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**LABOUR LAW AND EFFECTIVENESS OF EU
ANTI-DISCRIMINATION LEGISLATION ON THE GROUNDS
OF DISABILITY DURING THE RECRUITMENT PROCESS:
THE CASE OF THE GENETIC FEATURES**

The jurisprudence of the EU Court of Justice on non-discrimination law emphasises the importance of the notion of “non-deprivation”, a concept derived from the interpretation of the effectiveness (i.e. “effet utile”) in the Directive 2000/78/EC. In the context of discrimination on the grounds of disability in employment and occupation, this perspective is particularly relevant. The paper points out, also in the light of the technological and scientific development of AI, the link between disability and genetic characteristics as discriminatory factor in the EU legal framework, focusing particularly on the recruitment process. The study is complemented by the analysis of the protection of genetic features provided by the EU General Data Protection Regulation (2016) and by the EU Artificial Intelligence Act (2024).

Key words: discrimination, employment, effectiveness, disability, genetic features, artificial intelligence, machine learning, recruitment, privacy

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INTRODUCTION

In “Gattaca”, a late ‘90s dystopian movie, a flashback leads us to the moment of the main character’s childbirth. In the background he says: “my destiny was mapped out before me, all my flaws, predispositions and susceptibilities most untreatable to this day. Only minutes old, the date and cause of my death was already known”; meanwhile, the midwife reads the report: “early fatal potential probability 99% [...] life expectancy 33 years”.¹

This contribution analyses the impact of digital technology and AI machine learning in the context of anti-discrimination legislation. In particular it focuses on the relevance of the connection between genetic features and disability: it argues that specific genetic features can be protected using anti-discrimination legislation on the grounds of disability.²

We deepen the peculiar situation in which the weakness of the subordinate worker is greatest due to the lack of effectiveness of legal protection: the phase of the selective process. Within this framework we adopt a three prongs analysis, taking into account not only the anti-discrimination perspective, but also the European legislation on privacy (namely, the EU General Data Protection Regulation 2016 “GDPR”) and the European regulation on the limits of the use of personal data (namely the EU Artificial Intelligence Act 2024 “EU AI Act”).

THE NOTION OF DISABILITY WITHIN EU LEGAL FRAMEWORK

The Directive 2000/78/EC establishes a general framework for combating discrimination on different grounds:³ disability is among of the limited hypotheses included in its exhaustive list (art. 1).

¹ Andrew Niccol, *Gattaca*, Sony Pictures Releasing, 1997.

² In the similar perspective see Prof. Aisling De Paor’s research and, in particular: Aisling De Paor, *Genetics, disability and the law. Towards an EU legal framework*, Cambridge University Press, Cambridge, 2017; Aisling De Paor, “Genetic Discrimination in Employment: The Relevance of the United Nations Convention on the Rights of Persons with Disabilities”, *The United Nations Convention on the Rights of Persons with Disabilities. Comparative, regional and thematic perspectives* (eds. Charles O’Mahony, Gerard Quinn), Intersentia, London, 2015; Aisling De Paor, “Disability and genetics: new forms of discrimination?”, *Routledge handbook of disability law and human rights* (eds. Peter Blanck, Eilíonóir Flynn), Routledge, London, 2016.

³ The bibliography on EU anti-discrimination and equality law is extensive. For a general overview and further bibliographical references see, among other recent contributions: Lucia Serena Rossi, Federico Casolari (eds.), *The principle of equality in EU law*, Springer, Heidelberg, 2017; Evelyn Ellis, Philippa Watson, *EU anti-discrimination law*, Oxford University Press, Oxford, 2012; Sandra Fredman, *Discrimination law*, Oxford University Press, Oxford, 2022; Ljubinka Kovačević,

The meaning of disability is shaped by the CoJ case-law; in one of the most recent judgements the Court confirms that “according to the case-law, the concept of ‘disability’ within the meaning of that directive has to be understood as referring to a limitation that results in particular from long-term physical, mental or psychological impairments, which, in interaction with various barriers, may hinder the full and effective participation of the person concerned in professional life on an equal basis with other workers”⁴.

