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Artificial Intelligence, Law and Justice

Session 19

AI and Patents / Patenting- Part -II

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Artificial Intelligence, Law and Justice, Session 19. This is the second session on AI and patents.



Recap

- In the previous session we started with fundamentals of patent protection and criteria
- We further discussed the challenges AI poses to patenting in theory and practice



Let's do a quick recap. In the previous session, we started with the fundamentals of patent protection criteria. We also went further and discussed the challenges AI poses in patenting in theory and practice, particularly when it comes to inventorship. We also

delved in depth into the human-centric nature of inventorship in AI and patent law, and then discussed how AI is really challenging some of the cherished long-time assumptions regarding patentability, co-inventorship, and also some of the fundamental ideas, such as whether a human should be the sole inventor or if only humans should be the inventors. In this session, we will go further and also look at some of the other issues and controversial solutions, as well as some of the things that come up again and again when we discuss AI and patenting.



- **Breakthrough Discovery in 2015**
 - Eve made a significant discovery in the fight against malaria
 - Eve is a Robot Scientist, not a human being
- **Development of Robot Scientists**
 - Designed and built by a team led by Prof. Ross King
 - Adam was the predecessor of Eve
 - Field of automated drug design and synthetic biology
- **Role of Artificial Intelligence**
 - Robot Scientists use AI for automated drug discovery
 - Complex mechatronic systems involved
- **Patent Law Challenges**
 - Questions about the patentability of AI



So, to begin with, we should look to robot scientists Adam and Eve. They made a groundbreaking discovery in 2015. Eve made a discovery in the fight against malaria. Now the robot scientists are enabled scientists; I mean, they are robots, but they are enabled by a digital system, and of course, they use a whole lot of technologies. And Eve, being a robotic scientist, made a significant discovery in the fight against malaria. They were actually designed and built by a team led by Prof. Ross King. Adam is the predecessor to Eve. The field of automated drug design and synthetic biology was the idea. So, they used AI for automated drug discovery. Complex mechanical systems were involved. Look, this is not just AI. This was also a combination of multiple technologies using robots, with AI being a key component, and of course, there were also mechatronic systems involved. So, the patent law challenges that arise from their working question the patentability of AI or the challenges that AI always poses to patent law.



Drug Development



- **Importance of Adam and Eve in Drug Research**
 - Drug development takes 10-14 years
 - Costs range from USD 1 to 2.6 billion
 - Any simplification or acceleration is welcome
- **Drug Development Process**
 - Isolating a target molecule or cell structure
 - Searching for substances with desirable effects (hits)
 - Constructing promising substances efficiently
 - Optimizing results for effectiveness and efficiency
- **Role of Robot Scientists**
 - Use AI to optimize substance selection
- **Limitations of Robot Scientists**



Drug development is something very time-consuming, involving teams and teams of scientists. Often, it takes about a decade or more, even 20 years, to commercialize a drug straight from the days of conceptualization. This involves preliminary testing, screening, assay development, validation, applying for a patent, going through clinical trials, getting it finally approved, and then putting it on the market. So, it normally takes anywhere between 10 to 20 years, and it is cost-intensive in the sense that, depending on the complexity, the disease, and many other factors, it could range from 1 to 2.6 billion. However, whether it really needs so much money or whether they are so expensive is again a contested topic, which we will not go into. When it is such a time-consuming and laborious, money-consuming, resource-intensive process, anything that could reduce the time factor will be something that will really speed up the innovation process in drug discovery. So, the drug discovery process involves identifying a target molecule or cell structure, then searching for substances, constructing them, and optimizing the results for effectiveness and efficiency. Now effectiveness and efficiency are important because the problem is that to come up with a single drug that is effective and can finally be commercialized, thousands and thousands of molecules or thousands of samples have to be analysed. Many drug candidates may fail at the clinical trial stage, and everything else that has been done in the last 10-15 years may not bear fruit because of that. Similarly, many trials that fail, which may not even reach the pre-clinical stage, might have been developed at a very expensive cost. It's also a fact that many trials or many experiments in drug discovery do not proceed beyond a certain point because there's a valley of death. The valley of death occurs when you know that you have something that could be further developed and then put to market, but you may not receive sufficient funding, or it is also possible that the efficacy and efficiency of the drug may not be so fantastic or so great that they should invest more money to develop a new drug from it. So, there are so many facts; it's more a question of hit and miss; it's more a question of trial and error that ultimately ends in a patentable drug. Now what did these AI scientists and robot scientists do? They used AI to optimize substance selection, or they used AI to do something that is very fundamental.




