1. What role can/does the patent system play in encouraging the development and use of AI technologies?

As with any other area of technology, the patent system can encourage innovation within the AI and machine learning space. It is critical that the patent system does not place any additional legal burden upon an applicant for an AI invention when compared to any other form of computer implemented invention. Such burdens would detrimentally lead more applicants to consider trade secret protection over patent protection.

2. Can current AI systems devise inventions?

It is our belief that AI systems cannot devise inventions. Accordingly, we agree with the findings of the UKIPO, EPO, and USPTO that an "artificial intelligence" cannot be named as an inventor.

With regard to identifying the "actual deviser" of an invention, Jacob LJ in the Court of Appeal ([2006] RPC 21) held obiter dictum that:

> "a mere, non-enabling idea, is probably not enough to give the patent for it to solely the deviser. Those who contribute enough information by way of necessary enablement to make the idea patentable would count as 'actual devisers', having turned what was 'airy-fairy' into that which is practical"

To understand the transformation of an idea into "that which is practical", as described by Jacob LJ, the European style problem and solution approach to assessing inventive step provides a helpful structure within which the above concepts can be framed.

Under the problem and solution approach, it is not the genus of the idea per se which is considered to be the indicator of inventive, or patentable, activity; rather, it is the idea as embodied as a non-obvious technical solution to an objective technical problem. Put another way, it is when an idea is realised to be a beneficial solution to a technical problem that an inventive concept is born.

There is thus a clear distinction between a *possible* solution to a technical problem, and an *actual*, or *realised* solution to a technical problem.

This distinction can be illustrated by a fictitious scenario similar to the infinite monkey theorem. Consider a large number of computers set the task of generating a design for a mechanical component. The computers are configured to generate purely random designs within the loose constraints of what constitutes a mechanical component.

It is reasonable to assume that after a length of time, at least one computer will randomly generate a design which has a beneficial property. It is unreasonable to assume that the computer, acting randomly, had an understanding of this beneficial property. Such understanding would require a knowledge of the objective technical problem which said design solved, and the relevance and benefit of said design to the objective technical problem. Fundamentally, the computer is merely a tool for identifying possible solutions.

It is the point at which the possible solution—in this example a randomly generated design for a mechanical component—is identified as being an actual, beneficial, solution to an objective technical problem, that the idea has been turned into "that which is practical", and an inventive concept arises.

It is our submission that this "transformation" of a *possible* solution into an *actual and beneficial* solution is an act that can only be performed by a human. Even when a computer is involved in devising the underlying idea (i.e., a possible solution), it is the human who transforms that possible solution into that which is practical. As such, the human is to be considered the "actual deriver" of the invention.

Modern state-of-the-art AI and machine learning systems do not operate in a sufficiently different way to the random generation machines of the previous fictitious example to warrant a deviation from the above understanding of the actual deriver of an invention.

Modern artificial intelligence and machine learning systems have proven extremely effective at: (a) searching large problem spaces for possible solutions; and (b) learning to approximate highly complex mappings or functions between an input space and an output space (i.e., learning a function which can map an input pattern to a possible solution).

Neither of these activities can reasonably be considered as "intelligent" per se, and could conceivably be viewed as mere improvements to the random generation computers of the above fictitious example. That is, rather than randomly select possible solutions from the space of all possible solutions, the AI and machine learning systems constrain the search for a possible solution, or "learn" to approximate possible solutions.

Decisively, the activity of an AI and machine learning system remains limited to the identification of possible solutions, and does not extend to the "transformation" of a *possible* solution into an *actual* and *beneficial* solution. Regardless of how the possible solution is identified, or how efficiently the possible solution was identified, it is still the domain of a human to transform the possible solution into that which is practical—an inventive concept.

Even if an AI or machine learning system were able to identify "actual solutions" from a set of possible solutions generated by another AI or machine learning system, this activity is founded on the understanding that there exists a technical problem to solve and that beneficial solutions to this technical problem may be generated by the AI or machine learning system. Both of these understandings are imported to the AI or machine learning system by the human who initially put the system into place. Thus, the transformation still relies on human activity.

Accordingly, the use of an AI or machine learning system as *a tool* in aiding innovative activity is not to be misunderstood as the AI or machine learning system being *a source* of innovative activity. In consequence, and as set forth above, an AI cannot be considered an inventor. A human remains the actual deviser of an invention involving a possible solution generated by an AI or machine learning system.

2(a). to what extent is AI a tool for human inventors to use?

It is our view that AI is a powerful tool which can be used to *aid* innovative activity. Decisively, AI does not *devise* innovative activity.

2(b). could the AI developer, the user of the AI, or the person who constructs the datasets on which AI is trained, claim inventorship?

Any natural or legal person involved in the above described steps could be deemed an inventor.

2(c). are there situations when a human inventor cannot be identified?

For at least the reasons above, we believe that there are no situations whereby a human inventor cannot be identified.

3. Should patent law allow AI to be identified as the sole or joint inventor?

For at least the reasons above, we do not believe an AI can be identified as a sole inventor.

Moreover, naming AI as an inventor could have the negative effect of stifling innovation. If the output is as a result of mere use of a known (disclosed) AI, then the output cannot be deemed inventive without human input. Alternatively, if the AI is not known and patent protection is to be pursued for the output, then this would encourage people to keep the AI as a trade secret in order to avoid the former scenario.

4. If AI cannot be credited as inventor, will this discourage future inventions being protected by patents? Would this impact on innovation developed using AI? Would there be an impact if inventions were kept confidential rather than made public through the patent system?

We see no reason for innovative activity being discouraged as a result of AI not being "credited as inventor".

5-14. These questions can be addressed by following the approach taken by the EPO, whereby AI is presently treated as "super software" in order to provide a level of legal certainty. We see no reason that existing software law, and decisions drawn upon by the European Patent Office, should not be followed for AI related inventions.

15. Who is liable when AI infringes a patent, particularly when this action could not have been predicted by a human?

Even if a machine were to devise an invention, a human must be present in order to perform an infringing act as defined by Section 60(1) of the UK Patents Act 1977 as amended. That is, the AI still requires the input of a human to search for a solution in the space.

As such, we see no difference between the possibility of AI infringement of a patent and possible infringement of a patent by any other form of software. In the case of infringement by a computer program, current law states that the person liable for the infringement is the company and not the computer program itself.

Therefore, even if an AI or machine learning system were deemed to infringe a patent, then it is entirely reasonable to follow current law as set out for computer programs whereby the company is liable for infringement.

16. Could there be problems proving patent infringement by AI? If yes, can you estimate the size and the impacts of the problem?

As a human must be present for an infringing act to occur, this question is moot.