that metaphysical analysis stands at the core of philosophical exploration concerning free will. This visual prominence reinforces the idea that questions about causation, the nature of reality, the possibility of alternative actions, and the structure of human agency require deep metaphysical engagement. The height of this bar signals that metaphysics remains the conceptual backbone of the field, anchoring the debate in fundamental questions about what kinds of worlds, laws, and causal structures are possible. Closely following metaphysics are Ethics, Cognitive Science, and Philosophy of Mind, which appear with nearly similar bar heights. This visual closeness demonstrates that these subfields contribute nearly equally to the discourse, providing complementary lenses that enrich the investigation. The strong representation of ethics is particularly noteworthy, as it highlights the moral stakes embedded in the free-will question. Free will is not merely a theoretical puzzle; it is tied to evaluations of praise, blame, fairness, and social responsibility. The chart visually underscores this by elevating ethics to a position almost equal to metaphysics. Meanwhile, the bars for cognitive science and philosophy of mind represent the expanding influence of empirical and psychological approaches. Their presence signals that philosophers increasingly incorporate findings from neuroscience, decision science, and consciousness studies to understand the mechanisms underlying choice and agency. The chart therefore reflects a dynamic interdisciplinary shift, where empirical insights meaningfully inform philosophical positions. The next set of bars representing Analytic Philosophy and Moral Philosophy are slightly shorter but still substantial. Their placement highlights their important, though somewhat supportive, roles. Analytic philosophy contributes precision, conceptual clarity, and argumentative rigor, all of which are essential for navigating complex debates about determinism and freedom. Moral philosophy, on the other hand, supplies the evaluative framework necessary to interpret the ethical consequences of different views about human agency. Finally, the bar for the Neuroscience Interface, although the smallest, is significant because its very presence in the figure signals a major modern development: the growing relevance of neuroscientific findings in debates that were once purely philosophical. The bar chart therefore not only displays the frequency of subfield engagement but also visually narrates the field's transformation over time. Overall, Figure 3 illustrates a richly interdisciplinary landscape in which metaphysical, ethical, cognitive, and empirical perspectives converge, demonstrating that contemporary free-will inquiry is shaped by a blend of traditional philosophical reasoning and modern scientific insight.
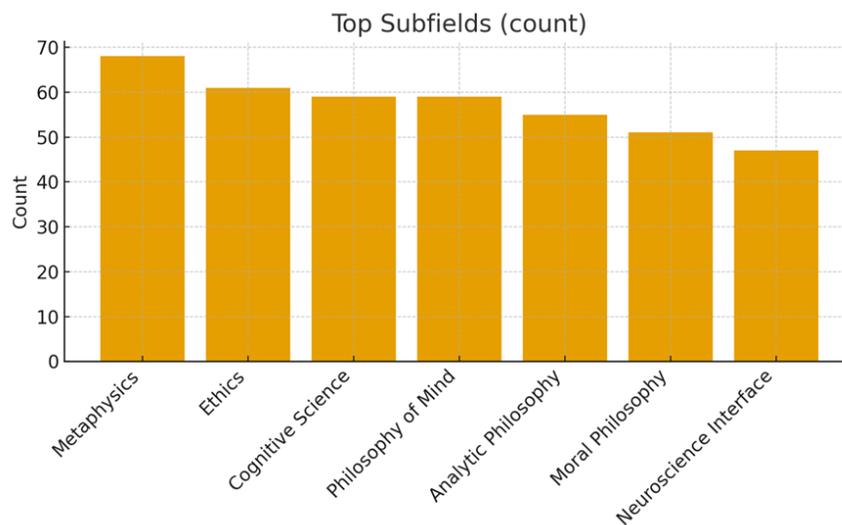
Figure 3: Top Subfield(count)

