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Ethical, Legal and Regulatory Framework for the Use of Artificial Intelligence in Autonomous Vehicles

Ms. Garima Panwar[1], Mr. Raj Anjanikumar Varma[2]
[1]Assistant Professor,
Symbiosis Law School, Pune
Email: garima.panwar@symlaw.ac.in

[2]Assistant Professor,
Symbiosis Law School, Pune
Email: raj.varma@symlaw.ac.in

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Abstract:
One innovation that can transform mobility into smart mobility that is fast, efficient, sustainable while ensuring ease of access in the present era is the development of autonomous vehicles that are powered by Artificial Intelligence (AI). From 'Faturnama' in 1939 to the current era of Google's AlphaGo, Waymo and Tesla, AI driven technology has had a ground-breaking impact on society while challenging the traditional concepts of ethics, accountability, liability, privacy and data security among others.
While international norms like the Vienna Convention on Road Traffic are being amended to account for this transformative technology, effective self-regulation that is strengthened by laws that are adaptive in nature is essential as there have already been instances of autonomous vehicles acting in a manner that would threaten human life and cause the death. This is especially applicable to the Indian situation which lacks a sui generis legislation to address the development of autonomous vehicles even though various legislations exist that address the facets of motor vehicles and liability.
This paper aims to evaluate the existing framework with regards to its readiness to meet new challenges posed by AI in autonomous vehicles. It would also propose a new model / framework to deal with these challenges especially in the Indian situation.
The authors would use doctrinal method and critically analyze the present situation through a multi-country analysis of the existing framework regarding autonomous vehicles through global best practices and ensuring the implementation of this technology while safeguarding everyone against the challenges that it poses.

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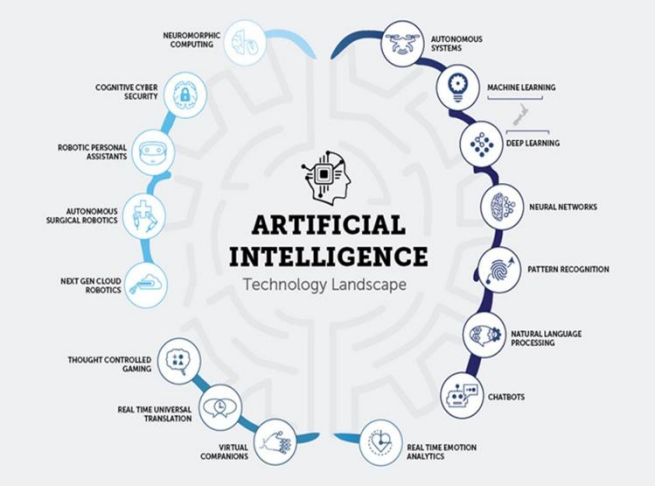
I. Introduction

In the present age, innovation is the primary driver of economic growth and access to transformative technology is essential for enhancing and enriching the lives of people across the globe. It is essential that such technology is accessible to all so as to ensure that it enriches the lives of people. These developments will act as an enabler for various services across the board. Artificial Intelligence is one such technology that has an impact across sectors; from autonomous systems, virtual assistants, chatbots, deep learning, surgical robots etc.



The above image gives a sample of the areas wherein AI systems have had an impact. [1]

As per some estimates, these are expected to add upto USD 15 trillion to the global economy[2]by 2030 which has the potential to lift millions out of poverty and enable them to gain access to fields that were out of bounds for them for generations.

Such technology is also essential for fulfilling the Sustainable Development Goals (SDG) of the United Nations (UN) which adopted the 2030 Agenda to emphasize a holistic approach to achieving sustainable development for all.[3] However, the Social Progress Index 2019 reveals that progress towards achieving the 17 Sustainable Development Goals (SDGs) is too slow, threatening the chances of fulfilling the 2030 Agenda for Sustainable Development[4].

Artificial Intelligence has penetrated our lives in a multitude of ways executing responsibilities that until recently required special skills and knowledge. Autonomous cars are a reality and have been approved operation in many US States and their inevitable arrival in the consumer market will revolutionize mobility into smart mobility that is fast, efficient, sustainable while ensuring ease of access. It is said that driverless car companies will be the next success story in mobility like Uber.

Just like Uber revolutionized the present transportation market from owning a car to hiring a car based on your convenience thereby saving the hassle of ownership, maintenance, driving etc.; autonomous vehicles will transform the market wherein it is hoped that accidents would reduce thereby saving in on human and financial capital, driving would be more efficient, human effort would reduce etc.

