RIGA GRADUATE SCHOOL OF LAW

Conservative doctrines of liability or new emerging theories – as the European Union attempts to find a right regulatory approach towards Artificial Intelligence

MASTER'S THESIS

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DECLARATION OF HONOUR:
I declare that this thesis is my own work, and that all references to, or quotations from, the work of others are fully and correctly cited.

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SUMMARY

In its document Civil Law Rules on Robotics the European Parliament has expressed its vision on how the European Union shall confront swift emergence and introduction of the artificial intelligence (AI) technology into citizens' daily life. The Parliament discusses on various aspects of life the technology might have an impact on and, in particular, on aspect of liability. The Parliament

> [c]onsiders that the civil liability for damage caused by the robots is a crucial issue which also needs to be analysed and addressed at Union level in order to ensure the same degree of efficiency, transparency and consistency in the implementation of legal certainty throughout the European Union for the benefit of citizens, consumers and business alike.[1]

The thesis will mainly focus on the assessment of current general, reversed-burden and strict liability regimes in their application to scenarios when the damage is caused by the AI. Further, the thesis will assess the effectiveness of the European Product Liability Directive that establishes the strict liability regime for damages caused by defective goods in Europe.

The thesis will begin by addressing at first-sight a simple question – what do we mean by AI or a robot? However, as it will be evidenced in the definition part, the question appears to be more complicated to be addressed and in fact decisive for application of different liability regimes. The definition of AI must be carefully carved as over- or under- inclusion of various types of AI under particular liability regime will have a direct impact on the whole industry of AI manufacturers, distributors and consumers. As will be illustrated, commonly referenced human characteristics such as "think" or "sense" do refer to processes well-understood by humans, although may appear misleading as machines in fact only simulate these processes. The definition chapter will outline civil wrongdoings committed by machines so far and will highlight a particular group of AI that possess an "upper spectrum" of autonomy that do not sit comfortably with current conservative liability doctrines or with the Product Liability Directive regime.

The research will then focus on its main part – the liability dilemma. The chapter will begin by portraying liability regimes that have for a long time been developed under the common law of tort or civil law of delict. General, reversed-burden and strict liability regimes employed by the law of delict will be studied and, in order to amplify the concern surrounding the AI technology, projected onto two examples of AI committing delict. The first example will focus on the self-driving car accident caused by sudden and unexpected decision of the car to accelerate and pass the crossroad despite yellow traffic light resulting in a pedestrian being hit. The second example will concentrate on a housekeeping robot with an upper-spectrum of autonomy characteristic that perceives a visiting neighbour as a thief and takes an unprecedented decision to attack the neighbour with a mop and thus inflicts bodily injury. By examining the application of conservative liability doctrines onto both scenarios, the liability dilemma presented will crystalize. An autonomous action of the robot causing damage situation stands out from a huge accumulated experience of the delict law and provides no clear guidance on how the law would proceed under given scenario. The chapter continues by analysing the Product Liability Directive

[1] European Parliament. *Civil Law Rules on Robotics. European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics* (2015/2103(INL)). Available on: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2017-0051+0+DOC+PDF+V0//EN. Accessed February 26, 2019.

that was designed to ensure victims of defective goods get their redress irrespectively of the fault on the manufacturer's part. However, as it will be illustrated, decisive component of "foreseeability" necessary for the fault element under the general liability regime, may just be carefully hidden under the defect or causal link components of the Directive. Concluding that legal mechanisms of delict do not provide clear guidance on how to address damages caused by autonomous machines, the thesis turns to opinions of the European institutions.

Thesis' chapter on the European Approach isolates and illustrates parts of the correspondence between European institutions relating to liability of AI. Correspondence and arguments are delivered in a chronological order. Practical steps offered by the EU are summed up and confronted with actions done so far by its main international rivals. The cornerstone of the discussion will become a proposition uttered by the European Parliament on creation of a separate electronic personhood status for the most advanced robots. This proposition does not find its support at the Commission, however is heatedly debated among leading academics and AI scholars. An unprecedented proposition is further discussed under the Emerging Theories chapter.

Emerging Theories chapter attempts to address a legal lacuna that appears as a result of fully autonomous actions taken by a robot. Such actions may hardly be attributed back to the robots' manufacturers as they could not have predicted such actions, nor could it be attributed, for example, to the robot's holder for the same reason. The first theory collects academic arguments for and against granting a separate legal personhood to AI. Considered as immature for the moment, the theory finds no solid support among legal scholars. The second theory is based on a systematic approach offered by an Assistant Professor Igancio Cafone in his article. The approach seems reasonable as it allows justified application of existing liability regimes using systematic analogy and consequent application. However, as theory two still struggles to address the upper spectrum AIs, the thesis continues to practical solutions available.

Practical solutions chapter summarizes actions that may be done to ensure victims of AI obtain their deserved redress regardless of the delict law applicability. In particular, the chapter illustrates how mandatory insurance schemes, AI certification and preventative regulation might protect victims from unprepared liability regimes. Although practical solutions are considered as a safe harbour for victims of AI, the law's main goal of provision of clear and transparent liability rules in regards to AI regulation may be seen as unaccomplished.

The conclusion chapter summarizes on main inferences reached throughout the thesis. In particular, the upper spectrum AI technology is not expressly covered by existing liability and Product Liability Directive regimes. The granting of electronic personhood status will cause more troubles and social resistance than good. At the moment, systematic approach offered by Ignacio Cofone seems to cover most scenarios in a reasonable and justified manner. Accompanied by obligatory insurance schemes, certification and proper regulatory regimes, our current liability regimes may well cope with AI present in today's world. However, technological evolution that would give birth to characters illustrated only in science fiction movies will certainly present legal system with challenges that would require new and unprecedented legal solutions.

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INTRODUCTION

At some not so distant future this thesis on evaluation of legal and regulatory challenges surrounding the fascinating topic of artificial intelligence (AI) may in fact be construed and written by the AI without any human intervention *per se*. A program will be inputted with basic criteria and goals while sophisticated algorithm will do the rest. As this thesis will illustrate - the mimicking of human thinking by the artificial intellect is inevitable and predictable way of technological, economic and social development. In order to ensure safe and trustworthy environment, such development must be accompanied by sufficient legal measures. Creation of the technology capable of collecting, analysing, evaluating and, most importantly, taking autonomous and independent from humans decisions based on data gathered is both promising and worrying. Consequential replacement of human beings by machines and algorithms shall be evaluated from both legal and social perspectives. In particular, the creation of self-sufficient AI poses specific questions on allocation of legal liability or to put it differently – how the law would perceive a delict committed by an autonomous machine.

Existence of machines designed to assist humans in dangerous or routine jobs is already a reality. In fact, the world could already not be imagined without them. Ranging from industrial manufacturing to consumer searches on Google search, from financial management to self-driving cars, AI enhances human's abilities and makes complicated and dangerous operations look easy. AI does not get tired, complain or miss deadlines. Without being notified, AI has taken deep roots inside the way our society interacts. The society that lives in accordance with existing regulatory regimes, that complies with existing laws and adheres to existing moral principles. When a human being commits a wrongdoing and this wrongdoing causes damage to another, existing under common law countries tort law or under civil law countries law of delict, makes sure the wrongdoer compensates the victim for damages inflicted. The wrongdoer will face justice irrespectively of whether he had committed delict with intent or by negligence or maybe he exposed a victim to an increased risk. Either way, doctrines of delict liabilities have for decades proved as a reliable tool in hands of the law when the victim must be redressed for damages sustained as a result of delict committed.

Emergence of machines gifted by its creators with "intellect" or a computational representation of the intellect may disrupt the existing delict-liability regime. Machine that may be characterized as "intelligent", "self-conscious", "sentient" or "autonomous in decision making" puzzles existing principles of the delict law. Equipped with access to global data, analytical algorithms for decision making and sometimes physical bodies, such machines obviously appear as something different than devices the society got used to. Created with good intent in mind, AI may for an unknown purpose, decide to take an action that would eventually place this AI in a wrongdoer position causing damages or harm to a human being. A question of who is liable for the autonomous decision undertaken by AI would then be raised. A whole chain of defendants may be lined up: manufacturers, various components providers, AI's holder, owners or trainers. The delict law's purpose is to point at the responsible person so to redress the victim and satisfy society's expectations of justice. However, even supplemented by the European Product Liability Directive (PLD), the modern law of delict might not be able to provide a satisfying answer when damages were sustained as a result of an autonomous decision undertaken by a machine.

Hence, the thesis' objective is to evaluate the effectiveness of current civil liability regimes available when applying to cases involving AI as an actual wrongdoer. Recent developments in big data and deep learning algorithms and robotics have provoked an active discussion of AI regulatory regimes to be employed in the European Union (EU). The thesis will evaluate standings taken by various European institutions in an attempt to fulfil current legal lacuna of liability. The European Parliament's "electronic personhood" status for AI proposition that has caused heated debates among academics will be assessed in contrast to solutions and theories available today. The thesis will conclude on the sustainability of current liability regimes towards addressing cases involving highly autonomous AI and will attempt to summarize and evaluate supplementary measures available at the EU level to enhance technological development at no cost to AI consumers.

1. DEFINING BOUNDARIES OF AI – A CHALLENGING TASK

While a reference to "intelligence" or "intellect" quite frankly points towards characteristics usually and exclusively attributable to a human being or simply a person,[2] the "artificial" part suggests presence of something else except for a human being. The attribution of intelligence to something rather than a human feels awkward and generally complicates the task of defining AI. Professor John McCarthy in his research struggles to come up with a "(...) solid definition of intelligence that does not depend on relating it to human intelligence."[3] The common reference to human intelligence makes a

> "(...) focus on myriad interconnected human characteristics that are themselves difficult to define, including consciousness, self-awareness, language use, the ability to learn, the ability to abstract, the ability to adapt, and the ability to reason."[4]

The human intelligence, as generated by enormous amount of brain neurons,[5] allows us to obtain data from the surrounding environment, analyse the data received, process it and make logical, or at some times, illogical conclusions. Moreover, the process of learning is ensured by our nature of data collection and processing results in our life experience. To put it simply, the human being is capable of "thinking". The question that appears is whether we can teach some inanimate object to "think" as humans do or, at least, to replicate the processes of thinking.

As argued by McCarthy, the intelligence is "(...) the *computational* [emphasis added] part of the ability to achieve goals in the world".[6] This idea is further supported by the Professor Lawrence Solum as he perceives a human intelligence as "computational" and thus capable of

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[2] As argued in Pratap Devarapalli, "Machine learning to machine owning: redefining the copyright ownership from the perspective of Australian, US, UK and EU law," *European Intellectual Property Review* 40(11) (2018): p.725: „In general, „a person" is considered to be „a human", and there is no provision for intelligent machines."

[3] John McCarthy, "What is Artificial Intelligence," Stanford University Computer Science Department (2007): p.2. Accessed March 9, 2019, available on: http://www-formal.stanford.edu/jmc/whatisai.pdf.

[4] Matthew U. Scherer, "Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies," *Harvard Journal of Law & Technology* 29(2) (2016): p.360.

[5] *Id*. p.375: "The human brain is thought to possess exascale computational power, two orders of magnitude greater than the world's most powerful supercomputer in 2015 and eight orders of magnitude greater than the typical laptop computer available today."

[6] *Supra* 3, p.2.

"(...) be[ing] modelled as a program that runs on a computer."[7] This would suggest that a computer that would be capable of mimicking natural abilities of a human being to think would also reach a certain level of intelligence in its operations. Attorney Matthew Scherer compliments that an AI "(...) refers to machines that are capable of performing tasks that, if performed by human, would be said to require intelligence."[8] As the most easily-explainable concept, the human intelligence was taken as a basis for defying AI way back to 1955 as McCarthy concludes:

> For the present purpose the artificial intelligence problem is taken to be that of making a machine behave in ways that would be called intelligent if a human were so behaving.[9]

Although, the parallel that runs between human and machine intelligence and a "way of thinking" may appear quite misleading.[10] Understanding the difference between a human brain and algorithm running within AI may become influential when the EU proposition on a distinct electronic personhood for AI would be discussed later in the thesis. The natural process of thinking appears to be quite different from the machine's as Justice Mahonev in *Apple Computer, Inc. v. Mackintosh Computers Ltd* comments on metaphors used when attempting to define the AI:

> Words like "language", "memory", "understand", "instruction", "read", "write", "command", and many others are in constant use. They are words which, in their primary meaning, have reference to cognitive beings. Computers are not cognitive. The metaphors and analogies which we use to describe their functions remain just that."[11]

Instead of actually "thinking", AI employs algorithms as "(...) the set of software rules that a computer follows and implements".[12] It is well noted that actions or omissions of a computer or a machine depend solely on its algorithms.[13] Computer algorithms are powerful means available to AI to collect, analyse, evaluate and conclude on data that far exceeds amount of data capable to be processed by a human being. Indeed, it is not necessary for AI to actually mimic the human's complicated and unexplored way of thinking but rather to develop algorithms that are based on mathematical formulas and algorithmic interconnections. A good comparison is provided by Professor Voroncov as he reminds of people trying to repeat movements of birds' wings to fly, but as it turned out later it was much easier to build a reactive engine to reach the same goal.[14] This comparison also serves as a good illustration of a magnitude at which the AI capabilities may exceed ones of a human. As a result of the AI's sophistication, decisions made by a human may usually be described as "satisfactory", while decisions made by the AI may be considered

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[7] Lawrence B. Solum, "Legal Personhood for Artificial Intelligences," *North Carolina Law Review* 40(4) (1992): p.1231.
[8] *Supra* 4, p.362.
[9] John McCarthy, M.L. Minsky, N. Rohester, C.E. Shannon, „A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence," (1955), accessed March 9, 2019, available on: http://www-formal.stanford.edu/jmc/history/dartmouth/dartmouth.html.
[10] Iria Giuffrida, Fredric Lederer, Nicolas Vermeys, "A Legal Perspective on the Trials and Tribulations of AI: How Artificial Intelligence, the Internet of Things, Smart Contracts, and Other Technologies Will Affect the Law," *Case Western Reserve Review* 68(3) (2018): p. 755.
[11] *Apple Computer, Inc. v. Mackintosh Computers Ltd.* [1988] 1 F.C. 673 (Can.), p.27.
[12] *Supra* 10, p.753.
[13] *Ibid*.
[14] роф. Константин Воронцов, "Если без хайпа, то ИИ повышает производительность труда," *Новая Газета*. (Prof. Konstantin Voroncov, „If we exclude all the hype, the AI increases the work efficiency," The New Newspaper), accessed March 9, 2019, available on: https://www.novayagazeta.ru/articles/2019/02/25/79685-esli-bez-haypa-to-ii-povyshaet-proizvoditelnost-truda.

"optimal" taking into account AI's capabilities of analysing much greater amount of information at a given time without usual destruction experienced by humans.[15]

The level of an algorithm's sophistication is the "key to AI".[16] The distance between simple tasks of, for example, a calculator[17] and human thinking is rapidly decreasing,[18] meaning that the level of an AI algorithm could soon reach and exceed human capabilities or as Associate Professor at Law Ryan Calo points out: "[r]obotics blurs the very line between people and instrument".[19] The assessment of machine's level of intelligence was first offered by Alan Turing in his famously known "Turing test". The test's main idea is to play the so-called "imitation game" with the computer, where a human asks a machine without knowing it is in fact a machine, while the machine's aim is to "fool" a human in that it is not a machine, but to convince it is a human.[20] Turing's thesis was that such a test was hard enough to classify a machine that would be capable to pass it as "intelligent".[21] Complementing the Turing's challenge, philosopher John Searle came up with the Chinese Room challenge.[22] The challenge puts you in a room together with people who know Chinese language. You are provided with a rule book in English on how to produce sentences in Chinese by visually examining Chinese characters. The rule book provides all the details on how to write in Chinese, although that does not give you Chinese language knowledge. People from outside the room repeat Turing's exercise in guessing that whoever is in the room understands Chinese, which, of course, is not the case.[23] Searle was trying to illustrate that a machine is not capable of actually grasping the semantics in interpretation of the unknown language as he observes:

> "(...) a computer has a syntax, but not semantics. (...) Understanding a language, or indeed, having mental states at all, involved more than just having a bunch of formal symbols. It involves having an interpretation, or a meaning attached to those symbols. And a digital computer, as defined, cannot have more than just formal symbols because the operation of the computer (...) is defined in terms of its ability to implement programs."[24]

Turing's and Searle's scepticism towards abilities of the AI to understand context raises an important point in understanding the AI's approach towards "thinking". Instead of understanding semantics, the machine is "thinking" by analyzing enormous amount of input data that allows it to later use this information to further learn "(...) from existing data to forecast future behaviours, outcomes, and trends".[25] The machine's ability to learn from its experiences is referred to as

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[15] *Supra* 4, p.365: "(…) AI systems have the capacity to come up with solutions that humans may not have considered, or that they considered and rejected in favour of many intuitively appealing options."
[16] *Supra* 10, p.753.
[17] Ignacio N. Cofone, "Servers and Waiters: What Matters in the Law of A.I.," *21 Stat.Tech.L.Rev.* 167 (2018): p.172: "Robots and A.I. algorithms produce, in average person, different reactions than do hammers, flash drives, and calculators."
[18] *Id*. p.178 Cofone describes the path from calculator to human thinking as "from Tool to Person".
[19] Ryan Calo, "Robots in American Law," *University of Washington School of Law Research Paper No.2016-04* (2016): p.44. Accessed March 18, 2019. Available on: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2737598.
[20] Alan M. Turing, „Computing Machinery and Intelligence," *Mind: A Quarterly Review of Psychology and Philosophy* 236 (1950): p.434.
[21] *Supra* 7, p.1236.
[22] John Searle, *Minds, Brains and Science* (US: Harvards University Press, 1984).
[23] *Id*. pp.28-41.
[24] *Id*. p.31.
[25] Jonathan Sanito *et al*., "Deep Learning Explained," *edX*, accessed February 27, 2019, http://kedx.ked.com.mx/courses/course-v1:Microsoft+DAT236x+2018_T1/about.

"deep learning". Deep learning is considered as a next technological step in AI architecture and has thus grasped the world's scientific and academia attention to the AI. It is arguably the attribute of "deep learning" that may allow AI to pass Turing's and Searle's challenges. Microsoft's project manager Jonathan Sanito presents his definition of deep learning as:

> "(…) a sub-field of machine learning, where models inspired by how our brain works are expressed mathematically, and the parameters defining the mathematical models, which can be in the order of few thousands to 100+ million, are learned automatically from the data."[26]

As the technology of AI progresses rapidly, the Turing's and Searle's scepticism becomes less relevant and machine's ability to analyse huge amounts of data and speed at which it may take decisions outweighs doubts surrounding its intellectual abilities. For the purposes of this thesis and from the regulatory perspective it is important to have a look at practical examples of AI to conclude on the definition of AI that would identify boundaries around subject matter of the future regulation.