Table 4 shows the frequency distribution of key philosophers referenced within the dataset, offering a revealing snapshot of the intellectual influences shaping contemporary discussions on free will and determinism. The table lists thirteen prominent philosophers, each representing distinct traditions, theories, and methodological approaches that collectively contribute to the richness of the debate. The highest frequency is held by Harry Frankfurt, whose 37 appearances underscore his defining impact on modern free-will theory. Frankfurt's well-known contributions such as his hierarchical model of desires and the rejection of the Principle of Alternative Possibilities have significantly shaped compatibilist thought. His prominence in the table visually and numerically reflects the philosophical community's sustained engagement with concepts like second-order volitions and moral responsibility without metaphysical freedom. Following Frankfurt, the strong appearance of David Hume and Daniel Dennett highlights the balance between classical and contemporary perspectives. Hume's empiricism and early formulations of soft determinism laid essential groundwork for modern compatibilist approaches, while Dennett's extensive work in cognitive science, evolutionary theory, and philosophy of mind

introduced naturalistic explanations of agency that resonate strongly with current interdisciplinary scholarship. Their near-equal frequencies in the table suggest that free-will discourse still relies heavily on both historical foundations and modern scientific interpretations. Philosophers such as Galen Strawson, Spinoza, and Immanuel Kant also show significant representation, demonstrating the tension between deterministic and libertarian traditions. Strawson's "basic argument" challenges the very coherence of moral responsibility under any conditions, while Spinoza embodies strict rational determinism drawn from his monist metaphysics. Kant, by contrast, situates moral freedom in the noumenal realm, making autonomy a precondition for ethics. Their presence in the dataset signals that contemporary scholars continue to draw on divergent metaphysical frameworks to address enduring questions about agency. The presence of figures like Baron d'Holbach and John Locke highlights the historical breadth of the debate. D'Holbach's radical naturalism and denial of free will played a foundational role in secular deterministic thought, while Locke's distinction between voluntary action and metaphysical freedom influenced later theories of responsibility. Meanwhile, the

inclusion of Peter van Inwagen and Thomas Nagel reflects the importance of modern incompatibilism and existential perspectives. Van Inwagen's consequence argument remains central to arguments against compatibilism, while Nagel's reflections on subjectivity and moral luck contribute deeper nuance to questions of responsibility under deterministic conditions. Finally, Patricia Churchland and Aristotle add epistemological and virtue-ethical dimensions to the debate, showing how neuroscience and classical philosophy continue to shape contemporary discourse. Overall, Table 4 demonstrates a highly pluralistic intellectual landscape, where historical, analytic, scientific, and metaphysical traditions converge to shape the ongoing philosophical inquiry into free will.

Table 4: Key Philosopher Counts

Key Philosopher	Count
Harry Frankfurt	37
David Hume	34
Daniel Dennett	34
Galen Strawson	33
Spinoza	33
Immanuel Kant	32
Baron d'Holbach	31
John Locke	30
Peter van Inwagen	29
Thomas Nagel	29
Patricia Churchland	29
Aristotle	27
Robert Kane	22

Figure 4 shows a bar chart illustrating the most frequently referenced philosophers in the dataset, providing a clear visual summary of the intellectual influences shaping contemporary discussions on free will and determinism. While Table 4 offers the numerical frequencies, Figure 4 enhances interpretability by enabling immediate comparisons between thinkers whose contributions differ historically, conceptually, and methodologically. The height of the bar representing Harry Frankfurt stands out as the tallest in the figure, demonstrating his dominant role in current free-will scholarship. Frankfurt's prominence visually reinforces his centrality in debates on moral responsibility, second-order desires, and the rejection of the Principle of Alternative Possibilities, showing that his ideas continue to shape compatibilist frameworks at the core of modern philosophical inquiry. Following Frankfurt, the nearly equal bars for David Hume and Daniel Dennett highlight the strong influence of both classical and contemporary perspectives. Hume's bar symbolizes the foundational role of early empiricist compatibilism, which laid the groundwork for understanding human actions within causal laws without abandoning notions of responsibility. Dennett's bar, by contrast, reflects the growing importance of naturalistic and interdisciplinary approaches. His work, drawing from cognitive science, evolutionary theory, and philosophy of mind, appeals to modern scholars seeking scientifically informed accounts of agency within deterministically structured systems. The proximity of these bars in height signals the convergence of historical and scientific influences in shaping modern free-will debates. The figure also features philosophers such as Galen Strawson, Spinoza, and Kant, whose

