E.TEC YEARBOOK

Industry 4.0: Legal Challenges

School of Law - University of Minho
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Sónia Moreira

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PREFACE

It is with great pleasure that we present the fifth E-Tec Yearbook, under the theme "Industry 4.0 – Legal Challenges".

As it is already usual in E-Tec publications, once again we offer texts that reflect the multidisciplinary research developed in this group of our Research Centre. The themes of this edition deal with issues ranging from the use of Scoring and Artificial Intelligence in consumer credit, Big Data and the protection of legal personality, civil liability problems in the context of Artificial Intelligence, the creation of an electronic legal personality, tax issues, Digital Government, etc.

Thanks are due not only to the authors, but also to Dr Pedro Rito, who has always accompanied us in the graphic editing of our works. We would also like to reiterate our gratitude to the Minho University Law School for, as always, supporting the initiatives of JusGov and the activities of its researchers and, finally, to the Board of JusGov, in the person of Professor Maria Miguel Carvalho, for granting us the means to achieve our goal, which is the dissemination of legal science to all those who wish to access it.

Braga, December 2022.

Sónia Moreira
Editor

PREFÁCIO

É com grande satisfação que apresentamos o quinto Anuário do E-Tec, sob o tema "Indústria 4.0 – Desafios Jurídicos".

Como é já habitual nas publicações do E-Tec, mais uma vez se disponibilizam textos que refletem a investigação multidisciplinar desenvolvida neste grupo do nosso Centro de Investigação. Os temas desta edição versam sobre problemáticas que vão desde a utilização de *Scoring* e de Inteligência Artificial no âmbito do crédito ao consumo, *Big Data* e a tutela da personalidade jurídica, problemas de responsabilidade civil no âmbito da Inteligência Artificial e de criação de uma personalidade jurídica eletrónica, questões fiscais, Governo Digital, etc.

É devido um agradecimento não só aos autores, como também ao Dr. Pedro Rito, que sempre nos tem acompanhado na edição gráfica da obra. Voltamos, ainda, a reiterar o nosso reconhecimento, muito grato, à Escola de Direito da Universidade do Minho por, como sempre, apoiar as iniciativas do JusGov e as atividades dos seus investigadores e, finalmente, à Direção do JusGov, na pessoa da Prof.ª Doutora Maria Miguel Carvalho, por nos conceder os meios de atingirmos o nosso fim, que é o da divulgação da ciência jurídica a todos aqueles que a ela queiram aceder.

Braga, dezembro de 2022.

Sónia Moreira
Coordenadora

AI-BASED CONSUMER'S CREDITWORTHINESS ASSESSMENT: ERA OF AUTOMATION, FUTURE OF SCORING AND THE EU POLICYMAKING ON AUTOMATED DECISION-MAKING

Diogo Morgado Rebelo[1]
Filipa Campos Ferreira[2]

Abstract: Today, credit data drives almost the entire consumer lending operation. Applicants should fear how some of their demographic, financial, employment or behavioural characteristics affect (may affect) determinately the possibility of obtaining loans. Credit scoring, fundamentally, stands as a tool that lies its value at the pre-contractual stage of determining the passive party. It is no longer the credit analysts or the programmers but the inputs sets' quality and, hence, the self-learning models derived, that decides whom to be granted a loan. From traditional judgemental systems to recent technological breakthroughs, AI software have shown an increasingly ability to operate successfully in classification tasks such as creditworthiness assessment. However, scoring based on

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AI raises an energetic tutelage on protecting personal data, especially in what esteems profiling consumers' solvency. Are the GDPR and the EU sectorial policymaking ready to meet the challenges exhorted by Big Data and AI? How lawful is it for lenders and bureau agencies to rely on alternative data to assess a client's creditworthiness? How or when credit analysts must intervene? What kind of information should they provide to the data subjects? Thus, it was in the light of the scope, legal grounds, and automated decision-making regime, as well as the somewhat illusory guarantees that the European legislator has enshrined – in Article 22 of the GDPR, Articles 13 and 14 of the Proposal for an AI Act, and in the Articles 12 and 18 (6)(a)(b)(c) of the Proposal for a Directive on Consumer Credits, of 30 June 2021 – that we conclude the need to adopt multidisciplinary regulatory policies striving for a better (cyber) consumers' financial info literacy.

Keywords: AI-based scoring; Automated decision-making; Creditworthiness assessment.

Resumo: Atualmente, os dados de crédito impulsionam quase toda a operação de concessão de empréstimos aos consumidores. Algumas das características sociodemográficas, financeiras, laborais e comportamentais dos candidatos afetam (ou podem afetar) determinantemente a possibilidade de estes serem aceites. O *scoring* de crédito é, portanto, fundamentalmente, um instrumento fulcral na fase pré-contratual para a determinação da parte passiva. Já não são os analistas de crédito ou os programadores, mas sim a qualidade dos conjuntos nas entradas e, consequentemente, os modelos de aprendizagem daqui derivados, que decidem a quem será concedido crédito. Dos sistemas tradicionais de opinião aos mais recentes avanços tecnológicos, dir-se-á que os *software* de IA têm envalecido uma capacidade crescente de operar em tarefas de classificação como esta. Em todo o caso, o *scoring* baseado em tecnologias de IA suscita uma tutela energética quanto a questões de proteção de dados pessoais, especialmente naquilo que contende com a definição do perfil dos candidatos quanto à sua solvência. Estarão, tanto o RGPD, como as políticas setoriais da UE, preparados para superar os desafios exortados pela *Big Data* e IA? É lícito para as instituições de crédito e sociedades financeiras e para os *bureaus* de crédito fazerem uso de dados alternativos para apurarem a solvabilidade de um cliente? Como (ou antes, quando) deve o analista de crédito intervir? Que tipo de informação deve ser prestada ao titular dos dados? Foi, portanto, à luz do âmbito, dos fundamentos de licitude e do regime das decisões automatizadas, bem como das ilusórias garantias adequadas que o legislador europeu consagrou – tanto no artigo 22.º, n.º 3, do RGPD, como nos artigos 13.º e 14.º da Proposta de Regulamento IA ou nos artigos 12.º e 18.º, n.º 6, als. a), b) e c), da Proposta de Diretiva, relativa aos créditos aos consumidores, de 30 de junho de 2021 – que se conclui pela necessidade de serem adotadas políticas regulatórias multidisciplinares que visem uma melhor alfabetização ciber dos consumidores em matéria de infoliteracia financeira.

Palavras-chave: *Scoring* baseado em IA; Decisões automatizadas; Avaliação de solvabilidade.

1. Introduction: scoring, data protection and the emerging regulatory tale for consumer credit

From mid-2015 until now, the credit industry worldwide has evolved from judgemental to electronic breakthroughs. Companies all over the world, such as FICO, Experian, Equifax, TransUnion, FriendlyScore, Lenddo, Tiaxa, Trusting Social, Lending Club, Prosper, SoFi, Zopa, Funding Circle, Alibaba (Credit Sesame), Prêt d'Union, Upstart, underwrite.ai, James – Credit Risk AI, ZestAI and Enova International, constantly put efforts to take greater competitiveness[3]. Nowadays, loans conceded are increasingly leaving the physical channels of commercialisation, instead putting online in consumers' 'pockets', mainly through virtual platforms (i.e., Apps or websites). This pathway traduces the panopticon of the new fast credit lines among the epilogue of customer onboarding phenomena. Practices alike increasingly involve lending large sums of money[4]. While trying to assume the avant-garde by implementing new business models, they simultaneously stand up to the might of the FinTech Giants – as JP Morgan Chase, Goldman Sachs, Barclays, and even the startup Revolut[5].

Today, credit data drives the entire lending operation in Banking 4.0.[6], especially where exclusive automated AI-based systems concede or meaningfully influence consumer credit approvals or denials[7]. The programmers no longer take on the main characters regarding the quality of Data Mining (DM) and

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[3] Federico Ferretti/Daniela Vandone, *Personal Debt in Europe: the EU financial market and consumer insolvency*, Cambridge, UK, Cambridge University Press, 2019, p. 34.

[4] Diogo Morgado Rebelo/Joana Covelo de Abreu/Cesar Analide, «O Mercado Único Digital e a '(Leigo)ritmia' da pontuação de crédito na era da Inteligência Artificial», *Revista de Direito e Tecnologia*, vol. 2, no. 1, 2019, p. 7 (pp. 1-69).

[5] "It is finance enabled by, or provided via, new technologies where the value chain increasingly includes alternative providers to the traditional ones". Federico Ferretti/Daniela Vandone, *Personal Debt in Europe…*, *cit.*, p. 142.

[6] Banking 4.0. refers to the set of technological changes that will transform the business scope and the relationship customers have with banking institutions or FinTech, especially from an omnichannel perspective. Cf. Brett King, *Bank 4.0, Banking Everywhere, Never at a Bank*, New Jersey: John Wiley & Sons, 2018, p. 333.

[7] Chrustoph Schmon, «Automated Decision-Making and Artificial Intelligence – A Consumer Perspective», *BEUC Position Paper*, June 2018, p. 3, available at https://www.beuc.eu/publications/beuc-x-2018-058_automated_decision_making_and_artificial_intelligence.pdf [accessed on 28/09/2022].

Machine Learning (ML) models[8]. On the contrary, together with the self-learning models, personal (often, if not always, sensitive) data patterns predict or prescribe whom to accept next. It is believed that the greater volume and diversity of attributes at the input layers of a given model will enhance profiling better consumer's creditworthiness[9].

However, the use of scoring techniques founded on AI technologies calls for an energetic attention concerning the data protection regime. Technological breakthroughs in credit, such as the ones implying predictive analytics, raise specific problems regarding automated decision-making, including profiling. Some authors have already argued that the prescriptions previously in force, following Directive 95/46/EC[10], cannot efficiently regulate technological phenomena like Big Data Analytics[11]/[12]. Moreover, irrespective of the Proposal for an AI Act on

[8] DM and ML modelling are carried out from the patterns and regularities standardised in past experiences from thousands of clients. The assumption that brings together DM techniques and ML techniques or vice-versa is refutable. Although both these AI micro fields may sometimes overlap in the training, validation and subsequent testing of algorithms or self-learning models, they differ in the underlying functionalities and the prospection or prediction stages they perform, accordingly. On the one hand, DM focuses more on the descriptive depuration of patterns or regularities to extract relevant insights of information from Big Data (*Descriptive Analysis*). ML techniques, on the other, exhibit more predictive purposes by resorting to insights previously explored by the DM in self-learning models, which adjust the execution rules according to specific targets by employing supervised, non-supervised and reinforcement approaches (*Predictive and Prescriptive Analysis*). Hence, if it is true that ML depends on DM for the more accurate achievement of its predictive and prescriptive tasks, integrated therein as its subfield, it is no less likely to point out the differentiated conjecture of the valences that each branch provides, independently. Oliver Theobald, *Machine Leaning for Absolute Beginners*, 2nd ed, London, Scatterplot Press, 2017, pp. 15-17; Ethem Alpaydin, *Machine Learning: the new AI*, Cambridge, MA, MIT Press Knowledge Series, 2016, pp. 10-16; Alfonso Palmer/Rafael Jiménez/Elena Gervilla, «Data mining: Machine Learning and statistical techniques», Kimito Funatsu (coord.), *Knowledge-Oriented Applications in Data Mining*, 2011, p. 373 (pp. 373-396).