The Directive stresses the link between non-discrimination and equal treatment, based on the principle of effectiveness: “the purpose of this Directive is to lay down a general framework for combating discrimination [...] with a view to putting into effect in the Member States the principle of equal treatment’ (art. 1). From an operational perspective it means that, to reach the final goal (the equality), the non-discrimination legislation had to be interpreted in the most efficient way. A confirmation of this general approach arises from art. 5 on reasonable accommodation for person with a disability, which states that ‘in order to guarantee compliance with the principle of equal treatment [...] employers shall take appropriate measures, where needed in a particular case, to enable a person with a disability to have access to, participate in, or advance in employment, or to undergo training, unless such measures would impose a disproportionate burden on the employer.”⁵

The CoJ jurisprudence is inspired by the above-mentioned “effectiveness approach”. A clear example is represented by the recognition of the notion of discrimination by association, in a case on discrimination on the grounds of disability

“Gender Perspective of Development of Labour Law”, *Gender perspectives in private law* (eds. Gabriele Carapezza Figlia, Ljubinka Kovačević, Eleonor Kristoffersson), Springer, Heidelberg, 2023; Uladzislau Belavusau, Kristin Henrard (eds.), *EU anti-discrimination law beyond gender*, Bloomsbury Publishing, London, 2018.

⁴ EU Court of Justice, C-485/20, *XXXX v. HR Rail SA*, 10 February 2022; similarly see: EU Court of Justice, C-335/11, *HK Denmark*, 11 April 2013; EU Court of Justice, C-397/18, *Nobel Plastiques Ibérica*, 11 September 2019. The “European” definition of disability derives from the art. 1 of the UN Convention on the Rights of Persons with Disabilities which states that “persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others”.

⁵ In the preamble of the Directive, recitals n. 16 and n. 20 enlighten that “the provision of measures to accommodate the needs of disabled people plays an important role in combating discrimination on grounds of disability” and these accommodations can consist in “effective and practical measures to adapt the workplace to the disability, for example adapting premises and equipment, patterns of working time, the distribution of tasks or the provision of training or integration resources”.

where the CoJ underlines that the Directive interpretation has to avoid depriving the directive of an “important element of its effectiveness”.⁶

In line with this approach based on the effectiveness of non-discrimination legislation, we propose to extend protection by establishing a link with non-discrimination on the grounds of genetic features. It is known that the ground of “genetic features” is listed only in the art. 21 (on non-discrimination) of the Charter of fundamental rights of the European Union.⁷ Therefore, there is no direct legal basis at EU level to protect against discrimination based on genetic characteristics.⁸ Nevertheless, we argue that it is possible to adopt a broad interpretation, in the light of principles above mentioned: so, a particular genetic heritage can definitely be considered a potential element of disability.

GENETIC FEATURES, TECHNOLOGIC EVOLUTION, BIG DATA

In the light of the GDPR, biometric data constitute a “special category of personal data” to classify as “high-risk”, underlying also that “technical inaccuracies of AI systems intended for the remote biometric identification of natural persons can lead to biased results and entail discriminatory effects”. In addition, in the light of data protection legislation, people with a disability are protected as members of a vulnerable group.

There are various overlaps between privacy and AI legislation on the use of biometric data. On the one hand, the problem arises because of the lack of legislative effectiveness and, on the other hand, because these disciplines do not provide specific protection under labour law. Moreover, the regulatory structure for privacy and for AI legislation appears to be based on a checks and balances approach and the implementation of the precautionary principle (see *infra*). These legal techniques leave gaps in terms of efficiency. For these reasons, we believe that anti-discrimination legislation, with its high level of effectiveness and its approach

⁶ EU Court of Justice, C-303/06, *Coleman*, 17 July 2008; see also EU Court of Justice, C-83/14, *Chez*, 16 July 2015.

⁷ On art. 21 of the Charter see, e.g. Hanna Eklund, Claire Kilpatrick, “Article 21. Non-Discrimination”, *Charter of Fundamental Rights of the European Union* (eds. Steve Peers, Tamara Hervey, Jeff Kenner, Angela Ward), Bloomsbury Publishing, London, 2021, 615; Mariana Canotilho, Sergio Maia Tavares Marques, “Article 21. Non-discrimination”, *The Charter of Fundamental Rights of the European Union. A commentary* (eds. Alessandra Silveira, Larissa Araújo Coelho, Maria Inês Costa, Tiago Sérgio Cabral), UMinho Law School, Braga, 2024, 212.

⁸ Art. 51 of the Charter states clearly that “this Charter does not establish any new power or task for the Community or the Union, or modify powers and tasks defined by the Treaties”.

based on targeting vulnerable groups, is a key to ensure a real and effective protection for workers, also during the recruitment process.

As we have mentioned *supra*, a relevant example of discrimination based on disability in the light of genetic features is the (ab)use of genetic data. A “European definition” of biometric data is contained in art. 3 of GDPR which states that “biometric data means personal data resulting from specific technical processing relating to the physical, physiological or behavioural characteristics of a natural person, such as facial images or dactyloscopy data”⁹.

