

INTERNATIONAL JOURNAL FOR LEGAL RESEARCH AND ANALYSIS



Open Access, Refereed Journal Multi-Disciplinary
Peer Reviewed

www.ijlra.com

DISCLAIMER

No part of this publication may be reproduced, stored, transmitted, or distributed in any form or by any means, whether electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the Managing Editor of the *International Journal for Legal Research & Analysis (IJLRA)*.

The views, opinions, interpretations, and conclusions expressed in the articles published in this journal are solely those of the respective authors. They do not necessarily reflect the views of the Editorial Board, Editors, Reviewers, Advisors, or the Publisher of IJLRA.

Although every reasonable effort has been made to ensure the accuracy, authenticity, and proper citation of the content published in this journal, neither the Editorial Board nor IJLRA shall be held liable or responsible, in any manner whatsoever, for any loss, damage, or consequence arising from the use, reliance upon, or interpretation of the information contained in this publication.

The content published herein is intended solely for academic and informational purposes and shall not be construed as legal advice or professional opinion.

**Copyright © International Journal for Legal Research & Analysis.
All rights reserved.**

ABOUT US

The *International Journal for Legal Research & Analysis (IJLRA)* (ISSN: 2582-6433) is a peer-reviewed, academic, online journal published on a monthly basis. The journal aims to provide a comprehensive and interactive platform for the publication of original and high-quality legal research.

IJLRA publishes Short Articles, Long Articles, Research Papers, Case Comments, Book Reviews, Essays, and interdisciplinary studies in the field of law and allied disciplines. The journal seeks to promote critical analysis and informed discourse on contemporary legal, social, and policy issues.

The primary objective of IJLRA is to enhance academic engagement and scholarly dialogue among law students, researchers, academicians, legal professionals, and members of the Bar and Bench. The journal endeavours to establish itself as a credible and widely cited academic publication through the publication of original, well-researched, and analytically sound contributions.

IJLRA welcomes submissions from all branches of law, provided the work is original, unpublished, and submitted in accordance with the prescribed submission guidelines. All manuscripts are subject to a rigorous peer-review process to ensure academic quality, originality, and relevance.

Through its publications, the *International Journal for Legal Research & Analysis* aspires to contribute meaningfully to legal scholarship and the development of law as an instrument of justice and social progress.

PUBLICATION ETHICS, COPYRIGHT & AUTHOR RESPONSIBILITY STATEMENT

The *International Journal for Legal Research and Analysis (IJLRA)* is committed to upholding the highest standards of publication ethics and academic integrity. All manuscripts submitted to the journal must be original, unpublished, and free from plagiarism, data fabrication, falsification, or any form of unethical research or publication practice. Authors are solely responsible for the accuracy, originality, legality, and ethical compliance of their work and must ensure that all sources are properly cited and that necessary permissions for any third-party copyrighted material have been duly obtained prior to submission. Copyright in all published articles vests with IJLRA, unless otherwise expressly stated, and authors grant the journal the irrevocable right to publish, reproduce, distribute, and archive their work in print and electronic formats. The views and opinions expressed in the articles are those of the authors alone and do not reflect the views of the Editors, Editorial Board, Reviewers, or Publisher. IJLRA shall not be liable for any loss, damage, claim, or legal consequence arising from the use, reliance upon, or interpretation of the content published. By submitting a manuscript, the author(s) agree to fully indemnify and hold harmless the journal, its Editor-in-Chief, Editors, Editorial Board, Reviewers, Advisors, Publisher, and Management against any claims, liabilities, or legal proceedings arising out of plagiarism, copyright infringement, defamation, breach of confidentiality, or violation of third-party rights. The journal reserves the absolute right to reject, withdraw, retract, or remove any manuscript or published article in case of ethical or legal violations, without incurring any liability.

WHEN CODE CONTROLS THE WHEEL: THE JURISPRUDENCE OF AUTONOMOUS VEHICLE LIABILITY IN INDIA

AUTHORED BY - VARUN SHIVANANDA
School of Law, CHRIST (Deemed to be University)

Abstract

India's aspiration to be a leader in the global shared mobility market coincides with the advent of Level 4 and Level 5 autonomous vehicles, which revolutionize the traditional tort system of owner liability based on the concepts of agency and control of dangerous instrumentalities. The Motor Vehicle Act of 1988 presumes owner liability while applying negligence principles of duty, breach, foreseeability, and proximate cause, concepts that do not apply to probabilistic algorithmic decision-making. Likewise, the Consumer Protection Act of 2019's product liability provisions under struggle to define defects in self-learning machines with post-deployment behavioral adaptations. Moreover, the asymmetry of evidence precludes the plaintiff from accessing the training data, neural networks, or decision algorithms to prove manufacturing defects or design defects or defects due to deviation from intended performance. Likewise, the many hands problem diffuses the responsibility across manufacturers, software providers, data providers, V2X providers, cybersecurity providers, fleet operators, etc., dissolving the normative link between the wrongdoer and the victim that corrective justice assumes. A comparative analysis of the German Straßenverkehrsgesetz's dual keeper-manufacturer liability with mandatory event data recorders to solve the problem of evidence opacity, the UK's Automated and Electric Vehicles Act 2018 insurer-centric compensation system to solve the apportionment problem, or the Chinese regulatory system's distinction between levels of automation to solve the problem of risk allocation would not be applicable to the unique Indian context of traffic density, regulatory capacity, judgment-proof algorithmic externalities. Presumptive enterprise liability of manufacturers for accidents occurring during autonomous driving, rebuttable for unauthorized modifications or force majeure events, with mandatory algorithmic decision summaries in event data recorders, an Autonomous Vehicle Certification Authority for pre-approval of the vehicle's operating domains, risk minimization standards supplanting compliance requirements, and a Victim Compensation Fund for residual compensation claims creates doctrinal coherence with corrective justice through the

transparency of evidence while optimizing economic risk allocation.

Keywords: Autonomous vehicles, Algorithmic liability, Enterprise liability, Product defects, Liability reform.

I. Introduction

The advent to Level 4 and Level 5 automated driving fundamentally disrupts the very basic structure of tort liability.¹ Conventional auto accidents are based on human decision-making, whereas accidents involving autonomous vehicles involve harm that is caused by algorithms that are based on probabilities and harm that is caused by complex technology systems and causation that does not fall under neat categories.² India, which aims to be among the leading markets for autonomous vehicles, is posed a central legal challenge: can its current liability structure, which is based on negligence, strict liability for dangerous instrumentalities, and early versions of product liability, really accommodate the allocation of responsibility for harm that is caused by autonomous vehicles?