Artificial Intelligence is being deployed rapidlyaround the world and its impact is being felt in allsectors. From finance and healthcare to transportand manufacturing, AI helps organisations automateprocesses, boost productivity, and optimize the useof resources.

Artificial Intelligence is an emerging focus area of the Government of India which is reflected through a discussion paper of the NITI Ayog that talks about a National Strategy for Artificial Intelligence with one of the primary focus areas in smartmobility. Also, the interim budget of 2019 announced that a National Centre for Artificial Intelligence will also be set up shortly. To actualise the ambitious initiative, the Central Government has identified nine priority areas, and the national portal on AI will be developed soon[5].

AI systems have been gradually developing across all fields; from defeating chess grandmasters, predicting the outcome of

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judgments linguistic analysis of texts, and robots who are being granted formal citizenship.As seen in science fiction movies, AI system also includes some controversial features such as facial recognition and scanning for potential terrorists.

As per some estimates, AI systems are expected to add upto USD 15 trillion to the global economy by 2030 which has the potential to lift millions out of poverty and enable them to gain access to fields that were out of bounds for them for generations[6].

There are also significant ethical concerns that AI systems could perpetuate the existing biases and discriminatory practices of humans, reduce and eventual eliminate human primacy in decision -making, replace humans in most of the jobs that they currently perform among others.

Further, there is another significant question with regards to accountability. Who will be held responsible in case of a mishap?We assume currently that autonomous vehicles will be safer. There could also arise a situation wherein an autonomous vehicle may make a decision as to which person to hit as compared to the other based on certain parameters.Special attention is needed in fields wherein vulnerable groups based on age, sex, gender, race etc that have historically been disadvantaged or are at risk of exclusion. Eg. Based on the datasets of an autonomous vehicle, in an accident scenario, it may decide that a certain race or gender "deserves" to be saved more than the other[7].

Therefore, this research paper aims to develop ethical and legal parameters for a responsible autonomous vehicle system, determine the rights and liabilities of the various stakeholders involved in order to create an effective, humane system conforming to ethical and normative framework. There is a need to formulate a well-balanced regulatory framework with legal policies and ethical parameters within the ART and sustainability framework for AI models in the Autonomous Vehicles in India which can be extended to global context as well

Accountability and AI

While at present we may consider AI systems to be equivalent to Aristotle's natural slaves how would we deal with future mishaps involving AI systems, Among the major legal grey areas surrounding AI, the primary is that who will be held liable when an AI system causes an accident? Will the manufacturer be held liable or will the coder or insurer be liable?

Such questions will keep on increasing with the expanding scope of AI. However, with all the possible problems, legal processes can be used to minimize AI induced risks to the public without stifling innovation.At present rights and liabilities are determined by assigning personhood, whether to a human being or a corporation. Without a strict legal definition regarding personhood it will be difficult to determine what will be legal liability of the AI system.

European Parliament from 2017, which says that autonomous self-learning robots having artificial intelligence could be granted "electronic personalities."[8] They are defined as: "specific rights and obligations, including that of making good any damage they may cause, and applying electronic personality to cases where robots make smart autonomous decisions or otherwise interact with third parties independently."

This could become a model for laws across the world if successful and turned into a workable regulatory framework. How the idea of a legal personality pans out is yet to be explore however what is for sure is that with complex issues of liability of complex self-learning AI systems we should be exploring all possibilities.

However, we have to acknowledge that that all these principles may not work in complete consonance with each other and as per our

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present understanding of what is just fair and equitable.

Opponents of this theory of electronic personality disagree and say that giving a status to AI system would completely erase the responsibility of manufacturers. Manufacturers who are pushing for such a law are trying to absolve themselves of responsibility for the machines that they have createdin many cases will still have control of a human being.

The modern developments enable AI systems and machines to fulfil tasks that earlier required critical human thinking. The present state-of-the-art technology permits these systems to make their own decisions by learning from human decisions. The primary concern of lawmakers and stakeholder is that will such systems eventually turn into a Frankenstein whose decision-making process will be too complex to understand going beyond human understanding as well which will make it impossible for

Unfair prejudice and Bias

As the use of AI is growing in sensitive areas like law enforcement, predictive criminal justice, autonomous vehicles, healthcare among others, there is a debate on whether the outcomes will be free from any bias and ensure complete fairness.

The use of AI in Law enforcement may only perpetuate existing biases like gender, caste, race, religion etc. Similar biases would also exist In autonomous vehicles and the challenge would be to ensure ethical parameters exist so as to ensure that the AI is responsible[9].