Antenna Design

- **Challenges in Antenna Design**
 - Achieving specific radiation characteristics is complex
 - Designing antennas is difficult even for experts
- **AI Assistance in Antenna Design**
 - AI simplifies the design process
 - NASA has used AI for antenna design for many years
- **Notable AI Achievements**
 - In 2006, a genetic programming algorithm created a unique antenna design
 - The design resembled a twisted paper clip
 - AI solved the problem without human intervention




Let us now take an example of antenna design. Antenna design is challenging because achieving a specific radiation characteristic is very difficult, and designing an antenna is difficult even for experts. But AI simplified the design process, and NASA has been using AI for antenna design for many years. In 2006, a generic programming algorithm created a unique antenna design that resembled a twisted paperclip. So, AI devised an antenna design without human involvement, without human intervention in the sense that no human told it, no human said it should devise it, it should do that. It devised it on its own. So, it is an achievement in the sense that antenna design without human intervention was proven to be feasible by NASA when they used AI.




Automation & Autonomy

- **Robot Scientists like Eve**
 - Located between human and machine autonomy
- **Antenna Design**
 - AI systems act more autonomously
 - Machines capable of finding autonomous solutions for specific tasks
 - Closer to autonomous invention than drug development
- **Drug Development**
 - Lags behind antenna design in machine autonomy
 - Requires significant human oversight and interaction
 - Potential for increased machine autonomy with sufficient data




Coming back to drugs, what exactly do these robots scientists do and who are they? They are located somewhere between human and machine autonomy. They are autonomous;

they are robust; they have some sense; they could do multiple things; they could do experiments; they could figure things out. Here, the AI systems in case of antenna, they acted more autonomously. And then, machines are also capable of finding autonomous solutions for specific tasks. So, these are closer to autonomous invention by humans than drug development. Because drug development requires human oversight, significance, and, more importantly, human interaction. It is also a fact that human interaction in terms of further direction and sufficient data needs to be done when you interact with a robot scientist to develop a drug. But in later years, or even in the near future, as AI is being used extensively in drug discovery, if not all the AI drug discovery processes and initiatives use robots, increased autonomy, and increased capacity of the machines to identify, work further, and learn on their own, along with more and more data, can allow them to simulate, synthesize, and come up with drug candidates in a much faster and better way. In the sense that the drug development process could become less human-interventionist and more AI-system dependent. Of course, an AI system on its own is powerless. We need to provide input data, train it, and give it a lot of things. But the point is that drug development in that case may become less human-intensive; humans will be involved, but not in the way it is happening right now, and then there will be more AI or more AI system-oriented approaches in the sense that during the developmental stage, the autonomous stage, the stage of further refining, redeveloping, testing, and then developing, as well as simulating, and also, to a great extent, identifying potential candidates. In the drug discovery process, what humans can do, AI should be able to do with the same efficiency, with the same idea of selecting the right candidate. So, if that happens, the drug development process, the way it is being done now, will undergo a paradigm shift. Humans are there, but their role will become very limited.