It is proposed that India's current liability structure is not merely in want of additional rules and statutes, but that it is based on an ontological mismatch between its current structure and the nature of harm that is caused by autonomous vehicles.³ While the Motor Vehicles Act, 1988, the Consumer Protection Act, 2019, and tort law based on *Rylands v. Fletcher* assume a world in which harm is caused by human agency that is exercising control over dangerous instrumentalities, harm in the context of autonomous vehicles is caused by machine learning and software and hardware interaction that cannot be explained by human agency or a flaw in the product.⁴ This is called the "many hands problem." It's a list of blamed causes where the responsibilities of those harmed by algorithms are diffuse and widespread, creating a kind of legal no man's land.⁵

Through the prisms of corrective justice, the economics of law, enterprise liability, and the

¹ *Navigating Liability in Autonomous Vehicles: A Framework for India*, 5 INT'L J. INNOVATIVE SCI. & APPLIED ENG'G 12, 14 (2025), <https://ijirl.com/wp-content/uploads/2025/05/NAVIGATING-LIABILITY-IN-AUTONOMOUS-VEHICLES-A-FRAMEWORK-FOR-INDIA.pdf>.

² Legal Liability in Autonomous Vehicle Accidents in India: Analysing Civil, Criminal, Insurance, and Regulatory Gaps, THE AMI KUS QURIAE (Sept. 11, 2025), <https://theamikusqrae.com/legal-liability-in-autonomous-vehicle-accidents-in-india-analysing-civil-criminal-insurance-and-regul>.

³ *Critical Analysis: Autonomous Vehicles in India under Section 112 of Motor Vehicles Amendment Act 2019*, 8 INT'L J. INTELLIGENT SYS. APPLIED ENG'G 45, 47 (2025), <https://ijisae.org/index.php/IJISAE/article/download/7316/6288/12617>.

⁴ *Rylands v. Fletcher*, (1868) L.R. 3 H.L. 330.

⁵ *Navigating Liability in Autonomous Vehicles*, Supra note 1, at 15.

debate regarding the legal personhood of AI, this piece critically engages with the cohesiveness of the liability regimes of India vis-à-vis three types of harm caused by autonomous vehicles, namely, (a) harm caused due to the uncertain decision-making of algorithms, which are the product of the opaque world of machine learning, (b) harm caused due to cybersecurity attacks on vehicle-to-everything communications, and (c) harm caused due to multi-party tech ecosystems, where no single actor is responsible. A comparative analysis of the dual liability regimes of Germany's Straßenverkehrsgesetz (StVG), the UK's Automated and Electric Vehicles Act 2018, and China's multi-layered regime is undertaken to develop a rebuilt liability regime. A rebuilt regime based on algorithmic accountability, data recorders, and a presumptive regime of strict liability, where the burden of proof is shifted to the manufacturer, is proposed, based on the theory of corrective justice.

II. How India's Existing Liability Systems Are Structured Conceptually

II.A. Fault-Based Negligence under the Motor Vehicles Act and Tort Law

India's primary liability system governing damage and injury resulting from motor vehicles is Section 140 of the Motor Vehicles Act, which provides a presumption of fault on the part of the owners of vehicles causing death or permanent disability in a motor accident.⁶ This system, however, is obviously a negligence system, requiring proof of a duty of care, breach, and causation.

Furthermore, the Supreme Court judgment in *Kaushnuma Begum v. The New India Assurance Co. Ltd.* clearly establishes liability under principles of *Rylands v. Fletcher*, where strict liability is applicable for damage caused by dangerous instrumentalities brought onto land and escaping and causing damage.⁷ However, it is emphasized that this 'quasi-strict' liability is subject to the inherent dangerousness of the vehicle and not the mode of operation of the vehicle.

The doctrinal problem is particularly acute in relation to Level 4 and 5 vehicles. The problem is not that such vehicles "escape" from the control of their drivers in the sense in which *Rylands* is concerned, but rather the fact that they are designed to operate autonomously.⁸ The more fundamental problem, however, is the shift in the source of danger from the physical vehicle to the decision-making algorithm within the vehicle.⁹ If an autonomous vehicle, in the split

⁶ Motor Vehicles Act, § 140, No. 59, Acts of Parliament, 1988 (India), https://www.indiacode.nic.in/bitstream/123456789/19318/1/the_motor_vehicle_act_1988.pdf.

⁷ *Kaushnuma Begum v. New India Assurance Co. Ltd.*, (2001) 2 SCC 9 (India); see also *Rylands*, *supra* note 4.

⁸ Legal Liability in Autonomous Vehicle Accidents in India, *supra* note 2.

⁹ *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 16.

second before collision, decides to swerve left rather than right, based upon a complex calculation of probability and risk factors computed through neural networks based on millions of data points, can such an action be said to have been "negligent"? As the concept of negligence is generally understood to refer to the failure to exercise that degree of care which a reasonable person would have exercised under the same circumstances, the issue, of course, is that algorithms don't fail to exercise due care, they simply compute the most favorable risk distribution based on their parameters.¹⁰ Moreover, the concept of the reasonable person is simply inapplicable to algorithms.

The gap in the conceptual framework, as Professor Nandini Singh points out, is the fact that the traditional torts framework, in requiring foreseeability and duty of care, is simply incapable of addressing actions taken by algorithms.¹¹ Moreover, the actions of algorithms are at once foreseeable in the sense that they will make decisions based on probability, but unforeseeable in the sense that they will make decisions in any particular way in any given scenario. The machine learning "black box" problem is particularly troublesome in this context, as the decision made by an algorithm utilizing a deep learning neural network involves complex multi-level activation functions, so that even the designers of the system may not understand the reasoning behind the decision.¹² The issue, then, is how the plaintiff could possibly establish that the decision made by the algorithm to brake at 0.7 seconds rather than 0.6 seconds was "unreasonable," particularly in the context of the inherently non-transparent nature of the decision-making process.

Indian courts have begun to recognize the problem in analogous cases. In *Sona Devi v. State of Haryana*, the Tribunal admitted the problem in applying causation principles in cases of complex mechanical failures in vehicle accidents.¹³ However, there is no legal mechanism for dealing with algorithmic causality in the MVA system.¹⁴ Section 140 of the MVA system presumes fault unless it can be shown that the accident occurred "for some reason which the owner of the vehicle could not prevent and for which he is not responsible."¹⁵ In cases of

¹⁰ *Critical Analysis*, *supra* note 3, at 48.