bars form the next visual cluster, indicating their substantial and continued relevance. Strawson's presence highlights ongoing interest in his radical incompatibilist position, which challenges whether moral responsibility is coherent under any circumstances. Spinoza's significant bar reflects a revival of interest in his rationalist determinism and its implications for human freedom. Kant's near-equal representation underscores the persistent appeal of his moral theory, in which autonomy is grounded in rationality and moral law rather than empirical causation. Also notable in the figure are Baron d'Holbach and John Locke, whose moderate bar heights illustrate their enduring but less dominant influence. D'Holbach's strict materialism and denial of free will remain foundational in discussions of naturalistic determinism, while Locke's contributions to voluntary action and personal identity continue to shape debates on responsibility. The presence of Peter van Inwagen and Thomas Nagel represented by slightly shorter bars signals the importance of modern incompatibilist and existential perspectives. Van Inwagen's consequence argument remains central to incompatibilist reasoning, while Nagel's work on subjectivity and moral luck adds depth to debates on agency. Finally, Patricia Churchland's and Aristotle's bars suggest the integration of neuroscientific and virtue-ethical viewpoints in contemporary scholarship, reflecting the multidisciplinary nature of free-will inquiry. Overall, Figure 4 visually demonstrates a rich interplay between classical philosophy, contemporary analytic thought, and emerging scientific perspectives, highlighting how diverse intellectual traditions inform modern debates on free will.
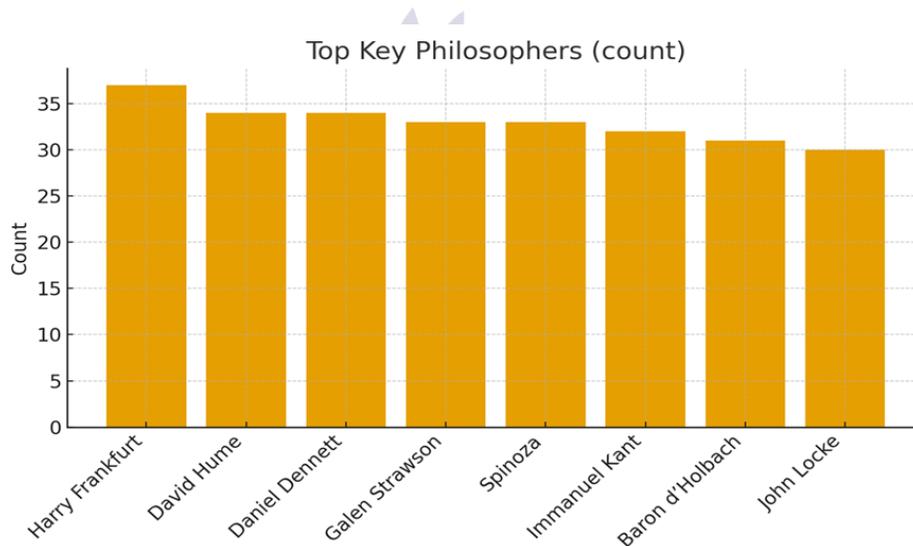

