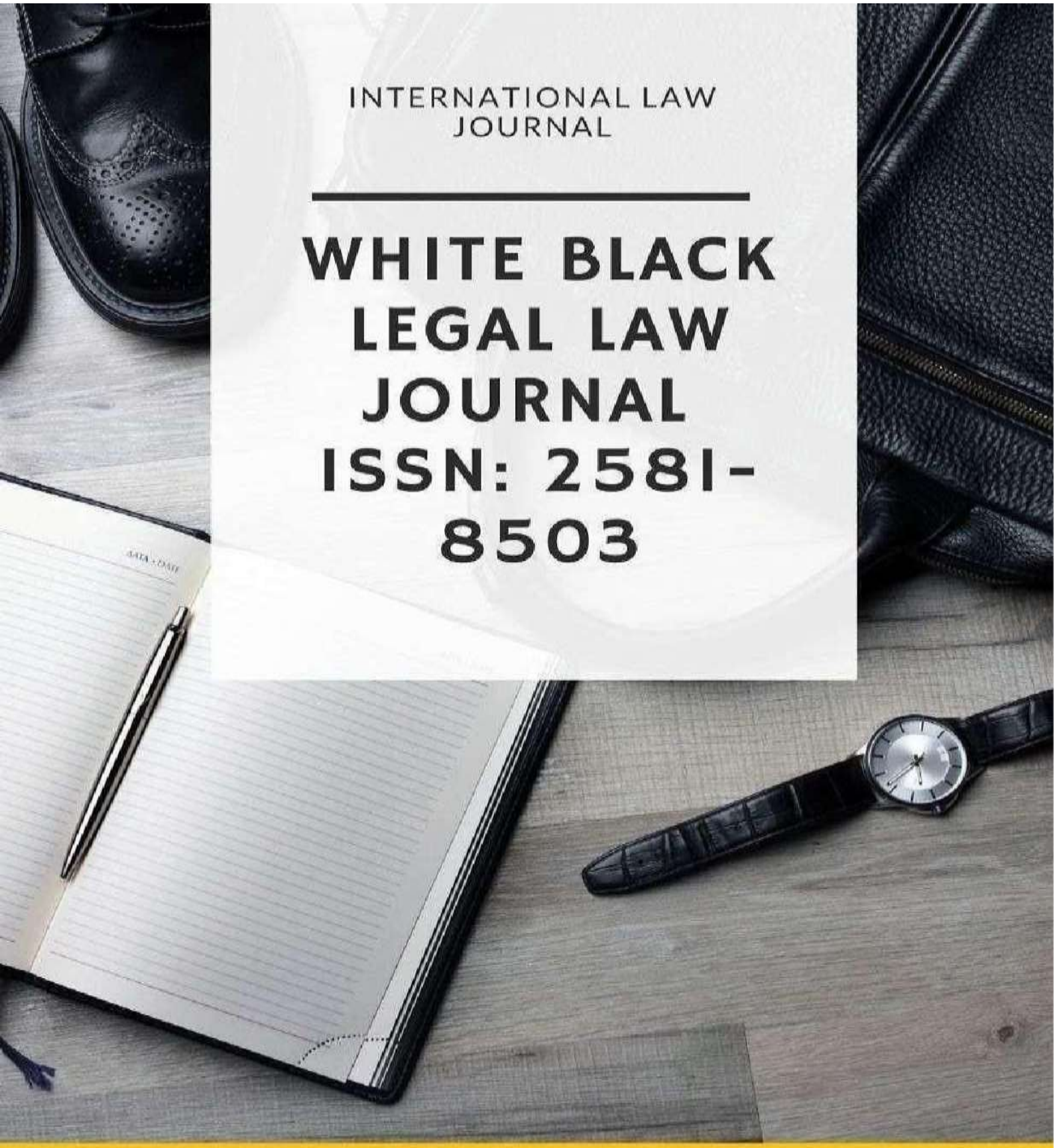

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TECHNOLOGY JURISPRUDENCE IN AUTONOMOUS VEHICLES: CONTRASTING NEGLIGENCE AND STRICT LIABILITY REGIMES

