

## ARTIFICIAL INTELLIGENCE AND INTELLECTUAL PROPERTY: MAPPING LEGAL CHALLENGES FOR THE EUROPEAN DIGITAL SINGLE MARKET

Giancarlo Frosio<sup>1</sup>

The regulation of Artificial Intelligence (AI)'s activities is set to become a primary policy issue.<sup>2</sup> Virtual agents, sapient algorithms, robots, will have a terrific impact on the European Digital Single Market (DSM). Artificial Intelligence (AI) and robots have been the subject of science fiction for some time. That fictional future is now a present reality. The AI market is predicted to grow from \$8 billion in 2016 to more than \$47 billion in 2020.<sup>3</sup> Investment in AI increased more than 300 percent in 2017 compared to 2016.<sup>4</sup> Intelligent machines, machine learning algorithms, sapient bots and neural networks have invaded our daily life. The digital society will be increasingly characterized by the interaction of human actors and non-human technological actants or virtual agents within the so called "infosphere".<sup>5</sup> In this context, there is a need for a policy framework that can promote a balanced coexistence of actors and actants in the DSM,<sup>6</sup> so that EU citizens may reap the benefits of disruptive technologies and innovation rather than being overpowered by them. In particular, the so-called Forth Revolution is also a revolution where machines come as innovators and creators. At least five themes are relevant for legal practice and research in this domain: IP protection for AI technology, regulation of information and data used as inputs for AI, ownership and protectability of AI's output, Digital Right Management (DRM) and IP enforcement through AI.

---

<sup>1</sup> Giancarlo Frosio is a Senior Lecturer and Researcher at the Center for International Intellectual Property Studies (CEIPI) at the University of Strasbourg.

<sup>2</sup> See European Parliament Resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)), <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2017-0051+0+DOC+XML+V0//EN>

<sup>3</sup> See Dow Jones and Springwise, A New Dawn of Artificial Intelligence: AI and its role in predictive modeling, <https://www.dowjones.com/new-dawn-of-artificial-intelligence>.

<sup>4</sup> *ibid.*

<sup>5</sup> See Luciano Floridi (2014), *The Fourth Revolution—How the Infosphere is Reshaping Human Reality*, Oxford, UK: OUP.

<sup>6</sup> The term actants, as employed by the literature, refers generally to material objects that are notable for their association with human actors and the activities they undertake in conjunction with such objects. See Bruno Latour (2005), *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford, UK: OUP.

## 1. Protection

First, there is a vast array of issues related with seeking IP protection for AI and Machine Learning (ML) systems. As per any software, protection can be granted through copyright or patent law.<sup>7</sup> Obviously, under the European Patent Convention, patentability can be obtained only for computer-implemented invention, rather than for software as such.<sup>8</sup> In this context, a fundamental challenge for protecting AI technologies with patents involves claiming subject matter that is patent eligible. Also, satisfying disclosure requirements can be challenging when seeking patent protection for AI-based inventions. Again, how an AI-based invention claim should be drafted? How does the doctrine of equivalents apply to AI inventions? In general, a number of novel questions will arise within the traditional framework of patentability of innovation that have now been only preliminary addressed.<sup>9</sup>

## 2. Input

Second, there are questions pertaining to the input data that must be fed to ML and other AI processes for AI learning and development to occur. Data and Big Data processing is indeed a fundamental portion of ML. On one side, **data ownership** is a critical issue. Developing AI and ML systems generally involves training it using large datasets, so the system can continuously improve its decision-making abilities. Who owns the IP in the datasets which are used to train the system? If intermediate data are generated by AI/ML during training, should there be IPR over them? Are new IP rights in data to be created? Should data be protected with a new exclusive right, as proposed by the European Commission and some scholars? And what should be the role of data mining, related exemptions and database protection in this context? On the other side, **data protection** regulations will play an important role in the evolution of AI and ML systems, with particular emphasis on the interpretation of the EU General Data Protection Regulation's provisions on profiling and automated decision-making. Finally, additional legal tools, such as competition law, unfair competition doctrines and trade secret law, might be deployed for regulating reuse of data input in ML and other AI processes.

## 3. Output

Third, creativity and innovation generated by AI will have disruptive effects on traditional business models and will force a re-consideration of the Intellectual Property (IP) framework.

### 3.1 AI-generated Creativity.

Artificial intelligence writes poems, novels and news articles, composes music, edits photographs, creates video-games, and makes paintings and other artworks. Like Google's Deep Mind, which generates and performs music or creates artworks, AI does so by listening to other music or

---

<sup>7</sup> See Directive 2009/24/EC of 23 April 2009.