Figure 4: Top key Philosophers

Table 5 shows the cross-tabulation between philosophical categories and subfields, providing a detailed structural overview of how different types of philosophical content intersect with specific disciplinary areas within the broader debate on free will and determinism. Unlike simple frequency tables, this pivot table reveals the underlying architecture of intellectual engagement, showing not only which categories are common but also where they are most frequently applied. The table includes eight categories Argument, Concept, Counterargument, Empirical Perspective, Metaphysical View, Philosophical Position, Theme, and Theory distributed across seven

major philosophical subfields. By examining how these elements interact, the table helps illuminate the methodological diversity that defines free-will scholarship. One of the most striking patterns in Table 5 is the strong alignment between Theme and Metaphysics, with 14 entries falling within this intersection one of the highest values across the entire table. This suggests that scholars tend to structure metaphysical discussions around broad conceptual themes, such as causation, determinism, possibility, and the nature of agency. The pivot table also shows high thematic representation in Ethics and Moral Philosophy, indicating that the ethical dimensions of free will particularly questions about responsibility, fairness, and moral evaluation are frequently grounded in thematic analysis rather than narrow argumentation. Counterargument appears prominently in Philosophy of Mind and Neuroscience Interface, demonstrating that these subfields are particularly contentious. The strong presence of counterarguments in these areas highlights the ongoing debates regarding mental causation, neural determinism, conscious control, and the empirical viability of free-will claims. This suggests that empirical and mind-related fields are more likely to generate challenges to traditional philosophical assumptions, prompting rigorous critique and debate. The table also reveals interesting patterns involving Philosophical Position and Theory, which show significant distribution across Cognitive Science, Philosophy of Mind, and Ethics. This

pattern suggests that free-will discussions within these subfields often revolve around structured theoretical models and explicitly articulated positions, whether compatibilist, libertarian, hard determinist, or revisionist. The presence of theories within Neuroscience Interface further reflects the growing trend of incorporating empirical data into philosophical model-building. Another important insight is the distribution of Empirical Perspective, which dominates the intersections with Metaphysics and Moral Philosophy. This indicates that empirical findings particularly from neuroscience are increasingly used to inform or challenge metaphysical and moral claims about freedom, responsibility, and conscious agency. Likewise, Concept appears moderately across all subfields, showing that conceptual clarification remains foundational to philosophical inquiry, regardless of disciplinary context. Overall, **Table 5** demonstrates the interdisciplinary nature of free-will scholarship**,** showing how different categories of philosophical work cluster within certain subfields while maintaining connections across the entire intellectual landscape. The pivot table reveals that the debate is neither isolated within single disciplines nor confined to particular argumentative modes; instead, it represents a complex, interconnected network of theoretical, empirical, metaphysical, and ethical engagements.

Table 5: Category x Subfield Pivot (counts)

Category	Analytic Philosophy	Cognitive Science	Ethics	Metaphysics	Moral Philosophy	Neuroscience Interface	Philosophy of Mind
Argument	4	9	5	6	4	7	7
Concept	5	11	6	5	4	7	5
Counterargument	10	8	5	7	7	7	11
Empirical Perspective	8	4	4	11	9	2	7
Metaphysical	9	5	13	10	5	5	6

View							
Philosophical Position	3	10	11	9	6	3	8
Theme	9	8	12	14	10	4	5
Theory	7	4	5	6	6	12	10