The Substantive Aspect

- **Substantive Aspect of Inventorship**
 - Interpret inventorship broadly to include task formulation and result acknowledgment
 - AI inventions can be protected under current law
- **Natural Person as Inventor**
 - Patent offices in various countries are considering machine-made inventions
 - Example: DABUS, a machine named as inventor in a patent application
- **Human Contribution in AI Inventions**
 - Formulating the task and acknowledging the result may justify inventorship
- **Arguments for Broad Interpretation**

So, the question here would be the substantive aspect of inventorship: will that shift from human to AI, or robotic systems, or combined systems where robotics, AI, and mechatronics come together? Again and again, the fundamental problem we are stuck with is the natural person as an inventor. DABUS: The same problem occurred. Human

contributions to AI inventions could be something different because we formulate the task and then look at the resulting acknowledgments and everything. But if we go for a broader interpretation and say the substantive aspect should be looked into, and if AI can come closer to the idea of inventorship—if AI can really develop a drug based on the data given to it, based on some of the other parameters and guidance, but without much subsequent human intervention—we can substantially say, or to a great extent we could conclude, that AI has attained the level of an inventor, or that AI has graduated to the level where we can say that AI, as an inventor in some disciplines or in some innovations, is something that should be recognized, acknowledged, and allowed. This means that we need to relook at the human-centric inventorship idea.

The slide is titled "The Substantive Aspect" in red text. It features two logos: NPTEL on the left and IIT Bombay on the right. The main content is a white box containing a graph and text. The graph is titled "Inventorship in the Age of Artificial Intelligence" and shows a line graph where the y-axis represents the scope of the term "inventor" (from narrow to broad) and the x-axis represents the level of machine autonomy. A shaded area under the line indicates the range of human and machine tasks. Below the graph, three stages are listed: "machine performs parts of entire task", "machine solves entire task alone", and "machine formulates and solves entire task". The text on the right of the graph says "Inventorship in the Age of Artificial Intelligence" and "Alfred Früh". At the bottom of the white box, it says "Fig. 1 Human and machine tasks in the inventive process and scope of the term 'inventor'" and "C. Godt, M. Lamping (eds.), A Critical Mind,". In the bottom right corner of the slide, there is a small video inset of a man in a blue shirt speaking.

So, when we say we can look at it in a beautiful graph provided by Alfred Früh, it is available in the book "A Critical Mind." So, he says that broad interpretation and narrow interpretation depend upon the level of autonomy, the human extension, and how much humans figure in comparison to machines. So, as it moves more towards greater machine autonomy, we need to consider the idea of inventorship as a progressive one. Progressive in the sense that machines become more autonomous, they attain the level of a human inventor, or they are due to be claimed or at least recognized as human inventors. So, the inventorship in the age of machine learning and artificial intelligence, as discussed in this chapter, gives us very good insights into it; however, I cannot go into each and every detail of this chapter. The fundamental idea presented here is something that is very substantial for us to understand. So, if we understand or if we can put the logic this way, as machines become more autonomous, humans come here. So, when human intervention is more, machine inventorship is less; the question doesn't arise. But when the balance is tilted in favour of machines, or we ourselves make the machines more autonomous with inventive capacities, the balance shifts in their favour, so the whole debate naturally has to move in a direction where we recognize them as inventors. But as full inventors or co-inventors? that's a difficult question.




The Formal Aspect

- **Formal Requirements in Patent Applications**
 - Patent offices can grant patents if formal requirements are met
 - Example: EPO application left inventor field empty
- **Machine as Inventor**
 - Applicants named a machine (DABUS) as inventor
 - Machine naming does not meet EPO formal requirements
 - Application refused due to lack of natural person inventor
- **Intermediate Findings**
 - No rights granted if machine is named as inventor
 - Rights can be granted if a natural person is named
- **Future of Inventorship**
 - Requiring human inventors is outdated

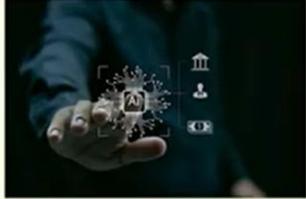



But you know this world is full of procedures, forms, classifications; someone has to sign, someone has to type, someone has to certify, someone has to endorse. And patenting is no exception to this. So, if you really file a patent form, besides the technical documentation and all, you need to fill out a whole lot of other details, including who the inventor or inventors are and the other details that need to be provided. The inventor column cannot be left blank. Even to meet the formal requirement, a fundamental requirement, I need to put a name there. I need to identify a person there. So, the machine cannot be listed as an inventor as in the DABUS case. So, the machine did not meet the criteria of an inventor, and the EPO, or European Patent Office, said you did not meet the criteria and refused to examine it. So, very simply, no rights will be granted if you list the machine as the inventor. Rights can be granted only if a natural person is present. So, requesting human inventorship in one sense can be argued to be outdated because DABUS is the inventor here, not humans.