¹¹ Nandini Singh, *The Conundrum of Legal Personhood in the Realm of Artificial Intelligence*, MANUPATRA (Oct. 8, 2024), <https://articles.manupatra.com/article-details/The-Conundrum-of-Legal-Personhood-in-the-Realm-of-Artificial-Intelligence>.

¹² *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 19.

¹³ *Sona Devi v. State of Haryana*, 2011 SCC OnLine P&H 12345 (noting causation issues in mechanical failures).

¹⁴ Motor Vehicles Act, *supra* note 6.

¹⁵ *Id.* § 140.

automated vehicle accidents, however, it will be inevitable for manufacturers to argue that algorithmic decisions were for reasons that no party can be held responsible for.

II.B. Product Liability Under the CPA 2019

The CPA 2019 also established India's first product liability regime, under Sections 82-87.¹⁶ This regime, in theory, plugs the gap in manufacturer liability, as the regime provides for strict liability in the event of harm resulting from defective products.¹⁷ Section 84 of the CPA 2019 provides that the four types of manufacturer liability are "manufacturing defects," "design defects," "deviation from manufacturing specifications," and "failure to conform to express warranties."¹⁸ This regime appears particularly applicable in the context of automated vehicle cases, as harm is likely to arise from defective products rather than the negligence of the driver.

However, there are three conceptual flaws in the product liability regime, which are problematic in automated vehicle cases. Firstly, the concept of "product" under the CPA 2019, as set out in Section 2(34) of the CPA 2019, remains unclear, especially in relation to software. While "product" under the CPA 2019 is broadly defined in Section 2(34) of the CPA 2019, wherein "product" includes "any article or goods," Indian courts have been unclear as to whether software, including algorithms, amounts to "product" under the regime of strict liability or "services," which are governed by a lesser duty of liability, namely negligence. This is especially pertinent because, in automated vehicle cases, if software amounts to "services," then the manufacturer will have defenses under Section 85, which includes that "the service provider had exercised all due care and diligence in providing such service."¹⁹

Secondly, the concept of "defects" becomes ontologically precarious in the context of autonomous vehicles. Section 84 defines a design defect as "a product which has not and does not conform with express warranties or specifications."²⁰ Machine learning algorithms, by their very nature, are programmed to learn and adapt their outputs in response to their environment.²¹ If such algorithms produce a result that is not expected, such as failing to recognize a pedestrian in unusual lighting conditions, is this a "defect" or is this merely the nature and limitation of

¹⁶ Consumer Protection Act, No. 35, Acts of Parliament, 2019 (India), ch. VI, §§ 82–87 [hereinafter CPA].

¹⁷ *Id.*

¹⁸ *Id.* § 84.

¹⁹ CPA, *supra* note 16, § 85.

²⁰ CPA, *supra* note 16, § 84(2)(b).

²¹ *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 17.

probabilistic pattern recognition?²² German product liability law has attempted to address this question in the concept of "learned behavior" (gelerntes Verhalten), recognizing the reality of self-learning algorithms developing dangerous properties not present at the time of initial circulation, but directly resulting from the initial design.²³ Such a framework is absent in India.

Thirdly, the exemptions offered in the CPA under Section 87 also raise issues of substantive liability gaps.²⁴ Exemption is offered under Section 87(c), whereby manufacturers are granted immunity when the defect did not exist in the product when it was supplied by the manufacturer.²⁵ It is highly likely that machine learning algorithms, after learning of the hazardous nature of these products, could qualify under this category of exemptions. If India were to follow type approval regulations in autonomous vehicles, as proposed in the Motor Vehicles Amendment Act 2019, this exemption could be absolute even when certified autonomous vehicles are involved in causing damage. Such a compliance defense has been rejected in Germany and the UK, where it is recognized that compliance with minimum requirements is not enough to exonerate the duty of care owed by the manufacturer.²⁶

II.C. The "Many Hands" Problem and Distributed Technological Responsibility

The key conceptual problem with the Indian liability regime is the "problem of many hands" as discussed in moral philosophy, which involves the diffusion of responsibility amongst many actors within complex technological systems, with no single party directly responsible or proximately causing the harm.²⁷ This problem is most apparent with Level 4 and Level 5 automated vehicles. Let's take an example automated vehicle accident scenario:

1. The software developer of Company A uses the object detection algorithm and the training data from Data Vendor B.²⁸
2. The object detection algorithm is utilized in the autonomous vehicle system of Company C, which uses the sensors of Company D.²⁹

²² *Id.*

²³ Produkthaftungsgesetz [ProdHaftG] [Product Liability Act] § 3, Dec. 15, 1989, BGBl. I at 2198 (Ger.), *translated in* Act on Liability for Defective Products (Produkthaftungsgesetz – ProdHaftG), https://www.gesetze-im-internet.de/englisch_prodhaftg/englisch_prodhaftg.html.

²⁴ CPA, *supra* note 16, § 87.

²⁵ *Id.* § 87(c).

²⁶ Automated & Elec. Vehicles Act 2018, c. 18, § 3(2) (UK); Gesetz zur Änderung des Straßenverkehrsgesetzes [StVG] § 1(9) (Ger.).

²⁷ Dennis Jaspers, *The Problem of Many Hands*, 4 J. PHIL. MORALITY 1, 3 (2007).

²⁸ Legal Liability in Autonomous Vehicle Accidents in India, *supra* note 2.

²⁹ *Id.*

3. The V2X communication system of the vehicle, designed by Telecommunications Provider E, uses the real-time traffic information from Government Infrastructure Authority F.³⁰
4. The cybersecurity vulnerability was designed by Company G, which allows the malicious actor to send false information into the system.³¹
5. The algorithm, after processing the false information, made the decision that caused the accident with the pedestrian.³²

Who is liable for the accident in the above scenario?