<sup>8</sup> See European Patent Convention, Art. 52(1)(c) and (3).

<sup>9</sup> See Yann Ménière, Ilja Rudyk, Javier Valdes (2017), Patents and the Fourth Industrial Revolution: The Inventions behind Digital Transformation, Munich, DE: European Patent Office, <https://www.lemoci.com/wp-content/uploads/2017/12/Patents-and-the-Fourth-industrial-Revolution-2017.pdf>.

analysing previous artworks online. How does this transformation fit with traditional copyright theory and existing doctrines? In particular, which are the conditions for protection of creations generated by deep neural networks under the main copyright regimes? Is AI an author according to tradition copyright standards? Should traditional copyright standards such as originality apply, and perhaps machine-generated creative works fall in the public domain? Here, it seems that textual reference to human creation both in Berne Convention and national laws might exclude the possibility of construing AI as an author under the current legal framework.<sup>10</sup> In addition to genuine challenges related to standards for AI's **authorship**, research and policy questions must address **ownership** of machine-created works and infringement. Who owns rights for the creative products (artwork/text/video) of an AI algorithm? Should specific arrangements conferring authorship to the agents spending skills, labour and efforts to create AI in the first place regulate the field? Some jurisdictions, such as the United Kingdom and other common law countries, have been enacting legislation to this effect.<sup>11</sup> In this context, however, ownership might still be tricky to allocate. Does it belong to the person who built the system, the person who trained it, or the person who fed it specific inputs?

Again, AI might engage into copyright **infringement** as a result of its creative activities. How does the dichotomy idea/expression, the notion of originality or the doctrine of fair use apply to computational creativity? Open questions become more complex in light of the growing power of ML algorithms to rewrite reality. ML tools, under the name of deepfakes, can turn shots of horses into zebras, black bears into pandas, dogs into cats, apples into oranges, and porn stars into celebrities, multiplying grounds for violation of economic and moral authorship rights and personality rights. In particular, deepfake pornography surfaced in 2017 and since then has been banned by several websites.<sup>12</sup>

In this context, a truly challenging question deals with how AI generated creativity impacts **cultural diversity** and identity politics. In particular, AI generated creativity might homogenize contents in the DSM. Should the EU promote policies incentivizing the propertization of AI-generated creativity, thus incentivising its development? In this regard, policy-making will be struggling with ethical issues that might be raised by a cultural ecosystem partially generated by AI and the possible ethical implications of the emergent business models for AI in digital/creative markets. However, investment in the AI industry will also depend on the capacity of the legal system to provide protection to AI as such and, in particular, to the innovation, other creative outputs and data generated by AI without direct human intervention. This a conundrum that will occupy policy-making for the years to come

### 3.2. AI-generated Innovation.

AI challenges also the most basic patent notions. What if an AI-enabled machine invents something? What if an AI algorithm—without any human intervention—develops a new business

---

<sup>10</sup> See, e.g., *Naruto v. Slater*, No. 16-15469 (9<sup>th</sup> Cir., 23 April 2018) (ending a long-lasting debate regarding the ownership of copyright by non-human agents, a macaque monkey in this case).

<sup>11</sup> See Copyright, Designs and Patents Act, § 9(3).

<sup>12</sup> See Wikipedia, Deepfake, <https://en.wikipedia.org/wiki/Deepfake>.

method, a drug, a machine, or other invention? What if an AI develops a technical improvement of itself? Can a robot be an inventor? Who owns AI generated inventions? Under which conditions the products of AI processes/systems can be granted protection? Multiple issues are critically relevant and still unanswered, such as Industrial applicability and plausibility, the problem of inventive step, the issue of defining the person skilled in the art when machines are imbued with an increased level of autonomy and (technical) creativity. In this context, as well as in the copyright domain, inventorship is a human-centered notion according to the black-letter law and naming a machine as an inventor might represent a ground for refusal of a patent application.

#### 4. Digital Right Management

Novel digital technologies may transform the possibilities to create effective policy mechanisms and means of implementing DRM systems. AI, and blockchain as a digital ledger technology, seem particularly promising in enabling a more transparent, efficient and reliable management of IP-related (copyright) aspects of the transactions. AI-enabled smart contract can substantially speed up IP-related transactions, while lowering transaction costs. Smart contracts and blockchain allow to track ownership/transactions, effect payments, integrate data, and provide transparency implementation. Again, micropayment services built on top of the blockchain can advance direct contract between creators and their public, enabling creators, for example, to sell or buy specific small segments of content.