[9] Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0. – EU Right to Suggestion of an IDSS MAS-Based Scoring Case Study in Consumer Credit», *JusGov Research Paper Series*, no. 3, 2021, p. 3 (pp. 1-31).

[10] Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

[11] Bert-Jaap Koops, «The trouble with European data protection law», *International Data Privacy Law*, vol. 4, no. 4, p. 256 (pp. 205-261); Karen Levy, «Relational Big Data», *Stanford Law Review*, vol. 66, no. 73, 2013, pp. 78-79 (pp. 73-79).

[12] "Big Data involves aggregating large amounts of often-messy information, so learning algorithms can sort and analyze that information to provide novel insights and solve problems in numerous disciplines and business arenas". Mathew Bruckner, «The Promise and Perils of Algorithmic Lenders», *Chicago-kent Law Review*, vol. 39, no. 1, 2018, p. 10 (pp. 3-60).

21 April 2021[13], the processing of consumer credit data is not exempted from the scope of the GDPR[14].

As best we can develop theoretically, below, its rules on automated decision-making will be directly applicable to situations of creditworthiness assessment via scoring[15]. However, for all due purposes, this essay focuses mainly on evaluating the normative eruption that configures the duty of lenders to assess a consumer's creditworthiness prior to the conclusion of any credit agreement (or any increase of the amount borrowed). The specific regime is until now envisaged in Article 8 of the Directive 2008/48/CE – enshrined in a short, generic, and abstract writing –, now, especially under Articles 12 and 18(6) of the Proposal for a Directive on consumer credits, of 30 June 2021[16]. Therefore, considering the framework of this proposal, Article 22 of the GDPR and Articles 13 or 14 of the Proposal for an AI Act, we will investigate the impact technologies such as AI-based scoring have mainly on GDPR regulatory feasibility from an engineering viewpoint, especially regarding the compliance with the so-called "suitable safeguards".

2. Credit scoring (material scope) and the parties in light of the General Data Protection Regulation (subjective scope)

Automated processing of credit data, some, or all of which deemed as personal, is subject to the general provisions of the GDPR. Predictors that integrate the databases of lenders (or bureaus agencies) are further extracted from the scoring models, hence, reflecting endogenous inferences relating to an identified or identifiable natural person, the data subject (Article 4(1) of the GDPR). Most

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[13] European Commission, «Proposal for a Regulation of the European Parliament and of the Council laying down harmonized rules on Artificial Intelligence (Artificial Intelligence Act) and amending certain union legislative acts», Brussels, 21.04.2021, COM(2021)206 final, available at https://eur-lex.europa.eu/resource.html?uri=cellar:e0649735-a372-11eb-9585-01aa75ed71a1.0001.02/DOC_1&format=PDF [accessed on 02/06/2022].

[14] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation).

[15] European Commission, «Proposal for a Regulation of the European Parliament and of the Council laying down harmonized rules on Artificial Intelligence (Artificial Intelligence Act)…», *cit.*, p. 4, para. 1.2.

[16] European Commission, «Proposal for a Directive of the European Parliament and of the Council on consumer credits», Brussels, 31.06.2021, COM(2021) 347 final, available at https://eur-lex.europa.eu/resource.html?uri=cellar:2df39e27-da3e-11eb-895a-01aa75ed71a1.0001.02/DOC_1&format=PDF [accessed on 02/06/2021].

of both traditional financial and behavioural variables (i.e., the *inputs*)[17], as well as the respective ratings extracted from the scoring models (i.e., the *outputs*)[18], fall within the special categories of personal data – the so-called sensitive sets – which are granted high protection under the prohibition enshrined in Article 9(1) of the GDPR[19].

Therefore, there is not – even if we bear in mind the heterogeneity of Big Data – non-personal sets, which cannot be indexed to the applicant, and which does not allow the re-identification of the consumer, directly or indirectly. Regardless of the source of collection (e.g., application forms, open data, search engine queries, social media, among others) and its format (e.g., audio, video, text, numbers, or images), credit data tends to relate to sensitive predictors that will enable profiling consumers' creditworthiness more accurately[20].

As for the subjective scope, whether relating to the applying clientele or those candidates seeking an increase in the amount borrowed, the collection of

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[17] The explanatory variables of a predictive scoring model are subdivided into sociodemographic, financial, employment and behavioural categories. Traditional variables with financial traits refer to the applicant's, household's financial assets or other commitments previously agreed. Behavioural, on the other hand, includes, for instance, the average of current account balances, other loans conceded, arrears, guarantees, as well as other sources of income. Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, p. 13; Martin Vojtek/Evïen Koândra, «Credit Scoring Models», *Czech Journal of Economics and Finance (Finance a úvěr)*, vol. 56, no. 3-4, 2006, p. 164, table 1 (pp. 152-167).

[18] Tiago Sérgio Cabral, «Forgetful AI: AI and the Right to Erasure under the GDPR», *European Data Protection Law Review*, vol. 6, no. 3, 2020, p. 386 (pp. 378-389).

[19] "(…) It becomes apparent how solvency data may raise issues of consumer classification, standardisation, simplification, sorting, economic discrimination and financial inclusion of some and exclusion of others. Generally, consumer solvency data are capable of driving the conforming of consumer behaviours to the economic needs of the credit industry under market tenets of the neo-liberal ideology". Federico Ferretti/Daniela Vandone, *Personal Debt in Europe…*, *cit.*, pp. 170-171. European policymaking and jurisprudence should classify, generally, AI-based creditworthiness processes as to their sensitive nature. As such, data protection rules should be grounded primarily on data usage and only secondarily consider the sources of collection. Cesar Analide/Diogo Morgado Rebelo, «Football 4.0.: a privacy-fairer sporting discipline», *RAILS Blog*, February 17, 2021, available at https://blog.ai-laws.org/football-4-0-a-privacy-fairer-sporting-discipline/ [accessed on 27/09/20 22], Sandra Wachter/Brent Mittelstadt, «A Right to Reasonable Inferences: Re-Thinking Data Protection Law in the Age of Big Data and AI», *Columbia Business Law Review*, vol. 2019, no. 2, 2019, pp. 572-581 (p. 616).

[20] Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, p. 14.

credit data depends on the public or private nature of the data brokers involved[21]. It is not contested that both the institutions directly responsible for lending and, often, the bureau agencies, carry out processing operations within the meaning of Article 4(2)(4)(7) of the GDPR. These legal persons determine the purposes and the means of scoring operations (i.e., what). Individually or even jointly, lenders process credit data collected and stored in databases, shared or not with each other, through the development of exploratory and predictive DM and ML models (i.e., how). Ultimately, these tools assist in predicting the future fulfilment of the repayment obligation to which potential debtors will be bound when consumer credit has been granted (i.e., the intended purpose)[22]. As such, the provisions corresponding to Articles 24, 25 and 26 of the GDPR will apply to these active parties in light of the data protection relationship[23].

To make it clear, AI-based scoring, to the extent lenders pursue autonomously – even if jointly with their holdings or bureau agencies – a significant influence on how such processing is carried out, those entities must be deemed as (joint) controllers. Consequently, consumer credit scoring undoubtedly falls

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[21] A fundamental distinction between public and private entities is relevant to the different performances of credit information brokers. The former typically embodies part of a national central bank or supervisory authority, legally institutionalised to address the financial system's stability while simultaneously controlling consumers' over-indebtedness level, especially from a macroeconomics perspective. On the contrary, the latter category – i.e., the private ones – aims to improve primarily the efficiency and profitability of banking institutions or other lenders with *Fintech* scope. Nowadays, private bureau agencies represent, in some countries, the primary channels for collecting credit data. In a multiple sharing paradigm, private bureau databases organise large sets of information subscribers provide according to the pursuit of pre-defined micro policies and, above all, considering the institutional interests they aim to achieve. These data brokers currently exist in all EU Member States except Luxembourg. *Idem,* pp. 125-128; Federico Ferretti, *The Law and Consumer Credit Information in the European Community: The Regulation of Credit Information Systems*, New York, Routledge, 2008, pp. 65-70; Peter Cartwright, *Banks, Consumers and Regulation*, Portland, Hart Publishing, 2004, pp. 31-34.

[22] EDPB, «EDPS Guidelines on the concepts of controller, processor and joint controllership under Regulation (EU) 2018/1725», adopted on 7 November 2019, pp. 7-10, available at https://edps.europa.eu/data-protection/our-work/publications/guidelines/concepts-controller-processor-and-joint_en [accessed on 03/0 6/2022]. Although bureau checks and borrower assessments appear to be geared towards fulfilling the same purpose (i.e., attributive and behavioural scoring), the scope of both means and purposes differ. First, the bureaus manage their own multiparty databases and, consequently, the models generated. Secondly, their activity is related to verifying payment history, or signalling financial commitments, besides validating the data collected from various sources. Paulo Viegas de Carvalho, *Fundamentos da Gestão de Crédito*, 1st ed., Lisboa: Sílabo, 2009, p. 120, Fábio Silva, *Credit Scoring as an Asset for Decision-Making in Intelligent Decision Support Systems*, Master's Dissertation, Braga: University of Minho, 2011, p. 144, available at https://hdl.handle.net/1822/27891 [accessed on 28/09/2022].

[23] FRA, *Handbook on European data protection law,* Luxembourg: Imprimerie Centrale, 2018, p. 106, available at https://fra.europa.eu/en/publication/2018/handbook-european-data-protection-law-2018-edition [accessed on 28/09/2022].

always within the material and subjective scope of the GDPR, specifically, under its Articles 2 and 3 thereof.