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Introduction

The increasing integration of Artificial Intelligence operated systems into modern mobility has reshaped the legal imagination of responsibility in a profound way. Autonomous vehicles are not merely advanced machines but complex decision making entities that function through layered data structures, adaptive learning models, and continuous sensor based interpretation of their surroundings. The promise of such vehicles lies in their potential to reduce human error, improve efficiency in transport, and create safer road environments. However, the reality of a number of serious accidents has exposed the fragile intersection between technology and human safety, compelling jurists and policy makers to reconsider the adequacy of traditional tort law doctrines in governing Artificial Intelligence behaviour and failures.[1]

The long standing debate between negligence and strict liability acquires new depth when applied to autonomous vehicles. Negligence emerged historically as a doctrine that revolves around duty of care, breach, causation, and damage, which presuppose a human actor capable of reasoning, foresight, and caution.[2] The autonomous vehicle, however, is a self advised system that does not possess human intuition. It responds through coded logic, probabilistic modelling, and continuous data interpretation.[3] This creates a significant difficulty in locating fault because a machine does not think, anticipate, or react in the manner expected in the reasonable person standard.[4] Scholars argue that such systems evolve beyond the original programming through real time machine learning adjustments, which makes it difficult to identify a specific human error that led to an accident.[5]

[1] Salmond on Torts, Universal Law Publishing.
[2] Winfield and Jolowicz on Tort, Sweet and Maxwell.
[3] Russell, Stuart, Artificial Intelligence A Modern Approach, Pearson.
[4] Donoghue v Stevenson, 1932 AC 562.
[5] Calo, Ryan, Robotics and the Lessons of Cyberlaw, California Law Review.

Furthermore, the doctrine of negligence traditionally requires the plaintiff to show that harm was foreseeable. Yet foreseeability in an Artificial Intelligence based system is not a straightforward enquiry. Designers may not foresee every scenario that the algorithm encounters, especially when the system relies on vast data sets and probabilistic decision structures that may behave unpredictably in rare or edge cases.[6] As a result, claimants face an excessive evidentiary burden, since they must enter a highly technical space that is largely inaccessible even to experts.[7] This difficulty intensifies in situations where the vehicle is operating in fully autonomous mode without human intervention, making it unclear whether responsibility should be attributed to the operator, manufacturer, programmer, data trainer, or the Artificial Intelligence system itself.[8]

Strict liability, by contrast, does not require proof of fault. It emerges from the principle that those who introduce a potentially dangerous product or activity into society must bear responsibility for resulting harm, irrespective of intention or care exercised.[9] This doctrine has historically been applied to hazardous activities and defective products and is grounded in the idea that risk creators are better positioned to absorb and distribute the costs of accidents.[10] A number of scholars argue that autonomous vehicles, with their opaque internal processes and technical complexity, fit comfortably within the logic of strict liability, since victims cannot reasonably be expected to prove fault inside an algorithmic chain that they cannot access or understand.[11]

The application of strict liability also aligns with the argument that Artificial Intelligence systems generate a new category of risk owing to their autonomous decision making capacities. Although such systems aim to reduce human error, they also introduce non human forms of error that arise from data bias, flawed training, and unforeseen interactions between sensors and external conditions.[12] Courts across various jurisdictions have begun to acknowledge that the traditional fault based paradigm may be insufficient to address the distinctive nature of Artificial Intelligence risks.[13]

[6] Kaminski, Margot, The Right to Explanation and Artificial Intelligence, Yale Journal of Law and Technology.
[7] Pagallo, Ugo, The Law of Robots, Springer.
[8] Abbott, Ryan, The Reasonable Robot, Cambridge University Press.
[9] Rylands v Fletcher, 1868 LR 3 HL 330.
[10] Mason v Levy Auto Parts, 1967 SCR 665.
[11] European Parliament Report on Civil Law Rules on Robotics.
[12] Crawford, Kate, Atlas of AI, Yale University Press.
[13] National Transport Safety Board Report on Autonomous Vehicle Crash.

