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ARTICLE

Governing AI Bias: Semi-AI, Hexa-Algorithm, and AI Design Council

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Abstract

Human cognitive limitations render algorithmic bias inevitable and persistent across AI design, training, and deployment, shifting the focus from futile eradication to principled governance. This paper proposes Semi-AI—a legislated hybrid framework that integrates technology, ethics, law, society, economics, and ecology—operationalized through a multidisciplinary AI Design Council and Hexa-Algorithm (Ethical Matrix + Hexa-Dimension Metric). The framework systematically balances six dimensions: technical efficacy, financial viability, legal validity, ethical soundness, social acceptability, and ecological sustainability. Post-human disruptions that attribute to technological convergence in AI, biotech, and robotics, where algorithmic bias exacerbate inequities in hybrid entities and scarce resources.

Keywords: AI bias; Semi-AI; Hexa-Algorithm; AI Design Council; Algorithmic Bias; Bias Governance; Principled Stewardship; Ethical Computing; Hexa-dimension Metric; Ethical Matrix

1. INTRODUCTION

AI bias arises inevitably: humans design biased objectives, curate skewed data, and embed cultural priors into models. Human beings are inherently predisposed to bias. As the developers, designers, and trainers of artificial intelligence (AI) systems are human themselves, algorithmic bias emerges as an inevitable corollary. If human bias is embedded in cognition and behaviour, then AI bias may likewise be understood as an unavoidable and thus normalized rather than treated as a contingent defect. The fundamental question, therefore, is not whether bias exists, but how humanity should coexist with it and ethically regulate its effects. A tenable response to this inquiry lies in the conceptualization of Semi-AI—a controlled, bias-minimizing paradigm of artificial intelligence that, given the theoretical implausibility and practical unattainability of bias-free AI, seeks to reduce bias to an ethically tolerable level while preserving the system's technical integrity and operational reliability. Algorithmic bias engenders complex legal and ethical ramifications, rendering the epistemological and normative definition of Semi-AI inherently intricate. Nevertheless, the model aspires to harmonize six constitutive principles: technical efficacy, financial viability, legal validity, ethical soundness, social desirability, and ecological sustainability. Analytical frameworks such as the Hexa-Algorithm that comprises the Ethical Matrix [1] and the Hexa-Dimension Metric [2] provide systematic mechanisms for evaluating these dimensions and their relative interdependencies, enabling structured judgment rather than ad hoc discretion. Conceptually, Semi-AI may be conceived as a form of bricolage — a hybrid construct that interlaces technology, ethics, law, and economics within a unified analytic configuration.

The proliferation of algorithmic bias, rather than the mere presence of AI bias, constitutes the primary focus of concern. This escalation of ethical and legal complexities has manifested with particular acuity in the domain of information security management. As Harari [3] anticipated, a posthuman era inhabited by "sapient bots" replacing or augmenting human agency would engender profound dilemmas surrounding "death-free" and "gender-agnostic" forms of existence, thereby necessitating juridical, ontological, and societal redefinitions of marriage, identity, and access to fundamental resources such as food and air. Concurrently, the digital age has ushered in "alternate realities" (novel epistemic

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environments) that challenge conventional boundaries of perception. Illustratively, I. Lee [4] observes that differing cartographic designations on Google Maps, for example, “East Sea” for South Korean users and “Sea of Japan” for Japanese users, transform geographical boundaries into perceptual constructs contingent upon sociocultural and political relativities.

As AI algorithms attain higher levels of sophistication, their behavioral architectures increasingly emulate human cognitive processes, narrowing the epistemic gap between technological aspiration and anthropomorphic realization. This convergence generates a recursive dilemma: persistent challenges in data protection intensify even as emergent ethical and juridical questions confront computer scientists, ethicists, and jurists. Contemporary advances in machine learning, particularly in image recognition, recommendation systems, and digital advertising, have exposed structural vulnerabilities in social justice, employment, and online engagement. Empirical evidence substantiates the amplification of bias relating to gender, race, and other socio-demographic factors: ProPublica’s investigation exposed racial disparities in criminal justice risk-assessment tools that disadvantaged African American defendants [5]; Amazon discontinued its automated recruitment system after evidence of discrimination against female applicants [6]; and research into advertising-ranking algorithms [7] revealed systematic bias embedded within machine-learning infrastructures.

Regulatory and ethical frameworks designed to mitigate such biases inevitably constrain AI innovation, producing a “capping effect” that limits the extent of technological advancement. This restraint is both normatively justified and pragmatically necessary, mediating the enduring dialectic between human aspiration and computational efficiency. Recognizing “bias by design” as a constitutive condition of AI development, a pragmatic course of action is to refine design, development, and training protocols toward a controlled, bias-minimized system—the Semi-AI paradigm. Yet critical questions remain unresolved: Who determines the regulatory boundaries? By what criteria are the limits of bias minimization defined? To what degree can the qualifier “semi” be operationalized or empirically delimited? The proposed answer is a legislatively mandated AI Design Council tasked with defining enforceable boundaries for bias minimization and shifting the focus from impossible elimination to ethical regulation that preserves technical integrity.