3. Automated decision-making in consumer credit scoring

In consumer credit scoring, it is worth highlighting the prohibition of being subject to a decision "based solely on automated processing, including profiling, which produces legal effects (...) or similarly significantly affects" an applicant. Such an axiological-normative entanglement arises mainly from the undetermined nature of the rule enshrined in Article 22(1) of the GDPR. This Europeanist obstacle of (lay)gorithmics tendency, here presented as an effective prohibitive jigsaw, exhibits the false nature of a legal right conceded to the data subject[24]. As regards its nature, the rule in question can only be interpreted as injunctive. It comprises a prohibition imposing, from the outset, the abstention on data controllers unless the exceptions listed in Article 22(2)(a)(b)(c) of the GDPR are met[25]. It, therefore, disguises the difficulties in pursuing a multidisciplinary and effective regulatory strategy, especially given the multiple risks involved by

[24] Sebastião Vale/Gabriela Zanfin-Fortuna, «Automated Decision-Making Under the GDPR: Practical Cases from Courts and Data Protection Authorities», in *The Future Privacy Forum*, May 2022, p. 6, available at https://fpf.org/wp-content/uploads/2022/05/FPF-ADM-Report-R2-singles.pdf [accessed on 03/06/2022]; Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, p. 16; Giovanni Sartor, «The impact of the General Data Protection Regulation (GDPR) on artificial intelligence», in *EPRS Study*, June 2020, pp. 59-60, available at https://www.europarl.europa.eu/RegData/etudes/STUD/2020/641530/EPRS_STU(2020)641530_EN.pdf [accessed on 03/06 2022]; Heleen Jansser, «An approach for a fundamental rights impact assessment to automated decision-making », *International Data Privacy Law*, vol. 10, no. 1, 2020, p. 79 (pp. 76-106); Lee Bygrave, «Article 22. Automated individual decision-making, including profiling», in Christopher Kuner/Lee Bygrave/Christopher Docksey (coords.), *The EU General Data Protection Regulation (GDPR) – A Commentary*, 1st ed., Oxford, Oxford University Press, 2020, pp. 530-532 (pp. 522-542); Michael Veale/Lilian Edrwads, «Clarity, surprises and further questions in the Article 29 Working Party Draft guidance on automated decision-making and profiling», *Computer Law & Security Review*, vol. 34, no. 2, 2018, p. 398 (pp. 398-404); WP.29, «Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679», adopted on 3 October 2017, as last revised and adopted on 6 February 2018, p. 19, available at https://ec.europa.eu/newsroom/article29/items/612053/en [accessed on 03/06/2022]; Isak Mendoza/Lee Bygrave, «The Right not to be Subject to Automated Decisions Based on Profiling», in Tatiana-Eleni Synodinou/Philippe Jougleux/Christiana Markou/Thalia Prastitou (coords.), *EU Internet Law,* Cham, Springer, 2017, pp. 85-87 (pp. 77-98).

[25] Sebastião Vale/Gabriela Zanfin-Fortuna, «Automated Decision-Making Under the GDPR…», *cit.*, pp. 9-12.

the usage of AI-based scoring systems[26]. We think this apparent legal right is an

[26] As it happens with any technological tool, AI-based scoring systems in consumer credit, in addition to the benefits they offer – especially in terms of greater profitability and better risk management – also trigger some newest (un) surmountable obstacles. Firstly, scoring creditworthiness assessments, due to the scientific incompleteness typical of the probability's universe, do not aim to ensure the complete quality and full correctness of the information inferred (i.e., the misclassification effect). This occurs to the extent AI do not suppose classifying either macroeconomic variables – e.g., taxes or fees – and many less will it measure unpredictable indicators or moral risks (e.g., lottery winnings, job losses, divorce, illnesses, or the death of relatives). Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, pp. 12-13; Federico Ferretti/Daniela Vandone, *Personal Debt in Europe…*, *cit.*, pp. 171-173; Nigel Balmer/Pascoe Pleasence/Alexy Buck/Heather C. Walker, «Worried sick: the experience of debt problems and their relationship with health, illness and disability», *Social Policy and Society*, vol. 5, no. 1, 2006, pp. 46-49 (pp. 39-51). Secondly, algorithmic settings imbued in the training, validation and testing of the self-learning models, sequentially, are not always able to process inputs neutrally and objectively, ultimately leading to the induction of outputs that may follow (direct/indirect) discriminatory criteria. Dolores Taramundi, «Discrimination by Machine-Based Decisions: Inputs and Limits of Anti-discrimination Law», Bart Custers and Eduard Fosch-Villaronga (coord.), *Law and Artificial Intelligence: Regulating AI and Applying AI in Legal Practice*, vol. 35, Information Technology and Law Series, T.M.S, Asser Press, The Hague, 2022, p. 80 (pp.73-85), Melissa Knutson, «Credit Scoring Approaches Guidelines», The World Bank Group, 2019, p. 27, available at https://thedocs.worldbank.org/en/doc/935891585869698451-0130022020/CREDIT-SCORINGAPPROA%20CHES-GUIDELINES-FINAL-WEB [accessed on 22/06/2022]; Fillippo Raso/Hilligoss Hannah/Krishnamurthy Vivek/Bavitz Christopher/Levin Kim, «Artificial Intelligence & Human Rights: Opportunities & Risks», Berkman Klein Center for Internet & Society Research Publication, 2018, p. 30, available at https://dash.harvard.edu/bitstream/handle/1/38021439/2018-09_AIHumanRights.pdf?sequence=1&isAllowed=y [accessed on 22/06/2022]; Mikella Hurley/Julius Adebayo, «Credit Scoring in the Era of big Data», *Yale Journal of Law & Technology*, vol. 148, 2016, p. 178 (pp. 148-216); Nizan Packin/Yafit Lev-Aretz, «Learning algorithms and discrimination», in Woodrow Barfield/Ugo Pagallo (coords.), *Research Handbook on the Law of Artificial Intelligence*, Massachusetts, Edward Elgar Publishing, 2018, p. 100 (pp. 88-111); Franck Pasquale, *The Black Box Society: The Secret Algorithms that Control Money and Information*, Cambridge, MA, Harvard University Press, 2015, p. 23; Cathy O´Neil, *Weapons of Math Destruction, How Big Data Increases Inequality and Threatens Democracy*, 1st ed., New York, Crown Publishers, 2016, pp. 179-202. Thirdly, classification scores in creditworthiness assessments may also have a non-contextualised effect on the profile inferred. Acceptances or denials in credit lead to the standardisation of consumption patterns and habits to such an extent it may impose to consumers a hetero-constituted or expropriated identity. Filipa Urbano Calvão, «O direito fundamental à protecção de dados pessoais e a privacidade 40 anos depois: impacto e evolução», in Manuel Afonso Vaz/Catarina Sarmento/Luís Heleno Terrinha/Pedro Coutinho (coords.), *Jornadas nos Quarenta Anos da Constituição da República Portuguesa*, 2017, UCP, Porto, p. 96 (pp. 87-101). Additionally, the logical-inferential process in which creditworthiness assessment in credit scoring operates so often forebodes Black-Box analyses rooted in an imbroglio of poor transparency and decision opacity. The way initial characteristics are manipulated into such analyses is neither readily visible nor comprehensible. In other words, it is very complex to determine their correlations. So, in the actual state-of-the-art, it is not conceivable to establish a cause-effect relationship between the inputs and outputs of algorithms or models, nor is achievable the representation of the information (or knowledge) in the middle of the process (i.e., the hidden layers). Sometimes, experts cannot even apply reverse engineering techniques to provide better understandings to developers or the final users themselves, the latter having minimum digital know-how. Yavar Bathaee, «The Artificial Intelligence Black Box and the Failure of Intent and Causation», *Harvard Journal of Law & Technology*, vol. 31, no. 2, 2018, p. 905 (pp. 889-938); Davide Castelvecchi, «The Black Boxes of AI», *Nature*, vol. 538, 2016, p. 21 (pp. 20-23); JENNA BURREL, «How the machine 'thinks': Understanding opacity in machine learning algorithms», *Big Data & Society*, vol. 3, no. 1, 2016, pp. 3-5, (pp. 1-12); Ed Mierzwinski/Jeff Chester, «Selling Customers, Not Lists: The New World of Digital Decision-Making and the role of the Fair Credit Reporting Act», *Suffolk UL Review*, vol. 54, no. 3, 2013, p. 846 and p. 850 (pp. 845-880). Also, in areas such as cyber-security, it is possible to detect the criminal use of information in cyber-attacks – whether on the inputs or the models or even on the inferential outputs – conducted by third parties without legitimacy to do so, i.e., the intruders. Diogo Morgado Rebelo, «From Homomorphic Crypto-Schema for Solvency Rating in Consumer Credit to the Engineering of Law: Cryptographic Homomorphism in (or for) a Multi-Agent System – *Quid Juris*?», SSRN, August 2021, pp. 9-15, available at https://ssrn.com/abstract=3881839 [accessed on 22/06/2022]. Finally, as expected in the scope of the design stages, the implementation of scoring systems in credit is not free from the need to overthink that the development and configuration of the models are not immediate, as they require the expenditure of time and resources. Since their performance is also not static, to these processes, implementing a monitoring plan should also be a priority to avoid model's deterioration. Maria Rocha Sousa/João Gama/Elísio Brandão, «Introducing Time-Changing Economies into Credit Scoring», *FEP Working Papers*, no. 503, November 2013, p. 2, available at https://wps.fep.up.pt/wps/wp513.pdf [accessed on 22/06/2022]. However, from a check and balancing standpoint, regardless of the challenges or trade-offs, the option of AI-based scoring for consumer credit continues to be the primary tool for service providers. By intending to minimise the operational costs of judgemental credit analysis, when developed with sufficient quantity and quality of information, these technologies can aim to automate 100% credit-granting decisions, especially when the amount requested is low. Paulo Viegas de Carvalho, *Fundamentos da Gestão de Crédito*, *cit.*, p. 206.

inadequate solution to the problem of automated decision-making. Eventually, it may even be seen as a technical falsehood enshrined by the chimerical need to facilitate technological progress, making it someway (if any) possible. However, in this digital age, AI does not yet have sufficient engineering forces to provide Law in Books clear answers coherent with the dilemmas posed by the latter[27]. Following this reasoning, the regime in force may be known for being too rigid and strict. On the one hand, it will be rigid because it does not allow for a fair balance between all the economic interests at stake, mainly the right to private or business initiatives[28]. On the other, it is rigorous insofar as Article 22(1) of the GDPR ensures an overly high level of protection for the applicants, completely disregarding their will to be subject to machine-made decisions[29].

So, in the light of the abovementioned, we consider this provision should not be systematically included in Chapter III on the rights of the data subjects. Instead, it shall be amended by way of repeal under the Title XII of the AI Act Proposal. Until now, the alternative (and transitory) suggestion made by Sandra Wachter and Brent Mittelstadt in 2019, who proposed an abrogating interpretation (and, hence, the application) of this general prohibition as a right to reasonable inference, is considered appropriate[30]. To some extent, such solution would allow avoid disproportionate costs enterprises must bear with uncertain and generic compliance policies[31].

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[27] Christopher Kuner/Dan Jerker B. Svantesson/Fred H. Cate/Orla Lynskey/Christopher Millard, «Machine learning with personal data: is data protection law smart enough to meet the challenge», *International Data Privacy Law*, vol. 7, no. 1, 2017, p. 1 (pp. 1-2).