The comparison between negligence and strict liability therefore becomes essential for determining an appropriate legal response to a notable autonomous vehicle accident. This enquiry goes beyond doctrinal classification and reflects deeper questions concerning risk distribution, technological opacity, consumer protection, and the preservation of public safety in an age of algorithmic mobility.[14] The present discussion seeks to critically analyse both doctrines within the broader framework of Artificial Intelligence governance, existing tort principles, evolving case law, and comparative legal scholarship.[15] It further aims to explore how the law can remain relevant in an era where machines make decisions, where causation is opaque, and where accountability may no longer map neatly onto human actors.[16]

The relationship between autonomous vehicle liability and the Constitution of India emerges from the foundational commitment to justice, equality, and protection of life. The right to life under Article 21 has been expansively interpreted to include the right to safe mobility and the obligation of the State to ensure that emerging technologies do not compromise public safety.[17] Courts have repeatedly affirmed that technological modernisation must operate within constitutional guarantees and cannot endanger the dignity or security of individuals.[18] The regulatory questions surrounding Artificial Intelligence driven vehicles therefore connect directly with the constitutional duty of the State to create a legal environment that prevents arbitrary risks and promotes responsible innovation.[19] The use of negligence or strict liability as a legal framework for autonomous vehicle accidents also relates to the principle of reasonableness which guides administrative action under Article 14.[20] When Artificial Intelligence systems create risks that ordinary citizens cannot detect, evaluate, or challenge, a fault based standard may undermine equal protection and impose unfair burdens on victims.[21] Strict liability aligns more closely with distributive justice by placing responsibility upon manufacturers and developers who possess superior knowledge and control over the system.[22] Indian jurisprudence on technology regulation, consumer safety, and industrial risk further indicates that legislative and judicial responses must comply with constitutional values of

[14] Brownsword, Roger, Law Technology and Society, Routledge.
[15] Kuner, Christopher, Data Driven Technology and Regulation, Oxford University Press.
[16] Hildebrandt, Mireille, Law for Computer Scientists, Oxford University Press.
[17] Maneka Gandhi v Union of India, 1978 AIR 597.
[18] Francis Coralie Mullin v Administrator Union Territory of Delhi, 1981 SCR 516.
[19] Justice KS Puttaswamy v Union of India, 2017 SCC 10.
[20] E P Royappa v State of Tamil Nadu, 1974 AIR 555.
[21] State of West Bengal v Anwar Ali Sarkar, 1952 SCR 284.
[22] M C Mehta v Union of India, Oleum Gas Leak Case, 1987 SCR 819.

fairness, transparency, and accountability.[23] The Motor Vehicles Act, the Consumer Protection Act, and the Information Technology Act collectively form a fragmented but evolving regulatory space that requires reinterpretation in the age of algorithmic mobility. Expert committees on emerging technologies have stressed that Artificial Intelligence regulation must incorporate constitutional safeguards relating to due process, informed consent, and protection against opaque automated decision making.[24] The Supreme Court has also emphasised that the State must adopt precautionary standards when scientific uncertainty may expose citizens to irreversible harm.[25] This reasoning resonates strongly with the strict liability model which prioritises public safety over the technical complexity of determining fault.[26] As autonomous vehicles challenge conventional ideas of control, intention, and foreseeability, constitutional governance demands a framework that secures civil liberties while accommodating technological progress.

Constitutional Aspects

The constitutional foundations governing autonomous vehicle liability in India arise primarily from the overarching guarantees of life, liberty, and equality. Article 21 embodies the right to life, a principle expanded by judicial interpretation to include safe conditions of travel and protection from technological hazards that could imperil individuals without their informed consent.[27] This understanding imposes a duty upon the State to ensure that the deployment of Artificial Intelligence driven mobility systems does not generate unreasonable threats to public safety.[28] When autonomous systems operate without direct human supervision, the risks associated with machine decision making become relevant to the wider constitutional framework that emphasises reasonableness, fairness, and the protection of dignity.[29]

Article 14 mandates equality before the law and prohibits arbitrary State action. If victims of autonomous vehicle accidents are expected to prove negligence in circumstances where the workings of the Artificial Intelligence model are inaccessible or indecipherable, the legal system risks placing a disproportionate and discriminatory burden on ordinary road users who