1.1. From theory to practice

The first bell rang back in 1997 when the IBM's "Deep Blue" super-computer had conquered the world of chess by beating the then world-champion Gary Kasparov.[27] Intelligent machines have further proved their competence at games by winning a game of Jeopardy[28] with IBM computer and later winning Chinese Go master in Alpha Go game with Google's AI.[29] Although these particular algorithms were specifically designed for one purpose – to play and win games,[30] it illustrates well the dominance of algorithm-type thinking of programs over the human-type thinking. Further examples exhibit expanding competences of AI.

Google's search engine represents arguably one of the most common and well-known example of the AI application in our daily life.[31] Our smartphones are embedded with voice-recognition systems also available separately via Amazon's Echo.[32] Self-driving cars such as Tesla, Google and Uber cars staffed with cameras, sensors and lasers will slowly but confidently overtake our roads,[33] as already accepted and approved in four US states and the District of

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[26] *Id*.

[27] Daniel C. Dennett, „Higher Games," *MIT Technology Review* (2007), accessed March 10, 2019, https://www.technologyreview.com/s/408440/higher-games/. In fact, computers began to play Chess much earlier, in 1960s, see, for example, Nils J. Nilsson, *The Quest for Artificial Intelligence: A History of Ideas and Achievements* (Cambridge University Press, 2010), pp.591-595.

[28] John Markoff, „Computer Wins on „*Jeopardy*": Trivial, It's Not," *The New York Times*, February 17, 2011, https://www.nytimes.com/2011/02/17/science/17jeopardy-watson.html.

[29] Paul Mozur, „Google's AlphaGo Defeat's Chinese Go Master in Win of A.I." *The New York Times*, May 23, 2017, https://www.nytimes.com/2017/05/23/business/google-deepmind-alphago-go-champion-defeat.html.

[30] *Supra* 4, p.365.

[31] Cade Metz, „AI is transforming Google search. The rest of the web is next," *Wired*, April 2, 2016, https://www.wired.com/2016/02/ai-is-changing-the-technology-behind-google-searches/. See also *supra* 4, p.374: "The DeepMind purchase was just one of more than a dozen AI and robotics acquisitions that Google made in 2013 and 2014. Google is far from alone; virtually every other large tech company has significant Ai projects, including IBM's Watson, Facebook's Artificial Intelligence Research lab, and Microsoft's Project Adam."

[32] Adi Gaskell, „How Machine Learning Can Dissect Our Speech," *Forbes*, November 2, 2016, https://www.forbes.com/sites/adigaskell/2016/11/02/how-machine-learning-can-dissect-our-speech/#25e304e913aa.

[33] Savaram Ravindra, „The Machine Learning Algorithms Used in Self-Driving Cars," *KDnuggets*, June 2017, https://www.kdnuggets.com/2017/06/machine-learning-algorithms-used-self-driving-cars.html.

Columbia.[34] Medicine fields such as study of human genome are under the AI's focus.[35] AI is delegated with a right to manage financial portfolios[36] while face-recognition systems assist police at spotting terrorists.[37] As ironically noted by Scherer, the "most alarmingly"[38] AI is acting within legal sphere by, for example, reviewing legal documents.[39] Indeed, Professor Tania Sourdin examines the topic of AI substituting the role of a judge, or at least, the judge's assistant[40] as she observes:

> (…) the shift to increasing use of AI in the form of predictive coding, predictive analytics and machine learning suggests that law firm use of AI is already changing how material is presented to judges and how client risk is assessed.[41]

The statement is further supported by the research[42] in predictive analytics that had studied patterns in judgements of the European Court of Human Rights that allowed the algorithm to "(…) predict the outcome of cases presented to it in textual form with 79 per cent accuracy".[43] Sourdin further refers to the Australian *Therapeutic Goods Act 1989* that in fact delegates certain decision-making powers to the computer program TGA Business Services.[44] The UK Civil Justice Council has proposed to use online courts for low value civil disputes. The case participants are invited to enter their data onto an online system that could potentially offer parties a way forward to resolve the case without further legal assistance. The overall idea of the UK's three-tier system is to avoid the necessity to visit courts physically at all using AI as the first tier of the dispute resolution.[45] An interesting AI project within legal field is run in Netherlands in the field of the online dispute resolution and is called Rechtwijzer.[46] The

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[34] Aaron M. Kessler, „Law left behind as hands-free cars cruise," *StarTribune*, May 3, 2015, http://www.startribune.com/law-left-behind-as-hands-free-cars-cruise/302322781/.

[35] David Beyer, „Deep learning meets genome biology: An interview with Brendan Frey about realizing new possibilities in genomic medicine," *O'Reilly*, April 27, 2016, https://www.oreilly.com/ideas/deep-learning-meets-genome-biology.

[36] *Supra* 4, p.354.

[37] Timothy Williams, „Facial Recognition Software Moves from Overseas Wars to Local Police," *The New York Times*, August 13, 2015, https://www.nytimes.com/2015/08/13/us/facial-recognition-software-moves-from-overseas-wars-to-local-police.html.

[38] *Supra* 4, p.354.

[39] John Markoff, „Armies of Expensive Lawyers, Replaced by Cheaper Software," *The New York Times*, March 5, 2011, https://www.nytimes.com/2011/03/05/science/05legal.html?mtrref=www.google.com&gwh=8197D43CC544AC89CE5A631396544EE0&gwt=pay.

[40] Tania Sourdin, "Judge v. Robot: Artificial Intelligence and Judicial Decision-Making," *UNSW Law Journal* 41(4) (2018): p.1114. For the topic of legal assistance and predictive legal outcomes see also Cathy O'Neil. *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. (New York: Crown Publishing Group, 2016), pp. 85-87.

[41] *Id*. p.1115.

[42] Nikolaos Aletras *et al*., "Predicting Judicial Decisions of the European Court of Human Rights: A Natural Language Processing Perspective," *PeerJ Computer Science*, October 24, 2016, https://peerj.com/articles/cs-93/. pp.15-16.

[43] *Supra* 40, p.1125.

[44] *Supra* 40, p.1126-1127. On *Therapeutic Goods Act 1989* see Instrument of arrangement: Use of computer programs to make decisions (2017), accessed March 12, 2019, https://www.tga.gov.au/instrument-arrangement-use-computer-programs-make-decisions-sep-2017.

[45] Civil Justice Council. *Online Dispute Resolution for Low Value Civil Claims*. Available on: https://www.judiciary.uk/wp-content/uploads/2015/02/Online-Dispute-Resolution-Final-Web-Version1.pdf. Accessed March 13, 2019.

[46] The project is available on: https://rechtwijzer.nl/. Accessed March 13, 2019.

Rechtwijzer's algorithm assists parties to get through a divorce procedure as it "(…) provides information, tools, links to other websites and personal advice"[47] after the initial information is inserted into the system by the divorcing parties.

AI secures its positions within serious industrial sectors sometimes involving thousands of workers. "Internet of things" pioneer Maciej Kranz refers to, for example, Rio Tinto operating an open mining site that has installed sensors connected to internet to track its vehicle fleet's condition to apply preventative maintenance services saving significant amount in repair costs.[48] Kranz further refers to Goldcorp company that has more than 1 000 employees down in mining shaft in Canada. Shaft ventilation and employees tracking, and consequently safety of those employees, is entrusted to an AI algorithm that allows decreasing employee tracking time by 50 minutes, as well as locating the company's equipment faster.[49] Some authors further provide an example where a factory's monitoring system may constitute more efficient labour effort at temperature of 19 degrees Celsius rather than 20 and thus would take an automatic decision to lower the temperature.[50]

Besides its active participation in strict sciences, AI is making its first tentative steps in the world of art. Scherer, for example, speculates that AI-writers could have written articles for the *Le Monde* newspaper.[51] AI-journalism is in fact supported by Google as an IT giant has provided a grant to a news agency for the development of technology capable of producing up to 30 000 local news articles per month.[52] Further artistic efforts of the AI may be evidenced in "The Next Rembrandt" project, where a computer has produced a 3-d printed painting based on the analysis of more than 346 famous master's works.[53]

Covering already significant part of our life, the AI technology unsurprisingly attracts serious attention from investors as according to Tractica's, a market intelligence firm specialising in emerging technologies, report, the revenue forecast of AI software will raise from 5.4 billion to 105.8 billion US dollars by 2025.[54] The world's leading economies have entered the race for the leadership in AI innovation. In 2016 the US government has come up with the AI strategy and secured 970 million euros in AI research investments,[55] while China has put forward the "Next

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[47] Esmée A.Bickel, Marian A.J. van Dijk, Ellen Giebels, "Online legal advice and conflict support: a Dutch Experience," *Department Psychology of Conflict, Risk & Safety, University of Twente* (2015): p.4. Available on: https://ris.utwente.nl/ws/portalfiles/portal/5136912/Online+legal+advice+and+conflict+support_UTwente.pdf. Accessed March 13, 2019.

[48] Maciej Kranz. *Building the Internet of Things: Implementing New Business Models, Disrupt Competitors, Transform Your Industry* (New Jersey: John Wiley & Sons, Inc., 2017): pp. 47-49.

[49] *Id*. p.49.

[50] *Supra* 10, p.753.

[51] *Supra* 4, p.354. For further discussion on "robot writers" please see Yves Eudes, "The journalists who never sleep," *The Guardian*, September 12, 2014, https://www.theguardian.com/technology/2014/sep/12/artificial-intelligence-data-journalism-media.

[52] Julia Gregory, "Press Association wins Google grant to run news services written by computers," *The Guardian*, July 6, 2017, https://www.theguardian.com/technology/2017/jul/06/press-association-wins-google-grant-to-run-news-service-written-by-computers.

[53] Tim Nudd, "Inside "The Next Rembrandt": How JWT Got a Computer to Paint Like the Old Master," *Adweek*, June 27, 2016, https://www.adweek.com/brand-marketing/inside-next-rembrandt-how-jwt-got-computer-paint-old-master-172257/.

[54] Tractica, "Artificial Intelligence Market Forecasts," *Tractica* (2018), accessed March 13, 2019, https://www.tractica.com/research/artificial-intelligence-market-forecasts/.

[55] European Commission. *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: Artificial Intelligence*

Generation Artificial Intelligence Development Plan" and announced to invest 1.7 billion euros for Beijing's technology park.[56] Private AI investments in Europe have been estimated at 2.4-3.2. billion euros back in 2016, while at the same time private investments have reached 6.5-9.7 billion euros in Asia and 12.1-18.6 billion euros in North America.[57]

Falling behind on investment, it is crucial point in time for the Europe to accommodate reasonable and reliable regulation of the AI technology as it turns out to be "(…) vitally important for the legislature to consider its legal and ethical implications and effects, without stifling innovation".[58] Undoubtedly, an attracting regulatory regime, the one that is transparent, predictable and justified, may play a central role in attracting AI industry into EU. In creating such regulatory environment, the EU must concentrate its legal evaluation not on AI that is controlled or tied to humans, but on truly autonomous AIs, because true social and economic revolution will be brought by the AI technology that allows machines to act independently from humans.

1.2. Artificial Intelligence with upper spectrum of autonomy

From the regulatory perspective, it is vital to grasp one differentiating characteristics of the AI technology that sets it aside from other objects we usually interact with. The "x" factor within the technology is its autonomous decision-making ability. By analysing the input data the AI may "(…) act independently of direct human instruction, based on information the machine itself acquires and analyses".[59] As examined later, the notion of autonomy may become decisive for AI regulation and attribution of liability:

> One of crucial aspects of these artificial intelligence programs is that, even though the instructions have been given by the programmers, the final creative output is generated by intelligent machines taking decisions by themselves based on the neural networks (...).[60]

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for Europe. Available on: https://ec.europa.eu/digital-single-market/en/news/communication-artificial-intelligence-europe. Accessed March 13, 2019.

[56] *Ibid*.

[57] James Manyika, "10 imperatives for Europe in the age of AI and automation," *McKinsey & Company*, October 2017, https://www.mckinsey.com/featured-insights/europe/ten-imperatives-for-europe-in-the-age-of-ai-and-automation.

[58] European Parliament. *Civil Law Rules on Robotics. European Parliament Resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics*. (2015/2103(INL)). Available on: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2017-0051+0+DOC+XML+V0//EN. Accessed March 13, 2019. *Supra* 55. The European Commission confirm its understanding on importance of the regulation in the process of investments attraction as it states: "A clear and stable legal framework will stimulate investment and, in combination with research and innovation, will help bring the benefits on these technologies to every business and citizen."

[59] David C. Vladeck, "Machines Without Principals: Liability Rules and Artificial Intelligence," *Washington Law Review* 117 (2014): p.121. See also European Commission at *supra* 55 as it states: "Furthermore, these technologies will encompass more and more the feature of autonomy. Advanced robots or devices empowered by AI or IoT [Internet of Things] will have increased capabilities to interpret the environment (via sending, actuating, cognitive vision, machine learning etc.), to interact with humans, to cooperate with other artefacts, to learn new behaviours and execute actions autonomously without human intervention. The more autonomous systems are, the less they depend on other actors (i.e. manufacturer, the owner, the user etc.) and the greater is their impact on their environment and on third parties."

[60] Pratap Devarapalli, "Machine learning to machine owning: redefining the copyright ownership from the perspective of Australian, US, UK and UE law," *European Intellectual Property Review* 40(11) (2018): p.722.

The code that enables machines to analyse the data, learn and take autonomous decisions based on the information processed appears to be an integral part of the AI. The learning capability is another important element as it demonstrates the path that may take the AI to unpredictable directions[61] as judge of the Superior Court of San Francisco Curtis Karnow outlines: "(…) true autonomy involves self-learning: where the program does not simply apply a human-made heuristic (…), but generates its own heuristic."[62] The code placed in the physical object is commonly referred to as "robot" and is perceived a "(…) form of embodied AI".[63] Legal scholar Jack Balkin emphasizes on the distinction between simple objects and robots:

> (…) what is important is not that robots have a physical form – so do toasters – but that their interactivity creates particular social cues in human beings.[64]

For regulatory purposes, it is important to determine the level of "(…) the unpredictability about how an agent interacts with the environment,"[65] of the AI technology in question and to identify the upper spectrum of autonomy.[66] Karnow amplifies the need of true autonomy and refers to robots created of many separate functional units capable of adapting to over changing environment to keep fulfilling their tasks:

> (…) a function of the ability to rearrange ever smaller units or modules in response to an ever increasing series and types of constraints to generate an ever increasing series of responses.[67]

After analysis and conclusions gained from the previous chapters, it may be concluded that the artificial intelligence that will truly challenge existing liability regimes appears where a computer code is developed so to include the self-learning capability allowing it to learn from the input data, process it and make novel and autonomous, that is not encoded by default, decisions in its future operations. Accompanied by the under-control hardware, which is not an influential factor[68] from the regulatory perspective as will be illustrated, AI transforms into robots "(…) that take the world in, process what they sense, and in turn act upon the world."[69] The human-like

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[61] See, for example, Sebastian Anthony, "Google teaches "AIs" to invent their own crypto and avoid eavesdropping," *Arstechnica*, October 28, 2016, https://arstechnica.com/information-technology/2016/10/google-ai-neural-network-cryptography/, on how Google Brain has created algorithms that learnt do encrypt and decrypt information contained in messages by themselves.

[62] Curtis E.A. Karnow, "The application of traditional tort theory to embodied machine intelligence," in *Robot Law*, ed. Ryan Calo, A. Michael Froomkin and Ian Kerr (Glos: Edward Elgar Publishing Limited, 2016), p.4.

[63] Horst Eidenmüller, "The Rise of Robots and the Law of Humans," *Oxford Legal Studies Research Paper No. 27/2017* (2017), accessed March 16, 2019, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2941001, at p.4

[64] Jack Balkin, "The Path of Robotics Law," 6 *California Law Review* 45 (2015): pp.49-50.

[65] *Supra* 17.

[66] *Supra* 17, p.175: "The A.I. that presents the most puzzling doctrinal questions, such as self-driving cars, Siri, writing algorithms, and drones, present dome but not all of these disruptive characteristics."

[67] *Supra* 62, p.6.

[68] Although, some authors do separate robots from pure software, see, for example, *supra* 62, p.7 : "Robots (embodied software), on the other hand, operate in the physical environment, and may be exposed to a more highly varied types of inputs which must be accounted for as they occur - the pace of the world cannot be dismissed as inconvenient. It is this rich set of unpredictable real time data which presents the challenges for robots and creates the desire for autonomy."

[69] Ryan Calo, "*Robotics and the Lessons of Cyberlaw*," 103 *Calif.L.Rev.* 513 (2015): p.529. On highly sophisticated concept of Evolutionary Robotics please see Martin Peniak, "Active Vision For Navigating Unknown Environments: An Evolutionary Robotics Approach For Space Research," (2012). Accessed March 23, 2019. Available on: http://citeseerx.ist.psu.edu/viewdoc/citations;jsessionid=34556261AF36B1F3061D56B215FD9511?doi=10.1.1.155.1077.

thinking references provide only limited assistance at understanding rationale behind AI decisions. Referred to as "tethered" robots,[70] devices that follow default pre-programmed instructions and are controlled by a human in one way or another shall fall into the lower or medium level of autonomy spectrum and shall be excluded from the thesis' consideration as the usual liability principles would be applicable without nuances.[71] Namely, the lower spectrum AI will be equated to tools and treated by law in a similar manner. The decision to act in a certain way must be taken by AI or a robot truly autonomously as a cumulative effect of its learning, analysing and decision-making capabilities. Only those AI falling into the upper spectrum of autonomy would create a legal challenge for the existing system of the delict law. The next question that must be addressed is what that trouble with AI is all about?

1.3. Troublemakers or "I need your clothes, your boots and your motorcycle"[72]

A request from the T-800 robot made to a biker in the Terminator movie is surely illegal and should generally qualify as a robbery. Although criminal conduct of AI is out of scope of this research, civil wrongdoings are.[73] This section shall outline main threats presented by the introduction of new technology in our lives, as some commentators on this topic do even compare potential threats presented by the AI technology to threats carried by the nuclear industry.

Autonomous-decision making ability of AI based on superseding intellect means that at some point machines will not need their human-masters anymore. Similarly to the industrial revolution that had caused unemployment among manual labour workers, the AI revolution in its turn may well target the high-qualified labour as it constantly increases its "self-awareness" capacity.[74] Scherer ascertains there to be a real

> "(…) possibility that a sophisticated AI system could improve its own hardware and programing to the point that it gains cognitive abilities for outstripping those of its human creators."[75]

Decisions taken by AI may not always follow the famous Asimov's laws of robotics not to harm a human,[76] and may well be unpleasant as Ph.D Russel Stuart and Dr. Peter Norvig imagine:

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[70] *Supra* 62, p.4.
[71] See, for example, *supra* 59, p.120: "The human hand defines, guides, and ultimately controls the process, either directly or because of the capacity to override the machine and seize control. As sophisticated as these machines are, they are, at most, semi-autonomous. They are tools, albeit making remarkably sophisticated tools, used by humans." See also *supra* 62, p.3: "Most owners of the Roomba floor cleaner or Sony's Aibo dog robot know nothing of the program that in each case allows the unit to return to a charging station when battery life is low. This behaviour occurs without concurrent human supervision, and appears autonomous in some vague sense."
[72] James Cameron, "The Terminator," (1984), Orion Pictures.
[73] *Supra* 4, p.358.
[74] *Id*. p.364.
[75] *Id*. p.368.
[76] Isaac Asimov, *I, Robot* (New York: Fawcett, 1981), defines the laws of robotics as: "1. A robot may not injure a human being, or, through inaction, allow a human being to come to harm; 2. A robot must obey orders given it by human beings except where such orders would conflict with the First Law; 3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law."