Yet, these technologies also present challenges. Issues of competition-limiting behaviour may arise, in particular when ownership and management of blockchain platforms overlaps with the ownership of the rights being exchanged. Moreover, the management of personal data in such networks would also need to be arranged to respect the GDPR. Data protection rules have particular implications on industries and activities that necessitate the identification and management of information relating to the parties involved in the transactions, such as in the case of DRM systems for the delivery of on-demand music (Spotify), films (Netflix) and gaming (Steam). Indeed, these data management systems should also be developed towards the inclusion of privacy-preserving mechanisms.

#### 5. Enforcement

Finally, AI and sapient Internet bots and algorithms come also as IP enforcers. IP enforcement online has been increasingly dealt through automated filtering and other algorithmic means.<sup>13</sup> There is an ongoing debate, and a EU reform proposal, dealing with algorithmic enforcement of IP rights online and the introduction of monitoring and filtering obligations for IP infringing content that might be shared on certain qualified online platforms.<sup>14</sup> The mentioned reform proposal

---

<sup>13</sup> Giancarlo Frosio (2017), 'The Death of 'No Monitoring Obligations': A Story of Untameable Monsters', JIPITEC, Vol. 8(3), p. 199-2015, available at [ssrn.com/abstract=2980786](https://ssrn.com/abstract=2980786).

<sup>14</sup> See European Commission (2016), Proposal for a Directive of the European Parliament and of the Council on copyright in the Digital Single Market, 14 September 2016, COM(2016) 593 final, Art. 13. See also Giancarlo Frosio (2018), 'To Filter or Not to Filter? That is the Question in EU Copyright Reform', Cardozo Arts & Entertainment L. J., Vol. 36(2), pp. 101-138, available at [ssrn.com/abstract=3058680](https://ssrn.com/abstract=3058680).

applies to online enforcement of copyrightable content and trademark protected content but automated enforcement extends also to AI-embedded hardware and devices that self-enforce IP-related rights offline as well as online. In addition, novel technologies, such as smart contracts and blockchain, provide opportunities for enforcement. As mentioned above, smart contracts and blockchain can serve multiple enforcement purposes by allowing to track ownership/transactions and the use of blockchain technology for IP management have been already implemented on music platforms and patent exchange platforms. Actually, AI and algorithmic enforcement then extend far beyond IP rights and applies to sanitization of any infringement that might occur online, including privacy rights, personality rights, anti-defamation and other speech-related regulation, such as regulation of hate-speech, dangerous speech, anti-terrorism, and child-pornography.<sup>15</sup> Multiple recent EU Commission's communications stressed how the impact of AI enforcement on online content has become a key policy question.

While the increasing complexity of semiotic governance online calls for extreme measures, taking down content through automated means poses challenges for online expression and access to information.<sup>16</sup> In addition, enforcement is generally understood as requiring the participation of the right holder and public authorities and is characterised by the implementation of fair trial basic tests. Obviously, a major challenge for the DSM will be developing a balanced approach where the deployment of automated enforcement means does not constrict fundamental rights.

Research in AI and IP-related studies is in its infancy. Literature is scarce. Theoretical and empirical research frameworks have still to be devised and deployed. The Center for International Intellectual Property Studies (CEIPI) has been investigating this field by dissecting legal, policy and ethical issues concerning AI's impact on innovation and creativity. To the end of disseminating this knowledge, CEIPI will be holding the 2<sup>nd</sup> edition of the Advance Training on AI and IP on 16-18 May. Further information regarding the training is available [here](#). The need of professionals with state-of-the-art knowledge of the challenges that AI and disruptive digital technologies bring to the present legal framework is an EU-wide priority. In this regard, the CEIPI training provides European participants with indispensable legal tools and knowledge to be competitive with other jurisdictions in a highly sensitive field for the European economy, and the upcoming DSM in particular, at a time when global market dynamics have still to be shaped and competitive advantage should be sought with any means, above all high-quality training, to leap-frog other competitors.

---

<sup>15</sup> Giancarlo Frosio (2017), 'Why Keep a Dog and Bark Yourself? From Intermediary Liability to Responsibility', Oxford Journal of Int'l Law & Inf. Tech., Vol. 25, pp. 1-33, available at [ssrn.com/abstract=2976023](https://ssrn.com/abstract=2976023).

<sup>16</sup> See Case C-70/10 Scarlet Extended SA v. Société belge des auteurs, compositeurs et éditeurs SCRL (SABAM) [2011] ECLI:EU:C:2011:771; C-360/10 Belgische Vereniging van Auteurs, Componisten en Uitgevers CVBA (SABAM) v. Netlog NV [2012] ECLI:EU:C:2012:85