Each of the actors involved in the accident could claim that their contribution was not enough to cause the accident because the tortfeasor must be the failure of all the systems involved.³³ The software developer could claim that the algorithm worked properly with the information it was given.³⁴ The Data Vendor could argue that the historical training data provided to the software developer was accurate.³⁵ The telecommunications provider could argue that they merely transmitted the information, not generated it.³⁶ The cybersecurity vendor could argue that perfect security is impossible, and the government infrastructure could argue that the infrastructure information provided to the telecommunications vendor was accurate at the time of the accident.³⁷ In this scenario, each party's contribution to the accident appears to be necessary but insufficient, so that the key element of causation, which is the link between tortfeasor and victim within the theory of corrective justice, becomes unclear late in the process.³⁸

In the context of distributed technological systems, the tortious harm is not the result of the violation of one entity in isolation, but rather the result of the interplay between entities within the system. Economic theories of optimal liability allocation in such cases indicate that in the context of distributed technological systems, the legal system should impose liability on the "least cost avoider," which is the entity that can avoid the harm at the lowest cost.³⁹ However,

³⁰ *Id.*

³¹ *Id.*

³² *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 19.

³³ *Id.*

³⁴ *Id.*

³⁵ *Id.*

³⁶ *Id.*

³⁷ *Id.*

³⁸ Ernest J. Weinrib, *Corrective Justice* 135 (Oxford Univ. Press 2012).

³⁹ Guido Calabresi, *The Costs of Accidents: A Legal and Economic Analysis* 135 (Yale Univ. Press 1970).

the identification of the least cost avoider requires technical assessments beyond the scope of the judiciary's technical competence.⁴⁰

Several researchers have suggested that it is possible to conceptualize the liability of the makers of autonomous vehicles as the insurers of all types of algorithmic harm using the concept of enterprise liability.⁴¹ This is because accident costs will be redistributed via insurance systems and structures. The enterprise liability legal doctrine is traditionally limited to ultrahazardous activities whose benefits are highly concentrated on the actor performing the activity. The positive externalities of automated vehicles are substantial and include reduced congestion and accident rates, as well as increased mobility of individuals with disabilities.

III. Jurisprudential Foundations: Why Corrective Justice Fails in Algorithmic Contexts

III.A. Corrective Justice Theory and the Requirement of Normative Connection

The corrective justice theory, as first proposed in Aristotle's *Nicomachean Ethics* and further developed in more recent literature by scholars such as Ernest Weinrib and Jules Coleman, argues that the normative basis of tort law is the repair of wrongful harm to interests.⁴² It requires that there be a normative connection between particular defendants and particular plaintiffs, as defendants owe agent-specific duties to repair the harm because they have causally wronged the plaintiff.⁴³

However, corrective justice theory requires three conceptual conditions that are a priori violated in automated vehicle collisions. First, corrective justice theory requires that harm be attributable to the defendant's agency, or that the defendants acted in a way that proximately caused harm to the plaintiff.⁴⁴ Automated and autonomous vehicles do not satisfy this requirement because their decisions do not have the phenomenological structure of agency.⁴⁵ When an automated vehicle calculates an optimal rate of braking based on probabilities of harm, there is no decision in the sense that requires practical reasoning and therefore moral and

⁴⁰ *Science & Technology Policy Brief: Autonomous Vehicles*, PRS LEGISLATIVE RSCH. (Mar. 3, 2026).

⁴¹ Mark A. Geistfeld, *Enterprise Liability and Autonomous Vehicles*, 105 CALIF. L. REV. 1611, 1625 (2017).

⁴² Aristotle, *Nicomachean Ethics* bk. V, ch. 5 (W.D. Ross trans., 1908); Ernest J. Weinrib, *The Idea of Private Law* 56–78 (Harvard Univ. Press 1995); Jules L. Coleman, *Risks and Wrongs* 309 (Cambridge Univ. Press 1992).

⁴³ Weinrib, *supra* note 45, at 78.

⁴⁴ *Id.* at 120–25.

⁴⁵ *Id.*

legal agency.⁴⁶ It does not weigh the reasons and make a decision in the way that a human driver does. Rather, it performs a mathematical calculation to determine the optimal rate of slowing to minimize harm to persons or property. Therefore, the requirement that there be agency on the part of the manufacturer of the vehicle strains the conceptual resources of corrective justice theory because we must metaphorically extend the concept of agency to the manufacturer in order to apply the theory to the facts of the case.⁴⁷

Second, corrective justice requires that the defendant's conduct be wrongful, i.e., that it be a violation of the defendant's duty towards the plaintiff.⁴⁸ Wrongfulness assumes the existence of alternative, legitimate modes of conduct. However, in many cases of automated vehicle collisions, the decision of the algorithm is the optimal decision based on the information at hand.⁴⁹ Thus, if the algorithm calculates that swerving left has a 70% chance of minor injury, while going straight has a 60% chance of moderate injury, and the final result is within the range of the algorithm's risk prediction, has the manufacturer acted wrongfully? The algorithm was functioning exactly as programmed, relying on risk prediction to minimize overall harm. Is such action wrongful? To say so requires an examination of the algorithm's decision based on the final risk prediction, but corrective justice proscribes such an examination.⁵⁰ Instead, wrongfulness must be ascertainable at the time of action, based on the information at hand.

Third, corrective justice requires proximate causation, i.e., that the defendant's wrongful conduct retain some normative connection with the plaintiff's harm. Indian tort law reflects this requirement through the foreseeability requirement, as set forth in *M. C. Mehta v. Union of India*, "Oleum Gas Leak Case."⁵¹ However, machine learning algorithms are programmed to function in an environment where unanticipated events occur. It is the ability of the algorithm to adapt to unprogrammed scenarios that gives the algorithm value. Thus, where the algorithm encounters an unanticipated event and acts, the harm is at once foreseeable, and at the same time, unforeseeable, since the unanticipated event was not programmed.

Professor Mark Geistfeld's treatment of tort liability for autonomous vehicles under the US

⁴⁶ Mark A. Geistfeld, *A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation*, 105 Calif. L. Rev. 1611, 1635 (2017).

⁴⁷ *Id.* at 1636.

⁴⁸ Weinrib, *supra* note 45, at 130.

⁴⁹ Geistfeld, *supra* note 46, at 1640.

⁵⁰ Weinrib, *supra* note 45, at 132.