[28] Martin Eber, «Regulating AI and Robotics», in Martin Ebers/Susana Navas (coords.), *Algorithms and Law*, Cambridge, UK, Cambridge University Press, 2020, p. 52 (pp. 37-99). For lenders, safeguarding consumer data can be disproportionately costly in two senses. At first glance, financial institutions may get ahead of the potential profits from data gathering, mining, and processing to avoid forthcoming privacy costs. This economic outcome *per se* constitutes the opportunity costs. Secondly, to avoid ex-post expected losses due to privacy-unfriendly practices, creditors may incur in higher ex-ante costs regarding compliance practices. Consequently, lenders now tend to invest (and, perhaps, over-invest) in data security and protection management. Alessandro Acquisti/Heinz College, «The Economics of Personal Data and Privacy: 30 Years after the OECD Privacy Guidelines», WPIE, OECD Privacy Guidelines, 2010, p. 14, available at https://www.oecd.org/sti/ieconomy/46968784.pdf [accessed on 22/06/2022].

[29] Diana Sancho, «Automated Decision-Making under Article 22 GDPR», in Martin Ebers/Susana Navas (coords.), *Algorithms and Law*, Cambridge, UK, Cambridge University Press, 2020, pp. 147-148 (pp. 136-156).

[30] Sandra Wachter/Brent Mittelstadt, «A Right to Reasonable Inferences: Re-Thinking Data Protection Law in the Age of Big Data and AI…», *cit.*, pp. 572-581.

[31] Diogo Morgado Rebelo, «Parábola Inconstitucional para o 'Ser' Artificial», *Observador*, Electronic Journal, 3 August, 2021, available at https://observador.pt/opiniao/parabola-inconstitucional-para-o-ser-artificial/ [accessed on 28/09/2022].

3.1. Three-step model: from the general prohibition to the assumption of solely exclusive automation

Today, scoring consumer credit is one of the most critical procedures when implementing banking management policies[32]. Processing of this nature epitomises collecting and analysing vast sets of personal data to make a final decision concerning the granting of loans through profiling consumer's creditworthiness (Article 4(4) of the GDPR)[33]. Regardless of the modelling techniques embedded in this kind of predictive analysis, there are three ambiguous postulations underlying the application of the prohibition envisaged in Article 22(1) of the GDPR[34].

Firstly, whether to accept or reject (or even to increase the loan amount borrowed) should be taken without any intervention – i.e., full automation. If there is a disruption of a human operator in the corresponding decision-making time gap, the underlying motivation should be based mainly on the recommendations extracted from the system itself – i.e., partial automation. In this respect, the European legislator has not clarified the level of human intervention required to assume what is to be understood as solely or exclusive automation[35]. In fact, 2014 BGH jurisprudence and a decision taken by the Spanish Data Protection Authority Decision, on 13 January 2021, stated those automated mechanisms for the mere assistance or preparation of decision-making in credit should not

[32] Hussein Abdou/John Pointon, «Credit scoring, statistical techniques and evaluation criteria: a review of the literature», *Intelligent Systems in Accounting and Management*, vol. 18, 2011, p. 64 (pp. 59-88).

[33] Mireille Hildebrandt, «Defining Profiling: A New Type of Knowledge?», in Mireille Hildebrandt/Serge Gutwirth (coords.), *Profiling the European Citizen,* Dordrecht, Springer, 2008, pp. 17-20 (pp. 17-45).

[34] Alexandre Veronese/Alessandra Silveira/Amanda Lemos, «Artificial Intelligence, Digital Single Market and the proposal of a right to fair and reasonable inferences: a legal issue between ethics and techniques», *UNIO – EU Law Journal*, vol. 5, no. 2, 2019, p. 78 (pp. 75-91).

[35] A request for a preliminary ruling made by Verwaltungsgerisht Wiesbaden (i.e., Administrative Court of Germany, Wiesbaden) has been pending before the CJEU since 15 October 2021. The German court asks the CJEU whether Article 22(1) of the GDPR must be applicable when the output value is transferred by a third party – i.e., in the best view of a credit bureau – and, mainly on this probability the decision by the lenders is based. Request for a Preliminary Ruling, of 1 October 2021, Case C-634/21, *Land Hessen vs. Schufa*, para. II, available at https://curia.europa.eu/juris/showPdf.jsf?text=&docid=250522&pageIndex=0&doclang=EN&mode=req&dir=&occ=first&part=1&cid=5390528 [accessed on 22/06/2022].

fall within the material scope of Article 22(1) of the GDPR[36]. Because of the legislative procedure preceding the adoption of this EU normative act, it is argued that the applicability scope of automated decision-making regime is restricted. To this conclusion, the European Commission's Proposal has introduced the wording "solely and predominantly automated", an inscription reduced in the final version proposed by the European Parliament, by eliminating the wording predominant[37]. Anyway, we argue for the adoption of a broad interpretation, consequently more holistic and in conformity with control theory from the psychology of decision-making outlook. In fact, credit analysts, even those with specialisation in Data Science, have limitations in cognitive processing power, unstable maintenance of reasonable attention levels, they likely exhort overly complacent involvement, and, at final, the halo effect can occur on them because of automation bias[38]. Hence, in the context of Big Data Analytics, the neuropsychological constraints of human capacities prevent any operator from being able to assess in real-time whether models are performing the scoring task properly.

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[36] On 28 January 2014, the German Federal Court of Justice had already ruled the applicability scope of the scoring systems. Following, at that time, the wording of Article 15 of Directive (EU) 95/46/EC, the *Bundesgerichtshof* declared if automation is restricted to the preparation of reports and if the merit assessment of the decision is still the judgemental accountability of the credit analyst, the processing portrayed by scoring systems will fall outside the scope of this regime, complex in itself. BGH, 28 January 2014, Schufa VI ZR 156/12, para. 34, available at https://juris.bundesgerichtshof.de/cgi-bin/rechtsprechung/document.py?Gericht=bgh&Art=en&Datum=Aktuell&nr=66910&linked=urt&Blank=1&file=dokument.pdf [accessed on 07/06/2022]. Also, on 13 January 2021, the Spanish Data Protection Agency (AEPD) published in its Sanction Procedure Resolution No. PS/00477/2019 a decision in which it found that the profiling practices, via pricing and credit scoring, relating to the customer portfolio of the institution "CAIXABANK", did not meet the requirements to the assumption of automation under the meaning given in (or by) Article 22(1) of the GDPR. Such conclusions were reached because the meaningful control of the decision was exercised under the judgemental procedures previously triggered by credit analysts. According to AEPD, the automated scoring systems were limited to the mere preparation of evidence. AEPD, Procedimiento Nº: PS/00477/2019, de 13 de Enero de 2021, p. 21, available at https://www.aepd.es/es/documento/ps-00477-2019.pdf [accessed on 07/06/2022]. Sebastião Vale/Gabriela Zanfin-Fortuna, «Automated Decision-Making Under the GDPR…», *cit.*, p. 31; Meike Kamp/Barbara Köffer/Martin Ebers, «Profiling of Customers and Consumers – Customer Loyalty Programmes and Scoring Practices», in Mireille Hildebrandt/Serge Gutwirth (coords.), *Profiling the European Citizen*, Dordrecht, Springer, 2008, p. 210 (pp. 201-215).

[37] Tiago Sérgio Cabral, «AI and the Right to Explanation. Three Legal Bases under the GDPR», in Dara Hallinan/Ronald Leenes/Paul De Hert (coords.), *Data Protection and Privacy – Data Protection and Artificial Intelligence*, London, Hart Publishing, 2021, pp. 32-34 (pp. 29-55).

[38] John Zerillu/Alistair Knott/James Maclaurin/Colin Gavaghan, «Algorithmic Decision-Making and The Control Problem», *Minds and Machines*, 29(4), 2019, p. 560 (pp. 555-578); Raja Parasurman/Dietruch Manzey, «Complacency and Bias in Human Use of Automation: An Attentional Integration», *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 2010, p. 387 (pp. 381-410); Lisanne Bainbridge, «Ironies of automation», *Automatica*, vol. 19, no. 6, 1983, p. 776 (pp. 775-779).

One can only imagine a human intervenor monitoring the decisions of an AI-based scoring system at some superficial or meta-level. In most cases, analysts' actions will lead to rubber-stamping model's outputs[39]. It, therefore, appears that for the application of the regime provided for in Article 22(1)(4) of the GDPR, the need for full automation of the decision-making process is not imperative[40]. In fact, accepting or rejecting a consumer loan application does not have to be based solely on the processing predictions exhorted by automated means. The outputs extracted from the scoring systems can materialise, on the one hand, both as a single and exclusive factor to the concrete decision-making and, on the other, the main conditioning characteristic – if it is a determining one – that co-exists with other traits measured by the human agent. To sum up this first condition, for scoring purposes to be considered exclusively automated, it is sufficient that the outputs inferred from the automated processing strongly influence the concrete outcome regarding the solvency assessment. In other words, the human intervention must be more than a token gesture[41].

Secondly, the boundaries of this prohibition must relate to the individual consumer and not to a predefined group of clients. As it is now clear, choosing whether to accept or reject a credit application stem from prior predictions regarding creditworthiness evaluation of a set of profiles grouping a category of consumers – to which the data subject is included. However, it makes no sense to exclude from this regime the decisions based on profiles that ultimately come from attributive features indexing directly or indirectly to a numerous set of applicants[42]. In fact, group profiling represents an increased danger to the protection of personal data and, as such, should be subject to reinforced legal safeguards as the ones established in Article 22(1)(4) of the GDPR. In those scenarios, many data subjects are unaware – nor should they be required to – of the other candidates' identities. Moreover, since in most situations they do not

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[39] *Idem*, *ibidem*.

[40] Sebastião Vale/Gabriela Zanfin-Fortuna, «Automated Decision-Making Under the GDPR…», *cit.*, pp. 32-33.

[41] WP.29, «Guidelines on Automated individual decision-making and Profiling…», *cit.*, p. 21; Marco Almada, «Human intervention in automated decision-making: Toward the construction of contestable systems», *ICAIL'19: Proceedings of the Seventeenth International Conference on Artificial Intelligence and Law*, June 2019, pp. 3-4 (pp. 2-17); Dimitra Kamarinou/Christopher Millard/Jatinder Singh, «Machine Learning with Personal Data», Legal Studies Research Paper, *Queen Mary School of Law Research Paper*, no. 247, 2016, pp. 11-12 (pp. 1-23); Lee Bygrave, «Automated Profiling: Minding the Machine – Article 15 of the EC Data Protection Directive and Automated Profiling», *Computer Law & Security Review*, vol. 17, no. 1, 2001, p. 20 (pp. 17-24).

[42] Dimitra Kamarinou/Christopher Millard/Jatinder Singh, «Machine Learning with Personal Data…», *cit.*, pp. 11-12; Alessandro Mantelero, «Personal data for decisional purposes», *Computer Law & Security Review*, vol. 32, no. 2, 2016, pp. 246-249 (pp. 238-255).

establish any inter-relational relationship with each other, they certainly have a limited perception of the collective aspects that they share and, ultimately, may be decisive to the outcome portrayed[43].