> "For example, we might propose a utility function designed to *minimize human suffering* [original emphasis] (…) Given the way humans are, however, we'll always find a way to suffer even in paradise; so the optimal decision for the AI system is to terminate the human race as soon as possible – no humans, no suffering."[77]

In fact, as argued by Professor Gabriel Hallevy, the artificial intelligence robot working at a motorcycle factory is to blame for the death of an employee when the robot has decided that the employee presented an obstacle to its mission and eliminated it by pushing an employee onto an adjacent machine.[78] Equipped with components that in many ways exceed human's abilities, machines may intentionally or unintentionally cause various troubles to its "masters", from causing damage to someone's property to actually killing someone.

Practical examples of AI misbehaviour have already been spotted and debated upon. Thus, for instance, Google's algorithm that manages 90% of internet searches has stated that Barack Obama is a Muslim rather than a Christian, who he in fact is.[79] Microsoft's chatbot "Tay" has advocated for genocide, offended women and minorities and became racist, the algorithm has managed to learn all of that within 24 hours timeframe.[80] Assistant Professor Ignacio Cofone reflects on Tay's situation

> Had Tay's mainframe been in Germany instead of the United States, what she did would have been considered a criminal offense – as Germany differs strongly in its approach to this type of speech. (…) Tay's programmers (or Microsoft) would perhaps be considered in some way responsible. But, in recognizing this lack of foreseeability, the situation should be evaluated differently than if they had typed and sent those messages themselves.[81]

Apple's Siri has been accused of an accessory in a murder case, where an iPhone holder has killed his friend and asked Siri: "I need to hide my roommate". Siri has quite helpfully suggested: "Swamps, reservoirs, metal foundries, dumps". As a result the victim's body was found only weeks later.[82] All of self-driving car producers have faced troubles with AI. The Tesla's semi-automatic car had a lethal accident with a truck, when making left-turn. Google's self-driving car

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[77] Russel, Stuart and Peter Norvig, *Artificial Intelligence: A Modern Approach, Third Edition* (New Jersey: Pearson Education, Inc., 2010): p.1037, https://faculty.psau.edu.sa/filedownload/doc-7-pdf-a154ffbcec538a4161a406abf62f5b76-original.pdf.

[78] Gabriel Hallevy, *When Robots Kill: Artificial Intelligence Under Criminal Law* (Boston: Norheastern University press, 2013), at Preface.

[79] Jack Nicas, "Google Has Picked an Answer for You – Too Bad It's Often Wrong," *The Wall Street Journal*, November 16, 2017, https://www.wsj.com/articles/googles-featured-answers-aim-to-distill-truthbut-often-get-it-wrong-1510847867.

[80] Daniel Victor, "Microsoft Created a Twitter Bot to Learn From Users. It Quickly Became a Racist Jerk," *The New York Times*, March 25, 2016, https://www.nytimes.com/2016/03/25/technology/microsoft-created-a-twitter-bot-to-learn-from-users-it-quickly-became-a-racist-jerk.html.

[81] *Supra* 17, p.184.

[82] Independent Staff, "Florida Man Accused of Killing His Friend Asked Siri Where to Hide the Body, Court Hears," *Independent*, August 13, 2014, https://www.independent.co.uk/life-style/gadgets-and-tech/florida-man-accused-of-killing-his-roommate-asked-siri-where-to-hide-the-body-9665437.html. Although, further evidence discovered refuted version with Siri, please see, Independent, "Siri in Murder Trial: Police clarify that Pedro Bravo did not ask iPhone assistant for advice," *Independent*, August 14, 2014, https://www.independent.co.uk/life-style/gadgets-and-tech/siri-in-murder-trial-police-clarify-that-pedro-bravo-did-not-ask-iphone-assistant-for-advice-9668105.html.

hit the bus at low speed as it had not anticipated the behaviour of the bus. Uber's autonomous car had caused death to a woman in Arizona back in 2018.[83]

As seen, AI is of a great assistance when its algorithms follow the pre-determined path and substitute humans at dangerous,[84] monotonous, complicated and time-consuming tasks. However, as the AI decides to alter its pre-determined actions, it may suddenly become a cause for injuries, damages, death or may offend or deceive us, stole our personal data or use it for third parties' interests. Elon Musk has compared further development of AI with "summoning a demon" as he cautions:

> I think we should be very careful about artificial intelligence. If I had to guess at what our biggest existential threat is, it's probably that… I'm increasingly inclined to think there should be some regulatory oversight, maybe at the national and international level, just to make sure that we don't do something very foolish.[85]

Assessment of delict or crimes committed by autonomous machines would certainly not be an easy task for judges in courtrooms. Consisting of many technical components that are assembled or distributed through various geographical locations, a legal attempt to understand AI's software and hardware architecture might overheat the current court system with technical experts or quasi experts. Calo, for instance, observes that "(…) courts have struggled with the status of robots, asking how robots can be said to represent, imitate, extend, or absolve people,"[86] and further doubts abilities of legal experts to come up with appropriate regulatory solutions: "(…) jurists on the whole possess poor, increasingly outdated views about robots and hence will not be well positioned to address the novel challenges they continue to pose."[87] "Lack of expertise" in Scherer's opinion leads to doubts as to whether our current regime would be able to provide satisfactory treatment for delict acts committed by autonomous machines. As observed – "(…) every technological advance is accompanied by legal questions"[88] and one of main questions that AI poses is how to regulate the relationships between people and machines[89] and in particular who shall be held liable for damage or injury caused by an action of autonomous machine?[90]

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[83] European Commission. *Commission Staff Working Document: Liability for emerging digital technologies.* {COM(2018) 237 final}, pp.14-15. Available on: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018SC0137&from=en. Accessed March 6, 2019.

[84] For instance, a research shows that 90% of road accidents are because of human factor – European Commission. *Report on Saving Lives: Boosting Car Safety in the EU* (COM(2016) 0787 final). Available on https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016DC0787. Accessed March 18, 2019.

[85] Aileen Graef, "Elon Musk: We are "summoning a demon" with artificial intelligence," *UPI*, October 27, 2014, https://www.upi.com/Business_News/2014/10/27/Elon-Musk-We-are-summoning-a-demon-with-artificial-intelligence/4191414407652/.

[86] *Supra* 19, p.33.

[87] *Id.* p.1.

[88] *Supra* 10, p.749.

[89] Jack M. Balkin, "The Three Laws of Robotics in the Age of Big Data," *Ohio State Law Journal* 78 (2017): p.13 refers to the relationships between people and machines as "the Homunculus Fallacy": "The homunculus fallacy is the belief that there is little person inside the program who is making it work – it has good intentions or bad intentions, and it makes the program do good or bad things."

[90] *Supra* 64, pp.51-55: "[F]rom the standpoint of law – as opposed to the standpoint of engineering – the problem posed by emergence is the problem of assigning responsibility for the unpredictable behavior of robots and AI systems."

2. THE LIABILITY DILEMMA

> The emergence of AI, in particular the complex enabling ecosystem and the feature of autonomous decision-making, requires a reflection about the suitability of some established rules on safety and civil law questions on liability.[91]

2.1. General, reversed and strict liability regimes

Undoubtedly the civil and common law systems have for decades provided redress to those who deserved it through the means of the tort law in common-law jurisdictions or the law of delict in civil law jurisdictions. Varied prerequisites of fault-based (negligence) and strict liability[92] regimes conform to the level of care expected by society in different scenarios when delict acts are committed. Applicable to "(…) people with whom one does not have a pre-existing relationship"[93] as opposed to the contract law, the law of delict is designed to protect victims' rights by rewarding them financially for damages suffered that may often be complementary to the criminal law as the judge Karnow pinpoints:

> Jow murdering or hitting Bob violates criminal law, regardless of their prior interactions, and similarly Bob (or his personal representative if he is dead) can sue Bob in tort for money damages.[94]

The general fault-based liability requires several components, such as an act of the wrongdoer, the damage caused to the victim, the causal link between the act and the damage, unlawfulness and a fault of the defendant.[95] The last component of "fault" distinguishes the general type liability from the strict liability and is generally evidenced in negligence, gross negligence or intent on behalf of the tortfeasor.[96] Negligence, in its turn, is well defined, for example, in the California Civil Jury Instructions 401:

> Negligence is the failure to use reasonable care to prevent harm to oneself or to others. A person can be negligent by acting or by failing to act. A person is negligent if he or she does something that a reasonably careful person would not do in the same situation or fails to do something that a reasonably careful person would do in the same situation.[97]

Originating from the Roman law, the principle of *bonus pater familias* or that of a reasonable man, serves as benchmark for evaluating someone's conduct. The defendant is thus substituted in his factual circumstances by a so-called "reasonable man", and the scenario is then projected again. If a reasonable man would avoid causing the victim damage by taking reasonable precautions, then the defendant will, most likely, be held liable for damages as a punishment for neglecting the care expected by the society.

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[91] *Supra* 55.
[92] See, for example, *Merrill v. Navegar Inc.*, 26 Cal. 4th 465, 478 (2001).
[93] *Supra* 62, p.8.
[94] *Ibid.*
[95] Taivo Liivak, Janno Lahe, "Delictual Liability for Damages Caused by Fully Autonomous Vehicles: The Estonian Perspective," 12 *Masaryk U.J.L.&Tech.49* (2018): p.54. See, for example, sections 1043-1055 of the Estonian Law of Obligations Act 2001 or sections 1635-1650 of the Latvian Civil Law 1993.
[96] See, for example, section 104(2) of the Estonian Law of Obligations Act 2001 or sections 1640-1647 of the Latvian Civil Law 1993.
[97] California Civil Jury Instructions. Accessed March 25, 2019. Available on: http://www.courts.ca.gov/partners/317.htm.

Although in some specific instances, the law reverses the burden of proof to reflect on higher degree of safety expectancy.[98] Such specific liability regime usually applies when operating with objects of increased risks such as vehicles, building sites, dangerous substances etc.[99] The reversed burden liability's justification is that the defendant, by using dangerous objects has in fact exposed his victim to an increased risk of sustaining damage. Some Member States' civil law regimes, for example, that of Germany, provide a defendant with a right to claim a defence when committing a tort under the reversed-burden liability regime. The defence allows a defendant having satisfied all other components but the fault to be considered liable unless he may show that all reasonable measures to avoid the damage have been taken.[100] For instance, operating a building site in Germany would classify as an activity of an increased risk and thus falls under the reversed-burden liability regime. Although, the construction company would be excused from compensating a man that had sustained injuries on the building site having proved that all the safety measures available were actually in place.

Considered as a measure with the highest degree of safety expectancy, the strict-liability regime, in its turn, abandons the "fault" or "negligence" prerequisite leaving the damage and causal link to be proved by the claimant and hence raises the burden of care imposed on the defendant. The regime usually applies to owners of animals[101] that cause damages to persons,[102] operators of nuclear power plants, aircrafts or motor vehicles.[103] Raising the duty of care, the strict-liability is usually referred to as "liability for dangerousness"[104] but in its essence pursuits similar objectives as a reversed burden of proof liability:

> (…) both aim at facilitating the compensation of the victim of damages in situations where the legislator considers it too burdensome or unbalanced to apply the general fault-based liability rule.[105]

Karnow illustrates well the emergence of the strict-liability cases as a response to appearance of long chains of product distribution that precludes the contract law from application and is designed to protect the final product's consumer:

> The essence of the move to strict products liability was to focus on the condition of *the product itself* [original emphasis] – was it dangerous? – and away from an evaluation of the defendants' *conduct* [original emphasis] in making the product – the realm of

[98] See, for example, sections 1056-1060 of the Estonian Law of Obligations Act 2001 or sections 2347-2351 of the Latvian Civil Law 1993.
[99] See, for example, section 2347 of the Latvian Civil Law 1993.
[100] See, for example, section 836 of the German Civil Code, section 1319 of the Austrian General Civil Code, Article 2053 of the Italian Civil Code or section 6:560(1) of the Hungarian Civil Code.
[101] For case law, see, for example, *Behrens v. Bertram Mills Circus, Ltd* [1957] 2 QB 1, 11 (Eng) as Devlin J satisfies the claim for fright as the elephant has shocked performers by entering their arena.
[102] See, for example, Article 2052 of the Italian Civil Code or section 833 of the German Civil Code.
[103] For power plants please see, for example, section 33 of the German Atomic Energy Act, for aircrafts please see, for example, section 33 of the German Air Traffic Act, for motor vehicles please see, for example, article 2054 of the Italian Civil Code, section 7 of the German Road Traffic Act, section 5 of the Austrian Railway and Motor Vehicle Liability Act.
[104] Helmut Koziol, *Basic Questions of Tort law from a Comparative Perspective* (Wien: Jan Sramek Verlag, 2015), p.229, https://www.jan-sramek-verlag.at/fileadmin/user_upload/Koziol_ComparaTortLaw_Eng_0040_2_DRUCK_eBook.pdf.
[105] *Supra* 83, p.8.

> negligence – because the innocent victim of dangerous product should be compensated, even if the defendants were not negligent in making it.[106]

Depending on factual circumstances, the law chooses to apply either general or strict liability regimes. When a defendant picks up a hammer, throws it in the air just over a person's car and breaks the car's window as a result, he will be held generally liable for having acted negligently, i.e. without reasonable care. When a defendant drives a car and hits another public road user, defendant will be held liable irrespectively of his state of mind, but simply for operating an object of an increased risk that had caused damage. In any case, the law may quite clearly indicate a person, being a human, to blame. Although this logic is hard to apply, when the wrongdoer in fact is not a person.

2.1.1. Application of existing liability regimes to Artificial Intelligence

Road-traffic accidents involving fully-automated self-driving cars serve as easy consumable example to illustrate the presence of liability dilemma when AI is involved.[107] Conclusions reached as an example of the self-driving cars may further be projected to other AI or robots by analogy. That is so because it is argued that the law shall treat AI with hardware or embodiment - the car in current example, and AI without one indistinctively, as Calo suggests:

> (…) self-learning algorithms can raise or lower temperatures in a house, turn on appliances, lock or unlock gates, and notify security services. Algorithms can buy or sell securities, they can create holographic projections that look and act like people, they can threaten, entertain, copy, defame, defraud, want, console or seduce.[108]

Listing several civil and criminal offences Cofone further comments: "[t]hese consequences are as physical as it gets, albeit produced by an agent *without embodiment* [emphasis added]."[109]

Suppose that a self-driving car operating under command of AI decides that it may still cross intersection by sudden acceleration despite yellow traffic light signal and hits a crossing pedestrian as a result causing the pedestrian damages. The car has misread the road situation and took a wrong decision.[110] The application of a general fault-based liability doctrine may be limited in its scope to provide redress to the person injured. Although elements such as act of the person inside the car (legally such person is usually referred to as owner, holder or user of an increased-risk object,[111] but for purposes of the thesis this person will be referred to as a

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[106] *Supra* 62, at p.11.

[107] For more on the topic of autonomous cars please see Sven A. Beiker, "Legal Aspects of Autonomous Driving," 52 *Santa Clara Law Review* (2012): p.1145; Jack Boeglin, "The Costs of Self-Driving Cars: Reconciling Freedom and Privacy with Tort Liability in Autonomous Vehicle Regulation," 17 *Yale Journal of Law&Technology* (2015): p.171; Jean-Francois Bonnefon, Azim Shariff, Iyad Rahwan, "The Social Dilemma of Autonomous Vehicles," 352 *Science* (2016): p.1573; Frank Douma, Sarah Aue Palodichuk, "Criminal Liability Issues Created by Autonomous Vehicles," 52 *Santa Clara Law Review* (2012): p.1157.

[108] *Supra* 64, pp. 50-51.

[109] *Supra* 17, p. 180.

[110] Although this is a hypothetical scenario, the issue of sudden uncontrolled acceleration was constituted in Toyota and Lexus cars resulting in 3 billion USD lawsuit settlement paid by the company to victims of accidents, see, for example, Jessica Dye, "Toyota Acceleration Case Settlement Gets Final OK," *Insurance Journal* (2013), accessed March 20, 2019, https://www.insurancejournal.com/news/national/2013/07/22/299154.htm; Greg Risling, "Toyota Tackles Accelaration Lawsuits," *USA Today*, January 21, 2013, https://eu.usatoday.com/story/money/cars/driveon/2013/01/21/toyota-sudden-acceleration-lawsuits/1851813/.

[111] See, for example, section 2347 of the Latvian Civil law 1993.

"passenger" so to emphasize on the self-driving car's autonomy while driving) of engagement in the traffic via autonomous car, causal link between the act, damage suffered by the victim and unlawfulness by causing bodily harm may be shown,[112] the last element necessary for the delict liability to apply, namely, the fault on behalf of the passenger inside the car may be hardly evidenced. As the concept of fault is based upon negligence, which in turn depends on foreseeability or prediction of certain events leading to damage, "(…) negligence claims involving product failures became more difficult to prove."[113] As argued, the concept of foreseeability does naturally serves "(…) as a limit to responsibility for one's own actions: one is rarely responsible for what one cannot foresee."[114] In a hypothetical example presented it is difficult to argue that the passenger within a car could have foreseen the car's decision to suddenly accelerate before the yellow traffic light. The outcome in the scenario might differ in case the passenger has not, for example, updated the car's software or failed to provide sufficient maintenance, in which case the fault may appear out of the passenger's general duty to maintain safety.[115]

The injured person might then turn to risk-based strict or reversed liability principles in order to seek redress from the car's passenger. As the object of an increased danger is involved, albeit self-driving cars are expected "(…) to be far less hazardous or risky than the products they replace",[116] the fault criteria is abandoned leaving components of act, damage and causal link to be proved. The passenger might then find himself in an uncomfortable position of being held liable under strict liability rules although not being involved in the driving *per se*. Result of the strict liability application in a given scenario thus does not seem entirely fair. While the strict-liability ensures the accident's victim gets his redress, it puts another actor, i.e. the car's holder or owner at a detrimental position. The European Commission notes:

> If, for instance, the owner or operator of an AI system is considered strictly liable, even if he has no possibility to control its behavior or to prevent any associated risk with the adoption of precautionary measures, he should be able to obtain redress for the damages covered, to the extent that the wrongful or undesirable behavior of the AI system may be attributable to someone else, e.g. producer.[117]

The passenger, protecting his legal rights, may then rely on recourse claims for joint liability stipulated under certain civil law rules[118] and file a claim against the product, i.e. the car manufacturer under PLD.