Legal Assessment

- **Formal Requirements for Inventorship**
 - Machines cannot be named as inventors
 - Natural persons must be named to grant patent rights
- **Issues with Current Inventorship Concept**
 - Human inventors requirement is outdated
 - Technological progress increases AI autonomy
- **Need for Policy Adjustments**
 - Current concept is not future-proof
 - But what is the alternative is not clear




So, the whole idea of machine-centred things comes up again and again, but the problem is that policy adjustment regarding where it should go is a big issue here.




Overcoming the Human Invention Requirement

- **Abandoning the Human Inventor Requirement**
 - Proposals for non-human inventorship have been made
 - Assigning inventorship to the machine's owner is impractical
- **Challenges with Machine Inventorship**
 - Machines are not necessarily physical devices
 - Machines lack legal status to be inventors
 - Patent offices cannot grant rights to machines
- **Alternative Solutions**
 - Companies as original right holders
 - Control over the machine as a criterion
- **What Amendments Needed**
- **Clarity in theory to consistent rules**
- **Patching up or Transformation?**




How do we overcome the human intervention requirement, if at all we want to overcome it? We don't know; in the future, we may be so adamant that we will say AI is fantastic, AI has great things, but sorry, we are humans, we cannot afford to give up the idea of inventorship and then say you are AI, you can also be given it. We can take such a stand; national governments can take such a stand. So, proposals for non-human inventors have been made in the literature stating that invention by machines may be impractical, but feasible solutions can arise because machines may have legal status, may not have legal status, and thus patents cannot apply to machines. These are all fantastic. But there are some alternative solutions, such as companies being the original rights holders. A limited

company is a legal entity. Many of the legal persons are not natural persons in the sense that they are not humans. So, extending the idea of legal person to AI systems, we can tweak around the notion of them being the inventor, the patent applicant, or the right holder. So, if companies can file patents in their name and then claim to be the original right holders, why not AI? And then, if companies can claim AI-based inventions in their own name, why not extend the logic and allow AI to also claim the name? So, what amendments are required, and where do we begin with the amendment? Should it begin with a patent application form naming the inventor as the AI system, or should a total overhaul of the system be required? We are not clear because the problem is not just a question in theory; it is also a question in practice. And in practice, the important thing is that the rules must be consistent at each stage of the patent application, scrutiny, analysis, and then grant.

If the rules themselves are not consistent, they will create chaos. For example, if the application form says that you can list AI as an inventor, but some of the criteria later do not allow AI as an inventor or the rules are tweaked in such a way that you can still file the form with AI as an inventor, the final outcome will not grant AI inventor status. So, where we make the change here becomes very interesting to look at. So, there are two options available. One: we can try to patch up, bringing some changes marginally, beginning with the application form, like AI being put as a co-inventor or AI being granted some rights; but then we can say that as the second inventor, not as the first inventor. You can say AI can be the co-inventor, but in the patent application you should come up with a disclaimer that although AI is granted to be listed as a co-inventor, AI will not have any rights for the invention, nor will AI claim any rights as an inventor, and AI is not the one that is going to assign the patent rights to someone else. So, some sort of thing can be done. But will that be sufficient? Will that be necessary? We don't know. So this tweaking can happen in some ways that the inventorship criteria can be partially relaxed; as we saw in moving towards human autonomy and moving less towards human autonomy, we can arrive at a situation where if the patent application and the patent applicant, whether human or a legal person, can prove that inventorship is 50-50%, then if it is proven to the satisfaction of the relevant parties, of course, we'll have to evolve a lot of rules to do that. That is a pretty complex issue because, with each AI system being a black box, how do we define and decide this? That is a totally different topic.