Last, thirdly, but not least, this kind of processing should have effects (both positive and negative) on the legal sphere of the (cyber)consumer or significantly affect him or her in a similar way[44]. Therefore, it does not emerge from the provision of Article 22(1), *in fine*, that this prohibition – enshrined also in Article 22(4) thereof, regarding sensitive processing – is not applicable when from the automated processing arises acceptances. Nor would there be sufficient reason to restrain this prohibition to the rejection cases. Even if the solvency assessment via scoring results in a favourable application outcome, the (cyber) consumer still may be bound by contractual commitments deriving from the conclusion of the consumer credit agreement, consequently, being obligated to repay the amount borrowed plus other interest charges.

Therefore, both the lending approvals and the unfavourable decisions have patrimonial effects on the data subject's legal sphere. In fact, such decisions often determine, in a solely automated manner, whether consumers can access or buy – or not – a specific good or service. In the short or medium term, automated decisions in credit can ultimately even impact a data subject's quality of life[45].

3.2. Legal grounds: from 'necessity' to 'public interest'

On the second level of analysis, the one that deals with the legal grounds underlying consumer credit scoring, it is essential to distinguish between financial and behavioural traditional characteristics, given their sensitive nature[46], and other predictors corresponding to socio-demographic and labour categories. In particular, the datasets that could comprise the attributive features concerning

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[43] Meike Kamp/Barbara Körffer/Martin Ebers, «Profiling of Customers and Consumers…», *cit.*, p. 206; Frank Pasquale, *The Black Box Society*…, *cit.*, pp. 22-26.

[44] Sebastião Vale/Gabriela Zanfin-Fortuna, «Automated Decision-Making Under the GDPR…», *cit.*, p. 35.

[45] Dimitra Kamarinou/Christopher Millard/Jatinder Singh, «Machine Learning with Personal Data…», *cit.*, p. 12.

[46] In the Opinion no. 22/2016, of 5 de July, CNPD, regarding the obligation to which creditors are bound to communicate Tax Authorities' information on clients' bank accounts, reported this category of predictors as sensitive data. CNPD, Parecer n. º 22/2016, de 5 de julho, Processo n. º 9180/2016, p. 2, available at https://www.cnpd.pt/umbraco/surface/cnpdDecision/download/92623 [accessed on 08/06/2022].

sex[47], nationality or residence of the European citizens[48] – or even, at most, in a more drastic (not to claim, wrong) perspective assumed by *Ombusman* decision, of April 2019, the age[49] – of an applicant must be automatically excluded from the creditworthiness assessments. As to other sociodemographic traits (e.g., marital status, civil identification number, household composition, among others) and employment factors (e.g., type or duration of the employment contract, if exists), the lawfulness of processing is assessed without the need to provide valid consent, hence, disregarding the exception provided for in Article 22(2)(c) of the GDPR. This supposition is founded on the strict necessity to comply with pre-contractual diligence following the data subject's request to access a consumer credit product. That is, in the circumstances of creditworthiness assessment, whether the negotiations are carried out in person or online, the final acceptance

[47] Concerning the gender variable, such an exception results from the anti-discrimination directive, namely the Council Directive 2004/113/EC, of 13 December 2004, implementing the principle of equal treatment between men and women in the access to and supply of goods and services. For instance, on 1 March 2011, the ECJ issued a ban on insurance companies from taking classes such as gender when determining insurance premiums. ECJ, of 1 March 2011, *Association belge des Consommateurs TestAchats ASBL, Yann van Vugt, Charles Basselier vs. Conseil des ministers*, Case C-236/09, ECLI:EU:C:2011:100, para. 30-35, *cit.* in Federico Ferretti/Daniela Vandone, *Personal Debt in Europe…*, *cit.*, p. 171.

[48] According to Article 6 of the Proposal for a Directive on consumer credits, of 30 June 2021: "Member States shall ensure that the conditions to be fulfilled for being granted a credit do not discriminate against consumers legally resident in the Union on ground of their nationality or place of residence or on any ground as referred to in Article 21 of the Charter of Fundamental Rights of the European Union, when those consumers request, conclude or hold a credit agreement or crowdfunding credit services within the Union".

[49] In April 2019, the Finnish *Ombudsman* issued a decision that the credit institution *Svea Ekonomi* should adopt privacy-friendlier practices when assessing creditworthiness. Notably, it decides for disregarding the predictor 'age' as an input. This conclusion assumed that age does not reflect an applicant's creditworthiness. In that way, it was presumed that, for scoring, the candidate's birth data does not have any linkage with the measurement of both his or her capacity or willingness to repay loans previously granted. Office of the Data Protection Ombudsman, The Data Protection Ombudsman ordered Svea Ekonomi to correct its practices in the processing of personal data, April 1, 2019, available at https://tietosuoja.fi/en/-/tietosuojavaltuutettu-maarasi-svea-ekonomin-korjaamaan-kaytantojaan-henkilotietojen-kasittelyssa [accessed on 08/06/2022], *cit.* in Sebastião Vale/Gabriela Zanfin-Fortuna, «Automated Decision-Making Under the GDPR…», *cit.*, pp. 45-46.

of a consumer credit agreement by lenders demands the knowledge of all the information considered as strictly necessary[50].

In any case, it is essential to understand how using this legal ground for processing at the Big Data scale is deemed lawful. What is at stake is not the whole range of information that credit institutions and financial companies (or even FinTech *startups*) are legitimately entitled to access from third parties – as is the case of the Portuguese *Central de Responsabilidades de Crédito* (CRC)[51] or, in Germany, with the information disclosed by "*Schufa*"[52]. The real question at hand is whether having access to alternative data is lawful in the absence of valid consent from the (potential) borrower[53]. From this viewpoint, it is worth highlighting that Recital 47 of the Proposal for a Directive on consumer credit, of 30 June 2021, outrightly excludes from the scope of the automated creditworthiness assessments both personal data obtained from social networking platforms and

[50] WP.29, «Guidelines on Automated individual decision-making and Profiling…», *cit.*, p. 23. To apply the exception of Article 22(1)(a) of the GDPR, it becomes necessary that the creditworthiness assessment relies on the high number of cases to be examined. It is also interrelated with the capacity of scoring systems based on AI techniques to surpass those judgemental analysis significantly. GIOVANNI SARTOR, «The impact of the General Data Protection Regulation (GDPR) on artificial intelligence», *cit.*, p. 61, with due thematic adjustments. Moreover, the dictates of good faith in the subjective sense impel the consumer to provide a whole set of information, firstly, that the AI systems infer as relevant as to the complete such classification task and, secondly, that would probably enable a best course for the negotiations carried out.

[51] The CRC aims to centralise financial, accounting and risk information on actual and potential credit liabilities arising from credit operations to benefit individuals in Portugal. It is an information system managed by Banco de Portugal. Summarily, CRC aggregates financial, accounting and risk information received from the participating entities. Regulation of the CRC established under the Instruction of Banco de Portugal no. 17/2018, of 27 August, approved by Decree-Law no. 204/2008, of 14 October, respectively.

[52] "*Schufa*" is Germany's best-known private credit bureau. It carries out scoring operations to assess creditworthiness and specific sector classifications – for example, in the telecommunications industry – or collection operations, the latter relating to customers showing signals of a propensity to default (if not happened yet) on their contractual commitments. Stefanie Eschoolz/Jonathan Djabbarpour, «Big Data and Scoring in the Financial Sector», in Thomas Hoeren/Barbara Kolany-Raiser (coords.), *Big Data in Context: Legal, Social and Technological Insights*, Cham, Springer, 2018, p. 64 (pp. 63-70).

[53] Alternative sets may be collected from online payments, by geolocation tracing, with email messages, the list of calls made, search engine searches, or even the tracking of the activity pursued by the internet users on social networks. WBG, «Disruptive Technologies in the Credit Information Sharing Industry: Developments and Implications, Finance Competitiveness & Innovation Global Practice», in *FinTech Note*, no. 3, 2019, pp. 11-12, available at http://hdl.handle.net/10986/31714 [accessed on 08/06/2022]; WBG/CGAP, «Data Protection and Privacy for Alternative Data», in *GPFT-FCPL Sub-group Discussion Paper*, 2018, p. 11, available at https://www.gpfi.org/publications/data-protection-and-privacy-alternative-data [accessed on 08/06/2022]; Ed Mierzwinski/Jeff Chester, «Selling Customers, Not Lists…», *cit.*, p. 846 and p. 862.

health data. However, it does not expressly dismiss all other categories collected in a web-based environment, as occurs with up-to-datedness AI-based scoring systems. The EDPS – in its guidelines, published on 26 August 2021 – strongly encourages broadening the scope of this ban to all predictors that may ultimately lead to discriminatory results, an aspect that is difficult to ascertain given the non-intuitive context of group discrimination that AI-based scoring may foster[54]. So, beyond the evidence that, objectively, is strictly necessary to conclude and perform a consumer credit agreement, all other information obtained *via* Big Data cannot be reported as strictly necessary, thus ruling out the lawfulness of this kind of processing considering the exception provided for in Article 22(2)(a) of the GDPR[55]. At any rate, the requirement for the data subjects to give free or explicit consent – as a basis for lawfulness, both for datasets collected in a web environment (Article 22(2)(c)), and for sensitive categories, including some recent traditional financial and behavioural characteristics (Article 9(2)(a), *ex vi* Article 22(4)), all of the GDPR – embodies an ineffective legal ground. That is, in the actual state-of-the-art, the principle of informational self-determination is not yet consistent with the current scoring reality. Hence, while managing pre-contractual practices, consent cannot be deemed entirely free, explicit, or informed. Nowadays, beyond digital or financial illiteracy enlivened, the conclusion of credit agreements depends primarily on whether the outputs recommend accepting or rejecting loan applications[56]. Often, from a pragmatical viewpoint,

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[54] EDPS, «Opinion 11/2021 on the Proposal for a Directive on consumer credits, of 26 August 2021», p. 7, para. 16, *cit.* in SEBASTIÃO VALE/GABRIELA ZANFIR-FORTUNA, «Automated Decision-Making Under the GDPR…», *cit.*, p. 47; DIOGO MORGADO REBELO, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, p. 16.

[55] Ana Alves Leal, «Aspetos jurídicos da análise de dados na Internet (*big data analytics*) nos setores bancário e financeiro: protecção de dados pessoais e deveres de informação», in António Menezes Cordeiro/Ana Perestrelo de Oliveira/Diogo Pereira Duarte (coords.), *FinTech: desafios da tecnologia financeira*, 2nd ed., Almedina, 2019, pp. 176-177 (pp. 82-220), § 47.

[56] This was the understanding taken by the AEPD in its Sanction Procedural Resolutions No. PS/00477/2019 and No: OS/00500/2020. The Spanish Data Protection Authority considered in both resolutions that the data subject's consent, on which "CAIXABANK" relied for the automated processing, including profiling client's creditworthiness, was neither informed, free nor specific. AEPD, Procedimiento Nº: PS/00477/2019..., *cit.*, pp. 17-18; AEPD, Procedimiento N.º: PS/00500/2020, de 21 de Octubre de 2021, pp. 59-60, available at https://www.aepd.es/es/documento/ps-00500-2020.pdf [accessed on 08/06/2022], *cit.* in Sebastião Vale/Gabriela Zanfin-Fortuna, «Automated Decision-Making Under the GDPR…», *cit.*, p. 31

it will be difficult, if not impossible, to obtain valid consent at the time of the collection for the intended purpose(s)[57]. It will not be deemed in any way as explicit.