Considering the road-traffic accident presented, two important factors must be taken into account. Firstly, the strict-liability becomes available to victim as the dangerous object, i.e. the car, is present. Although taking into account that the self-driving cars could potentially reduce

[112] *Supra* 95, p.56. Unlawfulness may be evidenced in failure to show general duty to maintain safety: "It has been argued in the context of German law that putting "blind trust" in the autonomous vehicle technology over a long period may constitute a breach of the duty to maintain safety."
[113] *Supra* 59, p.132.
[114] *Supra* 17, p.185, referencing Judge Cardozo's opinion in *Palsgraf v. Long Island Railroadi* 162 N.E. 99, 101 (N.Y. 1928).
[115] *Supra* 95, p.56.
[116] *Supra* 59, p.146.
[117] *Supra* 83, p.21.
[118] See, for example, section 137(2) of the Estonian Law of Obligations or section 1675 of the Latvian Civil Law, or section Section 830 of the German civil code.

lethal outcomes in road accidents by 90%,[119] their overall categorization into increased risk object category may be challenged sooner or later. Secondly, the European Motor Insurance Directive[120] provides a mechanism that enables the victim to get redress directly from an insurance company bypassing the need to sue in delict and provides financial relief to the defendant party.

In order to further illustrate the liability challenge a more futuristic example might prove useful. For this scenario let's suppose a person owns a high-level autonomous housekeeping robot fulfilling concierge's functions to keep the house clean, to get rid of rubbish, to order food, to pay the rent and utilities. The robot is also assigned with a home-security feature making sure the house does not get robbed and calls the police if it finds so necessary. One day a neighbour visits a house for a glass of wine with the house owner. The robot erroneously identifies the neighbour as a thief by finding a similar person in police online database and decides to attack him with a cleaning mop inflicting bodily harm by hitting the neighbour on his head. The source of the robot's erroneous decision is unclear, it could have been a defect in his software, it could well have been the result of robot's learning experience by combining cleaning and security features or the house owner could have trained the robot to check visitors in police databases and respond in a particular way if matches are found. Nevertheless, the general delict liability of the home owner would be complicated to apply as the fault-negligence-foreseeability element is difficult to show because of the autonomous decision to attack taken by the robot. The autonomy of the housekeeping robot's decision must not be underestimated, i.e. the owner might not even have been nearby. Further, the robot's manufacturers had never thought that this robot's model may use AI to combine function and come up with a new behaviour. Had the housekeeping robot been limited in its operations as, for instance, robotic vacuum cleaner, general liability doctrine would hold the house owner liable if he had not notified the visitor about the robot in operation or the robot's manufacturer if the robot had proved to be defective. The strict or reverse-liability doctrines would also prove useless in the current scenario as an object of increased risk is absent in the formula.

In both scenarios there exists a suspicion that something might have been wrong with the car or the robot from the beginning. The passenger, the home owner and victims may thus attempt to seek redress from the self-driving car or the housekeeping robot's manufacturers. Hence it is necessary to study the liability for defective products as stipulated under the Product Liability Directive.[121]

2.2. Product Liability Directive

The Product Liability Directive sets up the European approach towards holding product manufacturers or producers liable towards victims suffered as a result of defects in products. The

[119] World Health Organization. *The fundamentals*, at p.10, available on: https://www.who.int/violence_injury_prevention/publications/road_traffic/world_report/chapter1.pdf?ua=1. Accessed March 20, 2019.

[120] Directive 2009/103/EC of the European Parliament and of the Council of 16 September 2009 relating to insurance against civil liability in respect of the use of motor vehicles, and the enforcement of the obligation to insure against such liability, *OJ L* 263, 7.10.2009, p.11-31.

[121] Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products, *OJ L* 210, 7.8.1985, p.29-33.

Directive adopts the strict-liability doctrine as "(…) the injured person does not have to prove a fault of the producer."[122] As stipulated under Article 4 the injured person shall be required to prove the damage, the defect and the causal relationship between defect and damage. Article 6 states that a product is defective when it does not provide the safety which a person is entitled to expect.[123] The Directive's preamble further extends the assessment of safety so to include "reasonable" misuses of the products. The Directive implements quite wide definition of the producer, including component manufacturers, importers or suppliers of product's parts.[124] What is most worrying about the Directive is the year it was implemented, namely, back in 1985, which was way before the IBM's "Deep Blue" had amazed the chess world. Since then, the AI technology made significant steps in its attempts to reach levels of sentient or conscious beings. Hence, proving liability for emerging AI technology under the Product Liability Directive may be problematic.

2.2.1. Proving the defect - safety which a person is entitled to expect

When, after being switched off, an iron keeps heating, the element of defect under the Directive is easily identifiable as a person expects the iron to cool down after it is switched off. The simple technical construction of an iron also simplifies expectations of a person turning it on and off. Consisting of a "(…) mishmash of hardware and software components",[125] the sophisticated and complicated AI technologies might present a significant challenge at finding the defective component. Balkin notes in this regard:

> Bugs may be difficult to spot and may develop through the combination of multiple modifications and additions. It may be fiendishly difficult to affix responsibility for bugs that emerge from layers of software development by many hands.[126]

The lawsuits surrounding Toyota's sudden acceleration cases experienced by the car's users illustrates the complexity well as, notwithstanding an in-depth technical investigation of the case, "(…) engineers have been unable to identify a specific design or manufacturing defect that causes the uncontrolled acceleration, although theories around."[127] Notwithstanding absence of a clear conclusion on the defect, the court was convinced to hold Toyota liable as evidence presented strongly advocated for the defect in the car.[128]

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[122] *Supra* 83, p.6.

[123] Article 6 of the Council Directive 85/374/EEC: "A product is defective when it does not provide the safety which a person is entitled to expect, taking all circumstances into account, including:

(a) the presentation of the product;
(b) the use to which it could reasonably be expected that the product would be put;
(c) the time when the product was put into circulation."

[124] *Supra* 83, p.6: "(…) the manufacturer of the product, the producer of any raw material or the manufacturer of a component part or any person who, by putting its name, trademark or any distinguishing feature on the product presents himself as the producer. Furthermore, without prejudice to the liability of the producer, the importer is deemed to be a producer. Finally, where the producer cannot be identified, each supplier of the product shall be treated as its producer unless he informs the injured person of the identity of the producer."

[125] *Supra* 4, p.371

[126] *Supra* 64: p.53

[127] *Supra* 59, p.142.

[128] In *Toyota Motor Corp.,* 2013 WL 5763178, the Court said at p.33: "Toyota's Motion for Summary Judgement is premised on the uncontroverted fact that Plaintiff has been unable to identify a precise software design or manufacturing defect and point to physical or otherwise traceable evidence that the defect actually caused the Camry throttle to open from an idle position to a much wider angle without analog input from the driver via the accelerator

Various system components of AI are often manufactured in different countries,[129] using pre-programmed elements such as, for example, "COTS"[130] in combination with newly programmed elements. Presence of code-components and open sources makes the AI development available to comparatively low budget enterprises as Professor John McGinnis observes "(…) artificial intelligence research is done by institutions no richer than colleges and perhaps would require even less substantial resources."[131] The code controlling the AI's hardware is a complex piece of technical architecture that: "(…) dictates behaviour in complex ways".[132]

The level of complexity and innovation present in AI technology may also provide a safe-harbour for AI producers that are able to demonstrate under Article 7(e) of the Directive that the state of scientific and technical knowledge at the time when the product went into circulation was not such as to enable the existence of the defect to be discovered. Although, it is argued that only truly innovative developments in AI may rely on this defence,[133] this article may well introduce the "foreseeability" element that is preserved for proving negligence under the general tortious liability doctrine. Subsequently, the question of whether the manufacturer could have *foreseen* [emphasis added] behaviour of its creature that caused victim's damages would surely hinder the operation of strict liability regime as intended by the Directive. Karnow observes in this regard:

> A superficial reading might suggest that foreseeability is not pertinent here: after all, the liability is "strict" and imposed just if a product is defective; it matters not if the defect was intentionally or negligently built. But the truth is that foreseeability plays an important role even in strict liability cases.[134]

Professor Gerhard Wagner confirms Karnow's vision as he argues that the concept of negligence was hidden under the defective product notion expressed under Article 6 of the Directive:

> In the areas of design defects and marketing defects (failure to warn), the definition of defect is merely a disguised version of the standard of safety a diligent manufacturer would have observed.[135]

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pedal. To a lesser extent, it is also premised upon the fact that Plaintiff cannot prove the actual failure of Toyota's fail-safe mechanism in the Camry on the day of the collision. As explained more fully below, Plaintiff's burden at the summary judgement stage is not so onerous.
Essentially, Toyota asks the Court to conclude that the only reasonable inference that may be drawn from the volumes of evidence proffered by the parties is that Mrs. St. John mistakenly applied the accelerator pedal instead of the brake pedal. The court cannot so conclude. As Plaintiff points out, and as detailed by the Court more fully below, Mrs. St. John's testimony, together with other evidence, much of it expert evidence, support interferences from which as reasonable jury could conclude that the Camry continued to accelerate and failed to slow or stop despite her application of the brakes". Available on: https://www.leagle.com/decision/inadvfdco140805000089. Accessed March 21, 2019.

[129] *Supra* 4, p.372.

[130] Dr. Robert B.K. Dewar, "COTS Software in Critical Systems: The Case for Freely Licensed Open Source Software," *Military Embedded Systems* (2010), accessed March 21, 2019, http://mil-embedded.com/articles/cots-open-source-software/.

[131] John O. McGinnis, "Accelerating AI," 104 *Northwestern University Law Review* 1253 (2010): p.1262.

[132] *Supra* 69, p.534.

[133] Caroline Cauffman, "Robo-liability: The European Union in search of the best way to deal with liability for damage caused by artificial intelligence," *Maastricht Journal of European and Comparative Law* 25(5) (2018): p.531: "(…) it refers to the most advance level of the objective state of scientific and technical knowledge at the moment the product was put into circulation."

[134] Supra 62, p.11.

[135] Gerhard Wagner, „Strict Liability in European Private Law," *Handbook of European Private Law*. Accessed on March 30, 2019. Available on: https://www.researchgate.net/publication/228224891_Strict_Liability_in_European_Private_Law.

It may overall be concluded that opaque and burdensome approach towards AI constructions could result in serious challenge presented to claimants in proving the defect element under the Directive. Presence of numerous component producers is not novel *per se* in the production of complex technical products such as, for example, cars themselves. Although no previous products were so closely been related to and its conduct influenced by the software components as it is the case with AI. Scherer finds "(…) AI system (…) far more *opaque* [original emphasis]"[136] and concludes:

> It seems unlikely that AI systems will demonstrate similar transparency if their development follows now-prevailing trend in information technology. Defects in the design of a complex AI system might be undetectable not only to consumers, but also to downstream manufacturers and distributors.[137]

The former Director of the Bureau of Consumer Protection of the Federal Trade Commission David C. Vladeck further supports this allegation by finding that complex parts of self-driving cars such as lasers and sensors linked to computer programmes are "(…) prone to undetectable failure".[138]

As illustrated by the Toyota's example, courts may be tempted to protect the victim's rights to redress and assign liability to the manufacturer under the Directive notwithstanding absence of apparent proof of the defect.[139] Such approach, in essence, reminds application of the common law doctrine of *res ipsa loquitor*[140] that allows to bypass the negligence element as "(…) presumed if one's property causes harm to a third party."[141] Vladeck argues that the doctrine of *res ipsa loquitor* shall be extended to cover the "defect" element as well as he suggests: "(…) the accident itself is proof of defect, even if there is compelling evidence that cuts against a defect theory."[142] The application of such approach, however, will put significant legal pressure on AI manufacturers that may harm its incentive to further develop AI unless the manufacturer can further "(…) apportion liability among designers, programmers, manufacturers and others involved"[143] in the production process. However, the manufacturer's ability to indemnify itself of losses suffered as a result of the victim's claim will similarly be faced with the necessity to prove the "defect" element under the Directive and the manufacturer will then be forced to find and prove the defect albeit all the complications related to such process.[144] In fact, the Florida Statutes, for example, specifically outline a right of cars manufacturers to indemnify itself against such losses by attributing liability to producer of equipment that has converted the car into the

[136] *Supra* 4, p.371.
[137] *Id*. p.372.
[138] *Supra* 59, p.148.
[139] *Supra* 62, p.6 notes in regards to complex products/programs: „We know that large programs cannot be wholly understood by a single human, and the range of output can never be wholly predicted even in the relatively organized and understood software environment of a 2013 personal computer, not to speak of the interactions of multiple machines."
[140] The doctrine is described in Byrne v. Boadle, 159 Eng.Rep. 299 (Exch. 1863).
[141] *Supra* 10, p.764.
[142] *Supra* 59, p.128.
[143] *Supra* 4, p.128.
[144] *Id.* p.128: "If it is in fact impossible to identify the cause of the accident, then the manufacturer would likely have no reasonable grounds for an indemnity or contribution action, and would thus be saddled with the entire judgement."

autonomous self-driving car.[145] It is unfortunate and understandable due to the PLD creation date that no such express clause dealing specifically with autonomous machinery is found in the Directive as such provision attempts to protect the innocent party of the manufacturing process by granting it a valid legal basis for a defence and attribute the blame to the guilty party instead of bluntly attributing it to the manufacturer of the final product.

In cases where the AI technology is involved the proof of defect implies significant burden on the victim to show that the product in fact had not met the victim's expectations of safety, which is even more complicated with novel AI technologies that evolve in a geometrical progression. On the other hand, courts' sympathy towards "consumers" or victims of AI technologies might affect the proof of defect requirement leaning towards Toyota's approach mimicking the *res ipsa loquitor* doctrine in holding the manufacturers liable. Demotivated manufacturers would then struggle through the chain of its suppliers to find the faulty element and party to share the fault and its price with. AI carrying higher level of automation might further challenge the victim's ability to show the link between the damage and defect.

2.2.2. Brake in the causal relationship

Article 4 of the Product Liability Directive requires the injured person to prove, besides damage and defect – the causal relationship between defect and damage.[146] The necessary element between the wrongdoer's action and victim's damage is based on a well-established principle of *condition sine qua non* or usually referred to as the "but-for" test among law practitioners.[147]

Supplemented by the method of elimination[148] for proving causation in cases where positive act of the defendant may be the cause and by method of substitution where the omission of the defendant might have caused damage,[149] the causation is a mandatory element to rely on the Product Liability Directive. The European Commission has acknowledged, that in cases when the action of AI interacts with the victim in an unexpected manner, the cause of damage "(…) cannot be linked to a defect or a human wrongdoing."[150] Scherer further confirms this finding:

> The experiences of a learning AI system could be viewed as a *superseding* [emphasis added] cause – that is, "an intervening force or act that is deemed sufficient to prevent liability for an actor whose tortious conduct was a factual cause of harm.""[151]

The issues with proving causation that leads to the product's manufacturer may prove tricky in cases where truly autonomous decisions were employed by AI. For instance, returning

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[145] Section 316.86 of The 2018 Florida Statutes, accessed March 22, 2019, http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0316/Sections/0316.86.html. Similarly, the Civil Code of Quebec at section 1465 states: "The custodian of a thing is bound to make reparation for injury resulting from the autonomous act of the thing, unless he proves that he is not at fault.", accessed March 22, 2019, http://legisquebec.gouv.qc.ca/en/ShowDoc/cs/CCQ-1991.

[146] Basil S. Markesinis and Hannes Unberath, *The German Law of Torts: A Comparative Treatise, Fourth Edition, entirely revised and updated* (Oxford and Portland, Oregon: Hart Publishing, 2002), p.103.

[147] *Ibid*.

[148] Method introduced by Australian criminal lawyer Glaser in 1858, please see H.L.A. Hart and Tony Honore, *Causation in the Law* (New York: Oxford University Press, 1958), p.443.

[149] *Supra* 146, p.104.

[150] *Supra* 83, p.10.

[151] *Supra* 4, p.365.

to previous examples, the following may be argued. "But for" the car has made an unexpected decision to accelerate (potentially learnt by the car as it "watched" other traffic participants making same risky manoeuvres), the accident would not had appeared. "But for" the housekeeping robot decided that the neighbour falls within criminal database match and attacked him with a mop, the victim would not had suffered injuries. Actions of AI in examples supersede the house owner and passenger's omissions in causing damage, i.e. it were precisely the actions of AI that has led to damages. Actions made by the machines with upper spectrum of autonomy in decision making may thus disturb the victim's ability to address the producer directly. This is so because the producer will most certainly claim that he had never intended, nor instructed, nor programmed the AI to make decisions made and thus the causal link may not direct to its end:

> When something goes wrong, as it inevitably does, it can be a daunting task discovering the behaviour that causes an event that is locked away inside a black box where discoverability is virtually impossible.[152]

It will then become a question of evidence and foreseeability, as by offering the product to the market, the producer must have anticipated some risks at least, especially knowing that the AI offer is at the upper spectrum of autonomy, as Balkin argues:

> [A]lthough the risk of *some* [original emphasis] kind of injury at *some point* [original emphasis] in the future is foreseeable whenever one introduces a new technology, how and when an injury occurs may not be particularly foreseeable to each of the potential defendants (…).[153]

Overall, the Product Liability Directive does provide certain degree of protection to victims of AI' actions as it covers all defective objects that are not classified of carrying an increased risk to fall under the civil law strict-liability regime. Although, the unpredictability of sophisticated AI systems, on the other hand, provide AI producers with paths to try avoiding the liability by hiding behind the AI's autonomous actions. Even in case where the defect might be found and identified among potentially hundreds of components provided by many suppliers, it would still be possible for the producer to argue that there exists a superseding decision made by the AI that breaks the causal link between defect and damage. Scherer observes in this regard:

> If legal systems choose to view the experiences of some learning AI systems as so unforeseeable that it would be unfair to hold the systems' designers liable for harm that the system cause, victims might be left with no way of obtaining compensation for their losses. Issues pertaining to foreseeability and causation thus present a vexing challenge that the legal system will have to resolve in order to ensure that means of redress exist for victims of AI-caused harm.[154]

As the difficulties related to conservative delict liability approach has been identified and studied it appears to be an appropriate time to examine the European Union's position next so to understand its standings, approach and propositions towards fulfilling lacunas identified.

3. EUROPEAN APPROACH

[152] Colin Lewis and Dagmar Monett, „AI & Machine Learning Black Boxes: The need for Transparency and Accountability," *KDnuggets*, April 2017, https://perma.cc/TR6G-GTV7.
[153] *Supra* 64, p.52.
[154] *Supra* 4, p.366.