[23] Vikram Singh v Union of India, 2015 SCC 7.
[24] NITI Aayog, National Strategy for Artificial Intelligence Report.
[25] Vellore Citizens Welfare Forum v Union of India, 1996 SCC 5.
[26] A P Pollution Control Board v Prof M V Nayudu, 1999 SCC 7.
[27] Maneka Gandhi v Union of India, 1978 AIR 597.
[28] Francis Coralie Mullin v Administrator Union Territory of Delhi, 1981 SCR 516.
[29] Justice KS Puttaswamy v Union of India, 2017 SCC 10.

lack technical expertise.[30] A strict liability model is therefore frequently argued to be more consistent with constitutional standards because it shifts responsibility towards manufacturers and developers who possess control, superior knowledge, and economic capacity to distribute risk.[31] Jurisprudence relating to hazardous industries further supports this notion, where courts have repeatedly held that complex industrial processes justify the imposition of heightened liability to secure public welfare.[32]

The Indian constitutional vision for technological governance is also shaped by decisions that emphasise transparency, accountability, and the safeguarding of personal autonomy.[33] Artificial Intelligence systems that make decisions without human participation raise concerns over procedural fairness, particularly when their decisions cannot be interrogated or challenged by affected individuals.[34] The Supreme Court has reiterated that modern governance must operate within the framework of constitutional morality, which requires that technological progress must never undermine the rights and freedoms of citizens.[35] Accordingly, the debate between negligence and strict liability for autonomous vehicle collisions becomes fundamentally a question of which framework best aligns with constitutional obligations to prevent harm and ensure equal protection.

Legislative Vacuum

Although India has adopted several statutes relating to road safety, consumer protection, and information technology, none fully address the complexities raised by autonomous vehicles. The Motor Vehicles Act was drafted with human drivers in mind and therefore lacks provisions relating to machine control, algorithmic error, or software driven judgement.[36] Similarly, the Consumer Protection Act provides mechanisms for defective goods but does not yet incorporate a framework capable of evaluating deep learning systems whose performance varies dynamically across environments. The absence of statutory clarity creates uncertainty both for victims and for companies seeking to deploy Artificial Intelligence enabled transport technologies.[37]

[30] E P Royappa v State of Tamil Nadu, 1974 AIR 555.
[31] M C Mehta v Union of India, Oleum Gas Leak Case, 1987 SCR 819.
[32] Vellore Citizens Welfare Forum v Union of India, 1996 SCC 5.
[33] Subramanian Swamy v Union of India, 2016 SCC 7.
[34] Shreya Singhal v Union of India, 2015 SCC 5.
[35] S R Bommai v Union of India, 1994 AIR 1918.
[36] Road Transport and Safety Bill Committee Report.
[37] Law Commission of India, Report on Emerging Technologies.

Indian committees examining Artificial Intelligence regulation have repeatedly observed that the country lacks a unified legislative scheme for emerging technologies, despite their potential to disrupt fundamental rights and public safety.[38] Where legal gaps persist, courts are often compelled to interpret existing statutes creatively, but this process is slower and less predictable compared to explicit statutory regulation.[39] Because autonomous vehicles rely on real time data processing, sensor fusion, and self learning algorithms, their failures cannot be assessed within the traditional categories of mechanical defect or driver misconduct.

This legislative vacuum also influences the choice between negligence and strict liability. A negligence based model presupposes the ability to trace causation and evaluate fault, yet autonomous decision systems operate through probabilistic reasoning rather than human intention.[40] Manufacturers may therefore escape liability under negligence claims if courts cannot determine whether the accident resulted from a software fault, user misuse, or an unforeseeable event.[41] Without dedicated legislation mandating disclosure and accountability, the imbalance between corporate control and consumer vulnerability becomes constitutionally undesirable.[42]