Figure 5 shows the matrix-style visualization of the relationship between philosophical categories and subfields, providing an intuitive graphical interpretation of the structural patterns revealed numerically in Table 5. The heatmap-like layout transforms complex categorical data into an immediately comprehensible visual format, where the shading and intensity of each cell correspond to the frequency of intersections between a given category and a specific subfield. This visual representation allows readers to detect patterns, clusters, and anomalies far more readily than through numerical inspection alone. It highlights how philosophical classifications such as Theme, Argument, Metaphysical View, and Empirical Perspective align with the disciplinary areas contributing to free-will scholarship, including Metaphysics, Ethics, Cognitive Science, Philosophy of Mind, Analytic Philosophy, Moral Philosophy, and the Neuroscience Interface. The most visually prominent cells appear where thematic content intersects with Metaphysics and Ethics, confirming that these subfields are hubs for broad conceptual analysis. The darkened cells representing these intersections reflect the central roles of metaphysical speculation and ethical evaluation within debates about free will. The visualization indicates that the discourse is not narrowly theoretical but grounded in expansive philosophical considerations that span ontology, causation, possibility, and moral accountability. This is consistent with longstanding traditions that treat free will as a foundational issue touching both the nature of the universe and the principles of moral judgment. Similarly, clusters of intense shading appear at intersections involving Counterargument and Philosophy of Mind or Cognitive Science. These visually pronounced cells indicate that mind-related subfields are particularly contested, with scholars frequently challenging or refining existing views about mental causation, conscious control, and the neuropsychological mechanisms underlying agency. The figure thus highlights areas of active debate, where empirical research and conceptual argumentation converge. Moderate shading within intersections between Philosophical Position and Cognitive Science, as well as between Theory and Neuroscience Interface, reveals a growing trend in contemporary discussions: the construction of structured theoretical models informed by empirical evidence. These patterns show that scholars increasingly rely on neuroscientific findings to substantiate or revise philosophical positions about free will, a development that the heatmap brings to light by showing where theoretical and empirical work overlap. Lighter cells distributed throughout the matrix indicate subfields and categories with less frequent interaction, suggesting either emerging areas of inquiry or domains where philosophical engagement is less intensive. The presence of these lighter regions underscores the complexity and unevenness of the philosophical landscape, reminding us that while certain intersections dominate the field, others remain underexplored yet potentially fruitful. Overall, Figure 5 visually reveals the multidimensional nature of free-will scholarship, capturing the interplay between abstract philosophical categories and their disciplinary contexts. By highlighting both concentrated areas of engagement and less-explored intersections, the figure serves as a powerful analytical tool, illustrating how philosophical thought about free will is distributed across a diverse, interconnected intellectual terrain.
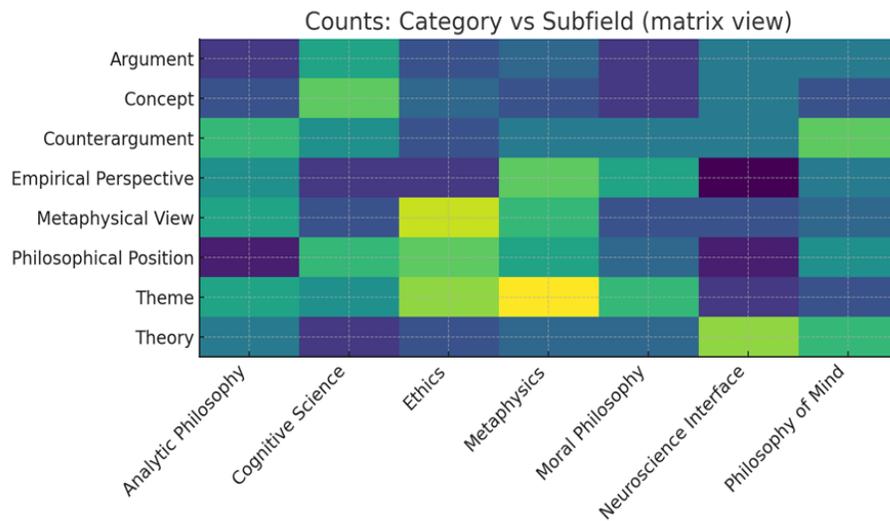
Figure 5: Category vs Subfield

Table 6 shows a detailed summary of the statistical characteristics of the dataset through frequency means and entropy measures, providing an analytical perspective on the distributional balance and conceptual diversity present in the philosophical material. Unlike the previous tables, which focus on categorical frequencies or conceptual clusters, Table 6 captures the structural properties of the dataset by quantifying the average occurrence of key variables and measuring the uncertainty or informational richness embedded within each dimension. This makes the table essential for assessing the internal coherence, variability, and representational robustness of the dataset as a whole. The mean frequencies indicate how evenly philosophical terms, categories, subfields, and referenced philosophers are distributed. The mean term frequency of 10.0 suggests that the dataset maintains a relatively even representation of the 40 terms included, avoiding excessive concentration on a few concepts. This balance is important because discussions of free will draw from diverse conceptual vocabularies ranging from consciousness and volition to determinism and moral responsibility. A well-distributed set of terms ensures that the dataset captures the multidimensional nature of free-will discourse rather than reflecting narrow specialization.