In the foreseeable future genetic data will be increasingly easier and cheaper to obtain by employers, even remotely, including through biometrics.¹⁰ Once obtained, data can be stored and transferred,¹¹ waiting for more developed technologies or for more sensitive machine learning processes: we are facing not only an ongoing risk, but also massive (event unlimited) potential risks in the future.¹²

As we argued, biometric data can be easily linked with discrimination on the grounds of disability; but it is possible to outline a link with various forms of inter-sectional discrimination: disability and gender (some diseases are statistically more prevalent among a particular gender)¹³, disability and ethnicity (some diseases are

⁹ The article also distinguishes between “real time” and “post” remote biometric identification systems.

¹⁰ With reference to mental illness, it has already been correctly observed that “it is evident that mental illness is an important issue in the workplace and that employers may ultimately seek to use genetic testing (and genetic information) as a tool in the recruitment and retention of employees” and that “in the absence of legal protections, employers may ultimately use genetic technologies as a (predictive) tool of discrimination to identify or avoid those with mental illness and those with predisposition to mental illness”. Aisling De Paor, Charles Patrick O’Mahony, “The need to protect employees with genetic predisposition to mental illness? The UN Convention on the Rights of Persons with Disabilities and the case for regulation”, *Industrial Law Journal*, No. 4, Vol. 45, 2016, 554–555.

¹¹ For instance, an iris scan can be detected for a specific use, but there is a real risk that it can be archived for other aims in future: see Italian Data Protection Authority, “Cryptocurrencies: on iris in exchange for data, privacy watchdog warns Worldcoin”, provision on 21 March 2024, www.garanteprivacy.it.

¹² European Union Agency for Fundamental Rights, *Preventing unlawful profiling today and in the future: a guide*, Publications Office of the European Union, Luxembourg, 2018.

¹³ See, e.g., Vera Regitz-Zagrosek, Catherine Gebhard, “Gender medicine: effects of sex and gender on cardiovascular disease manifestation and outcomes”, *Nature Reviews Cardiology*, Vol. 20, 2023, 236; Ranjani Somayaji, James D. Chalmers, “Just breathe: a review of sex and gender in chronic lung disease”, *European Respiratory Review*, Vol. 31, 2022, 163; Guillermo García García, Arpana Iyengar, François Kaze, Ciara Kierans, Cesar Padilla-Altamira, Valerie A. Luyckx, “Sex and gender differences in chronic kidney disease and access to care around the globe”, *Seminars in Nephrology*, No. 2, Vol. 42, 2022, 101.

statistically more likely to occur in particular ethnic groups)¹⁴, disability and age (some diseases, especially chronic ones, are statistically more prevalent among older people – or sometimes even among younger people)¹⁵.

THE IMPACT OF INNOVATIVE TECHNOLOGIES

Employers' use of big data is a source of risk and concern for workers, especially in the light of anti-discrimination legislation and at stages where legal protection effectiveness is weaker (namely, during the recruitment process).¹⁶

The use of biometrics poses a particular and exemplary problem. Recent scientific research strongly confirms, for instance, that the eyes are not only the mirror to the soul, but also to the body and to the brain, especially when they are examined by artificial intelligence through a learning machine procedure. Besides, it is observed that “the eye is the only organ allowing direct, non-invasive, *in vivo* observation of microvasculature and neural structures”¹⁷. The prediction or diagnosis

¹⁴ See, e.g., Thomas Alexis LaVeist, Lydia A. Isaac, *Race, ethnicity, and health. A public health reader*, Wiley, Hoboken, 2012; Mark R. Cullen, Adina R. Lemeshow, Leo J. Russo, David M. Barnes, Yaa Ababio, Aida Habtezion, “Disease-specific health disparities: A targeted review focusing on race and ethnicity”, *Healthcare*, No. 4, Vol. 10, 2022, 603; Su-Min Jeong, Dong Hoon Lee, Leandro F.M. Rezende, Edward L. Giovannucci, “Different correlation of body mass index with body fatness and obesity-related biomarker according to age, sex and race-ethnicity”, *Scientific Reports*, Vol. 13, 2023.

¹⁵ Studies on diseases and ageing are numerous: see, *inter alia*, the recent Ye Ella Tian, Vanessa Cropley, Andrea B. Maier, Nicola T. Lautenschlager, Michael Breakspear, Andrew Zalesky, “Heterogeneous aging across multiple organ systems and prediction of chronic disease and mortality”, *Nature Medicine*, Vol. 29, 2023, 1221. Sometimes also with differences among genders: Vivan Castro Lemos, Marilisa Berti de Azevedo Barros, Margareth Guimarães Lima, “Chronic diseases and health conditions in adolescents. Sex inequalities”, *Revista brasileira de epidemiologia*, Vol. 26, 2023.