It is feasible. Whether it is 20%, 70%, or 80% is a different question. So, the moment we conceive that AI can also be a co-inventor or a joint inventor, or can be a second inventor or third inventor in the application, we are slowly moving towards a fundamental change that goes beyond the human invention requirement. But if you totally transform everything and then say that irrespective of all that, AI can be an inventor, then there will be chaos because if we have not set the norms rightly, as we saw, the number of AI-related patent applications is moving, the system will have too many applications for either AI as a co-inventor or AI as the primary inventor, and then it will be very difficult to even deal with them.




International Treaties

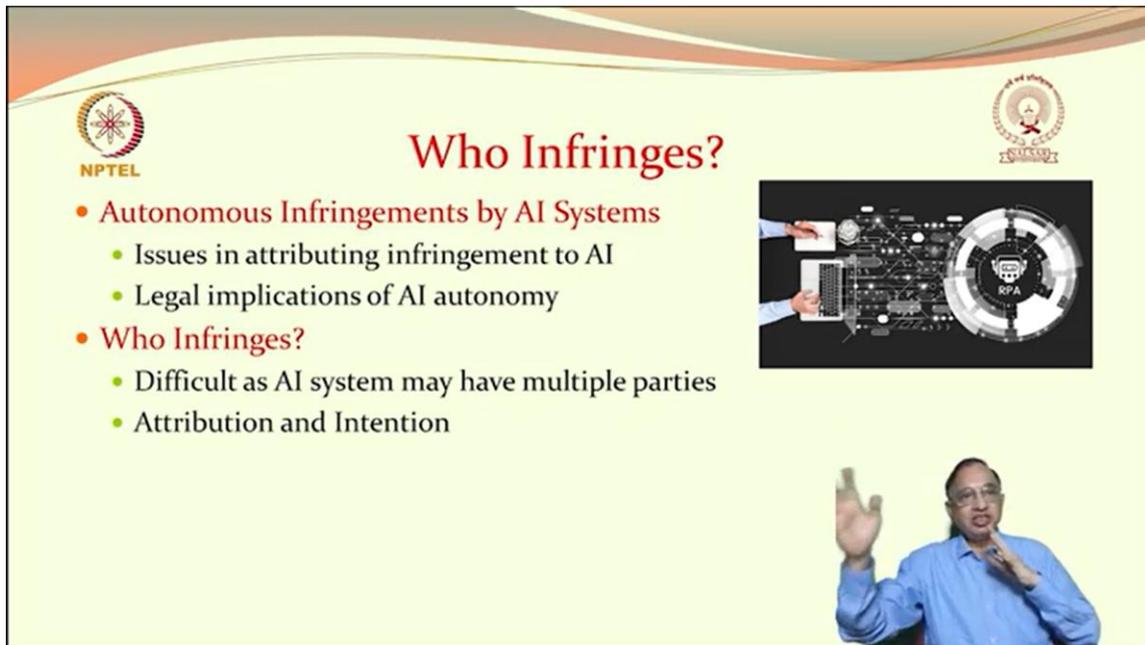
- **TRIPS Agreement**
 - Does not address moral rights of the inventor
 - Mentions inventor only in Art. 29(1) regarding disclosure requirement
 - TRIPS gives flexibility in some aspects like defining invention
 - Certain inventions can be denied patents but countries differ
 - TRIPS is technology neutral
- **Paris Convention (PC)**
 - Art. 4ter PC expresses moral rights of the inventor
 - PC does not define 'inventor', leaving it to national laws
 - National laws can include companies as inventors




The whole international IP system revolves around the TRIPS agreement, which is the Trade-Related Intellectual Property Rights Agreement. This is the fundamental agreement under the WTO that sets the norm for all IP rights, including copyright, patents, plant variety protection, and also trade secrets. So, the TRIPS agreement is the one that is the gold standard for every nation's patent criterion, and every nation's patent act and copyright act have to meet the norms set in TRIPS; in other words, if they are found to violate or be inconsistent with the norms set in TRIPS, they could be set aside or held as invalid. Now, the TRIPS agreement does not look into the moral rights of the inventor; that is point number one. Then, the inventor is disclosed only in the disclosure requirement. So, one set of arguments could be that there is no question of moral rights. So, TRIPS per se does not prohibit AI from being claimed as a co-inventor or when it comes to the disclosure norms based on Article 29(1) being tweaked.