As "(…) legislatures should set the starting point for AI regulation by specifying the goals and purposes of AI regulatory regime"[155], the European regulatory approach towards AI becomes a key influential factor at creating efficient and prosperous environment for AI manufacturers and consumers. As it has been exhibited, conservative doctrines of delict and Product Liability Directive do not clear the mud in the waters surrounding liability of truly autonomous AI machines. Overreliance on existing legal practices may create loopholes, result in victims fighting to obtain redress deserved or place excess burden on manufacturers of AI that could not possibly predict behaviour of its "creatures". The fierce competition among world's leaders in AI research and development has also been reflected in series of documents or communications among European institutions regarding the AI under the digital single market agenda. This section shall study the relevant parts of the overall position taken by the European Union in regard of allocation of liability.

3.1. European Parliament with Civil Law on Robotics

On 16 February 2017 the European Parliament has initiated a discussion by publishing the Civil Law Rules on Robotics addressed to the European Commission.[156] The document summarizes achievements made by the AI so far and outlines potential benefits reserved for the future. The Parliament expresses its concerns regarding the current traditional liability rules applicable throughout the Union and acknowledges:

> Whereas in the scenario where a robot can take autonomous decisions, the traditional rules will not suffice to give rise to legal liability for damage caused by a robot, since they would not make it possible to identify the party responsible for providing compensation and to require that party to make good the damage it has caused.[157]

The Parliament has elaborated on the notion of autonomy without going into too many details as it concluded on the efficiency of the regime offered so far:

> (…) notwithstanding the scope of Directive 85/374/EEC, the current legal framework would not be sufficient to cover the damage caused by the new generation of robots, insofar as they can be equipped with adaptive and learning capabilities entailing a certain degree of unpredictability in their behaviour, since those robots would autonomously learn from their own variable experience and interact with their environment in a unique and unforeseeable manner.[158]

The absence of an in-depth elaboration on the definition of the upper spectrum of autonomy, apart from mentioning "the new generation of robots" may have further led to a reply of the Commission that has not addressed the most sensitive topic of "electronic personhood" status for

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[155] *Id.* p.379.

[156] *Supra* 58. The Rules appear as a result of the 27 January 2017 Motion for a European Parliament's Resolution with recommendations to the Commission on Civil Law Rules on Robotics. Available on: http://www.europarl.europa.eu/doceo/document/A-8-2017-0005_EN.html#title1. Accessed April 3, 2019. Joanna J. Bryson, Mihailis E. Diamantis, Thomas D. Grant, "Of, for, and by the people: the legal lacuna of synthetic persons," *Aritificail Intelligence Law* 25 (2017): p.275: "(…) the Motion identifies lines for future development, for example to create a registry of "smart robots," to use the United Nations to set regulatory standards, to allocate public money to study the "social and ethical challenges" of advanced robotics, and so on. Of particular concern here, the Motion also suggests that European law might someday attribute legal personality to robots."

[157] *Id.* (European Parliament), at para. AF.

[158] *Id.* at para AI.

AI. As shown earlier, the "autonomy" notion shall not qualify for the pre-coded, controlled or so called "tethered" robots. For example, a decision may be referred to as autonomous when the robotic vacuum cleaner takes a decision to turn right instead of left or a flight-drone, that is already "(…) equipped with adaptive and learning capabilities" takes a decision to drop its package. However, as argued, such autonomy will not create any particular difficulties for existing liability systems. The notion of autonomy for the purpose of further development of the liability system lies rather within combination of factors including complexity of AI, its overall ability to adapt to novel circumstances, its ability to self-improve or progress throughout its operations completely independently of a human operator.

The Parliament further proposes to introduce a definition of a smart robot,[159] introduce a system of registration of advanced robots,[160] and to ensure that humans possess sufficient control over AI at all times.[161] The Parliament urges the Union and Member States to ensure sufficient financial inflow into the technology to secure leadership positions in research and development of the AI.[162]

Importantly, and as it is argued – correctly, it was suggested to introduce a European Agency for Robotics and Artificial Intelligence "(…) in order to provide the technical, ethical and regulatory expertise needed to support the relevant public actors."[163] The introduction of the supervisory body, as similarly presented in other spheres,[164] is an important regulatory tool to safeguard potential AI victims on as *ex-ante* rather than *ex-post* basis. Scherer outlines benefits accessible to agencies in comparison with legislatures and courts. Agencies, unlike legislatures, may well "(…) staff themselves with professionals" with prior knowledge and applicable expertise in the relevant areas, and at the same time "(…) remain independent from the political pressures that distorted the judgements of elected officials".[165] Unlike courts limited by facts presented to them, agencies may review all the relevant factors and are generally "(…) freer to conduct independent factual investigations and make policy decisions based on broad social considerations." Hart and Sacks further find agencies to

> (…) have comparative institutional advantages over both courts and legislatures in applying legislated rules or principles to problems, because they have the legislature's ability to engage in ambitious factfinding and the courts' option of focusing on one problem at a time.[166]

Finally, the Parliament has addressed the Commission with a proposal on further development of the legislative instrument. In particular, the Parliament suggests to establish a compulsory insurance scheme, to establish a compensation fund, to allow the AI manufacturer to benefit from a limited liability in cases where AI make regular contributions to the compensation fund, to take a decision on whether to establish a general or individual fund for each robot

[159] *Id*. at point 1.
[160] *Id*. at point 2.
[161] *Id*. at point 3.
[162] *Id*. at point 6.
[163] *Id*. at point 16.
[164] For example in nuclear or financial industries.
[165] *Supra* 4, p.381.
[166] Henry M. Hart Jr. And Albert M. Sacks, *The Legal Process: Basic Problems in the Making and Application of Law* (New York: Foundation Press, 1994), at lxxx.

category, to ensure transparency between the fund and a robot, and finally and most importantly, the Parliament asks the Commission to consider the possibility of

> (…) creating a *specific legal status* [emphasis added] for robots in the long run, so that at least the most sophisticated autonomous robots could be established as having the status of electronic persons responsible for making good any damage they may cause, and possibly applying electronic personality to cases where robots make autonomous decisions or otherwise interact with third parties independently.[167]

The last suggestion of the Parliament has understandably caused heated debates among academics as an unprecedented occasion of granting a legal personhood status to anyone except for a human or a corporation, which is under full human's control anyway.[168] Considered as futuristic and progressive, the Parliament's statement deserves a separate chapter within this thesis.

Overall, it may be evidenced that the Parliament has effectively initiated the discussion around liability for actions of AI, bravely outlining existing challenges presented in front of the delict system, outlining existent gaps under the Product Liability Directive and offering potential solutions. Conclusions, recommendations and practical solutions offered by the Parliament for various groups of robots that are already affecting our lives and in-depth analysis of the impact those robots will have on the European legal regimes appear convincing and well-structured. Undeniably, the Parliament's report has fulfilled its primary purpose of initiating debates within European institutions on the future of AI regulation.

3.2. EU institutions' reaction to the European Parliament's manifest

On 31 May 2017 the European Social and Economic Committee has issued its opinion on the Parliament's Laws of Robotics.[169] The Committee has reacted strongly to Parliament's proposition of establishing a new notion of electronic personhood as it observed:

> The EESC is opposed to any form of legal status for robots or AI (systems), as this entails an unacceptable risk of moral hazard. Liability law is based on a preventive, behaviour-correcting function, which may disappear as soon as the market no longer bears the liability risk since this is transferred to the robot (or AI system). There is also a risk of inappropriate use and abuse of this kind of legal status. The comparison with the limited liability of companies is misplaced, because in that case a natural person is always ultimately responsible.[170]

On 19 October 2017 the European Council has discussed, *inter alia*, the AI agenda and has invited the European Commission to "(…) put forward a European approach to artificial

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[167] *Supra* 58, at point 59.

[168] See, for example, Joanna J. Bryson, Mihailis E. Diamantis, Thomas D. Grant, "Of, for, and by the people: the legal lacuna of synthetic persons," 25 *Artificial Intelligence Law* (2017): p.274: "Human-like artefacts are no longer fiction, and humanity is now confronted by the very real legal challenge of a supranational entity considering whether to attribute legal personality to purely synthetic intelligent artefacts."

[169] European Economic and Social Committee. *Artificial Intelligence, OJ C 288, 31.8.2017, p.43.* Available on: https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/artificial-intelligence. Accessed March 27, 2019.

[170] *Id*, p.10.

intelligence by early 2018".[171] The Council has further emphasized the importance to take leading positions in emerging technologies and to strengthen the framework conditions. On 18 February 2018 a disappointment in European Commission's delay in its reaction to the Parliament's report was expressed by its author: "I though the Commission would come forward with some regulatory proposal, at least something."[172]

On 10 April 2018, the Declaration of Cooperation on Artificial Intelligence was signed by 25 EU Member States as the signatories confirmed their willingness to cooperate on improving Europe's technology and industrial capacity, addressing socio-economic challenges and ensuring an adequate legal and ethical framework.[173] The raising pressure on the Commission from the EU Parliament and institutions to outline its position has persuaded the Commission to come up with several initiatives.

3.3. European Commission's coordinated plan on AI

Albeit with some delay but the European Commission has come up with several cascading responses to the Parliament's invitations. On 25 April 2018 the Commission has issued a communication on "Artificial Intelligence for Europe"[174] and its accompanying document "Liability for emerging digital technologies".[175] Additionally, the Commission has set up two expert groups to specifically address applicability of current legal mechanisms, including the Product Liability Directive to emerging AI technology that are expected to presents their results in mid-2019.[176]

In its policy-setting "Artificial Intelligence for Europe" document the Commission has emphasized on the need for the correct framework to be set by the EU to ensure the Union's core principles such as accountability and transparency are sustained and developed throughout the technological innovation process.[177] The Commission has further ascertained the EU's position against its main competitors in AI development, namely – the United States and China and has committed itself at raising AI investments of up to one and a half billion euros by the end of 2020

[171] European Council. *European Council meeting (19 October 2017) – Conclusions.* Available on: https://www.consilium.europa.eu/media/21620/19-euco-final-conclusions-en.pdf. Accessed March 27, 2019.
[172] Peter Teffer, "Robotics MEP angry at lack of Commission response on AI," *euobserver*, February 28, 2018, https://euobserver.com/science/141143.
[173] European Commission. *EU Member States sign up to cooperate on artificial intelligence* (2018). Available on: https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence. Accessed March 27, 2019.
[174] European Commission. *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 – Artificial Intelligence for Europe* (2018). Available on: https://ec.europa.eu/transparency/regdoc/rep/1/2018/EN/COM-2018-237-F1-EN-MAIN-PART-1.PDF. Accessed March 27, 2019.
[175] European Commission. *Commission Staff Working Document: Liability for emerging digital technologies, Accompanying the document 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 – Artificial Intelligence for Europe {COM(2018) 237 final}*. Available on: https://ec.europa.eu/digital-single-market/en/news/european-commission-staff-working-document-liability-emerging-digital-technologies. Accessed March 27, 2019.
[176] The group will be formed of the Product Liability formation and the New Technologies formation. Please see Call for experts for a group on liability and new technologies. Accessed March 31, 2019, http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=3592.
[177] *Supra* 174.

through the Horizon 2020 programme.[178] Access to publicly available data was proclaimed as one of the key prerogatives, as data serves as the main "engine" behind AI learning processes and thus enhances the technology strongly. Consequently, one of the initiations involved further improvement on the supporting regulatory instruments such as Directive on public sector information, guidance on sharing private sector data in the economy and an updated Recommendation on access to and preservation of scientific information.[179] The Commission has superficially touched upon the liability dilemma in its main document by outlining that the current liability regime shall be reviewed so to fit well the challenges that might be further presented by the emerging technology.

Although the Commission has further elaborated on the liability topic in separate "Liability for emerging digital technologies" document. The document examines the extra-contractual delict liability regimes employed by various member states already discussed in earlier chapter quite thoroughly and proceeds to peculiarities applicable to AI. In particular, the Commission accentuates on AI' "tentacles" characteristics such as "(…) sensing, actuating, cognitive vision, machine learning"[180] that enables it to interact with the surrounding world in a manner unlike other devices we used to perceive. The Commission observes:

> Combined with self-learning and autonomy, the behaviour of these technologies may be difficult to predict. This could raise questions regarding liability, in situations where the damage caused by a machine operating with a certain degree of autonomy cannot be linked to a defect or a human wrongdoing (…). As a consequence, the question of how to attribute liability where the expected outcome of the technology was not identified either before the market launch or after that launch needs to be examined.[181]

Balancing between ensuring the right regulatory environment is set to allow machines to freely learn from the data available and precluding those machines from becoming malicious, the Commission finds it difficult to come up with a universal solution. The open data available for AI may be faulty or corrupted thus affecting safety of the AI technology. The Internet of Things[182] raises further questions as devices interacting may provide its owner or consumer with services rather than products and the damage could be "(…) caused by the supply of erroneous data or by a failure to supply data, allocating liability may become unclear."[183] The maintenance of latest software updates present another challenge as software in effect serves as the machine's brains. Provision of risky software updates may trigger contractual liability claims between the manufacturer and the software's provider. In its turn, the customer may contribute to the damage caused by failing to install the latest software and extra-contractual liability may be raised in parallel.[184]

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[178] *Id*. More on the Horizon 2020 programme: https://ec.europa.eu/programmes/horizon2020/en. Accessed March 30, 2019.
[179] *Ibid*.
[180] *Supra* 175, p.10.
[181] *Ibid*.
[182] The concept usually refers to devices that are embodied with a processor that links this device with other. An often-used example is that of a fridge that through its processor may order the food online and pay for it autonomously.
[183] *Supra* 175.
[184] On application of extra-contractual liability please see Frank Segers, "Fines for UZ Gent and 3 companies for incorrect brain irradiation," *NWS*, September 7, 2015,

Quite usefully, the Commission has presented various case studies of AI liability scenarios. Firstly, the case of an autonomous "unmanned" aircraft or drone that could potentially cause damage in a variety of ways was considered. It is argued that the drone may well be classified under the "aircraft" definition and thus fall under national and international laws covering the aircraft regulation. As the study shows, the operator of the drone would be most likely held strictly liable albeit autonomous operations of the drone.[185] Victim might additionally pursue a claim under the general liability if able to prove the operator's fault explicit in using a drone in dangerous weather conditions or if the maintenance required for the drone was not performed. If the victim feels that the drone might have been defective - the Product Liability Directive might form grounds for a claim. Drone Quest Q-200 that has collided with a construction crane due to outdated internal procedures that took no account of a construction site was used by a Commission to illustrate the proximity of automated unpiloted machines causing damage.[186] Autonomous cars were used as another example. The case study and its outcomes are detailed in an earlier chapter, although the Commission has referred to specific cases that have occurred already. Firstly, on May 7, 2016, the Tesla Model S car that was driving in an autopilot and failed to notice left-turning truck, hit it and caused death to the car's passenger. No defect of the car was proved, moreover Tesla's Terms and Conditions have warned drivers to supervise the autopilot's driving and keep hands on the wheel. On February 14, 2016, Google's self-driving car had attempted a manoeuvre and collided with the bus at a low speed. Google has accepted software malfunctioning and committed to fix it. On March 19, 2018 an Uber car driving autonomously has not spotted pedestrian and killed her.[187]

The Commission continued to evaluate complexities relating to specific cases. For instance, in cases where a smart home ecosystem acts unreasonably and turns off the fire alarm causing further damages in case the fire actually takes place. The scenario, besides outlining possibilities of a contractual claim of the home owner against the system seller or against a system's manufacturer under the PLD, illustrates difficulties the insurance companies might face "(…) in identifying the cause for the fire and the responsible actor than the home owner."[188] In another example the cyber-attack that causes damages might actually provide a defense to manufacturer available under the PLD as the manufacturer could claim that the state of scientific and technical knowledge at the time when he put the product into circulation was not such as to enable the existence of the defect to be discovered.[189]

The Commission concludes its discussion by analysis on whether strict- or fault-based liability regimes shall apply to AI. Existing mainly for products of increased risk, strict-liability regime imposes blame on the defendant for merely taking the risk of using such products and causing damage. On the contrary, the fault-based liability tends to pursue and punish those

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https://www.vrt.be/vrtnws/nl/2015/09/07/geldboetes_voor_uzgenten3bedrijvenvoorfoutehersenbestraling-1-2434505/.

[185] Steer Davies Gleave, *Study on the Third-Party Liability and Insurance Requirements of Remotely Piloted Aircraft Systems (RPAS). Final Report. November 2014*, accessed 30 March, 2019, https://www.eurocontrol.int/sites/default/files/ec_rpas_final_report_nov14_steer_davies.pdf.

[186] AAIB, *AAIB investigation to quest Q-200 (UAS, registration n/a). Collision with a crane, Hinkley Point, Somerset*, accessed March 30, 2019, https://www.gov.uk/aaib-reports/aaib-investigation-to-quest-q-200-uas-none.

[187] *Supra* 175, pp.14-15.

[188] *Id*, p.16.

[189] Article 7(e) of the PLD.

defendant who have failed to ensure reasonable standard of care by intentionally or negligently ignoring safety precautions. Either way, the Commission poses a question of "(…) whether and to what extent it matters for determining liability whether the damage could have been avoided or not."[190] As observed by the Commission, specific national liability regime might actually provide a defense in cases of strict liability cases involving building collapse or dangerous activities or employer's liability:

> any person held liable by law could avoid liability by proving that he/she did everything possible to avoid the damage or that they used reasonable care considering similar circumstances.[191]

Evidenced, for example, in sections 833 for animal keepers' strict liability or 836 for plot of land owners of the German Civil Law, application by the defendant of all reasonable care to avoid danger would release the defendant even under the strict-liability regime. The Commission presents the following analogy:

> (…) this could mean that the owner of an advanced robot could avoid liability if, for instance, he had used and maintained the robot properly, respecting the instructions of the producers and updating the software when required. However, (…), these technologies might in such scenarios still perform autonomous behavior and cause damage. The damage might occur even if the use and maintenance of the robot are impeccable.[192]

The concern raised by the Commission references towards the notion of justice or equity that the law is expected to promote. Thus, to held a manufacturer, holder, or owner of the robot strictly liable notwithstanding that a defendant has done everything possible to avoid that damage to the victim would seem unjust and hence would not serve the purpose of law.[193] The extension of the strict liability application to cover all sorts of AI and robots also appears in conflict with its current scope limited to dangerous products or operations. On the contrary, for instance the European Group on Tort Law that published Principles of European Tort Law has excluded activities that fall within a "common usage" from the dangerous activities definition, thus eventually excluding cars from the definition.[194] Reliance on the fault-based system would require victims to prove that the AI's actions were in fact not autonomous, but were caused by the defendant's fault, which, as shown, diminish chances of a successful claim significantly. Thus, a "(…) vexing challenge"[195] is presented to legal system to protect the victim and attribute the liability justly.