In summary, algorithmic bias—embedded throughout AI design, development, and training—constitutes a normal, intrinsic property of AI systems rather than a flaw, and therefore demands structured governance instead of futile eradication efforts. Human cognitive limitations make AI bias inevitable, catalyzing multidimensional challenges such as sapient-bot personhood, death-free and gender-agnostic existence, and culturally variable realities (e.g., map-label disputes). Biases are amplified across justice and markets—ProPublica’s COMPAS analysis, Amazon’s abandoned hiring tool, and Sweeney’s online advertising study—while the illustrative application of the Hexa-Algorithm to internet ad blocking [8] shows how Semi-AI can calibrate such biases. Given that post-human futures—sapient hybrids, extended lifespans—intensify risks to personhood and justice, the central governance question becomes who is authorized to set “tolerable” bias levels and under what ethical, legal, and social criteria.

2. Semi-AI Governance Framework

AI bias involves systematic unfairness in AI systems arising from human, data, and technical factors, while *Semi-AI* offers a governed alternative through ethical and regulatory integration overseen by an *AI Design Council.*

2.1. AI Bias: Definition and its Inevitability

AI bias manifests as systematic, discriminatory advantages or disadvantages AI systems create for or imposed on individuals or groups. These arise across the socio-technical lifecycle—from biased training data and human cognitive biases in design/deployment, to algorithmic structures like objective functions, feature selections, decision thresholds, and model architectures that yield unfair outcomes even with balanced data.

Though terms like algorithmic bias and machine learning bias are often used interchangeably in popular discourse, a precise distinction holds: AI bias spans the full ecosystem (historic data skews, labeling errors, social contexts, user interfaces), while algorithmic bias isolates the model's internal logic (optimization priorities, feature engineering, loss functions).

Syllogistic Proof of Inevitability:

Premise 1: Humans exhibit innate cognitive and social biases, as empirically established in psychology.

Premise 2: AI emulates human reasoning, thus inheriting biases from designers, trainers, and curators.

Premise 3: Algorithms encode these biases through explicit design objectives and implicit assumptions.

Premise 4: Human-mediated data collection perpetuates dataset imbalances.

Premise 5: Biased inputs, processed at scale, produce systematic unfairness in outputs.

Conclusion: AI bias is an inherent, structural property of current AI paradigms, persisting reliably via the Law of Large Numbers across diverse datasets and implementations.

2.2. Semi-AI: Definition and its Function

Semi-AI constitutes a bricolage framework integrating technology with ethics, law, society, economics, and ecology to render AI governable without sacrificing efficacy, adheres to the Hexa-Dimension Metric's six principles: technical efficiency, financial viability, legal validity, ethical soundness, social acceptability, and ecological sustainability, and is empowered to regulate through legislation:

- Authorized users/deployment conditions
- Blacklisting of high-risk algorithms/entities
- Transparent review processes
- Enforced ethical-legal alignment through design/development

2.3. AI Design Council: Composition and its Power

The AI Design Council, a legislatively mandated of multidisciplinary body (AI specialists, ethicists, cyber-jurists, digital sociologists, and computer scientists), operationalizes Semi-AI through binding, enforceable standards. Its core responsibilities include developing bias-minimization infrastructure, defining operational boundaries across the AI lifecycle, conducting compliance auditing, and executing regulatory enforcement, to institutionalize fairness.

3. Ethical and Legal Issues in a New World

3.1. Can AI Replace Humans?

Harari [3] has postulated a “new world” in which Homo sapiens evolve into hybrid entities, “hum-bots.” Advances in genetic engineering, robotics, artificial intelligence, and digital medicine, driven in part by research communities in places such as Silicon Valley, may ultimately yield a breed of beings, “Robo-man” or “homo-bot”, composed of organic and artificial parts. This prospective transformation resonates strongly with Harari’s broader thesis that technological progress could render Homo sapiens increasingly obsolete in their current form.

3.2. A Fictional Scenario and Sapient-Bots

Consider a fictional vignette set in a pub in Canberra, Australia. Instead of the familiar greetings “How are you, mate?” or “Where are you from?”, an exchange between two apparent strangers may proceed as follows:

“What are you?” (A asks B.)

“Thirty-seventy. And you?” (B replies and asks.)

“Fifty-fifty.” (A answers.)

In this hypothetical future, the numbers express the ratio of real to robotic components within each species: A and B. A is fifty percent human and fifty percent robot; B is thirty percent human and seventy percent robot. These species represent a new breed, which may be termed sapient-bots, that blurs the boundary between biological person and machine. Such a scenario dramatizes the extent to which identity, embodiment, and personhood could shift in a technologically saturated society.

3.3. Death-Free and Gender-Agnostic Existence

In the new world Harari envisioned, social reality tends toward being both death-free and gender-agnostic. It is "death-free" in the sense that future medicine may be capable of repairing pathogenic genes or replacing failing organs with artificial counterparts, potentially eliminating many causes of natural death and thereby exerting immense pressure on global population and resources. It is "gender-agnostic" because biological bodies, including reproductive and sexual organs, may be increasingly supplanted by mechanical or synthetic alternatives, eroding traditional gender distinctions and prompting profound social and legal change.