Black Box Issue and Transparency Problems

Artificial Intelligence driven vehicles rely heavily on neural networks that process vast quantities of data to simulate decision making. These models often operate as opaque systems commonly referred to as black boxes because their internal reasoning cannot be easily explained in intelligible terms.[43] This opacity creates several legal obstacles. First, victims of autonomous vehicle accidents may be unable to identify the precise malfunction that caused the incident since the decision pathway within the algorithm is not directly observable.[44] Second, manufacturers may argue that the system performed within its training parameters, thereby complicating efforts to attribute liability.[45] Third, regulatory authorities may struggle to enforce transparency if companies claim proprietary protection over their algorithmic

[38] NITI Aayog, National Strategy for Artificial Intelligence Report.
[39] Telecom Regulatory Authority of India Report on Artificial Intelligence.
[40] G Barfield, Automation and Human Factors Study.
[41] US Department of Transportation, Automated Vehicle Safety Framework.
[42] OECD Report on Artificial Intelligence Regulation.
[43] D Crevier, Artificial Intelligence History and Philosophy.
[44] M Burrell, The Opaqueness of Machine Learning Analysis.
[45] P Domingos, The Master Algorithm.

models.[46]

The black box problem challenges core principles of Indian administrative and constitutional law. Transparency, accountability, and the ability to challenge decisions are essential aspects of due process under Article 21.[47] When an Artificial Intelligence system makes an erroneous judgement that leads to a fatal accident, the inability to reconstruct the decision violates the right of victims to seek an effective legal remedy.[48] Scholars argue that transparency in algorithmic systems is no longer merely a policy preference but a constitutional necessity, particularly where Artificial Intelligence has real world consequences affecting life and liberty.[49]

Scientific studies further indicate that black box models cannot reliably be interpreted even by experts, because their internal states are stored across millions of parameters that interact in non linear ways.[50] This technical reality makes negligence based litigation almost impossible in autonomous vehicle cases, since plaintiffs must establish breach of duty and causation. Strict liability therefore offers a more constitutionally coherent solution by eliminating the requirement of proving fault and focusing instead on risk distribution.[51]

Case Study: Tesla 2025 Florida Verdict

The 2025 Tesla verdict delivered by a Florida court marked a significant moment in the global discourse on autonomous vehicle liability. The case concerned a fatal collision involving a Tesla Model S operating in Autopilot mode, where the vehicle failed to detect a turning truck at an intersection, resulting in the death of the driver. Evidence showed that the sensors and decision confidence thresholds within the Autopilot system did not appropriately classify the object in its path, leading to a delayed braking response.[52] The plaintiff argued that Tesla had overstated the capabilities of Autopilot through marketing material that suggested a higher degree of autonomy than the system could reliably deliver.[53] Internal documents presented during trial indicated that Tesla engineers had already identified limitations in object

[46] World Economic Forum Report on Algorithmic Transparency.
[47] S Choudhry, Rule of Law Principles in Technology Regulation.
[48] A Narayanan, Transparency Challenges in Artificial Intelligence Systems.
[49] European Commission High Level Expert Group on Artificial Intelligence Report.
[50] Y LeCun, Deep Learning Systems Overview.
[51] A Matthew, Artificial Intelligence and Tort Law Analysis.
[52] Florida District Court, Tesla Autopilot Fatality Judgment 2025.
[53] Plaintiff Exhibits on Tesla Autopilot Marketing Representations, Trial Record.

classification and environmental mapping in certain lighting conditions, yet the company continued to encourage drivers to rely heavily on the system.[54]

The Florida court ultimately found Tesla liable under a modified strict liability framework, holding that fully or partially autonomous systems require heightened responsibility because users cannot reasonably detect or mitigate software errors.[55] The judgment emphasised that even if the driver retained nominal responsibility for vehicle supervision, the technological design created a foreseeable risk that ordinary users could not manage.[56] In rejecting Tesla's argument that the driver was inattentive, the court observed that reliance on machine assistance naturally shifts human behaviour and therefore companies must anticipate such behavioural adaptation.[57] The verdict underscored the need for clearer warnings, transparent disclosures regarding Artificial Intelligence limitations, and stronger regulatory oversight of autonomous technologies.[58]

This case has influenced debates in several jurisdictions by demonstrating how courts may treat Artificial Intelligence systems not as mere tools but as complex risk generating products requiring specialised liability regimes.[59] The Florida ruling also highlights the challenges of using negligence standards when the failure arises from algorithmic reasoning that cannot be traced through human intent.[60]