Defining what counts as bias and what is fair is itself still a challenge. Bias may entail some form of preference towards something and discrimination towards the other that is unfair. It could also mean systematic discrimination against certain individuals or groups on the basis of certain traits like gender, race, language, religion, physical characteristics etc[10].

The concept of bias is inherently linked to the concept of fairness. One action that is biased towards one person may be deemed by the other as fair. Some experts may welcome algorithmic bias as against human bias probably because decisions made by an AI system can at least in principle be identified and remedied as it can be examined and interrogated more easily as compared to human bias.[11]

While AI can help enhance the lives of people and in theory also reduce bias, it can also perpetuate and scale up the bias[12]. Biases also penetrate during designing of AI systems and often take decisions on behalf of both private and public bodies.[13]

Example of bias:

In a study in the US it has been found that white judges often harbour similar kinds of implicit bias against black defendants as any common person and such biases may influence their decisions. However, in case there is sufficient motivation they can compensate for this bias[14]. From the above study it may be inferred that well defined ethical parameters that become the “basic structure” of any system, whether humans or an AI system help overcome biases.

In case an AI system has implicit bias due to the person who has developed the code, it may pose significant challenges on outcomes based on the area of operation of the AI. In the healthcare sector biases based on gender, class differences, race etc. may lead to undesirable outcomes. Social norms of a society may not be adhered to in case the code of the AI is not tweaked accordingly.

In one situation that is related to biases in crime prevention that may be unintended is was found that Palestinian Man was arrested after Facebook Auto-Translated a 'Good Morning' as 'Attack Them'[15]. This may not be a case of bias but

could also be a case of lack of data sets and inputs that resulted in an incorrect translation. Every language may have certain slangs, satire etc that an AI at present does not account for. Therefore, while their algorithms may raise red flags for certain arresting people simply on this basis, would be unfair.

In another case it was found that US Immigration Officials were using Google Translate to vet social media posts of refugees so as to flag potentially dangerous immigrants. This however may bring about unintended results as Google itself warns against using the tool as a replacement for human translators[16].

Thus, AI could embed within itself human biases and deploy them at a large scale. In one study it was found that black defendants were far more likely than white defendants to be incorrectly judged to be at a higher risk of recidivism, while white defendants were more likely than black defendants to be incorrectly flagged as low risk.[17]

In autonomous vehicles based on certain data that is fed into the system, it may recognize ability, who should be saved etc. in an accident on the basis on inherent biases of the programmers.

Ethical parameters

Some ethical parameters that may be necessary to be considered by an AI system that would include autonomous vehicles are as follows[18]:

1. Prevention and Protection against harm: AI systems should neither cause nor exacerbate harm or otherwise adversely affect human beings. This means that the utmost responsibility is to protect human dignity as well as mental and physical integrity. The environment in which AI operate should also be safe and secure. It should be technologically robust and it should be unexposed to malicious use.

2. Fairness

AI algorithms are prone to errors and manipulations by the users therefore it becomes necessary to ensure that it does not violate any human rights. Fairness refers not just the fairness of data but also fairness in respect of design, outcome and implementation.

3.Transparency: Transparency highlights upon the policy for disclosure and explanation of any act carried out by the AI system. The capacity to communicate the reasoned decision which can be can be traced and audited.

4. Privacy and data protection: These AI tend to thereby create a repository of information that also records on digital platform human behavior on different life events, infer individuals' sexual, religious and political preferences. Therefore, the access to such fiduciary information should be kept confidential especially that information between doctor and patient.

Autonomous vehicles: Issues, challenges and laws

These automated vehicles can also function along with the drones and for digital surveillance. Many nations have started developing and formulating policy guidelines to address the probable risks which can be posed by these automated vehicles. The probable future consequence would be that it would impact not just safety and security of the persons driving such unmanned vehicles but also issues such as liability, cyber security and ethical considerations would also plunge.

When the automated vehicles are allowed to run, many liability issues are involved leading to many challenges all the stakeholders of this technology. The existing test determines the driver's liability and adjudicates accordingly, but the problem arises in driverless vehicles fully on software without human intervention. Conventionally, insurance companies grant claims on the basis of the number and kind of

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accidents a person had and at which place the accident took place. But in case of driverless cars, can software be equivalent to a driver? Would insurance company grant personhood to such automated vehicles and grant insurance for the same? There are also chances in which the software is tampered, then in that case would the insurance company be responsible to indemnify for the loss the owner of the car has suffered.

Case study

In this case a US citizen was killed when his autonomous vehicle, a Tesla-S was into autopilot mode wherein the car sensor was unable to distinguish a truck against the sky. This has further raised alarm bells regarding determining liability and on whom will this liability rest; the manufacturer, driver or some third person[19].