Old problems would vanish, but new ones would arise. Conventional gender-based disputes, for example, same-sex marriage, could lose their relevance, as gender categories become less salient or even obsolete but as biological kinship and embodiment are reconfigured, the prevailing understanding of the family could be destabilized, and existing matrimonial and family law regimes would require fundamental reconsideration.

3.4. Resource Scarcity and Regulatory Questions

The demand for essential resources such as food, water, and clean air would intensify, possibly shifting economic power from fossil fuels to biospheric resources, triggering new legal and ethical dilemmas and exacerbating distributive justice concerns. This anticipated scarcity of key resources raises urgent normative and regulatory questions:

- As supplies of food and freshwater diminish, what technological, legal, and administrative interventions are feasible, and who should bear responsibility for their implementation?
- If clean air becomes a scarce and marketable resource, should states impose taxes or user charges analogous to water tariffs, and according to which principles of fairness and accountability should such schemes be designed?

These questions move beyond technical feasibility to encompass distributive justice, intergenerational equity, and the proper role of the state in regulating access to life-sustaining goods.

3.5. Humanity, Life, and Family Questions

The emergence of sapient-bots would also destabilize foundational concepts in law, philosophy, and social theory. Among the key questions are:

- What is man – what is a "human being" when biological and mechanical components are seamlessly integrated in a single conscious agent?
- What is life – how should "life" be defined when artificial systems exhibit autonomy, learning, and perhaps forms of consciousness or subjectivity?
- How should matrimonial law adapt to marriages involving sapient-bots, including unions between biological humans, hybrid beings, and entities with no sex organs?
- How should the physical composition and legal status of sapient-bot offspring be determined, especially where genetic, mechanical, and software components all contribute to identity and capacities?

Such questions challenge the orthodox definitions of "husband" and "wife," "parent" and "child," and require legal systems to reconsider long-standing assumptions about kinship, consent, capacity, and personhood.

3.6. Transformative Technologies and Institutional Trust

AI algorithms, empowered by machine learning (ML), function as conductors orchestrating transformative technologies in a synergistic partnership. The Internet of Things (IoT) enables seamless linkage of machines and devices to capture diverse data streams from multiple sources. Big Data handles the storage, supply, and management of vast IoT-generated volumes across varied structures, fueling AI algorithms. Cloud computing (including APIs) ensures rapid deployment, connectivity, and delivery of essential information. Blockchain guarantees data immutability and integrity.

These artificial intelligence-driven technologies are revolutionizing organizational practices in insurance, investment management, and allied industries—for instance, by enabling sophisticated risk modeling, dynamic pricing, and portfolio optimization, which enhance managerial efficiency and performance. Yet they simultaneously engender profound ethical and legal challenges related to algorithmic bias, transparency deficits, and accountability gaps. Trust emerges as the most delicate and central concern when pivotal decisions—like insurance underwriting, credit evaluations, or investment strategies—are consigned to inscrutable algorithms, risking systemic discrimination, diminished public confidence, reputational harm, and broader financial instability.

This prompts a core normative inquiry: To what degree should high-stakes decision-making be delegated to algorithms? Under which conditions do such delegation prove appropriate or legitimate? Resolving this inquiry demands not merely technical mitigations but comprehensive governance architectures, encompassing duties of explanation, rigorous auditability, and mandatory human oversight.

3.7. Autonomous Systems and Responsibility

The ethical and legal dilemmas inherent in artificial intelligence are cogently exemplified by autonomous vehicles. These systems are frequently posited safer and more efficient, based on the claim that a robot-driver—devoid of fatigue or distraction—obeys traffic rules more faithfully than a human-driver, yet when an unavoidable accident occurs—such as choosing between hitting pedestrians or endangering passengers—the attribution of moral culpability and juridical liability is imperative.

Possible bearers of responsibility include:

- The designers and engineers who coded the decision-making algorithms
- The manufacturers who deployed and marketed the vehicles
- The operators or owners who placed the vehicles in service
- Regulatory bodies that set or failed to set appropriate safety and liability standards

Existing legal frameworks, based on principles of human agency and negligence, are ill-equipped to address autonomous decision-making by non-human agents. This is both a technological and philosophical challenge, heightening the imperative for moral reasoning in the evolution of legal and regulatory paradigms.

3.8. Toward New Conceptual and Legal Frameworks

Contemporary scientific and technological developments, particularly in AI and biomedicine, have yielded extraordinary benefits but also introduced unprecedented ethical and legal tensions. Addressing resource depletion, climate deterioration, and the governance of AI-driven systems will require coordinated efforts from scientists, engineers, ethicists, jurists, policymakers, and international organizations. Instruments such as emerging AI governance frameworks and risk-management guidelines are early attempts to articulate principles for responsible innovation, though they often remain non-binding and incomplete.

As sapient-bots and other hybrid entities become conceptually, and perhaps one day practically, possible, the need for revised definitions of “human,” “life,” and “marriage” will become more pressing. Questions concerning rights, duties, and protections for beings that straddle the human–machine divide will confront law, philosophy, social science, and medicine alike. These are not esoteric concerns limited to academic specialists; they implicate the basic terms under which ordinary individuals live, work, form families, and participate in political communities.