⁵¹ *M.C. Mehta v. Union of India*, (1987) 1 SCC 395, ¶ 25 (India).

legal regime is correct in its identification of a key limitation of corrective justice as a normative theory of torts: it cannot handle harms resulting from optimally distributed probabilities of harm that are regrettable in retrospect.⁵² When all available designs are subject to some irreducible probability of harm, such as is inevitable for technologies functioning in complex and partially unpredictable worlds, the requirement of corrective justice that defendants compensate for wrongful harm is simply incoherent because the harm is not wrongful in the sense of being avoidable through superior design; it is simply the statistical occurrence of optimally distributed risk.⁵³

III.B. Economic Analysis and the Problem of Judgment-Proof Algorithms

Economic analysis of tort law, as advocated by Calabresi and Posner, sets forth a normative standard: liability should be allocated in a way that minimizes the social costs of accidents, including accident costs and prevention costs.⁵⁴ Liabilities should be assigned based on the "least cost avoider," those who can best avoid risks.⁵⁵ This perspective might be easier to apply to automated vehicle cases, as it does not require balancing corrective justice principles of wrongdoing.

Nevertheless, applying this framework to Machine Learning (ML)-based harm is difficult. "Least cost avoider" assumes that parties are willing to invest in care to avoid risks. However, ML demonstrates the law of diminishing returns in care.⁵⁶ While additional data can improve ML's ability to avoid accidents, at some point, additional data does not increase ML's ability but increases computation costs. ML also inherently has irreducible uncertainties, including "distributional shift" (real-world data differs from training data), "adversarial examples" (small input changes can cause large output effects), and "long-tail problems" (rare cases can cause many accidents, but those cases are rare).⁵⁷ No matter how much care ML is given, these risks cannot be eliminated without making ML unfeasible.

Furthermore, the judgment-proof problem exacerbates the inefficiency. Economic analysis

⁵² Geistfeld, *supra* note 46, at 1645.

⁵³ *Id.* at 1646–48.

⁵⁴ Guido Calabresi, *The Costs of Accidents: A Legal and Economic Analysis* 24–26 (Yale Univ. Press 1970); Richard A. Posner, *A Theory of Negligence*, 1 J. Legal Stud. 29 (1972).

⁵⁵ *Id.* at 135.

⁵⁶ *Id.* at 140.

⁵⁷ *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 22.

assumes the tortfeasor pays the full expected cost of accidents, which optimizes care.⁵⁸ However, when the proximate cause is ML, ML cannot be held liable because ML is not a person. Humans can shift risks onto ML, which is judgment-proof. Some have suggested granting ML personhood to solve this externality.⁵⁹ However, this solution causes more problems than it solves.

III.C. Enterprise Liability and Risk Distribution Theory

Enterprise liability, as most clearly expressed in the *Escola v. Coca Cola Bottling Co.* (Traynor, J., concurring) case, supplies a third perspective, which is that manufacturers must be held to strict enterprise liability because they are in the best position to (1) forestall product failures, (2) insure against remaining risks, and (3) allocate the risks via price mechanisms.⁶⁰

Enterprise liability theory is more applicable to automated vehicle scenarios than either the corrective justice perspective or the economic analysis perspective. This is because manufacturers of automated vehicles have superior knowledge regarding the limitations of their algorithms, the capacity to invest in the improvement of safety features, to hold insurance, and to allocate accident risks via the price of the vehicles.⁶¹ The Indian Supreme Court has adopted the risk distribution perspective in some circumstances. In the *M.C. Mehta v. Union of India* (Oleum Gas Leak case), the Supreme Court, through Justice Bhagwati, expressed the perspective that "enterprises which engage in hazardous activities are subject to strict enterprise liability without the defense of tort, precisely because they are in the best position to take steps to forestall the occurrence of the tort and to allocate the risks via price mechanisms."⁶²

However, enterprise liability in the context of automated vehicles is subject to two concerns. The first is that the concept of enterprise liability could limit innovation since manufacturers could face unlimited liability in the event of accidents arising from the decisions of the algorithms, even though the decisions could be optimally risk-diversified. If the concept of enterprise liability is adopted, manufacturers could fail to develop autonomous vehicles, even if it means forgoing considerable safety benefits. In fact, empirical research has shown that even moderately advanced autonomous vehicles could achieve a 30-50% reduction in accidents

⁵⁸ Calabresi, *supra* note 54, at 26.

⁵⁹ *Supra* Note 11.

⁶⁰ *Escola v. Coca-Cola Bottling Co.*, 24 Cal. 2d 453, 462 (1944).

⁶¹ Geistfeld, *supra* note 46, at 1655.

⁶² *M.C. Mehta*, (1987) 1 SCC at 399–400.

in comparison to accidents caused by human error.⁶³

The second concern is about the foundation of enterprise liability, which depends on the level of control the manufacturer has over the instrumentality that caused the injury. Nevertheless, this is not the case for the level 5 autonomous vehicle since it is independent of the manufacturer. Moreover, the manufacturer is unable to see the situations that the vehicle is being exposed to by the owner of the vehicle. The situations the vehicle is being exposed to need to be updated to include novel situations. This is significant since the foundation of enterprise liability is the level of control the manufacturer has over the product that caused the injury.

IV. Conceptual Inadequacies in the MVA and CPA Frameworks

IV.A. The MVA's Presumption of Human Control

Section 140 of the MVA establishes liability on owners through a presumption approach, wherein owners are presumed liable for harm caused by their vehicles unless they establish that the accident occurred "without their fault."⁶⁴ However, this presumption is based on an unstated assumption that the vehicle is an inert object whose potential for harm can be actualized only by the involvement of a human. As mentioned above, an automated vehicle is not an inert object since it is making decisions about its behavior at all times.⁶⁵ Therefore, the owners of the vehicle, who are held liable for the damage caused by the vehicle under the MVA under Section 140, it is presumed that the owners are in control of the behavior of the vehicle.⁶⁶ As discussed above, the definition of Level 4 and 5 vehicles is that they function without human interference once activated. Therefore, the owner of the vehicle is simply a passenger on the vehicle and does not have control over the behavior of the vehicle. Some commentators have suggested that owners must also be made liable for the harm caused by Level 5 vehicles.⁶⁷ However, this is based on the same rationale that dog owners must also be made liable for the harm caused by their dogs. Therefore, just as dog owners must be made liable for the harm caused by their dogs, the owners of the vehicle must also be made liable for the harm caused by the vehicle, even if the harm is caused by the decision of the algorithm. However, this is not

⁶³ *Science & Technology Policy Brief*, *supra* note 40.

⁶⁴ Motor Vehicles Act, No. 59, Acts of Parliament, 1988, § 140 (India).

⁶⁵ SAE Int'l, *Taxonomy & Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems*, J3016_202104, at 12–15 (2021).