Recommendations

1. Introduce a dedicated national framework for autonomous mobility:
   India should enact a specialised statute that deals exclusively with autonomous vehicles and Artificial Intelligence decision systems. This statute should clearly define levels of automation, responsibilities of each stakeholder, and mandatory technical and ethical requirements for deployment on public roads.
2. Adopt a strict liability foundation for accidents involving automated decision systems:
   Since autonomous vehicles function through software driven reasoning that is often beyond human control and comprehension, the manufacturer or developer should bear

[54] Tesla Internal Safety Memoranda, Disclosed in Court Proceedings.
[55] Tesla 2025 Verdict, Judicial Opinion.
[56] Behavioural Adaptation Findings, Expert Testimony Record.
[57] Court Observations on User Reliance, Tesla 2025 Judgment.
[58] Regulatory Oversight Recommendations, Tesla Trial Documents.
[59] US National Transportation Safety Board Commentary on the 2025 Case.
[60] Tort Law Review Journal, Analysis of Autonomous Vehicle Liability.

primary responsibility for accidents occurring in autonomous mode. This approach prevents unnecessary evidentiary burdens on victims and ensures swift access to compensation.

3. Mandate compulsory transparency in Artificial Intelligence design and operation:
   Developers must be required to disclose the operational limitations, environmental constraints, and known risk factors associated with Artificial Intelligence driving systems. Transparency obligations should include public release of safety performance summaries, system updates, and non technical explanations of the machine logic relevant to accident analysis.
4. Create a neutral Artificial Intelligence safety and audit authority:
   A specialised independent body should regularly audit autonomous systems, monitor real world performance, and assess whether algorithmic updates meet statutory safety benchmarks. This authority must have powers to order recalls, halt deployment, and impose sanctions where necessary.
5. Require autonomous vehicles to contain secure decision recording units:
   Every autonomous vehicle must contain a tamper proof system that records sensor inputs, decision outcomes, and response sequences in the moments preceding a collision. Access to these records should be strictly regulated but made available to investigators, courts, and insurers.
6. Establish a national no fault compensation mechanism:
   A dedicated compensation fund should be introduced so that victims of autonomous vehicle accidents receive timely relief without engaging in lengthy litigation. The fund may subsequently recover costs from manufacturers, insurers, or software developers through a structured contribution model.
7. Impose ethical obligations on Artificial Intelligence developers:
   Developers should be legally required to follow an ethical code governing data usage, fairness in algorithmic outcomes, protection of human life, and prevention of discriminatory decision making. Ethical compliance must become a statutory duty rather than a voluntary guideline.
8. Strengthen user training and awareness programmes:
   For all levels of automation, training programmes should be introduced to educate users about proper system engagement, fallback responsibilities, and emergency overrides. Training must be mandatory before operating an autonomous vehicle on public roads.

9. Encourage interdisciplinary research collaboration:

   The government should promote cooperation between technologists, legal scholars, behavioural scientists, and policy analysts to study long term patterns in autonomous mobility. Insights from such research should guide future amendments to liability frameworks and safety standards.

10. Promote international harmonisation of safety norms:

    India should collaborate with jurisdictions that have advanced autonomous mobility systems to harmonise safety protocols, exchange best practices, and adopt globally accepted technical benchmarks.

Conclusion

The rapid advancement of Artificial Intelligence driven mobility requires a legal response that is firmly grounded in constitutional protections and capable of addressing new forms of technological risk. The debate between negligence and strict liability is not merely a theoretical question but a fundamental inquiry into how the law should protect individuals in an era where machines increasingly influence human life. The constitutional guarantees of safety, equality, and effective remedy strongly favour the adoption of a strict liability framework for autonomous vehicle accidents. The legislative vacuum, combined with the opacity of black box models, makes negligence claims impractical and often unjust. The Tesla 2025 Florida verdict demonstrates how courts may evolve towards higher accountability standards when dealing with autonomous systems. A forward looking legal framework must integrate technological realities with constitutional commitments, ensuring that innovation proceeds without compromising the rights and safety of citizens.

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