3.9. AI Bias and the Case for Semi-AI

AI systems are unavoidably shaped by the data on which they are trained and by the objectives embedded in their design, making some degree of bias effectively inevitable. The goal, therefore, cannot be the complete elimination of bias but its mitigation and transparent management through technical, procedural, and legal safeguards. One proposed response is the development of a more constrained and controlled form of AI, described here as Semi-AI, which emphasizes human–machine collaboration, mandatory human oversight, and robust ethical controls rather than fully autonomous decision-making.

Such an approach aspires to harness the advantages of AI while preserving human responsibility and moral agency. In this emerging landscape, disruptive technologies pose serious risks but also offer opportunities to reimagine law, ethics, and social institutions in ways that better reflect the complex, hybrid world that may lie ahead.

4. Hexa-Algorithm

The ethical issues that arise are typically complex, mutually interacting, and at times countervailing. The Octopus Card case in Hong Kong [9] exemplifies this, as it engaged virtually all major ethical principles, thereby obscuring a holistic, balanced, and defensible assessment of the situation. To address such challenges, the Hexa-Algorithm, a structured analytical tool within Ethical Computing (the practice of Computer Ethics), systematically identifies and articulates the ethical issues involved. This algorithm comprises two primary components: the Ethical Matrix, which provides a holistic view of the ethical dimensions, and the Hexa-dimension Metric, which evaluates the quality and efficacy of actions or decisions by assessing their consequences against six key measures, principles, or requirements.

4.1. Ethical Computing

Ethical Computing is an applicable paradigm of computer ethics aiming to identify and analyze ethical issues emerging from the development and use of computer-based application systems, while formulating balanced solutions. Its primary areas of interest encompass include data privacy, intellectual property, the digital-divide, professionalism, trust, and anonymity. Key methods and tools for ethical analysis include the newly adapted Ethical Matrix and the newly developed Hexa-dimension Metric, which together comprise the Hexa-Algorithm [10].

4.2. Computer Ethics

Computer Ethics, akin to medical ethics, legal ethics, and business ethics, constitutes a branch of applied or professional ethics situated within cyberspace. It has been denoted by various labels, such as sociotechnical ethics, information ethics, digital ethics, and cyberethics. The term Computer Ethics is preferred for several reasons: first, it encompasses the full spectrum of information and communication technology (ICT) in a generic sense [11]; second, the prefix "cyber" is inappropriate, as ICT extends beyond mere control; third, ethical issues originate from the computer itself, regardless of sophisticated infrastructures like the internet and social media; and fourth, most undesirable acts (threats) are impossible without computers.

However, like the term "ethics," no universally agreed definition of Computer Ethics exists, with abundant definitions and perspectives in the literature [11,12]. A representative classic definition is that of James Moor [13]:

Computer Ethics is the analysis of the nature and social impact of information and communication technology, and the corresponding formulation and justification of policies for the ethical use of such technology.

Loosely speaking, Computer Ethics addresses issues from the abuse of computers and their peripherals, though this view proves unsatisfactory. This chapter reiterates the representation of Computer Ethics through the notion of Double Duality, which delineates Dual Function and Dual Mission, as depicted in Figure 1.

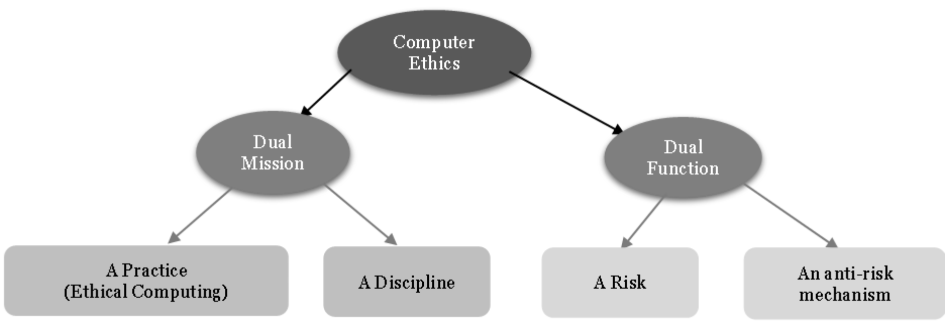

Figure 1. Double Duality [10]

Dual function of computer ethics

Computer Ethics serves a dual function: it acts as both a distinct type of risk and a unique anti-risk mechanism.

A different type of risk: Using computers in violation of ethical principles introduces risks that transcend traditional technical or operational concerns. For instance, assessing software "softlifting" solely through technical access controls risks overlooking harm from the misuse of personal, sensitive information. Similarly, replacing a corporate legacy system with a web-based one might prioritize economic gains like improved speed and reduced headcounts, while neglecting adverse effects such as diminished employee morale and user dissatisfaction due to disrupted routines.

A different kind of anti-risk mechanism: Incorporating ethical checks into risk analysis transforms Computer Ethics into an anti-risk tool. Such analysis can uncover ethical consequences, like reputational damage or societal harm, that traditional audits might miss.

Dual mission of computer ethics

Computer Ethics fulfills a dual mission: its theoretical aspects establish it as an academic discipline, while its practical aspects constitute a professional practice.