Investigations are underway whether the AI system of the car played a role in the accident. It was found that the car driver was drunk and it was not likely that the autopilot was switched on. Ascertaining liability is crucial in determining whether a specific insurance cover is required by the driver. Some authors argue that either the manufacturer or seller should be liable in case the AI system of the car could not control the car thereby making it dangerous.

Legal Framework for Automated vehicles

The Vienna Convention on Road Traffic 1968 was amended in 2014 which permitted driving of automated vehicles on road but the driver should be given the choice to override the system and even stop it. However, the European Union is also demanding that the fully automated cars without drivers should also be allowed[20].

UK

In February, 2019 UK Center for Connected and Autonomous Vehicle published Code of Practise: Automated vehicle trailing wherein it is also mandatory for conducting public trials of automated vehicle technology to follow below mentioned regulations:

a. A driver is present, in or out of the vehicle, who is ready, able, and willing to

resume control of the vehicle;

b. The vehicle is roadworthy; and
c. Appropriate insurance in place.

In case of any untoward situation the government shall impose the responsibility on those carrying out trials.The Code also provides for protection of privacy of the users and imposes a duty upon those who are trailing such vehicles to protect data collected from individuals. The trailing organization should also ensure that the personal data which has been obtained and collected by them should be fairly used and with utmost security by complying with the provisions of the Data Protection Act 2018. There is also a requirement to maintain appropriate security measures tomanage data security and the risk of unauthorized data access so as to protect the information collected by the manufacturers of the trailing organizations against any kid of cyber threat[21].

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The Table Below gives a multi-country analysis for the use of AI in autonomous vehicles

No.	Country	Guidelines for AI	Guidelines of AI ethics	Principles laid down for AI ethics	Relevance in Autonomous vehicles
1.	United States	No specific sui generis federal legislation for covering all aspects of AI. Federal Algorithm Accountability Act, 2019 for ensuring data protection in AI	- House Resolution 153 introduced in Feb, 2019 for ethical implications of AI - The National Artificial Intelligence Research and development Strategic plan	-Engagement of AI in industry, government, academia and civil society. - Transparency and explain ability - empowerment of women and marginalised -life long learning -accountability and oversight -Information privacy and data protection - Access and fairness of services and benefits -safety, security and control of AI	- No uniform law for all the states regulating the use and trial of autonomous vehicles - There is are separate legislation with respect to the respective subject matters • Cyber security legislation- Consumer Data Security and Notification Act. - State of Nevada passed Automated vehicle legislation in 2012, - Passing of the National Highway Traffic Safety Administration Act- recognised automated vehicles and has also classified them.
2.	United Kingdom	It formulated AI Committee but still not enacted any legislation for the same.	Published 'A guide to using artificial intelligence in Public Sector'. This guidance is a summary of Alan Turing Institute's guidelines on AI ethics and safety.	- Accuracy - Transparency - Interpretability - Fairness -Integrity and control - Impact - Accountability and learning	- In February, 2019 UK Center for Connected and Autonomous Vehicle published Code of Practise • responsibility on those carrying out trials. • No driverless cars allowed appropriate

					security measures to • manage data security and the risk of unauthorised data access - Key Principles of Cyber Security for Connected and Automated Vehicles, 2017 formulated by department of transport.
3.	European Union	Recognised the need for embracing change relating to AI in the competitive international framework "Communication from the commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions"	Published, Ethical Guidelines for Trustworthy AI' in June 2018	In order to be trustworthy an AI should follow the basic fundamental rights and ethical principles namely, - Transparency - Accountability -Privacy and protection of Data - Societal well being -Respecting diversity by being immune from biases -Technical robustness and safety -Societal and environmental well being	- Directive on Security of Network and Information Systems, 2016- cyber safety - EU General Data Protection Regulation, 2016- for data protection of the residents of EU- recognised consent to play a major role before use of such data for any unauthorised use. - Formulated Guidelines ontheExemption Procedure for the EU Approval ofAutomated vehicles (Adopted on 17th May, 2018) • Rules governing safety performance in the automated mode • Full automation is not allowed and human intervention and control is essential and mandatory. • Need recognised to protect against cyber security and hacking.

					• Tortuously made the person who is directly or indirectly controlling the such vehicle.
4.	India	No specific legislation for governing or defining AI.	Discussion paper on National Strategy for Artificial Intelligence, June 2018	It has acknowledged that there are unclear, privacy, security and ethical regulations. It has established for FAT framework (Fairness, Accountability and Transparency) however we are still not ready for facing the ethical challenges by this technology.	Following are a few general laws governing the relationships arising out of interaction between human and machine interaction. - Motor Vehicles Act, 1988 - Consumer Protection Act, 2019 - Information Technology Act, 2000 (“IT Act”) and Information Technology (Reasonable security practices and procedures and sensitive personal data or information) Rules, 2011. - Data Protection Bill 2018 Therefore, there exists no specific legislations or guidelines on use and trial of automated vehicles.