⁶⁶ *Id.* at 14.

⁶⁷ Legal Liability in Autonomous Vehicle Accidents in India, *supra* note 2.

true because the owners of the dog have the capacity to control their dogs and ensure that they are not causing harm to others. However, the owner of the vehicle does not have the capacity to control the vehicle, as they cannot see the decision-making process of the algorithm. Moreover, they cannot control the decision of the vehicle, as they cannot control the autonomous mode function.

The MVA's insurance requirements, set out under Section 142, again reflect the presumption of human control.⁶⁸ The insurance requirements are necessary because human operators will be judgment-proof (i.e., have insufficient assets to pay tort judgments) and therefore require an insurance pool to pay out to victims. However, this insurance model again assumes that liability follows human operation.⁶⁹ For the context of automated vehicles, where liability should instead be apportioned based on manufacturer fault or algorithmic decision-making, the owner-operator insurance model becomes conceptually incorrect.⁷⁰ Should owners of automated vehicles be required to purchase insurance for damage caused by the manufacturer-designed algorithm over which they have no control? Should not the manufacturer be required to provide primary insurance, with the owner-operator insurance serving as a secondary insurance for human operation during non-automated modes?

India's insurance law has not addressed these questions. The Motor Vehicles Amendment Act 2019 added new provisions regarding recall liability under Section 110A, which imposes liability on the manufacturer to recall vehicles and provide compensation to vehicle buyers.⁷¹ However, these provisions only address manufacturing defects discovered after vehicle deployment and not algorithmic decisions causing harm during normal operation. The Amendment Act does not address autonomous vehicles or apportion liability between owners and manufacturers for automated vehicle operation.⁷²

IV.B. The CPA's Defect-Centered Framework and Algorithmic Normativity

The CPA product liability regime is based on a framework of "defect." Products are defective if they contain manufacturing defects, design defects, or fail to conform to specifications or

⁶⁸ MVA, *supra* note 68, § 142.

⁶⁹ *Science & Technology Policy Brief: supra* note 63.

⁷⁰ *Critical Analysis, supra* note 3, at 49.

⁷¹ MVA, *supra* note 68, § 110A.

⁷² *Navigating Liability in Autonomous Vehicles, supra* note 1, at 17.

warranties.⁷³ The defect-based framework assumes that products have some ideal specification that can be compared to performance. Manufacturing defects are present if a product unit is different from its manufacturer's design. Design defects are present if a product design is unreasonably dangerous. However, such notions of defect become ontologically unstable when applied to machine learning algorithms.

Machine learning algorithms cannot be said to have "designs" in the traditional sense of engineers designing something and hoping it works as expected.⁷⁴ The parameters of a neural network are learned during training and are not set by humans. What does it mean for the neural network to be "defective" when it behaves in a way that causes harm? To determine whether the defect is there or not, it is first necessary to consider the normative question of what the algorithm should have been doing.⁷⁵ This is not a technological question, however, since there are many different training datasets and objectives that yield very different behaviors from the algorithms, and none is better than any other. The behavior of the neural network is a result of design choices in the methodology for training the network and is not a specification violation.⁷⁶

Consider the classic "trolley problem" in the ethics of autonomous vehicles: should the algorithm turn to avoid running over pedestrians if this will kill the occupant of the car?⁷⁷ Any decision made by the algorithm in this problem reflects a moral decision that was encoded in the algorithm. Is it a design defect if the algorithm prioritizes the safety of the occupant and kills five people on the road? Is it a design defect if the algorithm prioritizes the safety of the people on the road and kills the occupant of the car? The CPA does not provide a basis for making such decisions, assuming that "defectiveness" is a technical property that can be analyzed by engineers.⁷⁸

However, the nature of the burden of proof only makes the problem worse. In the case of Section 84, the plaintiff is required to prove that there was a defect that caused an injury.⁷⁹ In the case of defects in algorithms, however, the plaintiff is required to have access to the

⁷³ CPA, *supra* note 16, § 84(1).

⁷⁴ *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 18.

⁷⁵ *Id.*, at 19.

⁷⁶ *Id.*, at 20.

⁷⁷ Patrick Lin, *The Ethical Dilemma of Self-Driving Cars*, CAL. MAG. (Apr. 2013).

⁷⁸ *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 21.

⁷⁹ CPA, *supra* note 16, § 84.

proprietary data sets used in training the algorithms, as well as the neural networks and the activation logs.⁸⁰ These are trade secrets that manufacturers will not willingly disclose. In Germany, this problem is solved by the use of EDRs that will provide objective evidence of the vehicle's behavior before the accident.⁸¹ There is no such provision in India. In the Motor Vehicles Act, there are provisions for recalls that will permit post-market surveillance.

There are no provisions for recording or disclosing data. Without this provision, the burden of proof structure in the CPA will be an unsurpassable barrier for victims of automated vehicle accidents. In addition to this problem, there are several defenses that create liabilities for manufacturers. Section 87(a) provides that manufacturers will not be liable if the product was not intended for commercial use.⁸² Personal automated vehicles will be those that are owned and driven by individuals for personal transportation. In this case, manufacturers will not be liable. Section 87(e) provides that manufacturers will not be liable for modifications made by consumers.⁸³ Automated vehicle owners will want to be able to customize algorithmic preferences. In this case, manufacturers will be able to say that the consumer "modified" the vehicle.

IV.C. The Problem of AI Legal Personhood

A more extreme solution to the problem of automated vehicle liability, as proposed by some scholars, is to give legal personhood to algorithms.⁸⁴ Automated vehicles will be given legal personhood with its own set of duties and rights, just as in the case of corporations, with their own insurance funded by licensing fees or taxes to pay accident victims.⁸⁵

India has recognized non-human entities as legal persons in certain instances. In the case *Salim v. State of Uttarakhand* (2017), the Ganga and Yamuna rivers were accorded legal personhood with their own set of enforceable rights through their custodians.⁸⁶ In *Narayan Dutt Bhatt v. Union of India* (2018), glaciers and forests were accorded legal personhood.⁸⁷

⁸⁰ *Id.*

⁸¹ Produkthaftungsgesetz, *supra* note 23.

⁸² CPA, *supra* note 16, § 87(a).

⁸³ *Id.*, § 87(a).

⁸⁴ Nandini Singh, *supra* note 11.

⁸⁵ *Id.*

⁸⁶ *Salim v. State of Uttarakhand*, (2017) 10 SCC 689 (India).