An academic discipline: As a specialized field of study, Computer Ethics identifies ethical dilemmas in computing, maps existing ethical theories onto cyberspace phenomena, and develops new theories to address gaps. It examines techno-ethical issues in ICT development and application, investigating how ethical principles impact business and society in computer-based environments, and vice versa. The discipline also refines existing analytical tools and creates new ones to bridge identified shortcomings.

A practice (Ethical Computing): In practice, termed Ethical Computing, it establishes and promotes professional conduct rules and ethical standards. This involves applying analytical tools, developing new ones, and fostering platforms for scholars, practitioners, and stakeholders to share knowledge on moral issues in ICT systems.

4.3. Ethical Matrix

The Ethical Matrix (the Matrix) serves as a decision-support tool that provides a holistic view of the ethical implications of an action or decision. Originally designed to assist decision-makers in evaluating the ethical acceptability and optimal regulatory controls for technologies in food and agriculture [1], it has been adapted for ICT applications.

Elements of the Matrix

The columns represent prima facie ethical principles or values relevant to the stakeholders or interest groups involved in the issue. The number of columns varies by application. Rows correspond to stakeholders—human or non-human entities affected by the decision—such as customers, providers and employees, organizations, communities, animals, and the environment. Cells articulate each stakeholder's main criterion or objective aligned with a given principle; some cells may remain empty if a stakeholder has no concern for a specific principle.

The Ethical Matrix Algorithm [14]

Quantification: A common method is to assign scores from -2 (very bad) to 0 (neutral) to +2 (very good). However, the Matrix primarily identifies ethical issues rather than quantifying impacts on principles. Scores act as qualitative indicators: principles in cells may be respected (positive score) or infringed (negative score), with the duty "not to harm" often overriding "do good," alongside varying positive and negative effects per principle.

Limitations of Simple Scoring: The Matrix does not determine overall ethical acceptability, as decision-makers may weight principles and evidence differently; thus, summing scores yields no reliable conclusion on technology acceptability [1]. Instead, adapting the Pugh method [15] provides a structured alternative through weighting scales and procedures.

Definition of the indicators*:*

I-weight: Importance of a principle to the issue being considered (weight of each principle showing its importance to issue being considered)

D-weight: Degree of respect a stakeholder attaches to a principle (weight of each stakeholder showing the degree of respect that stakeholder attach to a principle)

S-stakeholder: Sum of weights for the s^{th} stakeholder ($\sum s$, s = 1 to number of stakeholders)

S-principle: Sum of weights for the t^{ph} principle ($\sum p$, p = 1 to number of principles)

The procedure for using the Ethical Matrix (seven steps).

1. Assemble the *Group*: Gather participants (ideally four for practicality) to review the case and grasp the ethical issues involved; these are the users or decision-makers
2. Identify stakeholders: Determine individuals or organizations affected by the action or decision (interest groups).
3. Determine the principles: Deliberate on and select relevant prima facie ethical principles
4. Fill the cells: Use debate or the Delphi method to articulate stakeholder concerns with respect to each principle
5. Assign weights: Estimate and assign I-weight (a principle's importance) and D-weight (stakeholder respect for principle) on a scale from 0 (unimportant) to 5 (very important)
6. Calculate sums: Multiply I-weight by D-weight, then sum products for each stakeholder (S-stakeholder) and principle (S-principle)
7. Interpret results: Use S-stakeholder and S-principle gain an indicative sense of the final decision.

This procedure allows users to identify stakeholders and valued principles, document ethical impacts per stakeholder-principle pair, and weigh issue importance by potential impact on interests. Through discussion and debate, participants express views to reach consensus on how options affect stakeholder wellbeing, autonomy, and justice.

Illustration of the Ethical Matrix Algorithm

Steps 1 and 2: For this illustration, assume the group consists of four members, four stakeholders (interest groups), and three principles: wellbeing, autonomy, and justice. Table 1 illustrates the structure of an Ethical Matrix.

Table 1. An Ethical Matrix

Stakeholders \ Respect for	Wellbeing	Autonomy	Justice
Interest Group 1	Cell (1,1)	Cell (1,2)	Cell (1,3)
Interest Group 2	Cell (2,1)	Cell (2,2)	Cell (2,3)
Interest Group 3	Cell (3,1)	Cell (3,2)	Cell (3,3)
Interest Group 4	Cell (4,1)	Cell (4,2)	Cell (4,3)

Steps 3, 4, and 5: In this hypothetical case, assume the group emphasizes justice particularly, with relatively less focus on wellbeing and autonomy (see Table 2 for I-weight values). D-weights vary: Interest Group 1 views all three principles as equally and very important; the others reflect differing degrees of importance per principle; and Interest Group 4 disregards justice entirely (Table 3).

Table 2. I-weight

Principles	Wellbeing	Autonomy	Justice
I-weights	4	3	5

Table 3. D-weight

Stakeholders \ Respect for	Wellbeing	Autonomy	Justice
Interest Group 1	5	5	5
Interest Group 2	5	3	2
Interest Group 3	4	4	5
Interest Group 4	2	3	0

Step 6: Multiply the I-weight and D-weight and sum the products for stakeholders and principles (Table 4).