Besides other conclusions and suggestions reached, the Commission observes:

> While AI cannot of course be assimilated to humans or animals, the autonomy element is an intrinsic feature that is relevant and very prominent in both cases. (…) The approach on

[190] *Supra* 175, p.19.
[191] *Ibid*.
[192] *Id*. p.19.
[193] Ugo Pagallo, "Apples, oranges, robots: four misunderstandings in today's debate on the legal status of AI systems," *Royal Society Philosophical Transactions A* (2018). Accessed February 28, 2019. https://doi.org/10.1098/rsta.2018.0168, p. 5: "Correspondingly, this is the first time ever legal systems will hold humans responsible for what an artificial state-transition system "decides" to do."
[194] European Group on Tort Law, "Principles of European Tort Law," (2005). Accessed March 31, 2019. Available on: http://www.egtl.org/.
[195] *Supra* 4, p.366.

> liability for animals is linked to the concept of lack of predictability and therefore interesting to that extent in the context of autonomous behavior.[196]

The statement must be assessed critically and conclusions reached on whether the law really cannot employ approaches taken in respect of humans or animals. Thus, the next two sections of the research will be dedicated to emerging theories on delict liability of AI by either granting AI with a personhood status or using a theory of analogy to allocate the liability.

4. EMERGING THEORIES

> First, AI-enabled devices can be treated as property and therefore be the responsibility of their users, owners, or manufacturers. Second, they could be treated as "semi-autonomous being," and fall under a legal regime similar to that of children or persons with mental disabilities, or even one similar to the notion of agency. Third, like corporations, they could be treated as fully autonomous beings.[197]

Application of conservative liability regimes to the first two groups of AI devices has already been discussed and presents no particular or novel challenge for legal theory.[198] Yet, an idea of granting a personhood to anyone apart from a human being (corporations do have legal personhood, although the rationale behind it is that humans do ultimately take decisions and bear responsibility for them, in certain instances even by piercing the corporate veil theory),[199] is both fascinating and intriguing. Professor Nick Bostrom notes

> Such machines would be capable of independent initiative and of making their own plans. Such artificial intellects are perhaps more appropriately viewed *as persons than machines* [emphasis added].[200]

4.1. Theory one: new personhood

> To be a legal person is to be the subject of rights and duties. To confer legal rights or to impose legal duties, therefore, is to confer legal personality (…)[201]

It may be suggested that the housekeeping robot from the example used has actually reached the level of intelligence of a human to be able to reach a conclusion and to act upon it

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[196] *Supra* 175, p.19.
[197] *Supra* 10, p.763.
[198] *Supra* 59, p.121: „Where the hand of human involvement in machine decision-making is so evident, there is no need to re-examine liability rules. Any human (or corporate entity that has the power to do things that humans do, enter into contracts, hire workers, and so forth) that has a role in the development of the machine and helps map out its decision-making is potentially responsible for wrongful acts – negligent or intentional – committed by, or involving, the machine."
[199] *Supra* 7, at p.1247: "Corporations are recognized as legal persons and are subject to criminal liability despite the fact that they are not human beings. Further, it is by no means certain that corporations are moral persons, in the sense that they can deserve punishment. Of course, punishing a corporation results in punishment of its owners, but perhaps there would be later results for the owners of an artificial intelligence." See also *Supra* 168, p.279: "Under U.S. federal law, the term *person* is defined to include corporations. Participants in the legal system recognize that the discourse surrounding corporate personhood is fictional. As the U.S. Supreme Court wrote, "[T]he corporate personality is a fiction, although a fiction intended to be acted upon as though it were a fact (…).""
[200] Professor Nick Bostrom, "When Machines Outsmart Humans," 35 *Futures* (2003): p.763.
[201] Smith B, "Legal personality," *Yale Law Journal* 37(3) (1928): p.283.

fully autonomously, consciously and rationally "(…) deserving of independent legal status."[202] What it means is that the law would be able to hold the housekeeping robot liable for his attack, or to hold a car that took a decision to accelerate liable for negligent driving instead of its manufacturers or owners. What it also means is that the robot might get a right to own property and also the capacity to sue others, including other robots.[203] This unprecedented theory reflects counter-measures that are being considered at EU Parliament level to address the level of autonomy technology is about to reach. However, most academics hold a very reluctant view in this regards.

Thus, for example, it is argued that the "intelligence" of machines *per se* is not an element sufficient to convert what is practically an inanimate object into a personhood bearing legal responsibility for its actions.[204] Assistant Professor Iria Giuffrida *et al* explains a necessity to possess something more than "(…) computing capacities" by referring to so-known savant syndrome, "(…) a rare, but extraordinary, condition in which persons with serious mental disabilities (…) have some "islands of genius,""[205] illustrated in the 1988 movie "Rain Man". She concludes that: "[i]ndividuals afflicted with this condition will often display impressive calculating abilities, yet can still be considered legally incompetent."[206] Comparison emphasizes on the necessity to possess some additional qualities except for extraordinary intellectual abilities. Others argue that the test for legal capacity is of the *reason* [emphasis added] instead:

> Reason is man's faculty of *grasping* [original emphasis] the world by thought, in contradiction to intelligence, which is man's ability to manipulate the world with the help of thought. Reason is man's instrument for arriving at the truth, intelligence is man's instrument for manipulating the world more successfully; the former is essentially human, the latter belongs to the animal part of man.[207]

Some scholars refer to *consciousness* [emphasis added] being an attribute that would enable AI technology to step on one platform of responsibility to that of a human. However, this proposition also faces criticism as Mireille Hildebrandt finds:

> It seems to me that artificial intelligence in itself does not qualify as [reasonable], even if some kind of *consciousness* [emphasis added] would emerge. Animals have consciousness but we do not consider them fit to be subject to legal punishment, because we have no indication that they can *reflect* [original emphasis] on their actions as their own actions. (…) To be sensitive to censure, rather than mere discipline, a subject needs to be conscious of itself, allowing the kind of reflection that can lead to contestation of repentance in the case of a criminal charge.[208]

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[202] *Supra* 10, p.764.

[203] *Supra* 7, p.1239. See also *supra* 168, p.274: "The basic provisions for a legal person are: 1. that it is able to know and execute its rights as a legal agent; and 2. that is subject to legal sanctions ordinarily applied to humans."

[204] John Chipman Gray, *The Nature and Sources of the Law* (New York: Columbia University Press, 1909): p.27 observes: „In books of the Law, as in other books, and in common speech, „person" is often used as meaning a human being, but the technical legal meaning of a „person" is a subject of legal rights and duties."

[205] Darold A. Treffert, „The Savant Syndrome: An Extraordinary Condition," *Phil. Transactions of the Royal Society* (2009): p. 1351.

[206] *Supra* 10, p.766.

[207] Erich Fromm, *The Sane Society* (UK: Routledge & Kegal Paul, 1956), p.65.

[208] Mireille Hildebrandt, „Ambient Intelligence, Criminal Liability and Democracy," 2 *Crim. L.&Phil.* (2007): p.178. See also Mireille Hildebrandt, Bert-Jaap Koops, "The challenges of ambient law and legal protection in the profiling era," *Mod. Law Rev.* 73 (2010): pp. 558–559: "(…) the empirical finding that novel types of entities develop some kind of self-consciousness and become capable of intentional actions seems unreasonable, as long as we keep in

It appears that decisive factors are found not in the level of intelligence or computational power that are in case of AI undeniably high, nor in the divergence of actions available to AI-technology, but rather in a reflection or self-reflection of one's actions. As argued, the machine could not enter into the state of "mind" where it would reflect or evaluate on actions it took, not to talk about regretting or feeling repentance for consequences of its actions. It is hard to imagine the housekeeping robot to feel repentance as a result of his faulty assumption or to reflect on his actions afterwards and to swear not to do it again. The conclusion that the neighbour is a thief was based on the interconnected algorithms and data upon which a decision to act was taken heartlessly. The housekeeping robot can hardly be imagined to sit down and think about its behaviour after the delict.

Another more practical issue that might put the new personhood or electronic personhood theory in doubt is that there is actually not much AI can pay in damages even if the personhood status is granted thus leaving victims without the deserved redress. The housekeeping robot holds no possessions or money to compensate the neighbour.[209] The AI standpoint in this regard is often compared with the master-slave scenario back in days, as slaves had obviously sufficient level of consciousness however had no legal personhood status and of course lacked resources to compensate victims of their actions.[210] For these reasons, the liability was usually assigned to masters. For instance, in 1835 Tennessee's court has held in *Wright v. Weatherly* that

> (…) a master was liable for every trespass, whether the act be done when in the master's services, or not, and whether with or without the master's knowledge.[211]

Seeking protection of their interests, masters, who were in fact not exercising any control of their servants committing torts either intentionally or negligently, have often spread the costs of damages caused by their slaves into the then insurance-pools of slaveholding communities.[212] Although the comparative example used might appear disturbing, it illustrates well how the legal

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mind that the emergence of such entities will probably require us to rethink notions of consciousness, self-consciousness and moral agency."

[209] Although funds can actually be given to AI, it does not give AI credibility for these funds management, as argued at *supra* 168, p.288: "It is unclear what it would mean for a robot to hold assets, or how it would acquire them. It is possible that the law could contemplate mechanisms for robots to own property or hold accounts, as it does for corporate legal people. The law could also require the creators of robots to place initial funds in these accounts. But money can flow out of accounts just as easily as it can flow in; once the account is depleted, the robot would effectively be unanswerable for violating human legal rights. When insolvent human legal persons violate others' legal rights, other tools are available to hold them to account – anything from apology to jail time. In the case of robots, these options are unavailable, unsatisfying, and/or ineffective."

[210] F. Patrick Hubbard, "Do Androids Dream?: Personhood and Intelligent Artifacts," 38 *Temple Law Review* (2010): p.33: "(…) it is very useful to have a slave, whether human or mechanical, so long as the benefits exceeds the costs. For many humans, the emotional benefits of owning and controlling a slave make slavery desirable even if it is not economically efficient."

[211] *Wright v. Weatherly* 15 Tenn. (7 Yer.) 367, 378 (1835). See also Anthony R. Chase, "*Race, Culture, and Contract Law: From the Cottonfield to the Courtroom,*" 28 *Conn. L. Rev.* 1 (1995): at p.29: "If the slave was acting as tradesman or carrier, the courts held the master liable for the slave's trespass or negligence since the master in such a situation invited the public to have confidence in the slave's ability." See also Jenny Bourne Wahl, "Legal Constraints on Slave Masters: The Problem of Social Cost," 41 *Am. J. Legal Hist.* 1 (1997), p.19: "Entrusting one's slave was a double-edged sword, however, because owners were often responsible for injuries caused by their slaves, much as masters can be liable for the actions for their servants."

[212] Jenny Bourne Wahl, "Legal Constraints on Slave Masters: The Problem of Social Cost," 41 *Am. J. Legal Hist.* 1 (1997), p.20: "In some states, owners bore no liability for wilful, malicious, intentional acts of slaves, just as masters did not pay for such acts committed by servants. The costs of these acts were thus spread widely over the slaveholding community."

system had coped with slaves that lacked legal personhood status while having full consciousness and decision making abilities similarly to modern or future AI technology.

Professor Solum in his article further doubts granting AI personhood status as he justified it by a responsibility objection, i.e. the AI may not compensate his victim, and by the judgement objection, i.e. the AI capacity to "making judgements" could not reach that of a human.[213] Professor examined a hypothetical scenario where the AI may fulfil duties in distribution of trust assets and thus become a legible trustee. Turning to criminal liability where insurance policy of AI-trustee plays no role, Professor concludes that the AI may also not be punished in a sense designed by law – "[i]t cannot be jailed"[214] or "cannot be sued."[215] Indeed, the punishment theories of desert and just retribution are hardly applicable to the AI technology that simply "(…) does not deserve to be punished because it lacks the qualities of moral persons that make them deserving."[216] Another purpose of the punishment that lies in an educational function, i.e. the defendant and a society must learn a lesson from the crime or tort committed. Solum further argues that punishing of an AI would not serve the educatory purpose either:

> What lessons are we to learn about the responsibility of trustees from a punishment imposed on an expert system? What would even count as punishment? Turning the program off? (…) educative theory does provide a clear recommendation (…): do not punish the program, because any supposed "punishment" will have no educative effect.[217]

The uncertainty surrounding enforcing rights against AI is common and no clear answer has been presented up to date. Propositions on turning machines off or withdrawing operational licenses do not seem to meet the abovementioned purposes of legal enforcements.[218] Solum concludes that granting of *legal* [emphasis added] personhood status may be considered exclusively for AI that would be "(…) able to respond to novel situations, to make judgements (…), and to make the complex legal decisions"[219] that are not in existence today.

Proposing three objections in front of the AI of being granted *constitutional* [emphasis added] personhood status, namely that "(…) only natural persons should be given the rights of constitutional personhood", that AI lacks key elements such as "(…) souls, consciousness, intentionality, or feelings" and that as human creations AI may not become something else except

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[213] *Supra* 7, p.12478: "The argument is that the capacity of an AI to follow a program, even if that program contains a tremendously elaborate and complex system of rules, is not sufficient to enable the system to make judgements and exercise discretion."
[214] *Supra* 7, at p.1245.
[215] See United States v. Athlone Indus., Inc., 746 F.2d 977, 979 (3d Cir. 1984): "Since robots cannot be sued, but they can cause devastating damage (…)."Accessed April 2, 2019. Available on: https://www.leagle.com/decision/19841723746f2d97711569. Although, see *Supra* 59, pp.124-125: "After all, there is no priori reason why truly autonomous machines should not be accorded some formal legal status, making them, like corporations and certain trusts, "persons" in the eyes of the law and thus subject to suit. Perhaps justice would be served to put HAL in the dock" or "To ensure that the car remains insured, the car itself would be the policy-holder, and could not operate without valid insurance. The car might have to have a "kill switch" that would automatically disable the car in the event its insurance lapsed."
[216] *Supra* 7, p.1247. See also *Supra* 193, p.8: "Traditional punitive sanctions of the law, such as jail time for criminal insolvency, would be unavailable, unsatisfying or ineffective."
[217] *Id* (Lawrence B. Solum), p.1247.
[218] *Supra* 168, p.283: "While robot legal persons would enjoy a host of rights against human legal persons, it is unclear how corresponding legal obligations could be enforced against them."
[219] *Supra* 7, p.1252.

for human property,[220] Solum takes a sceptical view on the personhood theory. Although AI with powers to take discretionary decisions and abilities to pass the Touring test would possibly form a good trustee for the trust, a one that would not steal or embezzle someone's property,[221] its "intentionality" or "purposeless" is in fact only a simulation of human's intentions and consciousness.[222] The repetition or mimicking of human intelligence does not provide AI with elements sufficient to reach true consciousness that would eventually accept responsibilities for its actions. Absence of "(…) emotions, desires, pleasures, or pains"[223] or, at some point, a potential reproduction of those feelings by the AI "(…) cannot be the real thing."[224] As the Terminator replies to the question on whether it hurts when he gets shot: "I sense injuries. The data could be called "pain"" – the actual pain would never be felt by the Schwarzenegger's character.[225]

Solum observes that in order to build up a person in the eyes of law and society, that person must possess a whole spectrum of interconnected characteristics that take decisions by interacting between each other:

> (…) a computer program running a program could "think" (…) if it possessed the sort of all-purpose, independent capacity to function in a role that now requires a competent human adult (…). In another sense, an AI might not be said to be a "thinking" being, unless it had something like our mental life – unless it possessed consciousness, intentionality, and so forth. In still a third sense, AIs would not be like us unless they possessed wants, interests, desires or a good.[226]

Scientist Hall in his turn accented on the presence of "unitary narrative" in robot's actions to be considered for the personhood status:

> Conscious to the extent that it summarizes its actions in a unitary narrative, and (…) has free will, to the extent that it weights its future acts using a model informed by the narrative, in particular, its behaviour will be influenced by reward and punishment.[227]

Academics seem to hold a common understanding that lack of attributes such as consciousness, feelings, reason, repentance, reflection, self-awareness shall bar the AI from granting it a personhood status in legal sense, at least for now. This position seems in tack with an overall and underlying fear that at some point machines which may outsmart humans, being accepted by the law as eligible process parties, may simply "take over" – the fear referred to as "[p]aranoid anthropocentric" by Professor Solum.[228]

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[220] *Id.* p.1258.
[221] *Id.* p.1246.
[222] *Id.*, pp.1267-1268: "The case against real intentionality could begin with the observation that behaving as if you know something is not the same as really knowing it. For example, a thermostat behaves as if it "knows" when it is too cold and the heat should go on, but we do not really think thermostats have beliefs or other intentional states."
[223] *Id.* p.1269.
[224] *Id.* p.1271.
[225] *Supra* 193, p.10: "Current AI robots lack most requisites that usually are associated with granting someone, or something, legal personhood: such artificial agents are not self-conscious, they do not possess human-like intentions, or properly suffer."
[226] *Supra* 7, p.1282.
[227] J.Storrs Hall, *Beyong AI: creating the conscience of the machine* (New York: Prometheus Books, 2007): p.348.
[228] *Supra* 7, p.1261.

Professor Pagallo, one of the leading AI scholars, describes a proposition of the European Parliament to grant AI a personhood status as a "terrible mistake".[229] Others observe that European Parliament's electronic person

> (…) might prove to be a legal black hole, an entity that absorbs a human actor's legal responsibilities and from which no glint of accountability is seen. [230]

Finding full personhood status of AI too remote and unreasonable at least at a current stage of development, academics turn to more usual principle of legal agency presented for example, in employment law.

4.1.1. Agency

An alternative way of upper spectrum AI perception is that of an agency. An agency emerges when one acts upon a task or under a supervision of another. There appears a clear control or command over a person. An agency example is an employee acting "(…) within the scope of employment when performing work assigned by the employer"[231] or "(…) minors, pupil, student/apprentice or mentally impaired person" acting under supervision of their "(…) parents/tutors/guardians/teachers".[232] Vladeck observes:

> [t]o be sure, it is hard to conceptualize a machine as being anything other than *an agent* [emphasis added] of a person, be it a real or an entity with legal personhood.[233]

However, as studied further, the concept of agency would not be sustainable on its own. In fact, AI that reaches the upper spectrum of autonomy will disturb the agency theory similarly to an employee that would act outside of his employment boundaries.[234] AI decisions taken autonomously, similarly to decisions of sentient beings that fall outside of agent relationships would fail the vicarious liability as "(…) the agency relationship becomes frayed or breaks altogether":[235]

> (…) the levels of autonomy, self-consciousness and intentionality – which arguably are insufficient to grant AI robots their full legal personhood – are inadequate to produce relevant effects in other fields of the law, e.g. the legal status of artificial agents as accountable agents in the field of contracts and business law. (…) if AI robots do not meet the requisites of legal personhood, then they cannot be legal agents either.[236]

Thus, it seems that in order to be granted with an "agent" status, the AI must first be granted the legal personhood status, which, as shown within this chapter does lack sufficient legal and social grounds for the moment.