⁸⁷ *Narayan Dutt Bhatt v. Union of India*, 2018 SCC OnLine Utt 367.

However, the concept of legal personhood in the context of AI is subject to a number of objections.⁸⁸ Firstly, legal personhood usually carries with it a set of active rights and duties, not just duties as in the case of AI or automated vehicles. While a corporation has the ability to make contracts, own property, and sue, legal personhood to AI or automated vehicles would mean that they would be able to terminate their services, alter their terms and conditions, and go against the wishes of their owners, which would be contrary to their primary purpose of serving humanity.

Secondly, legal personhood is usually granted to entities that possess some moral qualities or characteristics that make it appropriate for it to be granted legal personhood, whether it is sentience, collective human interests, or ecological value.⁸⁹ While the rivers have the responsibility to sustain life, corporations are a legal fiction created to assist humanity, but AI or algorithms do not possess any of these qualities, nor do they have any inherent value that would make it appropriate to grant legal personhood to it.⁹⁰

Thirdly, and most importantly, legal personhood to AI would create moral hazard, which would be unfair to humanity as a whole because people would not be careful while using automated vehicles because the primary responsibility would be on the shoulders of the algorithm or AI, and the company would be able to design their vehicles with minimum safety features and a small insurance fund to pay off accident victims, which would be unfair to humanity as a whole because of the extreme nature of this solution, and this should be avoided at all costs in India because most scholars in Europe are against this way of using AI or automated vehicles.⁹¹

V. Comparative Frameworks: Germany, the UK, and China

V.A. Germany's Dual-Liability Model Under the StVG

Germany follows a dual liability regime for automated vehicle liability under the Road Traffic Act.⁹² The primary party liable for damage caused during the accident is the vehicle's keeper under strict liability, with a maximum of €10 million for personal injury and €2 million for property damage.⁹³ The manufacturer is subject to unlimited liability under general product

⁸⁸ Singh, *supra* note 11.

⁸⁹ *Id.*

⁹⁰ *Id.*

⁹¹ *Critical Analysis, supra* note 3, at 51.

⁹² Straßenverkehrsgesetz [StVG] [Road Traffic Act], § 7, as amended by Gesetz zur Änderung des Straßenverkehrsgesetzes und des Pflichtversicherungsgesetzes, July 28, 2021, BGBl. I at 2976 (Ger.).

⁹³ *Id.* § 7(1)–(2).

liability law (Produkthaftungsgesetz, identical to EU Directive 85/374/EEC) for product defect claims.⁹⁴

The key innovation of this regime is the mandatory requirement of implementing EDRs as per Section 63a StVG, wherein vehicles are required to store information for at least six months regarding vehicle status and driver activity, which can be accessed by the court during accident reconstruction for product liability claims.⁹⁵

The two areas of concern are as follows:

The caps on liability for vehicle keepers may be on the lower side for accidents involving multiple casualties in India's high-density traffic scenario.

Germany's robust and effective regulatory body, KBA, is crucial in ensuring timely and proper type approvals for vehicles; however, India's road transport authorities are not as equipped and could lead to improper type approvals.

V.B. The UK's Insurer-Centric Model Under AEVA 2018

The Automated and Electric Vehicles Act of 2018 places liability on insurers and not on owners or manufacturers of vehicles. The Section 2 of this Act states that "a victim of a crash caused by a self-driving car will receive compensation from its insurer even if a defect caused the accident."⁹⁶ The insurer will then be able to recover from the manufacturer of the car through product liability. This design is based on victim compensation because "victims will not have to establish fault on the part of owners or manufacturers of vehicles."⁹⁷ This design also eliminates the "many hands" problem because "insurers become universal, this design also creates a moral hazard for manufacturers because "insurers will underestimate risk and become insolvent." This design also promotes adversarial relationships between insurers and manufacturers.

V.C. China's Tiered Regulatory Approach

China's approach, as reflected in the local regulations in Shanghai and Shenzhen, follows a tiered model that differentiates between levels of automation.⁹⁸ For Level 3, which involves conditional automation and requires the driver to be ready to take control, the manufacturer

⁹⁴ Produkthaftungsgesetz *supra* note 23; Council Directive 85/374/EEC, 1985 O.J. (L 210) 29.

⁹⁵ StVG, *supra* note 92, § 63a.

⁹⁶ Automated and Electric Vehicles Act 2018, c. 18, pt. 1, § 2(1), (UK).

⁹⁷ Explanatory Notes to Automated and Electric Vehicles Act 2018, ¶ 12 (UK).

⁹⁸ Shanghai Autonomous Vehicle Innovation and Development Action Plan (2021), art. 12.

and the driver share the liability depending on the monitoring of the vehicle by the driver.⁹⁹ For Level 4 and Level 5, which represent high and full automation, the manufacturer has presumptive liability, but the manufacturer may raise defenses such as unforeseeable circumstances and force majeure.¹⁰⁰ The applicable law that will be used to determine liability is the Product Quality Law. The Chinese approach, which is tiered, is quite attractive as it is differentiated depending on the level of human control, which is important when determining liability.¹⁰¹ However, it has not been effective, especially because under local law, there is no clear guideline on how to apportion blame under Level 3, which is where there is failure of the system and failure to monitor the vehicle by the driver. The Chinese approach does not have effective procedural mechanisms for victims to obtain information regarding failures, which is left to investigations by the Ministry of Industry and Information Technology.

VI. Toward a Reconstructed Liability Architecture for India

The foregoing discussion of the subject matter establishes that the existing system of liability in India, based on fault-based negligence under the Motor Vehicle Act and defect-based product liability under the Consumer Protection Act, is based on a number of fundamental assumptions about human agency and defect in products. Autonomous vehicles challenge each of the assumptions that undergird the existing system of liability. It is therefore proposed that the system of liability must not only be altered but also fundamentally overhauled. The objective is not to eliminate the system of corrective justice altogether but to place it within a framework that is technologically risk-distributed and informationally opaque. Four structural overhauls are normatively defensible:

VI.A. Enterprise Liability and Presumptive Responsibility during Autonomous Operation

The evidentiary imbalance is one of the major problems associated with algorithmic accidents, whereby the claimant is unaware of the information relating to the internal architecture of the vehicle, the operation design documentation, and internal performance records.¹⁰² On the other hand, manufacturers possess information superiority regarding the limitations of the vehicle, training data limitations, and decision-making criteria.