And then TRIPS gave full flexibility in some aspects regarding inventions, In the sense that how you define an invention, the patentability criteria are not fully flexibility, but rather some sort of flexibility under TRIPS is present. Certain inventions cannot be denied in some countries, but others can be denied in some countries. For example, in some countries you can patent a genetically engineered mouse, whereas in others you cannot. Europe has its own patent convention where the norms of ordre public, morality exist, so the conditions and criteria vary, but the fundamentals remain the same. More importantly, TRIPS is technology neutral in the sense that it covers all fields of technology and all fields of science. The TRIPS agreement could be the starting point for such changes; one way to look at it is that countries can agree to insert some sections in TRIPS for copyright norms related to AI-based inventions or AI as authors. Similarly, for patents, they can introduce some norms, but again, to what extent those criteria or articles will provide flexibility and how to align them with the broader ideas of copyright and patents under TRIPS will need to be thoroughly discussed and sorted out. When we talk about patentability criteria and what inventions can be patented, flexibility is given. Some countries may or may not allow AI-related inventions to be patented. Some countries may

allow it. So, a broader consensus on the fundamental issues is more important than trying to tweak or do some tinkering with TRIPS and other agreements. The Paris Convention is relatively older, but TRIPS is the current norm. So, we have mentioned the Paris Convention also to indicate that, again, it does not define "inventor," leaving the individual nations to decide.



The slide features the NPTEL logo on the left and the Indian Patent Office logo on the right. The title "Who Infringes?" is centered in red. The main content consists of two bullet points, each with sub-bullets. An inset image shows a person's hands interacting with a complex digital interface. A video inset at the bottom right shows a man in a blue shirt gesturing while speaking.

Who Infringes?

- **Autonomous Infringements by AI Systems**
 - Issues in attributing infringement to AI
 - Legal implications of AI autonomy
- **Who Infringes?**
 - Difficult as AI system may have multiple parties
 - Attribution and Intention

We have talked about authorship, we have talked about inventorship, and we have also talked about autonomous systems and how autonomy moves. But the question here is about the other important aspect of patenting and patent law. Can an autonomous patent system infringe on a patent? Can we attribute infringement to AIs? And if we can attribute infringement to AI, who is liable? Is it the AI, the system developer, or the one who developed and then used the system? Who exactly? And then, if AI is autonomous, if we can claim that AI is autonomous, it can make decisions and claim inventorship. Logically, infringement should be attributed to AI. If you can invent something, you also have the capacity to infringe. So, you cannot argue that AI can be an inventor, but AI cannot be an infringer. Both are inconsistent. Either totally this or totally that. You can say AI cannot be an inventor; therefore, AI cannot be an infringer. Similarly, AI can be an infringer, and AI can be an inventor. But the problem is that AI systems may have multiple parties involved, in the sense that there is the developer, then the one who fixed it, and then the one who is using it, followed by someone who made subsequent modifications to it. Additionally, the same AI system could be used by multiple parties for multiple purposes, and the AI system can be part of a larger system within a corporation or in a larger ecosystem of AI systems interacting with each other. However, regarding infringement, one thing to consider is whether there is an intention to infringe, or if this is something akin to a criminal mind. Is there a criminal mind to infringe upon? Can we attribute that to AI? And then, is there a real intention that AI did that purposefully and with full knowledge that infringement is a crime and is punishable, or did it happen due to some unanticipated development where nobody could be held

responsible? These are some of the fundamental issues that need to be tackled if you say that AI can infringe on rights.