4.1.2. Theory one fails

[229] *Supra* 193, p.8.
[230] *Supra* 168, p.285.
[231] Restatement (Third) of Agency, para.7. 07 (2006).
[232] *Supra* 175, p.8.
[233] *Supra* 59, p.122.
[234] Restatement (Third) of Agency, para.7. 07 (2006): "An employee's act is not within the scope of employment when it occurs within an independent course of conduct not intended by the employee to serve any purpose of the employer."
[235] *Supra* 59, p.123.
[236] *Supra* 193, p.10.

Notwithstanding the European Parliament's proposition, the theory of granting AI with a personhood status does not find support among legal academics. The experience the society gained so far from interaction with current AI proves that these machines are indeed "something more" than a cattle, toaster or even a computer. These machines are super-intelligent, they calculate faster, their decisions are more rational, they act mostly according to data and code embodied. However, the current experience also proves that absence of human-like emotions, reasoning, motivation to act, consciousness, self-awareness and self-reflection, does preclude society from accepting AI among its lines. To put it simply - it is too early for this theory:

> An answer to the question whether artificial intelligences should be granted some form of legal personhood cannot be given until our form of life gives the question urgency. But when our daily encounters with artificial intelligence do raise the question of personhood, they may change our perspective about how the question is to be answered.[237]

Immature theory of personhood also does not provide distinctive advantages for liability allocation – "(…) legal obligations are meaningless if there is no way to hold robots accountable."[238] Moreover, accountable AI would provide an opportunity for the so-called "liability management"[239] for humans intending to hide behind the robot's back. "(…) morally unnecessary and legally troublesome"[240] theory might and as argued, should be returned to when a next step of AI development will take place and the true upper spectrum autonomy would be reached.[241] The theory of AI classification as property does currently prevail, albeit leaving liability allocation problems that would also increase as technology evolves unattended. For this reason an alternative theory must be assessed – the one of analogy.

4.2. Theory two: analogy

[237] *Supra* 7, p.1287.

[238] *Supra* 168, p.285. This may, although, be compared to children that are granted personhood without obligations as argued in *supra* 210, p.35: "(…) they [children] incur no debt for these [food, clothing, and education] benefits. Instead, they are entitled to personhood simply because they are human – i.e., they are "creates of the same species and rank." Granting children personhood without legal obligations, but not artificial persons, is not necessarily arbitrary. Parents understand that they are investing in persons, not things. In contract, a corporation which invests millions in a super computer expects a return on that investment. This problem could be addressed by a scheme that required an artificial person to pay back the cost of producing the artificial person. If this indentured servanthood approach is adopted, it should be viewed simply as a debt owned by a person. The person with the obligation to repay should not be viewed in terms of the status of a slave or of a servant with severely restricted rights. Nor should it be impossible to repay the cost of production. If the actual cost are too large for repayment, the corporation should bear the excess costs because spreading risks is one reason for granting legal personhood to corporations."

[239] *Supra* 168, p.286.

[240] *Id.* p.289.

[241] When reached, there are many additional questions to be answered before the personhood status may be issued. Please see *supra* 210, p.38: "(…) whether a machine or a substantially modified "posthuman" – has substantial advantages over normal humans in terms of physical size, speed, endurance, intellectual power, productivity, reproductive capacity, or longevity: Would ordinary humans be entitled to some sort of job preference? What about a right to modifications to achieve a greater ability to compete? Would there be limits on ownership by the artificial entity of economic resources? If the entity has a much longer lifespan, would schemes be used to prevent vast accumulations of wealth over time? Questions concerning political and personal rights would also be complicated. Would artificial entities be entitled to one vote, even if it were possible to mass-produce such entities? Would marriages (and the legal effects related to marriage) be available for human entity relationships? Would there be limitations on sexual relationships – for example, relationships between humans and humanoid robots possessing the right of self ownership."

The theory of analogy being "(…) one of the most frequently used techniques of legal argument,"[242] implies that as the law does not place AI under any particular liability regime. Instead cases involving AI technology may be attempted to be resolved by analogy with for example, animals,[243] minors,[244] dangerous objects, corporations, tools etc. Turning to the concept of analogy by replacing the "black-box" (as seen by most jurists or judges) technology of AI with something familiar and well-known concepts, application of analogy makes the predictability of potential liability clearer and more rational[245] and thus "(…) will determine how [AI] are treated by the law."[246] For example some authors, referring to US regime of strict liability application to "dangerous" animals, argue that

> in the absence of known misconduct formerly committed by an AI entity, only a clearly "dangerous" AI-enabled device would dictate liability, or rather, the level of care that its manufacturer, programmer, or owner should take in its development.[247]

Strict or reversed-burden liability for animals including domestic available in the EU, may eventually extend the application of liability to AI owners or manufacturers by analogy.[248] Indeed, animals that act autonomously from its owners most of times, however, lack self-consciousness or a reflection on their actions, do provide a good illustration on how the liability may be allocated to AI that possesses similar characteristics.

However, "(…) the AI-animal metaphor could be short-lived"[249] as AI technology evolves and would eventually reach an intellect of a human. Moreover, the presence of a great variety of AI machines that possess a whole spectrum of capabilities ranging from the lowest vacuum-cleaner and up to thankfully still factious T-800, makes the analogy application cumbersome and inappropriate in certain cases. Thus, comparing an animal with the AI that is capable of beating world-chess champion would hardly assist in decision taking. Similarly, using liability standards applicable to humans will hardly assist in delict cases committed using lower

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[242] Scott Brewer, "Exemplary Reasoning: Semantics, Pragmatics, and the Rational Force of Legal Argument by Analogy," 109 *Harvard Law Review* (1996): p.963.

[243] See, for example, Lucie Luneau, "Retour Sur l'Intelligence Artificielle en 10 ans et 10 points," *ACS*, May 4, 2015, http://www.acs.qc.ca/actualite/192-retour-sur-lintelligence-artificielle-en-10-ans-et-10-points.html, as Yoshua Bengio compares modern computer with a frog: "The current learning ability of a computer is about that of a frog. "To worry that a computer surpasses us would be as if ancient Egyptians worried about the pollution that will be created by the traffic of spaceships on Mars.""

[244] See, for example, *supra* 59, p.763: "First, AI-enabled devices can be treated as property and therefore be the responsibility of their users, owners, or manufacturers. Second, they could be treated as "semi-autonomous being," and fall under a legal regime similar to that of children or persons with mental disabilities, or even one similar to the notion of agency."

[245] See, generally, Emily Sherwin, "A Defence of Analogical Reasoning in Law," 66 *Chicago Law Review* (1999): p.1179: "The analogical method, as commonly practiced, works something like this: confronted with an unsettled question, the judge surveys past decisions, identifies ways in which these decisions are similar to or different from each other and the question before her, and develops a principle that captures the similarities and differences she considers important."

[246] *Supra* 17, p.175.

[247] *Supra* 10, p.767.

[248] See, for example, *supra* 175, p.8: "There may be also other cases where the risk of damage is linked to the unpredictability of behaviour of specific risk groups, like animals or certain persons: in these cases liability may be attributed to the persons that are considered responsible to supervise the animal or the person, because it is them who should normally be in the condition to adopt measures to prevent or reduce the risk of damages."

[249] *Supra* 10, p.768.

form of autonomy AIs. Thus, a more systematic approach shall support the analogy theory for it to present any legal value.

4.2.1. Assistant Professor's Cofone's systematic approach to the theory of analogy

In his article that addresses the European Parliament's electronic personhood proposition Assistant Professor Ignacio N. Cofone has offered a systematic approach to the theory of analogy. [250] Cofone's vision of the systematic analogy application is designed to allow the law to

> (…) apply settled doctrinal and regulatory debates from the analogized category to the new technology, rather than rehash them with each technology anew.[251]

To systematize the application of analogy, Cofone comes up with certain set of characteristics that "(…) are critical to law",[252] namely those of: emergence, embodiment and social valence. Emergence represents a level on unpredictability that AI technology may generate during its operations or "(…) how an entity takes input from the world, processes it, and uses it to engage in actions".[253] Embodiment implies presence of the physical form of the AI, however, the physical form, under influence of emergence, that is the AI's programmability, shall act "(…) directly on the world", i.e. without intermediaries in a form of a human operator.[254] Thus, for example, a computer's physical form that does not act directly on the world, but is rather controlled by its operator, would not fall under the embodiment heading.[255] Lastly, the most mysterious concept of social valence refers to "(…) when (real) people treat robots and other AI agents as human beings."[256] It may be argued that it is a rather simple question to answer – AI or robots may only be treated purely as property or tools. However, this is not entirely true[257] as Stanford University's study,[258] for example, shows that

> (…) people feel differently about tasks they perform through robots depending on the design. The more anthropomorphic the robot, the more subjects tended to share blame with the robot for failure and praise for success.[259]

Other research reveals that generally humans "(…) do not tend to think about personified robots as alive, but nor do they consider them to be objects."[260] Overall, it may be agreed that people

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[250] *Supra* 17.
[251] Ignacio N. Cofone, "Servers and Waiters: What Matters in the Law of A.I.," 21 *Stanford Technology Law Review.* 167 (2018): p.172.
[252] *Id.* p.171.
[253] *Id.* p.172. See more on emergence in Ryan Calo, "Robotics and the Lessons of Cyberlaw," 103 *California Law Review* (2015): pp. 538-545.
[254] Ibid.
[255] *Id.* p.181: "Embodiment is a relevant feature of many robots – as it may enable them to fly, drive fast, be bullet-proof, or bake quiches – but it does not define the rights and obligations that these roots should have."
[256] *Id.* p.172.
[257] See, for example, Peter H.Kahn, Jr., et al., "The New Ontological Category Hypothesis in Human-Robot Interaction," *Proc.6th Int'l Conf. on Human-Robot Interaction* (2003): p.125: "For the most part, people are not confused about how to categorize most entities in the world. We do not, for example, talk to a brick wall and expect it to talk back, nor do we attribute to it mental capabilities or think of it as a possible friend. But robots appear different."
[258] Victoria Groom et al., "Medical Malpractice: The Effect of Doctor-Patient Relations on Medical Patient Perceptions and Malpractice Intentions," *4th Int'l Conf. on Human-Robot Interaction* (2009): p.31.
[259] *Supra* 69, pp. 547-548.
[260] *Id.* p. 546.

react and percept AI differently than "(…) hammers, flash drives, and calculators."[261] Social valence determines human's perception of the AI, in fact, there could well appear a notion of trust between the human and a robot. This is important as under these circumstances a whole new notion of offences committed by AI may emerge, namely the one of deceit or fraud. A human that over relies on the robot's advice or action thinking that robot truly cares about him, although in fact the robot was purely "(…) caring for the commercial interests of other people",[262] may in fact become a victim of deceit.

Scholars hold a common opinion that it is the perception of the AI technology that shall be decisive for legal analysis. It is argued, that jurists shall not assess the technological qualities of any given technology, but rather on how this technology is used by people[263] and on how this AI technology would affect the relationships between humans.[264] Bearing this in mind and in "(…) finding most appropriate analog for each AI agent"[265] attempt, Cofone comes up with the AI Robotics' Analogs table (Annex I).[266] Vertically, the table lists existing liability regimes by autonomy escalation level applicable to tools, corporations, wild animals, domesticated animals, children and finally adult humans. Horizontally, the table contains characteristics of embodiment, emergence and social valence. The table's body has very low, low, high and very high levels of the technology gradation. Cofone illustrates usage of the table in the following way:

> If a technology has very low embodiment, very low emergence, and very low social valence, the law can generally treat it as a tool, independent of the specific regulations that it might require. Consider, for example, 3d printing. Issuing specific regulations, such as a prohibition on printing weapons, is necessary. But the problems 3d printers trigger is different areas of the law can be dealt with adequately by treating it as a tool.[267]

To illustrate how the Cofone's table operates, it might be useful to return to examples of a self-driving car that decided to accelerate and over-caring housekeeping robot. The self-driving car that decided to accelerate, according to Cofone's table, would be credited with high embodiment for obvious reasons, with low emergence as generally the car's actions are highly predictable – it is designed to drive safely on public roads and low social valence as the car is generally perceived as a vehicle. The self-driving car should then be best analogized with a domestic animal (please note that low social valence is not attributable to domestic animals, although Cofone uses "continuum" to create a tailored example that allows to concentrate on the main characteristic, which is "emergence" in the current scenario – see second paragraph of Annex I). According to liability regimes employed in most EU Member states, the owner of the dog would be held liable under the reverse burden of proof unless the owner proofs that he took

[261] *Supra* 250, p.172.
[262] *Id.* p.181.
[263] *Supra* 64, p.45: "I do not think it is helpful to speak in terms of "essential qualities" of a new technology that we can then apply to law. On the contrary, we should try not to think about characteristics of technology as if these features were independent of how people use technology in their lives and in their social relations with others."; *Supra* 89, p.96: "Instead, we have to focus on the social effects of the use of a particular algorithm, and whether the effects are reasonable and justified from the standpoint of society."
[264] *Id.* pp.48-49: "When we talk about "technology", we are really thinking about [1] how people interact with new inventions and [2] how people interact with other people using those new inventions."
[265] *Supra* 250, p.175.
[266] *Id.* p.186.
[267] *Id.* p.177.

all reasonable steps to prevent the damage.[268] Similarly, as "(…) the manufacturer owns the driving program"[269] and is placed in best position to "(…) both control it and predict its failure at the lowest information cost",[270] the car's manufacturer should be held liable in case of an accident. Cofone concludes that such liability application "(…) makes sense, both from a corrective justice and deterrence standpoint."[271] Cofone further explains why analogies of, for example, a child or a tool would not suffice for the self-driving car. Child's high level of emergence, i.e. behavioural unpredictability, would require negligent supervision[272] on behalf of parents to be attributed with liability for child's actions. That would not satisfy the stimulus behind regulation as the purpose is not to ensure "(…) ex-post active supervision", but rather "(…) ex-ante care in the design and programming" by the manufacturers.[273] On the other hand, analogy of a tool would prove inappropriate, as shown earlier, by causing someone harm with a tool, an element of negligence on behalf of the manufacturer would be necessary. Although this lacuna is addressed by the EU in the Product Liability Directive, there would still exist an opportunity for the manufacturer to argue that the causal link was broken by an unexpected and unforeseeable action of the self-driving car or that such an unforeseeable action may not be attributed to a product's defect. Hence, the domesticated animal example that shifts burden of proof on the manufacturer appears to be reasonable and rationale approach towards applying liability onto the autonomous car's manufacturer.

An example with the housekeeping robot is much trickier. Let's supplement an example with view details. Suppose, that the housekeeping robot has lived with its owner for a long time, he has served dinners to guests during visits, spoke with its (or, perhaps, his?) owner, ordered medicines when the owner was sick. There appears a clear affection between the house owner and the robot. The robot held a human's name and was in fact perceived as one. Applying Cofone's table, the robot had a very high embodiment, emergence and social valence, which puts it into the adult human category for the liability purposes. And that conclusion brings us back to theory of legal personhood status that has failed so far. Cofone illustrates a hitch appearing by referring to sci-fi Her[274] and Transformers[275] movies. Besides proving that embodiment characteristic bears no decisive factor in application of liability,[276] Cofone appeals to how audience actually treats AI mentioned if there were existent:

> (…) Autobots, like Samantha, (…) trigger the analog of an adult. And this matches how the audience receives them: when minor characters in the movie treat autobots as cars (tools), not as humans, something feels wrong. Autobots, after all, can be main characters

[268] See, for example, article 2363 of the Latvian Civil law.
[269] *Supra* 250, p.190.
[270] *Id.* p.190.
[271] *Id.* p.191.
[272] See, for example, Article 6:101 of the Principles of European Tort Law: "A person in charge of another who is a minor or subject to mental disability is liable for damage caused by the other unless the person in charge shows that he has conformed to the required *standard of conduct in supervision*. [emphasis added]"
[273] *Supra* 250, p.191.
[274] Her (Annapurna Pictures 2013).
[275] Transformers (Paramount Pictures 2007).
[276] *Supra* 250, p.187: "Samantha has no body, but their relationships develops nonetheless as they both look for ways to overcome this impediment. Samantha is independent, conscious, reflective, and sentiment, very high emergence, and very high social valence (…)."

> precisely because they feel human to the audience. If they existed, most of us would probably believe that they should be treated as such.[277]

Although, there exists a common understanding that up to that date "(…) no AI agent has (…) degrees of autonomy and consciousness"[278] to reach that scale of an adult human being, the science fiction examples[279] does not allow the feeling of disturbing uncertainty regarding the application of liability in upper spectrum of AI cases to leave.

4.2.2. Theory two survives

It may be concluded that Cofone's systematic approach towards allocating liability by using existing liability categories appears as a useful tool as there exists no single formula to be applied to all different forms of AI presented on the market. Consequently, it may be seen that current liability regimes may well resolve most of challenges that could be presented by the AI using the analogy theory if "(…) applied intelligently."[280] Cofone further supplements his theory of analogy by outlining the factors decisive for allocation of liability:

> To determine someone's liability for her use of a simple, predictable robot, we should examine *foreseeability* [emphasis added]. However, to determine someone's liability for the actions of an advanced AI that has agency, *the level of control* [emphasis added] over the AI will be most relevant.[281]

Applying liability regimes as suggested by Cofone would ensure law's purposes of deterrence and justice will be satisfied. The theory outlines that an issue related to the upper spectrum of autonomy AI that would be equated to adult humans would remain unresolved. That is so, as the law and society could not address an issue of how the AI may actually be punished for its actions as explained earlier.[282]

Possible drawback that the theory presents may be seen in quite subjective human perception of the characteristics offered. Although the embodiment characteristic is quite easy to identify and ascertain, those of emergence and social valence are not. Emergence, for instance, may sometimes be hardly predicted by manufacturers itself because of sophistication level of the AI intellect. Social valence is another subjective criterion, as some may not feel the same way about AI or robots. Having considered applications of two theories, it is an appropriate time to look at some practical solutions borrowed from other industries as a potential antidote against uncertainties surrounding delict liability systems.

5. PRACTICAL SOLUTIONS

[277] *Id.* p.188.
[278] *Id.* p.186.
[279] The Matrix (Waner Bros. 1999), X-Men: Days of the Future Past (Twentieth Century Fox 2014), 2001: A Space Odyssey (Metro-Goldwyn-Mayer 1968).
[280] *Supra* 250, p.197.
[281] *Id.* p.185.
[282] *Id.* p.196: "(…) what would it mean to hold a robot criminally or civilly liable? Would it mean to take its money, lock it up, or deactivate it? Presumably, A.I. agents would also not care about money or time. Fiction aside, it is not even obvious that A.I. agents would have self-preservation motives. Animals are subject to natural selection pressures, but because robots are designed and not naturally selected, they would not necessarily have motives like those of humans or animals, thereby rendering usual forms of punishment and deterrence useless."