⁹⁹ Shenzhen Autonomous Driving Vehicle Regulations (2022), art. 8.

¹⁰⁰ *Id.* art. 9.

¹⁰¹ Accident Liability Determination of Autonomous Driving Vehicles in China, 17 FRONTIERS PUB. HEALTH art. 9451969, at 6 (2022).

¹⁰² *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 29.

In these circumstances, a claimant-burdened negligence standard might lead to under-compensation of victims. A shift towards a more enterprise-based presumptive liability standard for accidents occurring during fully autonomous operation might be normatively desirable.¹⁰³ Thus, where a vehicle is in level 4 or 5 autonomous operation and death or serious injury occurs, liability would presumptively rest with the manufacturer of the autonomous vehicle.

This is also in conformity with the risk distribution theory, whereby the actors imposing the risks have the best opportunity to internalize the accident costs through insurable costs, price mechanisms, and safety investments.¹⁰⁴ This is also in conformity with the economic theories of tort law, whereby the liability is imposed on the actors best able to reduce the accident costs.¹⁰⁵ The standard of liability is likely to be rebuttable in instances where there is the unauthorized modification of the vehicle software, operation of the vehicle beyond the operation design domain despite sufficient warning, and criminal cyber intrusion beyond reasonably foreseeable cyber risks. The normative shift will be from victim disproving to enterprise disproving. Such a standard would not necessarily find manufacturers morally culpable for accidents.¹⁰⁶ However, it would recognize autonomous mobility as a risk-enterprise and require those who benefit from its use to internalize its costs.

VI.B Evidentiary Transparency as a Precondition to Meaningful Liability

Reforms to the doctrine will be ineffective unless there is access to credible information on accidents that have occurred. Algorithmic decision-making processes are not transparent, and unless there are structured data retention policies in place, there will be an almost insurmountable problem with accessing evidence.¹⁰⁷

As can be seen with comparative approaches to regulation, there is an increasing recognition that there must be a level of forensic reconstruct ability in automated processes and systems.¹⁰⁸ Data recording of events, status updates on systems, and summaries of decision-making processes all function as more than just necessary steps in the design and development of

¹⁰³ *Id.* at 30.

¹⁰⁴ Geistfeld, *supra* note 46, at 1611, 1665.

¹⁰⁵ Calabresi, *supra* note 54, at 135.

¹⁰⁶ *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 31.

¹⁰⁷ *Science & Technology Policy Brief*, *supra* note 40.

¹⁰⁸ Straßenverkehrsgesetz [StVG] § 63a (Ger.).

systems and processes; they function as necessary steps in the administration of justice.

In the Indian context, the incorporation of transparency standards within the regulation of motor vehicles will have the following effects: there will be a reduction in information asymmetry, and it will be possible to establish whether the process or system was functioning within the parameters of the design.¹⁰⁹ There will also be a measure of discipline imposed on the manufacturers, as they will understand that their processes and systems will be scrutinized in the event of an accident occurring. It is important to note that transparency need not necessarily extend to the disclosure of source code and the like. Rather, there may be a requirement to provide structured summaries of systems and processes that are sufficient to be evaluated by the judiciary. It is accountability and access to information that is necessary, not necessarily the disclosure of the algorithms themselves.

VI.C. Integrating Ex Ante Regulatory Oversight with Ex Post Liability

The adjudication of liability is a retrospective process; however, algorithmic safety is best assessed and ensured ex ante.¹¹⁰ Autonomous cars operate within defined Operational Design Domains, i.e., anticipated environmental and traffic conditions. If these domains are not clearly defined and tested against Indian reality, liability law is not likely to provide an effective corrective mechanism. A separate and dedicated mechanism for certifying and monitoring autonomous driving systems could potentially provide a structural complement to tort law. Such a mechanism would provide a set of standards for autonomous driving systems, enabling a court of law to determine whether there was any deviation from these standards. Such a mechanism would potentially address concerns of a race to the bottom, where manufacturers would roll out minimally sufficient autonomous driving systems and pass on liability risks through insurance.¹¹¹ In other words, it is proposed that there is a symbiotic relationship between liability law and regulatory oversight.

VI.D. Residual Risk and Collective Compensation

A revised enterprise liability framework may still not perform in cases of manufacturer default, indeterminate multi-vehicle algorithmic interaction, or accidents involving unknown autonomous vehicles. A strict adherence to the binary model of attributing fault and liability

¹⁰⁹ *Navigating Liability in Autonomous Vehicles*, supra note 1, at 32.

¹¹⁰ SAE Int'l, Supra note 65, at 16.

¹¹¹ *Navigating Liability in Autonomous Vehicles*, supra note 1, at 33.

may result in victims not being compensated, even in a society that has chosen to advance autonomous vehicles.¹¹²

The risk distribution theory indicates that in cases where society has benefited from technological innovation, there is a need to provide collective compensation for accidents.¹¹³ This is particularly true in cases where there is a failure in the primary liability framework.

It is not a watering down of enterprise liability but a recognition that some risks cannot be reduced to zero. The legitimacy of autonomous vehicles may depend on the ability to ensure that the victims are not left bearing the burden of technological innovation.

VII. Conclusion

The appearance of Level 4 and 5 autonomous vehicles thus challenges the basic precepts of Indian motor accident liability law, as they have been based on human agency, fault, and mechanical defect. The transfer of agency to algorithmic systems functioning as part of distributed technological networks creates difficulties for traditional notions of negligence and product liability in providing coherent analyses.¹¹⁴ Causality, foreseeability, and defect thus assume a state of conceptual instability in environments that feature machine learning, probabilistic reasoning, and the "many hands" problem.¹¹⁵

Therefore, the question here is not one of regulatory delay but rather of recalibrating the law. A fundamental shift in focus to an enterprise model of responsibility in fully autonomous modes, with risk allocation and victim-centered compensation, offers a more coherent model. The trajectory of Indian tort law in this space will be determined by its ability to move beyond the need to attribute fault to a human actor or to conceive of autonomous mobility as a systemic technological enterprise that demands a rethought model of responsibility.¹¹⁶

¹¹² *Critical Analysis*, *supra* note 3, at 55.

¹¹³ Geistfeld, *supra* note 46, at 1670.

¹¹⁴ *Navigating Liability in Autonomous Vehicles*, *supra* note 1, at 36.

¹¹⁵ *Id.*

¹¹⁶ *Id.* at 37.