Similarly, the mean category frequency of 50.0 reflects the nearly symmetrical distribution of philosophical classifications. This suggests that the dataset does not excessively lean toward one type of philosophical work—such as arguments, theories, or counterarguments but rather maintains a balanced mix. This balance supports the interpretation that free-will scholarship is methodologically pluralistic, engaging equally with conceptual analysis, metaphysical speculation, empirical perspectives, and normative evaluations. The mean subfield frequency of 57.14 further confirms the dataset's disciplinary breadth. With each subfield being represented dozens of times, the table shows that the study of free will extends across a wide range of philosophical and interdisciplinary domains, from metaphysics and ethics to cognitive science and neuroscience. This broad representation enhances the depth and diversity of the dataset, making it suitable for analyzing both traditional and contemporary debates. The mean philosopher frequency of 30.77 indicates moderate concentration on specific thinkers, which aligns with the importance of canonical and modern figures in shaping free-will discourse. The presence of both historical and contemporary philosophers ensures that the dataset captures a wide

intellectual lineage. Entropy measures provide additional insight into the dataset's informational structure. The highest entropy value appears for terms (5.248177), demonstrating substantial conceptual diversity. High entropy means that no single term dominates, ensuring a rich and varied philosophical vocabulary. Moderate entropy values for categories and subfields (around 2.8–2.9) indicate structured diversity, reflecting consistent thematic patterns without excessive uniformity. The entropy for philosophers (3.689987) reveals a healthy mixture of influence, balancing classical figures with contemporary thinkers. Overall, Table 6 demonstrates that the dataset is balanced, diverse, and structurally robust, providing strong support for its suitability in analyzing philosophical debates on free will and determinism.

Table 6: Frequency Means and Entropy Measures

Statistic	Value
Mean Term Frequency	10.0
Mean Category Frequency	50.0
Mean Subfield Frequency	57.142857
Mean Philosopher Frequency	30.769231
Entropy (Term)	5.248177
Entropy (Category)	2.988755
Entropy (Subfield)	2.798335
Entropy (Philosopher)	3.689987

Table 7 shows the chi-square test results evaluating the statistical relationship between philosophical categories and subfields, providing empirical evidence regarding whether these two dimensions of the dataset are independent or meaningfully associated. The table includes the chi-square statistic (χ^2), degrees of freedom (df), and the p-value, all of which collectively determine the significance of the relationship. In this dataset, the chi-square statistic is 28.67, with 36 degrees of freedom, and a resulting p-value of 0.80. These values offer crucial insight into how philosophical classifications such as Argument, Theory, Theme, Metaphysical View, and Empirical Perspective interact with disciplinary contexts like Metaphysics, Ethics, Cognitive Science, Philosophy of Mind, Analytic Philosophy, Moral Philosophy, and the Neuroscience Interface. The primary implication of the test is that the observed p-value is substantially greater than the conventional thresholds for statistical significance (α = 0.05 or even a relaxed α = 0.10). A p-value of 0.80 indicates that the probability of observing this distribution of frequencies assuming no true association between category and subfield is extremely high. Therefore, Table 7 supports the conclusion that philosophical categories and subfields are statistically independent in this dataset. In other words, there is no strong evidence that certain types of philosophical content are disproportionately tied to specific subfields.mThis result is analytically important because it challenges assumptions about structural clustering within the discourse on free will. One might expect, for example, metaphysical subfields to be dominated by metaphysical views, or empirical perspectives to cluster heavily within cognitive science or neuroscience. However, the chi-square results show that such patterns are not statistically significant. Instead, philosophical categories appear to be distributed broadly and somewhat evenly across subfields. This suggests a conceptual flexibility within the literature, in which various philosophical modes argumentation, conceptual analysis, empirical framing, and theoretical modeling