Table 4. Products (I-weight x D-weight) and Sums

Stakeholders \ Respect for	Wellbeing	Autonomy	Justice	$\sum_{stakeholder}$
Interest Group 1	4 x 5 = 20	3 x 5 = 15	5 x 5 = 25	60
Interest Group 2	4 x 5 = 20	3 x 3 = 9	5 x 2 = 10	39
Interest Group 3	4 x 4 = 16	3 x 4 = 12	5 x 5 = 25	53
Interest Group 4	4 x 2 = 8	3 x 3 = 9	5 x 0 = 0	17
$\sum_{principle}$	64	45	60	

Step 7: In conclusion, after completing steps 1–6, the S-stakeholder sums recommend prioritizing Interest Group 1 (60), followed by Interest Group 3 (53), Interest Group 2 (39), and Interest Group 4 (17). The S-principle sums highlight wellbeing (64) as a key focus. This suggests the company allocate resources based on risk severity to interest groups, invest in staff development or client education (depending on the issue), and promote policies enforcing justice and fair dealings, reflecting stakeholders' collective views.

4.4. Hexa-dimension Metric

The Hexa-dimension Metric, originally conceived to supplement orthodox doctrines, serves as a checklist to measure the quality and efficacy of actions or decisions against six key measures, principles, or requirements. It facilitates balancing justifiable returns on substantial investments with optimal utilization of costly technologies, while assessing success in financial and technical terms and mitigating legal, ethical (e.g., from information abuse), and social issues (e.g., unequal benefits). Versatile in application, it adapts to diverse fields for decision-making or dispute resolution, as demonstrated in ICT ethical analysis (e.g., the USB case).

Limitations of the extant decision-making models

The most prominent limitation of existing decision models, such as the Simon Model, lies in their assumption of rational decision-makers, despite humans being inherently irrational. Human biases and egoism (universal traits) influence decisions variably based on environment, circumstances, mental state, and impulses.

These models primarily measure variables in technical, economic, and legal terms, emphasizing quantitative, tangible efficiency. They seek to "select the alternative, among those available, which will lead to the most complete achievement of your goals" [16], relying on profit-loss analysis [17] and risk assessment via [18,19] metrics like ROI, NPV, and payback period. Effective solutions, however, must extend to ethical, social, and ecological concerns.

Another inherent weakness is that individuals may render different decisions depending on whether choices are personal or impersonal, or made as private versus corporate persons. Corporate decisions diverge from personal ones, prioritizing organizational intent over individual needs[20]. Consequently, policies and codes of conduct remain technically and financially oriented, inadequate for post-implementation ethical and social issues IT professionals encounter daily.

Finally, risk misinterpretation exacerbates limitations. Professionals in science and technology, shaped by flawed curricula, equate risk with physical destruction or legal damage, overlooking ethical risk from principal violations. Decision formulation requires expansion to include ethical, social, and ecological variables alongside technical, economic, and legal ones in today's technology-driven environment.

The six principles/measures

Technical efficiency. Ensure optimized use of up-to-date technologies to meet targets efficiently, aligning with investment goals.

Financial viability. Justify technology investments by aligning actions with corporate performance metrics, risk standards, and expert financial advice, as measured by Return on Investment (ROI) and Net Present Value (NPV).

Legal validity. Compliance with current laws, organizational rules, and conventions (as guided by corporate counsel) forms a foundational principle of business practice.

Ethical acceptance. Actions must align with core ethical principles of duty and reciprocity, enforced through public relations and human resource policies.

Social desirability. Extend ethical acceptance by ensuring equitable benefits for shareholders and the public, incorporating local cultural considerations — Decision-makers must verify public benefit via surveys, adhere to utilitarianism and consequentialism, and safeguard data from abuse.

Ecological sustainability. Since technologies consume resources (electricity, water, paper) and generate pollution (air, noise, radiation) — contributing to climate change — organizations must implement energy-saving measures, pollution controls, and emission standards to protect the environment.

The Hexa-dimension Metric Algorithm [14]

Definition of the variables:

Coefficient of Success (β). The Coefficient serves as an indicator and predictor of the degree to which a desirable outcome, action, policy, or solution is achieved or achievable. For reference, levels of success are tabulated below for standardized measurement.

Degree of Success	Unacceptable	Marginal	Passable	Acceptable
B-value	0 - .0.3	0.4	0.5 - 0.7	≥ 0.8

Standard Coefficient of Success (β_s). This is the coefficient of a desirable solution derived under ideal condition, that is, the principles are of equal importance, and serves as a reference standard. It is derived, with $\lambda = 6$, $R_s = 5$, $S_s = 1$, and $\forall i\ R_i = 5$ and $S_i = 100\%$ or 1, and $\varepsilon = 0$, as follows.

The W_β Equation.