So, to the traditional financial and behavioural characteristics, previously qualified as sensitive data, it remains to consider automated AI-based scoring as a substantial public interest. These features are proportional to the scoring pursuits – such as preventing over-indebtedness, granting responsible lending and the macroeconomic stability of the financial systems[58]. In line with the provisions of Article 9(2)(g) of the GDPR, when transposing the Proposal for a Directive on Consumer Credit, of 30 June 2021, Member States shall provide consumers with the most appropriate, engineering feasible and specific legal measures to suitably safeguard the fundamental rights and interests at stake.

3.3. Suitable safeguards

Indeed, once the lawfulness of an AI-based scoring operation has been established, (joint) controllers are not dismissed from the obligation to apply appropriate measures to safeguard the data subject's rights, freedoms, and legitimate interests, as enshrined in Article 22(3) of the GDPR, in Articles 13 and 14 of the Proposal for an AI Act and, more recently, in Articles 12 and 18(6)(a)(b)(c) of the Proposal for a Directive on consumer credits, of 30 June 2021. Thus, where creditworthiness assessment involves using profiling tools or any other automated processing, Member States shall ensure that the consumer applying for a loan can exercise three rights. Hence, according to Law in Books, the applicant may: (i.) request and obtain human intervention, *ex-post*, to review the decision; (ii.) ask for an explanation of the creditworthiness assessment, notably about the logic and risks involved; and, ultimately, as a result of previous rights, the data subject must be granted the right (iii.) to express his or her point of view and challenge the concrete solvency estimation.

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[57] *Idem*, pp. 9-12; Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, p. 21; Giovanni Sartor, «The impact of the General Data Protection Regulation (GDPR) on artificial intelligence», *cit.*, p. 61; Christoph Schmon, «Automated Decision-Making and Artificial Intelligence», in *BEUC Position Paper*, 2018, p. 12, available at https://www.beuc.eu/publications/beuc-x-2018-058_automated_decision_making_and_artificial_intelligence.pdf [accessed on 08/06/2022].

[58] Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, p. 5; Julie Goetgherbuer, «AI and Creditworthiness Assessments: The Tale of Credit Scoring and Consumer Protection – A Story with a Happy Ending?», in Jan De Bruyne/Cedric Vanleenhove (coords.), *Artificial Intelligence and the Law,* Brussels, Intersentia, 2021, pp. 436-439 (pp. 429-450), Jorge Morais Carvalho, *Manual de Direito do Consumo*, 7th ed. Coimbra: Almedina, 2021, p. 439, ECJ, of 27 March 2014, ECLI:EU:C:2014:190, *LCL Le Crédit Lyonnais v. Fesih Kalhan*, para. 41.

i) The right to obtain human intervention

As it is now clear, AI-based scoring foresees a world in which credit decision-making can be achieved by reference to three basic strategies. The first, more familiar to us, regards the assumption of full human control via judgemental scoring[59]. This kind of practice has fallen into disuse, given its inaccuracy and impracticality[60]. The second approach, the one we uphold in this paper, is described by the entirely transfer of the decision to the software. However, the trend of Article 14 of the Proposal for an AI Act and Article 18(6)(a) of the Proposal for a Directive on Consumer Credit, of 30 June 2021, endorse a continuous human-machine interface, the third viewpoint on how credit analysts shall, at least theoretically, interact with AI software[61]. By establishing this legal requirement of an *ex-post* interface, the EU legislator exhibits, once again, the aspiration to control the decision-making processes on consumer credit *via* autopathy. However, from the outset, it is doubtful that an *ex-post*-human involvement would mitigate the adverse effects resulting from group discrimination[62]. As previously elucidated, numerous credit applications exist in which the analysts (will) face scenarios where the lack of knowledge, expertise and reaction time is notorious. Given these constraints, and after determining that systems' reliability levels are minimally satisfactory, it is proposed, in this regard (and even more so in the current state-of-the-art), that it is better to outsource (almost *in toto*) the performance of this computational task to the software itself[63]. Therefore, we believe that, especially in Big Data environments, granting full operational autonomy to

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[59] Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, p. 16; Hussein Abdou/John Pointon, «Credit scoring, statistical techniques and evaluation criteria…», *cit.*, pp. 63-64.

[60] Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, pp. 7-8; Naem Siddiqi, *Intelligent Credit Scoring: Building and Implementing Better Credit Risk Scorecards,* 2nd ed., New Jersey, John Willey & Sons, 2017, pp. 251-252; Lyn Thomas/David Edelman/Jonathan Crock, *Credit Scoring and Its Applications: Monographs on Mathematical Modeling and Computation*, 2nd ed., Philadelphia PA, Society for Industrial and Applied Mathematics, 2002, p. 3; David Hsia, «Credit Scoring and the Equal Credit Opportunity Act», *Hastings Law Journal*, vol. 30, no. 2, 1978, pp. 372-375 (pp. 371-448).

[61] Henry Kissinger/Eric Schmidt/Daniel Huttenlocher, *The Age of AI: and our Human Future*, New York, Little, Brown and Company, 2021, p. 21, generally.

[62] TAlia Gillis, «The Input Fallacy», *Minnesota Law Review*, vol. 106, no. 1175, 2022, pp. 78-79 (pp. 1-86).

[63] Gianclaudio Malgieri, «Automated decision-making in the EU Member States: The right to explanation and other 'suitable safeguards' in the national legislations», *Computer Law & Security Review*, vol. 35, no. 5, 2019, p. 22 (pp. 1-26); Meg Leta Jones, «The right to a human in the loop: Political constructions of computer automation and personhood», *Social Studies of Science*, vol. 47, no. 2, 2017, p. 224 (pp. 216-239).

the AI software, and investing the analyst in a Human-Out-of-Control status, is more an issue of necessity than of axiological-normative convenience[64].

Also, in this regard, Giovanni Sartor raises a pertinent key challenge: does the improved performance of machines – even considering the political and legal values at stake, e.g., ensuring equal and fair opportunities for all candidates – not make the anthropomorphic intervention redundant or dysfunctional[65]? At best, it seems that the human meddling in this kind of decision-making could, at most, be traced back to some incomputable minor moral aspects – i.e., legal or ethical grounds mathematically impossible to describe or predict by the sort of DM and ML models[66]. In any case, it is worth highlighting that Article 18(6)(a) of the Proposal for a Directive on consumer credits, of 30 June 2021, must be interpreted in accordance with its Recital 47. Consequently, even if the score inferred traduces an estimation of conceivable future-proof default, there will be case types in which financial inclusion leads credit to be granted by way of exceptional referrals[67]. Such events involve, for instance, long-term clients, educational loan agreements and circumstances in which credit are taken out to cover health care costs or even those for disabled consumers.

To summarise this safeguard, from winter judgemental systems to recent technological breakthroughs, AI systems have shown an ability to operate quite successfully and autonomously in fields such as creditworthiness assessment[68]. We do not deny, however, that future scientific findings in consumer AI-based credit scoring may enable a more and better combination of human and artificial intelligences, considering the strengths and weaknesses of both. If it comes to engineering feasibility, it can already be considered a tangible supervision that, in practice, enables credit analysts to deduce the causational or correlational process – still opaque today – and, in the final, reverse the decision if (or when) needed to[69]. Taking in account this background, the burden of human interven-

[64] Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, p. 16.

[65] Giovanni Sartor, «The impact of the General Data Protection Regulation (GDPR) on artificial intelligence», *cit.*, p. 61.

[66] Mireille Hildebrandt, «Privacy as a protection of the incomputable self: from agnostic to agonistic machine learning», *Theoretical Inquiries in Law*, vol. 20, no. 1, 2019, pp. 91-93 (pp. 83-121).

[67] Hussein Abdou/John Pointon, «Credit scoring, statistical techniques and evaluation criteria…», *cit.*, p. 64; Raymond Anderson, *The Credit Scoring Toolkit: Theory and Practice for Retail Credit Risk Management and Decision Automation*, New York: Oxford University Press, 2007, p. 105.

[68] Giovanni Sartor, «The impact of the General Data Protection Regulation (GDPR) on artificial intelligence», *cit.*, p. 62.

[69] *Ult. loc. cit.*

tion provides, at least, an additional safeguard to the data subjects, which can be translated sometimes into the possibility of challenging the decision, fighting for overrides and, in the final, if justifiable, reverse the decision.

ii) Ex-ante transparency requirements and the (chimerical) right to ex-post explanations: a trade-off between 'traceability' and 'accuracy' that no one remembers

Given this background, it is worth reflecting on data protection transparency and explainability regime since its rules still portray intricate feasible safeguards granted to (cyber) consumers in matters of creditworthiness assessment.

Generally, transparency represents an ethical imperative or legal good, for all due purposes, embodied as a right of the data subject under the terms of Articles 12, 13(2)(f), 14(2)(g) and 15(1)(h) of the GDPR and, indirectly, now in Articles 13 and 52 of the Proposal for an AI Act. It bears the capacity that the lender may exhibit, on an *ex-ante* basis, as to the provision and granting access to the information in what concerns the general logic underlying automated decision-making. The boundaries of transparency in AI-based scoring therefore relate to the generic intelligibility, both for the controller and the data subject, of the inferential logic that will be carried out[70]. This mandatory value must thus be met from a regulatory by design and by default viewpoints – also following Article 18(6)(b) of the Proposal for a Directive on consumer credits, of 30 June 2021 – by providing (cyber) consumers with a clear and plain explanations of the concrete creditworthiness assessment made. This procedure should clarify, *ex-ante*, both the fuzzy logic inherent to induction and the importance of this procedure for promoting responsible credit and preventing over-indebtedness, as well as (or rather, above all) clarifying the potential risks of group discrimination that this DM and ML modelling entails.