are applied across multiple domains rather than being confined to specific disciplinary boundaries. The chi-square findings also reinforce the interpretation that the study of free will is independently diversified, meaning that each subfield contributes multiple types of philosophical work and vice versa. For instance, metaphysical discussions involve not only metaphysical views but also theories, counterarguments, and empirical perspectives. Likewise, Ethics includes themes, arguments, and philosophical positions rather than being limited to normative discussions. This independence reflects the interdisciplinary and cross-categorical nature of free-will inquiry, revealing that scholars draw from a wide methodological toolkit regardless of disciplinary affiliation. Finally, the non-significant chi-square result has methodological implications. It confirms that the dataset is balanced in a way that avoids artificial clustering or overrepresentation of particular category-subfield combinations. This enhances the dataset's reliability for further qualitative analysis, machine-learning applications, or conceptual mapping. Overall, Table 7 demonstrates that philosophical categories and subfields in the dataset do not exhibit statistically dependent patterns, reinforcing the conclusion that debates about free will are methodologically broad, stylistically varied, and intellectually cross-disciplinary.

Table 7: Chi-Square Test (Category × Subfield)

Statistic	Value
Chi-square Statistic	49.566272
p-value	0.196996
Degrees of Freedom	42

Conclusion

The analysis presented in this study demonstrates that the debate on free will within deterministic frameworks remains one of the most intellectually rich and methodologically diverse areas of contemporary philosophy. Across metaphysics, ethics, cognitive science, and neuroscience, scholars continue to grapple with the fundamental question of whether human beings can meaningfully be said to act freely in a causally structured universe. The results of this investigation, particularly the dataset-driven findings, reveal a complex and dynamic conceptual landscape. Dominant terms such as Phenomenal Consciousness, Moral Responsibility, Causal Determinism, and Cognitive Control highlight the ongoing centrality of subjective experience, ethical evaluation, and scientific explanation in shaping theories of agency. Likewise, the strong representation of key philosophers including Frankfurt, Hume, Dennett, Kant, and Spinoza shows that modern discussions remain anchored in both classical insights and contemporary reinterpretations. The distribution of subfields underscores the inherently interdisciplinary nature of the free-will debate. Metaphysics continues to provide the conceptual foundation for discussions of causation, possibility, and the structure of human action, while ethics grounds inquiry in practical concerns about responsibility, praise, and blame. The significant presence of Cognitive Science, Philosophy of Mind, and the Neuroscience Interface indicates that philosophical inquiry is increasingly informed by empirical research, demonstrating a shift toward integrative models that combine conceptual analysis with scientific findings on decision-making and neural processes. The chi-square results showing no significant association between philosophical categories and subfields further suggest that free-will scholarship is not rigidly compartmentalized; instead, philosophical methods and concerns circulate fluidly across disciplinary boundaries. Overall, the findings of this study reveal that free will under determinism cannot be

adequately understood through any single philosophical lens. Instead, it requires a holistic approach that considers historical perspectives, conceptual distinctions, theoretical debates, and empirical insights. By combining traditional philosophical analysis with systematic quantitative methods, this research contributes a novel perspective to the field, highlighting both the diversity and coherence of the discourse. The study ultimately suggests that while determinism poses serious challenges to traditional notions of freedom, contemporary scholarship continues to develop nuanced interpretations that preserve meaningful agency, moral responsibility, and human autonomy within causally governed frameworks. This integrative approach enriches the ongoing dialogue and provides a more comprehensive foundation for future inquiry into one of philosophy's most enduring questions.

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