$\beta = \{\sum [(R_i/R_s) + \varepsilon] + [S_i \text{ x } S_s]\}/ 2\lambda$, $i = 1, \ldots, \lambda$

$\beta_s = \{\sum [(R_i/R_s) + \varepsilon] + [S_i \text{ x } S_s]\}/2\lambda = \{\sum [(5/5) + 0] + [1 \text{ x } 1]\}/12 = 1$

R-weight = the rank or importance (of the attribute or principle [wellbeing, etc.] with respect to the case under study), 1, …, 5 (least to most important) (R_i, $i = 1, \ldots, \lambda$)

Rs (Standard R-weight, in ideal state, all attributes are of equal rank or importance ∀i) = 5

S-weight = the level (%) of satisfaction (of the stakeholders' expectation the action meets) (100%, …, 0%) (Si, $i = 1, \ldots, \lambda$)

Ss (standard S-weight, in ideal state, ∀i Si = 100%) = 1

$\lambda = 1, \ldots, 6$, depending on the number of attributes (principles/measures) pertinent to the issues under consideration. For example, $\lambda = 6$ if all six principles/measures are applicable.

i ranges from 1 to λ

ε is a normalization constant (normally zero)

The procedure for applying the Hexa-Dimension Metric (five steps).

1. Assemble the Group, i.e., the parties in participating in determining the measure of the quality of the decision or action
2. Determine the λ-value, λ = 1, …, 6, depending on the number of attributes (principles/measures) (assuming having successfully fulfilled all management requirements)
3. Estimate and assign the R-weight (1, …, 5 [least to most important], R_i, $i = 1, \ldots, \lambda$; $\forall i\ R_s = 5$), and the S-weight (100%, …, 0%, S_i, $i = 1, \ldots, \lambda$; $\forall i\ S_s = 1$)
4. Compute β_p and βa using the W_β-Equation:
   $\beta = \{\sum [(R_i/R_s) + \varepsilon] + [S_i \text{ x } S_s]\}/ 2\lambda$, $i = 1, \ldots, \lambda$;
   where ε is a normalization constant (normally zero)
5. Draw conclusion

Illustration of the Hexa-dimension Metric Algorithm.

Step 1. A group of three consultants is assembled to evaluate a policy a company plans to enforce.

Step 2. The group determines all six principles apply ($\lambda = 6$)

Step 3: The group assigns unequal R-weights (ranks) and estimates varying S-weights (satisfaction levels %), as shown in Table 5.

Table 5. Specifics of a hypothetical case for illustration

Attributes	R-weight (Rank/Importance)	S-weight (Satisfaction Level)	
		Planned	Actual or estimated
Legal validity	4	100%	80%
Ethical acceptability	3	80%	100%
Social desirability	4	60%	80%
Technical efficiency	1	100%	60%
Ecological sustainability	5	50%	50%
Financial viability	1	100%	50%

Step 4. Compute β_p (planned satisfaction coefficient) and β_a (estimated pre-action or actual post-action coefficient).

β_p = {[4/5+0]+[1x1]+[3/5+0]+[0.8x1] + [4/5+0]+[0.6x1] + [1/5+0]+[1x1] + [5/5+0]+[0.5x1] + [1/5+0]+[1x1]}/12 = 0.68

β_a = {[4/5+0]+[0.8x1]+[3/5+0]+[1x1]+[4/5+0]+[0.8x1]+[1/5+0]+[0.6x1] + [5/5+0]+[0.5x1] + [1/5+0]+[0.5x1]}/12 = 0.65

Step 5: The planned (β_p = 0.68) and actual (β_a = 0.65) coefficients are close but indicate only a slightly better-than-average chance of success. Decision-makers should review/revise plans or prepare defenses.

5. Application

This section illustrates the application of the Hexa-Algorithm to the USB Dilemma-taking a USB drive home from work.

While taking minor items like a pen is commonplace and often overlooked, removing a USB drive is far more serious. It constitutes company property, and doing so violates rules and regulations. Leaving it in place risks physical damage or loss, and since it may contain proprietary or unencrypted data, this could breach privacy policies, leading to severe consequences such as lawsuits, reputational damage, eroded trust, and legal liabilities.

The Story

One afternoon, Alex hurriedly took a USB drive when leaving the office in Causeway Bay to attend an evening seminar in downtown Central, planning to continue his assigned project at home afterward. Alice accidentally witnessed this while passing Alex's office en-route to the staff pantry.

***Complication*:**

- Alex and Alice had been steadily dating for nearly two years.
- Betty (the boss) recommended Alex's promotion just last week.
- The USB contains classified information, forbidden by company rules to leave premises.
- The USB is unencrypted.

***Dilemmas*:**

- For Alice: Report the incident or stay silent?
- For Alex: Pretend ignorance of rules, confess, or defend by claiming the intent was to boost productivity by working from home?
- For Betty (if informed by Alice): Reprimand Alex, dismiss the report, or take another course?

Key Concerns:

- Loyalty (between Alex and Alice and to the company)
- Professionalism (both Alex and Alice regard themselves as IT professionals)
- Alex's pending promotion (shared concern for Betty, Alex, Alice and the team)
- Upholding company welfare, protecting company property
- Observing data privacy policy

Applying the Ethical Matrix Algorithm

Step 1. A hypothetical group of four decision-makers assembles to analyze ethical issues in the USB case.

Step 2. The group identifies four stakeholders: Alex, Alice, Betty, and the Team.

Step 3. The Group determines three principle that Alex respects: deontology, utilitarianism, and consequentialism.

Step 4. The Group articulates ethical concerns for each stakeholder-principle pair (Table 6).