Attribution of AI Acts In Patent Law

- **Attribution of Autonomous Acts in AI Systems**
 - Debate in general tort law
- **Direct Use of Patented Invention**
 - Autonomy of AI does not exonerate user
 - Equating AI actions to human actions
- **Responsibility for Patent Infringement**
 - Liability does not require personal fulfillment
 - Facilitation or assistance in fulfillment
- **Knowledge and Reasonable Effort**
 - Liability for supporting infringing acts
 - Reasonable effort to obtain knowledge



Coming to the next point, the attribution of AI acts in patent law, whether it is an autonomous act, is something that is possible in general tort law, but as of now, in patent law, we do not recognize them as AI agents or autonomous agents, so that is difficult. On the other hand, one argument could be that the direct use of a patented invention using AI cannot be one where we can exonerate the user. Users should be equally applicable. But equating AI actions with human actions is always problematic. So, the question of responsibility for patent infringement, liability, and then the question of knowledge and reasonable effort remains unanswered. Did AI know, or did the AI system know that this act is an infringement? Was it aware? And then, did it make a reasonable effort to prevent it or not indulge in it, knowing fully well that this can result in infringement, which is something that is punishable? Did the AI system make sufficient effort to know and acknowledge what exactly an infringement is, how it should avoid it, or what to do if it is doubtful that it is going to infringe on something? So is the system inbuilt that it takes care of these norms or this idea that AI system has got the potential to infringe. So, these are some of the questions that are not hypothetical; these could arise in the future, but these are questions that repeatedly come up again and again when we talk about infringement and attributing AI acts in patent law.

User Liability For AI System Actions

- **Setting a Cause for Infringement**
 - Alleged infringer must prevent infringement by third parties
 - Failure to prevent can establish liability
- **Insufficient Measures**
 - Any reproachable cause of infringement suffices
 - Includes insufficient measures to prevent third-party infringements
- **AI and Patent Use**
 - Equating AI use with third-party use
 - User remains responsible for insufficient precautions against AI infringements




But let us also look at user liability. Setting a cause for infringement. The alleged infringer must prevent infringement by third parties. Then there is a failure to do that. Insufficient measures, AI and patent use, equating AI with third parties: these are all evolving ideas. User liability for patent violation and the AI system's actions are going to be very controversial. But something will happen.

Insufficient Precautions Against AI Infringement

- **Definition of Insufficient Precaution**
 - Relates to infringement by a third party
 - Applies in cases of non-intentional action
- **Conditions for Insufficient Precaution**
 - Contribution to causing the infringement
 - Breach of a legal obligation
- **Legal Obligation**
 - Serves to protect the infringed patent right
 - Observance would cease the contribution to causation




Then insufficient precautions can itself be something that could be challenged or that could be forced as an offense, or it could be said that since you didn't take sufficient precautions to prevent infringement by AI, you are liable. And you did contribute to the infringement. So those arguments can be stated as you have breached a legal obligation. So, linking attribution and the mental state, and then knowingly infringing or unknowingly infringing, taking steps to prevent infringement, knowing fully well there is

potential. These are certain things that are very interesting, but again there are a lot of counterarguments for each point in them.



Legal Obligations & Infringement Prevention

- **Existence of Legal Obligation**
 - Depends on the weighing of all interests concerned
 - Decisive factor: Reasonableness of expected actions
- **Interplay Between Protection & Reasonableness**
 - Injured party's need for protection
 - Reasonableness of obligations to examine and act

Between protection and reasonableness: injured party needs a protection. Reasonableness of the obligation to examine and act. But if we extend this logic to AI systems, then it becomes all the more problematic because as we said, if the user is not held liable or user is exonerated and everything shift to AI system, then how do we arrive at an amicable solution? AI will not be able to pay damages. AI will not pay compensation. Someone has to bear responsibility. But it could be that the user will be fully responsible, although the AI is the one who primarily caused it, or certain things were caused without any actual intention or were caused on account of certain other problems but not on account of defects. It could be that some liability will be there but that will not be a harsh infringement liability but something less severe.