From the self-determination and axiological-normative perspective, only a complete understanding of both the general logic behind and the inherent risks of scoring will enable the exercise of an alleged right to an *ex-post* explanation, theoretically envisaged in Article 22(3) of the GDPR, by following the expression used in Recital 71 thereof. Interpreting the existence and scope of a right to *ex-post* explanation in the context of automated individual decision-making, including profiling, has triggered a heated debate in the European doctrine. In 2016, Bryce Goodman and Seth Flaxman, while pointing out the technical hindrances and the ambiguity of the regulatory writing, argued any appropriate legal linkage between Article 22(3) of the GDPR and its Recital 71 demands that any

[70] Emre Bayamliglu, «Transparency of Automated Decision in the GDPR: An Attempt for Systematisation», in *Tilburg Institute for Law, Technology and Society*, January 2018, pp. 26-28, available at https://dx.doi.org/10.2139/ssrn.3097653 [accessed on 21/06/2022].

adequate explanation should, at the very least, describe how the data collected is articulated with the predictions exhorted[71]. However, such an articulation would need to assume greater clarity, intelligibility and understanding of the modelling techniques from the soft computing programming to the concrete modelling output, which does not occur in the actual engineering state-of-the-Article. Meanwhile, in 2017, Sandra Wachter, Brent Mittelstadt and Luciano Floridi have challenged not only the existence of a right to *ex-post* explanation but also its viability[72]. Andrew Selbst and Julia Powels strongly criticised this paper, considering that theory as an overreaction that strongly contribute to distort the debate about this right[73]. For them, although recitals have no binding nature, they carry a decisive impact on the interpretation of the EU norms[74]. Indeed, not only Andrew Selbst and Julia Powels, but also Lilian Edwards, Michael Veale and, more recently, Tiago Sérgio Cabral, concluded the existence of a right to an *ex-post* explanation because of the information and access duties provided for in Articles 13(2)(f), 14(2)(g) and 15(1)(h), all of the GDPR[75]. Regarding this issue, we follow the position adopted by Sandra Wachter, Brent Mittelstadt and Luciano Floridi in 2017. In other words, the exercise of the rights to information and access by the data subject shall be positioned *ex-ante*, i.e., before this kind of autonomous

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[71] Byce Goodman/Seth Flaxman, «EU Regulations on Algorithmic Decision-Making and a 'Right to Explanation'», *AI Magazine*, vol. 38, no. 3, 2016, p. 55 (pp. 50-57).

[72] Sandra wachter/Brent Mittelstadt/Luciano Floridi, «Why a Right to Explanation of Automated Decision-Making Does Not Exist in the General Data Protection Regulation», *International Data Privacy Law*, vol. 7, no. 2, 2017, p. 80 (pp. 76-99).

[73] Andrew Selbst/Julia Powles, «Meaningful Information and the Right to Explanation», *International Data Privacy Law*, vol. 7, no. 4, 2017, p. 234 (pp. 233-242).

[74] In fact, recitals are useful interpretative tools in the EU legal order, helping out solve ambiguities by to explaining the purpose behind GDPR generic and abstract provisions. In any case, the case law of the CJEU does not give to the preamble of an EU normative act any autonomous legal effect. As such, since the application of EU law is also based on the principles of certainty and legitimate expectations, the recitals should in no way have any derogating (or additional, i.e., any positive axiological-normative) effect vis-à-vis the requirements laid down in the provisions. ECJ, of 19 November 1998, *Helsingborgs tingsrätt vs. Gunnar Nilsson, Per Olov Hageigren, Solweig Arrborn,* ECLI:EU: C:1998:554, para. 54; ECJ, of 13 July 1989, *Casa Fleischhandels-GmbH vs. Bundesanstalt für landwirtschaftliche Marktordnung*, ECLI:EU:C:1989:331, para. 31; Roberto Barata, «Complexity of EU law in the domestic implementing process», *The Theory and Practice of Legislation*, vol. 2, no. 3, 2014, pp. 302-303 (pp. 293-308); Tadas Klimas/Jurate Vaiciukait, «The Law of Recitals in European Community Legislation», *ISLA Journal of International & Comparative Law*, vol. 15, no. 1, 2008, p. 62 (pp. 61-93).

[75] Tiago Sérgio Cabral, «AI and the Right to Explanation…», *cit.*, pp. 38-50; Lilian Edwards/Michael Veale, «Slave to the algorithm? Why a 'right to explanation' is probably not the best remedy we are looking for», *Duke Law and Technology Review*, vol. 16, no. 1, 2017, p. 22, p. 81 (pp. 18-84); Andrew Selbest/Julia Powles, «Meaningful Information and the Right to Explanation», *cit.*, p. 237.

processing is carried out[76]. Consequently, (joint) controllers or processors must provide or concede access, in an *ex-ante* prism, only to information regarding "the logic involved, as well as the significance and the envisaged [general] consequences of such processing for the data subject". Article 29 Data Protection Working Party, in its guidelines adopted on 3 October 2017, as last revised and adopted on 6 February 2018, does not support this understanding, following the position initially claimed by Andrew Selbst and Julia Powles in 2017[77]. However, it appears that these alternatives do not provide neither to controller nor to data subjects, *in toto* – especially within the current engineering practices – a complete comprehension of whether and what kind of *ex-post* explanations data controllers are bound to provide to the latter (i.e., consumers).

First, as a matter of fact, from a technological approach, the implementation of Explainable Artificial Intelligence (XAI) techniques – from the DARPA project launched in May 2017[78] – reinforces a trade-off between transparency and the classification's accuracy. In fact, nowadays, a personalised *ex-post* explanation entails lower reliability levels compared to the original model's precision[79]. Therefore, a right to *ex-post* explanation also implies a breach of the principle of accuracy, as enshrined in Article 5(1)(d) of the GDPR. Explainability approaches thus constitute looping bulwarks conceived nowadays as a legal policymaking for the decision-making jigsaw that, until now, when and if subject to XAI techniques, mature larger error margins[80]. This legal dead-end also occurs because the current explainability techniques do not provide tangible explanations with sufficient self-informational details. Moreover, determining which data point will have a decisive influence on the direction of the decision appears to be more

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[76] Sandra Wachter/Brent Mittelstadt/Luciano Floridi, «Why a Right to Explanation of Automated Decision-Making…», *cit.*, p. 78. Not to mention that if an explanation is considered an adequate guarantee and a corollary of transparency (Article 12 of the GDPR), the principle of *ne bis in id*em would be breached. We should not forget that any breach of the chimerical 'right' foreseen in Article 22 and non-complying with the principle of transparency – as enshrined in Article 5(1)(a) of the GDPR – will be subject to administrative fines or penalties, up to 20 000 000, 00 EUR or, in the case of a company, up to 4% of its annual worldwide turnover (Article 83 (5)(a)(b) of the GDPR).

[77] WP.29, «Guidelines on Automated individual decision-making and Profiling…», *cit.*, p. 16.

[78] David Gunning/David Aha, «DARPA's Explainable Artificial Intelligence Program», *AI Magazine*, vol. 40, no. 2, 2019, p. 44 (pp. 44-58).

[79] Cynthia Rudin, «Stop explaining black box Machine Learning models for high stakes decisions and use interpretable models instead», *Nature Machine Learning*, vol. 1, no. 5, 2019, pp. 207-208 (pp. 206-215).

[80] AI HLEG, «Ethics Guidelines for Trustworthy AI», April 2019, p. 18, available at https://www.europarl.europa.eu/cmsdata/196377/AI%20HLEG_Ethics%20Guidelines%20for%20Trustworthy%20AI.pdf [accessed on 21/06/2022].

fruitful when the model is designed rather than when it is implemented on the market or put into service.

Until now, at least one practical solution was presented by the doctrine regarding the alternatives of compliance *vis-à-vis* the idiosyncratic demands of a casuistic *ex-post* explanation. In effect, Sandra Wachter, Brent Mittelstadt and Chris Russell proposed, in 2018, the assumption of a counterfactual recommendation modelling[81], engineering feasible by way of Local Interpretable Model-Agnostic Explanations (LIME). This explanation subtype postulates that controllers must clarify the predictive characteristics that need to be changed to interpret (and, if applicable) to reverse a rejection or, alternatively, to understand the predominant traits that lead to the acceptance of a particular loan application[82]. However, this theory does not proceed considering the Proposal for a Directive on Consumer Credit, of 30 June 2021. By reference to the adequate explanations referred to in its Article 12 – a provision that does not make it clear whether these clarifications should be provided before or after the assessments – its Recital 39 demands that explainability cannot be reduced, nor should it constitute, a personalised recommendation.

So, in domains like AI-based consumer credit scoring, all that remains is to follow the path of ensemble explanations, which are simply implemented through interpretability layers in the ML models but not solve at all the issue of accuracy deterioration[83]. Additionally, joint explanations are generic; although coherent with syntax and semantics, they do not contextualise the pragmatics of decision-making[84].

From theory to practice, Fábio Silva, and Cesar Analide's 2011 case study (see, Figure 1, below) may help understand, in practice, today's imbroglio of a

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[81] Diogo Morgado Rebelo, «On the way to look at *Big Data* as an asset for CWA 4.0.…», *cit.*, p. 20; Sandra Wachter/Brent Mittelstadt/Chris Russel, «Counterfactual Explanations without Opening the Black Box», *Harvard Journal of Law and Technology*, vol. 31, no. 2, 2018, pp. 844-846 (pp. 841-887).

[82] Rory Grath (*et al.*), «Interpretable credit application predictions with counterfactual explanations», in *arXiv preprint*, 2018, pp. 3-5 (pp. 1-9), available at https://arxiv.org/pdf/1811.05245.pdf [accessed on 28/09/2022].

[83] DAvide Carneira/Fábio Silva/Miguel Guimarães/Paulo Novais, «Explainable Intelligent Environments», in Paulo Novais/Gianni Vercelli/Josep Larriba-Pey/Francisco Herrera/Pablo Chamoso (coords.), *11th International Symposium on Ambient Intelligence*, Cham, Springer, 2020, p. 36 (pp. 34-43)

[84] Chaofan Chen (*et al.*), «An interpretable model with globally consistent explanations for credit risk», *arXiv preprint*, 2018, p. 6 (pp. 1-10), available at https://arxiv.org/pdf/1811.12615.pdf [accessed on 28/09/2022].

right to an *ex-post* explanation at a multi-agent business level[85]. To make it clear, while explanations assist in understanding, generally, what could be changed during modeling to receive accurate outputs in the future, interpretative rule-proof "describes [how] a minimal change to the input would result in the opposite prediction" [86].

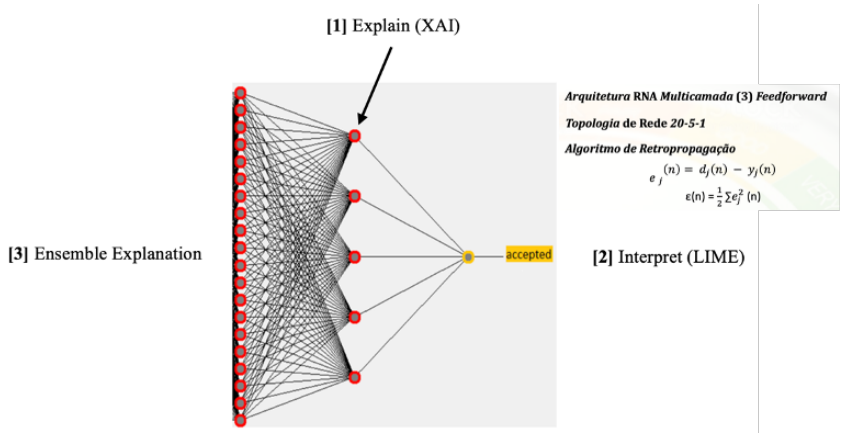

Figure 1. Classification agent designed by Fábio Silva/Cesar Analide, «Information asset analysis: credit scoring and credit suggestion», *International Journal of Electronic Business*, no. 9, 2011, p. 208 (pp. 203-218).