Liability and Insurance

When the automated vehicles are allowed to run many issues of liability are involved leading to many challenges all the stakeholders of this technology. The existing test determines the driver’s liability and adjudicates accordingly, but the problem arises in driverless vehicles fully on software without human intervention. Conventionally, insurance companies grant claims on the basis of the number and kind of accidents a person had and at which place the accident took place. But in case of driverless

cars, can software be equated to a driver? Would insurance company grant personhood to such automated vehicles and grant insurance for the same? There are also chances in which the software is tampered, then in that case would the insurance company be responsible to indemnify for the loss the owner of the car has suffered.

Position in India[22]

Motor Vehicles Act, 1988

The Motor Vehicles Act, 1988mandates that a driving license is compulsory for driving a motor vehicle. It has also specified the age limit in connection with driving of motor vehicle. Therefore it makes the owner of the vehicle responsible for any legal unjust which is suffered due to his act or omission. However, in case of automated vehicles can the owner of the vehicle be held liable for an act which is not under his/her control? If not, can the AI in the automated vehicle be imputed with legal personality and held responsible for the acts done by it? Will no fault liability be included?

Consumer Protection Act, 2019

With the digitization of trade and commerce, Consumer Protection Act of 2019 has been enacted substituting the earlier 1986 Act. As per that the consumers should be protected against any defect in goods and efficiency in services. Manufacturers are also held responsible for their negligence and they are imparted with greater responsibility to ensure consumers do not suffer any harm due to any misrepresentation or any other breach of warranty by them. Under the new legislation, 'product liability' enables the consumer to claim compensation from the product manufacturer, service provider and seller.

Information Technology Act

The Information Technology Act, 2000 ("IT Act") and Information Technology Rules, 2011 would cover the fundamental concepts of privacy and data protection. With respect to autonomous vehicles multiple there could be situations wherein the AI system of the vehicle would take complete control of the car. The policies of the AI systems should incorporate necessary provisions so as to protect the data of citizens and dealing with the treat of hacking.

Data Protection Bill 2018

The current Data Protection Bill, 2018 aims to keep personal data secure and protected. It expands the scope of Section 43 of Information Technology Act, 2000 and provided that processing of the personal data shall be done by both private and government body and its their equal responsibility to protect the confidentiality of personal data. However, this bill states that the State is not required to take consent of the public before taking the data.

Analysis and Conclusion

When a user shares his personal information with the AI it is also a possibility that the AI might also inadvertently take such personal data which are not consensually given by the user. In case of automated vehicles, the AI system often tend to take personal information of the drivers/owner of the vehicle which is recorded and saved in the central server. Many companies who are enabling these AI systems are not providing for the regulation and protection against any breach of these personal data. In addition to these the users also have the right to be forgotten and right of erasure, but in the interface like Google where all your location history is automatically saved, how will be the privacy of the users be ensured? There is also a chance that the data collected from the users can be misused at other platforms so there is no check and balance mechanism for tracking such unauthorized bodies/individuals keeping a track over the activities of such automated vehicle

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Policies have to ensure the best practices that autonomous vehicles have to follow as a standard operating procedure. Various factors such as ethical issue, having a human as a backup operator in the event of an emergency, licenses for such vehicles, liability etc. have to be taken into consideration. There could also be a situation wherein there is a collision between two different autonomous vehicles. There are also various ethical issues such as in case of an inevitable collision, will the AI system of the vehicle save the driver / passenger or pedestrians.

Autonomous vehicles can also be used as weapons by terrorists.[23]

Some countries have woken up to the challenges that are posed by autonomous vehicles. In the US, the "Grow America" Act has already made hacking of a vehicle a criminal offense. This technology while potentially transformative can also intrude into the personal lives of people. The Act has provisions to monitor, detect and deal with cyber attacks.

Data privacy, especially that of personal information is vital in the case of autonomous vehicles as the vehicles would be connected to a centralized server that can raise serious questions about privacy.All information of the passengers, their travel history etc can be determined from the centralized database.

In this situation the aspect of liability becomes more complex as various factors and parties would be involved. While technology moves at a rapid pace, regulations move at a snail's pace. We have to update our policies so as to keep pace with the rapid technological advancements.

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