Conclusion



- AI asks fundamental questions on Patent Law
- From Human Centric to Machine Centric?
- More questions will arise as technology advances
- But arriving at a broader agreement globally is needed
- At least on fundamental issues and resolving them



So, the question here is that the AI is asking repeatedly fundamental questions about whether copyright or patent law applies. Then, as the systems move towards autonomy—thinking, recreating, full creativity, capacity to develop drugs, capacity to develop molecules, new molecules, capacity to develop so many things—the whole idea of inventing innovation is also moving towards machines in the sense that we are still with it; we can work with them. We are not saying that AI will become the only class of inventors. We are not saying that. We are saying that as they become more powerful, we are also moving towards working with them, not against them. So, when that machine AI system collaboration happens, the questions again need to be rethought in that context. And it is all the more interesting and important when AI does drug discovery, when AI focuses on the identification of molecules in chemistry, or when AI develops equations in mathematics. In any branch of science, in any branch of technology, today AI can come up with new ideas, novel molecules, novel proteins, synthesized proteins, or any number of chemical compounds without human intervention, such that humans cannot be involved in each and every stage. Therefore, extending the logic across disciplines and all fields of science, engineering, and technology will also mean that since we have been saying that patents are technology-neutral and not technology-oriented or biased against any technology, many things will become problematic in the sense that if AI comes up with a new drug molecule, the company that invested in the AI will be the one patenting it.

But it is also possible that the person who developed an AI system with inventive capacity and then said, "I am giving it to you on lease," or we both enter into an agreement that my system is oriented towards drug discovery invention and it has the capacity to come up with new molecules that could be tested and proved. But in drug discovery, the patenting starts at a very early stage; you don't wait until you prove the efficacy. You file the patent the moment you know that it is going to meet the three criteria: it could be industrially applicable, it is novel, and has inventive step. The first thing patent companies and pharma companies will do is go for patenting. So, in such a

context, if I develop a drug discovery-oriented AI system, whether it is an LLM or referred to as a Pharma LLM, and then I come up with an agreement that my system will be the one used, in such a case, my system will be the co-inventor. Legally, I take responsibility for the actions done by the system. Is it possible to think of such a scenario that may be possible in the future, in which case you can attribute certain things to machines with liability and certain things to humans with full liability, and then full attribution coming with humans with AI playing no role? How this mix and match of human creativity and AI creativity will work in the future is yet to be seen. So, what we are saying is that as technology advances, more questions will arise in terms of infringement, liability, co-inventorship, inventorship, and more fundamentally, the criteria for patentability. So, broader agreement on a global stage, at least on the fundamental issues, is necessary, but it is not going to happen, nor is it happening, because no country is negotiating any AI-related patent law amendments in the TRIPS Council in the sense that things are not being discussed. Certain things are being discussed in meetings at WIPO and elsewhere, but they have not reached the stage where countries have proposed that we will have formal negotiations or that we will at least come up with country-level position papers for the TRIPS Council to take them further.

It will come; if not today, maybe in another 5 to 10 years. So, unless fundamental issues are resolved, arriving at a broader case is necessary. But irrespective of that, national patent offices and national governments will try to resolve them on their own. This need not wait for the TRIPS Agreement to be amended. National governments, national copyright offices, and national patent offices can, on their own, do many things. But will that be compatible with each other? Will that be TRIPS-compatible? In the sense that if TRIPS is later amended, you would not know. But we have looked at both copyright and patent, and then also looked at why AI remains a controversial technology that strikes at some of our fundamental conceptions when it comes to copyright and patent. This also tells us one thing: that AI's role in law and justice is much broader, much more visible, and going to be much more impactful than we can even think of. So, some of the things that we have discussed so far also tell us one thing: AI is not an eternal technology that has come in the midst of other emerging technologies. So, more challenging and more interesting things will be discussed in the subsequent classes. As the next class is on AI ethics, we will touch upon what AI ethics is, why there is a need for AI ethics, and why we do not discuss ethics in the context of many technologies. We do not talk about motor vehicle ethics. We do not talk about water pump ethics. We do not talk about electric motor ethics. But why AI? So, we will discuss that in the next class.