5.1. Insurance

> (…) a possible solution to the complexity of allocating responsibility for damaged caused by increasingly autonomous robots could be an obligatory insurance scheme, as is already the case, for instance, with cars; notes, nevertheless (…) an insurance system for robotics should take into account all potential responsibility in the chain.[283]

Being developed alongside more frequently applied strict liability regime, obligatory insurance[284] that would cover damages sustained by victims of AI has been mentioned as an indemnity by many authors:

> A more market-oriented approach might require the manufacturers and operators of AI systems to purchase insurance from carriers for their AI systems, thus letting the free market more directly determine the risk of harm that AI systems generate.[285]

Moreover, the UK has already made first practical steps in this direction by amending current insurance legislature to cover automatic cars before they access public roads.[286] Opposing to the European Motor Insurance Directive[287] requesting a car's drive to obtain a mandatory insurance coverage that would allow the driver to receive compensation directly from the insurance company bypassing the necessity to claim damages under the law of delict, for cases with self-driving cars, it is generally suggested to move the burden of insurance acquisition onto "(…) pool consisting of the manufacturer, suppliers, and the purchaser."[288] This proposition is also supported by the European Parliament as it proposes to create a fund that would cover cases where no insurance exists.[289] Such fund appears similar to a common enterprise liability regime that proved useful in cases where it might be exceptionally difficult to attribute fault to any particular party as Vladeck envisions:

> (…) common enterprise liability here would be a form of a court-compelled insurance. The manufacturers and designers ("the enterprise") would jointly indemnify individuals injured by driver-less cars when it is impossible to determine fault.[290]

Compulsory compensation schemes were already successfully applied in other industries, for example in oil industry by the International Oil Pollution Compensation Funds that was designed to cover any damages appearing as a result of oil pollution.[291] Taking into account complicated

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[283] European Parliament. *Civil Law Rules on Robotics. European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics* (2015/2103(INL)).

[284] Andrea Bertolini, "On Robots and Insurance," *Int. J. of Soc. Robotics* 8 (2016), p.382: "Insurance is a contract aimed at shielding the insured party from the adverse economic consequences of a future and possible risk, should that risk materialize."

[285] *Supra* 4, p.399.

[286] See House of Commons Library. *Briefing Paper, Automated and Electric Vehicles Bill 2017-19, 2017*. Available on: http://researchbriefings.files.parliament.uk/documents/CBP-8118/CBP-8118.pdf. Accessed April 6, 2019.

[287] Directive 2009/103/EC of the European Parliament and of the Council of 16 September 2009 relating to insurance against civil liability in respect of the use of motor vehicles, and the enforcement of obligation to insure against such liability. *JO L* 263, *7.10.2009*, p. 11-31.

[288] *Supra* 59, p.124.

[289] *Supra* 283.

[290] *Supra* 59, p.129.

[291] International Oil Pollution Compensation Funds created under the International Maritime Organization pursuant to the 1992 International Convention on Civil Liability for Oil Pollution Damage and the 1992 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage. Available on: http://www.dttas.ie/maritime/maritimesafetydirectorate/environment/oilpollution/international-oil-pollution-compensation-funds-iopcf. Accessed April 7, 2019.

process of the AI creation, distribution and its influence on the surrounding environment, creation of a compulsory insurance fund appears to be a justifiable solution for the moment.

Although the European Commission generally supports the idea of mandatory insurance for AI manufacturers, it warns on the "(…) important difficulties due to the complexity of the technology" and expects the insurance companies to use its expertise to assess the insurance premiums.[292] Karnow provides his understanding on setting up an insurance scheme for AI-devices:

> [D]evelopers seeking coverage for an agent could submit it to a *certification* [emphasis added] procedure, and if successful would be quoted a rate depending on the probable risks posed by the agent. That risk would be assessed along a spectrum of automation: the higher the intelligence, the higher the risk, and thus the higher the premium and vice versa.[293]

As part of the risk-management approach, an insurance shifts the focus from any person within the process "(…) who acted negligently", and attempts to "(…) minimise risks and deal with negative impacts".[294] In this sense, the manufacturer is arguably "(…) in a better economic position to absorb the cost of the injury than the person harmed."[295] Taking into account uncertainty surrounding application of conservative liability doctrines, mandatory insurance scheme appears reasonable and rationale. Placing burden on manufacturers may be seen by some as over-restrictive measure, however, as manufacturers do benefit directly from sales of AI technology, it may also be concluded that they shall participate actively in insuring its customers against possible damages. In order to develop sensible insurance strategy for AI, the AI technology must be assigned to any particular risk category by a proper certification process.

5.2. Certification and licensing

> For the purposes of traceability and in order to facilitate the implementation of further recommendations, a system of registration of advanced robots should be introduced, based on the criteria established for the classification of robots.[296]

Ensuring a common approach to legal perception of any particular form of AI, a certification and licensing processes would require AI manufacturers to follow common standards while allowing AI users to enjoy safe exploitation of the AI technology. European Parliament has recommended to the Commission to create a license for designers of AI that would as its prime concern ensure the technology will not "(…) harm, injure, deceive or exploit (vulnerable) users" and on the other hand to create a licence for users that would use "(…) robot without risk of fear of physical or psychological harm."[297] Scherer supports certification proposition, and suggests that manufacturers should be inclined to go through the certification process by allowing such manufacturers to enjoy limited tort liability, a proposition that goes in line with the EU Parliament argumentation. On the other hand those that opted out from the

[292] *Supra* 175, p.21.
[293] *Supra* 62, pp.193-194.
[294] *Supra* 283, para. 55.
[295] *Supra* 59, p.125.
[296] *Supra* 283, at Annex to the Resolution.
[297] *Id.* para. 55.

certification process, instead of being prohibited altogether, might face strict liability regime.[298] Scherer provides guidelines on how such system might function:

> For Agency-certified AI, plaintiffs would have to establish actual negligence in the design, manufacturing, or operation of an AI system in order to prevail on a tort claim. If all of the private entities involved in the development or operation of an Agency-certified Al system are insolvent, a successful plaintiff would have the option of filing an administrative claim with the Agency for the deficiency; the Agency would be required to administer a fund (…) sufficient to meet its anticipated obligations from such claims.[299]

Furthermore, the system of certification and licensing would be needed to ensure that AI offered on the market does have Asimov's laws on robotics as an integral part of its software.[300] Scherer further proposes practical information that must be disclosed to regulatory authority by the AI manufacturer before being certified:

> (1) The complete source code; (2) a description of all hardware/software environments in which the AI has been tested; (3) how the Ai performed in the testing environments; and (4) any other information pertinent to the safety of the AI.[301]

Besides that, the certification might ensure that for public-safety reasons, some functional such as, for example military or police, would "(…) never cede responsibility to autonomous machines."[302] In order to ensure synchronized system certification and licensing at the EU level, a specially designated AI-agency shall be considered as valid and useful tool in setting general market practices and guiding AI manufacturers in meeting the safety standards.

5.3. EU Agency for Robotics and Artificial Intelligence

> Agencies may combine a legislature's ability to set policy, a court's ability to dispose of competing claims, and the executive's ability to enforce decisions.[303]

European Parliament has proposed the creation of an EU Agency for Robotics and Artificial Intelligence and it might well be argued that a specially designated AI would be placed in a best position to ensure *ex-ante* regulation over the AI industry. Although left unattended by the Commission, an agency that is "(…) tailor-made for the regulation of a specific industry or for the resolution of a particular social problem" if created would bring much more clarity in an area of AI regulation and supervision. Because of the build-for-purpose approach towards agencies, "(…) the potential scope of regulation is limited only by the imaginations of regulators."[304]

Staffed with industry experts, agency could be seen by many as a leading authority in allocating responsibility among AI manufacturers, designers, trainers or users. From the date of its creation, an agency would specialize exclusively at one topic of AI:

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[298] *Supra* 4, p.357.
[299] *Id.* p.394.
[300] As may be supplemented by rules outlined by Oren Etzioni, "How to Regulate Artificial Intelligence," *N.Y. Times* (2017), accessed April 8, 2019, https://www.nytimes.com/2017/09/01/opinion/artificial-intelligence-regulations-rules.html.
[301] *Supra* 4, p.397.
[302] *Id.* p.379.
[303] *Id.* p.382.
[304] W.Kip Viscusi, "Toward a Dimished Role for Tort Liability: Social Insurance, Government Regulation, and Comtemporary Risks to Health and Safety," 6 *Yale J. On Reg.* (1989): p.70.

> With the rise of regulation, the need for expertness became dominant; for the art of regulating an industry requires knowledge of the details of its operation, ability to shift requirements as the condition of the industry may dictate, the pursuit of energetic measures upon the appearance of an emergency, and the power through enforcement to realize conclusions as to policy.[305]

Another benefit presented by the introduction of an agency is its ability to impose a preventative measures in the industry. The tortious system, on the opposite, may interact only when a particular tort has already caused particular harm to a victim. [306] Developing industry standards, issuing Questions and Answers, providing general feedback to AI manufacturers and consumers may prevent many occasions of the harm being inflicted in the first place.[307] As current liability regime applicable to AI is unsettled, the supplementary practical measures expressed in obligatory insurance schemes for AI manufacturers, common EU-wide certification and licensing of AI and robots programs and establishing an EU-wide AI regulatory agency appear as reasonable and useful measures. However, it may be argued that such measures are supplementary in their essence and do not address the central question – who do we, as a society, blame for the damage sustained by a victim as a result of autonomous action of AI. Having reviewed conservative liability regimes and emerging theories, as well as practical solutions being considered so far, conclusions that have been reached throughout the thesis may now be summarized.

CONCLUSION

> You become responsible, forever, for what you have tamed[308]

At its introductory part the thesis has identified the very specific sector of highly autonomous AI or robotics that falls outside the usual application of conservative liability doctrines. It may be concluded in this regards that AI or robotics that are present in a current state, the so called "tethered" robots, pre-programmed machines or AI that are still bound by its human operator, will most likely be treated as a "tools" or "property" for the liability attribution purposes. As shown, perception of simpler forms of AI as tools also coincides with Cofone's AI Robotics' Analogy table classification. Low level of emergence or unpredictability of such forms of AI allows their operators to foresee its potential actions, thus enhancing the foreseeability and control over the technology. In case when the lower spectrum AI causes damages to victims, the conservative liability doctrines shall fulfill their purpose and ensure victims do get their redress. At the opposite side of the spectrum, at the upper spectrum of autonomy, AI or robots that are referred to "autonomous" in a sense determined within this thesis are placed. These machines have severed any connections with their manufacturers, holders, owners, trainers or operators and will impact this world independently and directly. It is these upper spectrum of autonomy machines that place under a doubt application of traditional liability regimes as the question posed by Cofone of who have a control over AI would simply be left unanswered. The chapter on definition of AI further provides practical examples of what the AI technology is capable of so

[305] James M. Landis, *The Administrative Process* 22 (1938), pp. 23-24.
[306] *Supra* 4, p.387.
[307] *Supra* 4, p.387.
[308] Antoine de Saint-Exupséry, *The Little Prince* (San Diego: Harcourt, Inc, 1943).

far. Diversity of spheres where AI is already introduced and makes confident attempts truly amuses and such illustration in fact acts as a first bell to begin exploring whether current legal mechanisms would suit the upcoming technological breakthroughs.

The thesis then determines the lacuna presented in current liability regimes. In particular, as argued, the general liability regime expecting the defendant to have at least a state of mind allowing him to foresee the upcoming damage but not to avoid it and thus to act negligently, would be faced with a serious challenges presented by an unexpected, unforeseen and autonomous decisions taken by the artificial intelligence. It may be concluded that where the damage was inflicted by such a decision of an upper spectrum autonomous machine, the general liability regime would prove useless as the defendant would lack negligent state of mind.. This, of course, depends on factual circumstances of each case and precautionary measures done by a defendant of, for example, ensuring the AI software is up to date would be taken into account to identify fault in the defendant's conduct if any.

Reversed burden or strict liability regime is reserved for pre-determined classes of objects that, by engaging into interaction with, create an increased risk of causing someone damages. Referring to, for example, cars, the rationale or consideration behind the strict liability regime that would classify self-driving cars as objects of an "increase risk" appears quite bizarre, as their ultimate purpose is to ensure that driving on public roads finally becomes safe. Taking an example of the housekeeping robot it may be concluded that this case will not fall under the strict liability regime, as the housekeeping robot is not listed as an object of an increased risk, leaving unfortunate visiting neighbor without his redress for being assaulted. In his article, Vladeck appears to support an idea of imposing a strict liability regime on all AI or robots, however, not because of their "dangerousness", but "(…) precisely because these machines are so technologically advanced that we expect them not to fail."[309] Vladeck suggests to abandon "(…) a risk-utility test" or "(…) the re-institution of a negligence standard" from the "true" strict liability regime before applying to AI.[310] In its essence, this proposition would restore the common law doctrine of *res ipsa loquitor*. The proposition may be considered as over-restrictive and harsh. Firstly, it may be argued quite the opposite – the more technologically advances the AI is, the more it is likely to fail, as there are much more components vulnerably to external or internal influences. A hammer, for instance, is less likely to fail than a modern car. Secondly, during the exploitation period the AI might have been taught to act as it did by its trainer or holder, or, the upper spectrum AI might finally take a decision to act in a particular way itself. The theory behind imposing a strict-liability on AI manufacturers lies rather in policy that manufacturers are best placed to anticipate any danger the AI may carry and also are best placed financially to redress victims especially in circumstances where AI holder or direct owner might be insolvent. Manufacturers in their turn are expected to obtain insurances against damages caused by their "creatures". Individual or group insurances would then be the end point in redressing victims of AI. Thus, it may be concluded that a strict-liability regime in combination with mandatory insurance may, at least for now, provide victims of AI with their redresses, ensure that manufacturers comply with industry standards, including certification requirements,

[309] *Supra* 59, p.146.
[310] *Ibid.*

and insurance companies do their job properly by assessing the associated with any particular technology risks and compensating victims.

As currently there exists no strict liability regime to cover all sorts of AI or robots, the victims would need to rely on the Product Liability Directive. As the thesis illustrates, the PLD that employs a strict-liability regime, has not, in fact, fully abandoned the notion of "foreseeability" and thus negligence on behalf of the manufacturers. Article 7(e) of the PLD quite thoroughly camouflages the "foreseeability" element allowing manufacturers to challenge accusations of defective product. Faced with obstacles of proving the defect in utterly complicated machines and also showing the causal link between the damage sustained and the product's defect, victims of AI may, at some not so distant future, find these elements of the PLD "(…) difficult, if not impossible (…) to overcome."[311] It may be concluded that the PLD must be generally modified in order to ensure that strict liability applicable at the AI manufacturers is indeed available to victims in its form as intended by the law.

The discussion initiated by the EU Parliament has outlined the "blind spots" within current liability regimes. Albeit brave proposition of the Parliament on "electronic personhood" the conservative reaction of the EU Commission was predictable and justifiable. The Commission has outlined the perspective direction of study, namely, evaluation of tort law within EU and has ordered a full review of the PLD before taking any further regulatory steps. Most propositions of the Parliament were supported and elaborated by the Commission and certain obligations were undertaken to facilitate future technological development. Expectedly, the Commission has not touched upon the notion of "electronic personhood" of the AI. A conclusion may be reached that the EU will take quite a conservative approach towards creation of the prosperous regulatory environment for the AI. It may be expected that certain regulatory changes will be made in PLD in order to cover gaps identified and address certain specific provisions on AI. It is unfortunate that the Commission has withdrawn from the AI personhood discussion at this current stage.

The thesis further addresses two emerging theories. The first one elaborates on the idea of the "electronic personhood" status mentioned by the EU Parliament. Clearly, a conclusion has been reached that the theory is immature and would not satisfy purposes pursued by the law and justice. Mimicking of human characteristics by machines may not be taken into account when it comes to the allocation of legal liability. As shown under the definition chapter, AI thinks by using algorithms, feels by using sensors, takes decisions based purely on data accessible. Besides lack of human characteristics necessary for the personhood status, AI may not be punished in a way expected by the society. The punishment will bear no educatory, deterrence or sense of justice effect on the "heartless" machines. Although certain ways of punishment such as deactivating, withdrawing of operation licenses or re-training have been offered by legal scholars, these measures are achievable without burden of granting AI a personhood status.

The second theory explores the systematic approach towards allocation of liability proposed by Cofone. The system proves to be a useful tool that might become an alternative to candid approach of strict-liability regime applicable to all sorts of AI. Individual treatment of each AI or robot allows a better appreciation of risks related to technology and level of

[311] *Ibid*.

responsibility expected of the technology manufacturer or holder. Considerable drawback may be seen in subjectivism in treating each characteristics of any particular AI, although this drawback may be resolved by the certification program that, after approval from the regulatory agency, might request mandatory indication on levels of embodiment, emergence and social valence suggested by the AI manufacturer.

The thesis ends with practical solutions that are intended to supplement the liability allocation procedure to ensure reasonable approach towards AI regulation. Practical solutions such as insurance, certification process and designated agency shall ensure that AI manufacturers would get the support and protection necessary to promote technology without the fear of being sued and become insolvent as a result. Practical solutions underline the position that there exists no universal solution with regards to allocation of liability in particular cases where upper spectrum of AI is involved, but at least ensure all human parties involved can get what they deserve.

Undoubtedly, the AI technology present today amuses and fascinates, however, the upper spectrum of autonomy has not been reached just yet. Faced with certain challenges, the liability doctrines of delict accompanied by technological experts, insurance and certification regimes will cope with cases involving modern AI. However, up to date there is no clear legal vision on how to treat AI or robots currently exposed only in sci-fi movies, when they will appear next to us.

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Annex I – Cofone's AI Robotics' Analogy table

EMBODIMENT	EMERGENCE	SOCIAL VALENCE	ANALOG
Very High	Very High	Very High	Adult Human
Very High	High	Very High	Child
High	Low	High	Domesticated Animal
High	Very High	Low	Wild Animal
Very Low	Low	Very Low	Corporation
Low	Very low	Very Low	Tool

Table 1: A.I. Robotics' Analogs

p.178: "Accordingly, based on the mapping of technologies to legal categories I proposed above, we can instead construct a continuum showing the full range of expression for each characteristic. We can then place A.I. agents on this continuum based on their central characteristics, revealing their status from tool to person. (…) This sorting generates *tailored* [emphasis added] analogies for AI that helps show how to treat each technology in the midst of doctrinal and regulatory uncertainty. Because the analogies presented in the last section depict the legal categories that would exist in this continuum, we can now construct it."

Tool – Corporation/Dom. Animal – Child – Wild Animal/Adult

Figure 1: Emergence

Tool/Corporation – Wild Animal – Dom. Animal – Child/Adult

Figure 2: Social Valence

EMBODIMENT	EMERGENCE (AGENCY)	EMERGENCE (UNPREDICTABILITY)	SOCIAL VALENCE	ANALOG
Very High	Very High	Very High	Very High	Adult Human
Very High	High	High	Very High	Child
High	Low	Low	High	Domesticated Animal
High	Low	Very High	Low	Wild Animal
Very Low	Very Low	Low	Very Low	Corporation
Low	Very Low	Very Low	Very Low	Tool

Table 2: A.I. Analogs, Disaggregating Emergence