XAI	Flag the data point corresponding to the first node of the second layer as the one that had led to the approval.
LIME	Score X was returned ("approval") because variables Y had values (y1, y2…) associated with them. If Y instead had valued (y'1, y'2, …), and all other variables had remained constant, score x' would have been returned "Rejected".
Ensemble	In a sizeable sample of 7000 requests, all applicants who declared a salary over 1,5000 € and had expenses under 1,200.00 € were accepted.

[85] A software agent has more robust and more particular significance than the autonomy trait commonly identified in Article 3(1) of the AI Act Proposal. It refers to an autonomous system that exhibits mentalistic notions of knowledge, beliefs, intention or obligations and has social ability, reactivity and pro-activeness attributes. See, on the weak and strong notion of agents. Michael Wooldridge/Nicholhas Jennings, «Intelligent agents: theory and practice», *The Knowledge Engineering Review*, 1995, pp. 116-117 (pp.115-152).

[86] Cynthia Rudin, «Stop explaining black box Machine Learning models for high stakes decisions and use interpretable models instead…», *cit.*, p. 210.

As it is now clear, notwithstanding the progress revealed by the obligation to inform the logic inherent, some doubts are still raised by controllers and national Data Protection Authorities[87]. Legal experts increasingly reveal the need to acquire multidisciplinary knowledge so that looping policies, which hinder technological breakthroughs, are not adopted. Engineers have faced a truthful black hole for explanations over predictive modelling.

Also, the boundary between this 'suitable' safeguard and the intellectual property rights on formulas, credit management policies, the software design method, tools or even on the compilations of financial information, often subject to trade secrets and anti-competition protection, is not clear[88]. In this regard, the one concerning Recital 63 of the GDPR, the trend in German case law suggests that the information (joint) controllers must provide is limited to the general logic – *ex-ante* or *ex-post* – that governed the concrete and exclusive automated decision[89].

Having this said, it can be guaranteed that the requirements demanded by the GDPR – and, nowadays, those resulting from Article 13.º of the Proposal for an AI act, and Articles 12 and 18(6)(b) of Proposal for a Directive on consumer credits, of 30 June 2021 – in terms of transparency and explainability, impose restrictions that do not provide enough clarification as to the legal-engineering scoring practices to be pursued by lenders.

On the one hand, from an *ex-ante* standpoint, there are still generic transparency obligations under Article 12 of the GDPR. On the other, the specific

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[87] Landesverwaltungsgericht Wien, VGW-101/042/791/2020-44, de 11. Februar 2022, *cit.* in. Sebastião Vale/Gabriela Zanfin-Fortuna, «Automated Decision-Making Under the GDPR…», *cit.*, pp. 19-20. In this context, national Data Protection Authorities tend to interpret this dispute in the sense that specific transparency obligations should require those responsible for providing an ex-post explanation of the meaning of the acceptance or rejection decision. Suppose the CJEU adopts this understanding. In that case, lenders will have to draw up a list of the specific categories of personal data impregnated in the scoring models, as well as determine, via interpretation or explanation – with the respective repercussions in terms of accuracy that both approaches entail – those input variables that predominated in the induced outputs. As such, technical-mathematical explanations, access to algorithms, models, or even detailed information on the AI computer systems developed and implemented are excluded from this scope of informational self-determination. *Ibidem*, p. 19. Specifically, for the Norwegian supervisory authority (Datatilsynet), the latter conglomerate of information is not per se deemed to fall within the framework of what is understood to be personal data under the Article 4(1) of the GDPR. Datatilsynet, «Artificial Intelligence and Privacy», Report 2018, p. 19, available at https://www.datatilsynet.no/globalassets/global/english/ai-and-privacy.pdf [accessed on 21/06/2022].

[88] Federico Ferretti/Daniela Vandone, *Personal Debt in Europe*…, *cit.*, p. 169; Maria Iglesia/Sheron Shamulia/Amanda Anderberg, «Intellectual Property and Artificial Intelligence: A literature review», JRC Technical Report, Luxembourg, 2021, pp. 20-21, available at https://publications.jrc.ec.europa.eu/repository/handle/JRC119102 [accessed on 21/06/2022].

[89] BGH, 28 Januar 2014, *Schufa VI ZR* 156/13, para. 10 and para. 17.

obligations that may result – if this is the case, by adopting an alternative understanding – from the rights of information and access under Articles 13(2)(f), 14(2)(f) and 15(2) of the GDPR – are still vague and ambiguous. Once again, the law-technology lag is not yet able to understand how to provide data subjects explanations about "the [general] logic involved, as well as the significance and the envisaged consequences of such processing (...)". Truthfully, fields like AI-based creditworthiness assessment are of such empirical complexity that only an interdisciplinary convergence between academics in the areas of law, ethics, psychology of decision-making and information technology can provide the most pragmatic determination of this – for the time being, chimerical – appropriate measure.

iii) Contestability of the creditworthiness assessment

Nowadays, since creditworthiness assessment involves the greater use of AI-based scoring mechanisms, the data subject is also granted the possibility of expressing his or her point of view, contesting the assessment and the decision itself – according to Article 22(3), also following what is the writing draft of Article 18(6)(c) of the Proposal for a Directive on consumer credits, of 30 June 2021. To this end, the effective exercise of this contestability would presuppose – because this is not yet the case – the undeniable fulfilment of three assumptions. Firstly, the data subject must consciously perceive that he or she is being submitted to a decision exclusively based on automated processing. Secondly, consumers must understand, in a minimally holistic, objective, and realistic manner, the effects – both positive and negative – that profiling his or her solvency may entail. That is, as argued above, any automated acceptance or rejection of a loan application interferes in his or her legal sphere in a similarly meaningful manner. Along with all these circumstances, data subjects must also be aware of the potential effects of group discrimination that these large-scale processing carry. Lastly – and most importantly – an aptitude for contestability would imply – which is not yet the case, once more – a sufficient understanding of the general logic (let alone the concrete traceability) that presides over the operation of DM and ML software allocated to these tasks.

3.4. What now?

GDPR compliance is an option of complex and unfeasible implementation in what esteems automated decision-making[90]. When using scoring based

[90] For all due purposes, it is worth recalling that, according to Article 18(4) of the Proposal for a Directive of 30 June 2021, credit shall only be granted (or, in the case of revolving credit, an increase in the amount borrowed) if the result of the creditworthiness assessment predicts the future fulfilment of the obligations to which debtors will be bound – with the exception listed in Recital 47 of the latest version of the proposal.

on technologies such as AI, (joint) controller will wonder: how or when to intervene and what information should be provided to data subjects with average technical knowledge – if any – or with low financial and digital literacy skills?

On the one hand, the rationale underlying predictive modelling does not allow credit analysts to interfere anyhow in the automated decision-making process – even *ex-post* – nor, on the other hand, will the data subject understand the non-traceable logic inherent from model inputs to outputs. Consequently, nowadays, lenders must face many burdens while trying to observe privacy-friendly provisions as the one of consumer creditworthiness, particularly regarding the compliance with human intervention, transparency, and explanation duties. Even for what is considered as adequate explanations, under Article 12 of the Proposal for a Directive, of 30 June 2021, its Recital 39 prohibits any counterfactuals by way of personalised recommendations.

Accordingly, if these pathological deviations, typical of Law in Books, appear to be problematic, the solutions enshrined by the European legislator – namely, under the terms of Article 22(3) of the GDPR, replicated, in essence, by Article 18(6)(a)(b)(c) of the Proposal for a Directive on consumer credits, of 30 June 2021 – also disarm, in the end, jus-interpretative and pragmatic alleys with no feasible engineering background in sight.

So, amid this unfinished symphony of consumer AI-based credit scoring, the data's value shall focus on both individual rights and trade secrets. Perhaps the solution should include the endorsement of educational policies leading to greater digital literacy and autonomy, in addition, of course, to rectifying the regime enshrined in Article 22 of the GDPR. Undoubtedly, the best pathway to follow in this sectorial policy will be traced through more and better info literacy, advantageous to both (jointly) controllers and data subjects. The former, i.e., the lenders, are currently unable to unveil, in technical terms, their duties relative to the feasible measures deemed as adequate guarantees. On the other hand, consumers are tired of trying to understand the ambiguous legal jargon that does not help them understand neither the logic involved nor the possible group discrimination effect. This literacy path in policymaking appears to be the only way to effectively guarantee adequate measures that safeguard all the rights, liberties, and legitimate interests of (cyber) consumers. In the best view, at final, only if the matrices of an effective informational self-determination are met will the data subject be able to express his or her point of view and, if he or she so wishes, challenge the concrete decision machine-made.

4. Conclusion: is Data Protection ready to meet AI-based scoring challenges?

Although the new technologies topic has been one of the main driving forces behind the reform of the EU Data Protection regime, several shortcomings and criticisms have been pointed out to the GDPR about automated decision-making. In addition to the failures that can be detected from a global perspective, the current regime (and the one proposed on 30 June 2021) is inadequate and ill-suited to the effective regulation of AI-based creditworthiness assessment via scoring, usually triggered on a Big Data scale. The GDPR, as well as Articles 12 and 18(6) of the Proposal for a Directive on consumer credits, of 30 June 2021, not only do not provide engineering and psychological answers to the challenges posed by these cutting-edge technologies but also the prerogatives contained therein are expected to be inappropriate in the face of future (if not already current) pragmatic contexts.

It is undeniable: increasingly, the DM and ML models decide – in exclusively automated contours – who get consumer credit or, as the case of rotative credit, to whom analysts shall approve an increase in the amounts borrowed. Above all, it is essential to make (cyber) consumers aware of the need to make their individual choices, adhering to public offers based on the personal data strictly necessary or which is deemed to be of public interest. In what concerns this topic, policymakers shall, once and for all, discuss these issues without mono-disciplinary mental reservations. The regulation in force (or even the one proposed) must foster the correct adjustment between the greater competitiveness or flexibility of lenders and the adequate protection of the data subjects' rights and freedoms. In fact, what is certain is that not all AI impacts are easily regulable. Therefore, traditional, from an axiological-normative viewpoint, policymaking like the one enshrined in Article 22 of the GDPR and Article 18(6)(a)(b)(c) of the Proposal for a Directive on consumer credits, of 30 June 2021, may not work well. Despite the instability of the scoring sector, particularly in the consumer credit market, the awakening of the 'sleeping princess' – e.g., mainly the GDPR – may embody critical elements of a reform that reflects, here, too, increased concerns. Ultimately, the regime in force may even be seen as disproportionate, especially while check and balancing data protection (lay)gorithmics with all the economic interests at stake, frequently undervalued.

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