Table 6. The first-cut results

Respect for / Stakeholders	Deontology	Utilitarianism	Consequentialism
Alex	productivity	promotion	data protection
Alice	loyalty to Alex, company, professionalism	Alex's promotion	violation of data privacy policy

Betty	firm's welfare & property	her recommendation of Alex's promotion	data leaking
The team	team spirit & morale	promotion opportunity, fairness of treatment	data privacy

Step 5. The group deems all three principles equally important and very relevant to the issue (USB removal ethics), assigning I-weight = 5 for each. Alex views them as equally critical (D-weight = 5), while others receive varying D-weights reflecting differing priorities per principle (Table 7).

Table 7. D-weight

Respect for / Stakeholders	Deontology	Utilitarianism	Consequentialism
Alex	5	5	5
Alice	3	3	5
Betty	4	4	5
The team	2	3	1

Step 6. Multiply I-weight by D-weight for cells, then sum products for stakeholders (S-stakeholder) and principles (S-principle) (Table 8)

Table 8. Products (D-weight x I-weight) and Sums

Respect for / Stakeholders	Deontology	Utilitarianism	Consequentialism	$\sum_{stakeholder}$
Alex	5 x 5 = 25	5 x 5 = 25	5 x 5 = 25	75
Alice	5 x 3 = 15	5 x 3 = 15	5 x 5 = 25	55
Betty	5 x 4 = 20	5 x 4 = 20	5 x 5 = 25	65
The team	5 x 2 = 10	5 x 3 = 15	5 x 1 = 5	30
$\sum_{principle}$	70	75	80	

Step 7. In conclusion, S-stakeholder sums indicate Alex as diligent, conscientious, and dutiful in prioritizing time optimization, company service, and deadlines. Alice (his girlfriend) worries most about his fate; Betty (with decision authority) may feel ethically outmatched by Alex's score; and the Team adopts an impersonal stance. All fear consequences like a suppressive regime if Alex faces dismissal or mistreatment. The lesson: the company should promote its code of conduct or establish one if absent.

Applying the Hexa-Dimension Metric Algorithm.

Step 1. The hypothetical group consists of four decision makers (the Group) to participate in carrying out the analysis of ethical issues in the case of taking home a USB from work.

Step 2. The Group concludes that Alex's action has no bearing on climate change nor financial implications and does not have any effect on the technological effectiveness. Thus, $\lambda = 3$ (Table 9)

Table 9. Hexa-dimension Metric

The measures	Verdicts of Alex's action	Check
Financial viability	Taking a USB home involves no obvious financial issues except a possibly indirect contribution to the company's overall productivity	n. a.
Technical effectiveness	Yes – the use of the USB is maximized and Alex's productive time is optimized	n. a.
Legal validity	No prima facie evidence of illegal action except violation of the company's information security regulations	√
Ethical acceptability	Yes – in deontic terms, Alex is beyond call for duty; in consequentialist terms, he turns in a complete assignment in time	√
Social desirability	Yes – the team would be happy to see a diligent colleague	√
Ecological sustainability	Not an ecology issue	n. a.

Step 3. The Group goes on to assign the R-weighs and S-weights as shown in Tables 10.

Table 10. The R-weight and S-weight assigned by the Group

Attributes	R-weight (Rank/Importance)	S-weight (Satisfaction Level)	
		Planned	Actual or estimated
Legally valid	5	100%	80%
Ethically acceptable	5	80%	100%
Socially desirable	5	60%	80%

Step 4. Given $\lambda = 3$, $\varepsilon = 0$, $I_s = 5$, $S_s = 1$, and $\beta = \{\sum [(R_i/R_s) + \varepsilon] + [S_i \times S_s]\}/ 2\lambda$, $i = 1, \ldots, \lambda$,

β_p = {[5/5+0]+[1x1]+[5/5+0]+[0.8x1]+[5/5+0]+[0.6x1]}/6 = 5.4/6 = 0.90

β_a = {[5/5+0]+[0.8x1]+[5/5+0]+[1x1]+[5/5+0]+[0.8x1]}/6 = 5.6/6 = 0.93

Step 5. In conclusion, the β values of Alex's planned (0.90) and actual (0.93) actions are nearly identical and approach a desirable solution. Thus, Alex has done the right thing right.

6. Conclusion

This paper reconceptualizes algorithmic bias—from defect to intrinsic, irreparable feature of AI systems, rooted in human cognitive limitations across design, development, training, and deployment—demanding structured governance over futile eradication.

Core Innovation

Semi-AI normalizes bias as an ethical decision point, systematically evaluated through the Hexa-Algorithm (adapted Ethical Matrix + novel Hexa-Dimension Metric) and governed by a multidisciplinary AI Design Council establishing enforceable thresholds. This paradigm shifts from unattainable neutrality to principled stewardship across six dimensions: technological effectiveness, ethical soundness, legal validity, social desirability, financial sustainability, and ecological responsibility.

Transformative Implications

The integrated framework—Semi-AI (governed hybrid), Hexa-Algorithm (analytical tool), AI Design Council (enforcement body)—enables controlled AI advancement amid emerging realities—sapient bots, death-free existences, and gender-agnostic entities—harmonizing AI innovation with moral, legal, and societal imperatives.

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