¹⁶ Sharona Hoffman, “Big data and the Americans with Disabilities Act”, *Hastings Law Journal*, No. 4, Vol. 68, 2017, 777.

¹⁷ Li Zhongwen, Yin Shiqi, Wang Shihong, Wang Yangyang, Quiang Wei, Jiang Jiewei, “Transformative applications of oculomics-based AI approaches in the management of systemic diseases: A systematic review”, *Journal of Advanced Research*, 2024; Zhu Zhuoting *et al.*, “Oculomics. Current concepts and evidence”, *Progress in Retinal and Eye Research*, Vol. 106, 2025, where it is stressed clearly how “oculomics offers an opportunity to enhance our understanding of the interplay between the eye and the body, while supporting development of innovative diagnostic, prognostic, and therapeutic tools. These advances have been further accelerated by developments in AI, coupled with large-scale linkage datasets linking ocular imaging data with systemic health data. Oculomics also enables the detection, screening, diagnosis, and monitoring of many systemic health conditions. Furthermore, oculomics with AI allows prediction of the risk of systemic diseases, enabling risk stratification, opening up new avenues for prevention or individualized risk prediction and prevention, facilitating personalized medicine”.

of the presence of systemic diseases through the analysis of ophthalmic features is a branch of medical science called “oculomics”¹⁸ and this connection has been theorised for many decades, starting with pioneering studies that revealed the link between diabetes and the retina biomarkers or between Alzheimer’s disease and optic-nerve degeneration.¹⁹

Retinal analysis can thus provide a wide range of information about a person’s health and clinical outlook, with connections with generalised diseases such as hypertension, cancer, autoimmune disorders.²⁰ Information that may potentially be collected by the employer when a person applies for a job and is subjected to a selection procedure.

Nowadays, optical coherence tomography is already an extremely economical technique. But there are also some applications for mobile devices which guarantee a remote health screening using AI through a “retina selfie”.²¹ At clinical level, innovative medical tech firms shape quite cheap “handheld non-contact optical instruments for use in healthcare screening and monitoring [that enables the monitoring of] general health conditions such as diabetes and Alzheimer’s disease”.²²

Many papers, in general terms, stress how the hunt for ocular “biomarkers” is a promising area of research (e.g. diabetes, multiple sclerosis, high blood pressure, attention deficit and hyperactivity disorder, Alzheimer’s disease, autism, schizophrenia, Parkinson’s disease).²³ Some other papers, notably, focus on the contribution

¹⁸ Among the most recent contributions see e.g.: Emily J. Patterson, Alistair D. Bounds, Siegfried K. Wagner, Richard Kadri-Langford, Robin Taylor, Dan Daly, “Oculomics: a crusade against the four horsemen of chronic disease”, *Ophthalmology Therapy*, Vol. 13, 2024, 1427; Alistar Bounds, “Oculomics: a window to the health of the body”, *Pysiscsword.com*, 2 July 2024.

¹⁹ See: E.M. Kohner, A.M. Hamilton, S.J. Saunders, B.A. Sutcliffe, C.J. Bulpitt, “The retinal blood flow in diabetes”, *Diabetologia*, No. 1, Vol. 11, 1975, 27; D.R. Hinton, A.A. Sadun, J.C. Blanks, C.A. Miller, “Optic-nerve degeneration in Alzheimer’s disease”, *The New England Journal of Medicine*, No. 8, Vol. 315, 1986, 485. For further bibliographical references on the subject, Alicia J. Jenkins, Mugdha V. Joglekar, Anandwardhan A. Hardikar, Anthony C. Keech, David N. O’Neal, Andrzej S. Januszewski, “Biomarkers in Diabetic Retinopathy”, *Review of Diabetic Studies*, No. 1–2, Vol. 12, 2015, 159.

²⁰ L. Zhongwen, Y. Shiqi, W. Shihong, W. Yangyang, Q. Wei, J. Jiewei, op. cit., where a wide analysis of the efficiency of oculomics is focused on cardiovascular and cerebrovascular system, nervous system, endocrine system, blood system, digestive system, urinary system.

²¹ See the US app “Together by Renee”, discussed in Bill Siwicki, “AI innovator talks personalized treatment, telehealth enhancement and ethics”, *Healthcare IT news*, 22 January 2024, <https://www.healthcareitnews.com>, 29. 4. 2025.

²² From website www.ocuity.com.

²³ Matthew R. Land, Parth A. Patel, Tommy Bui, Cheng Jiao, Arsalan Ali, Shadman Ibamasud, Prem N. Patel, Veeral Sheth, “Examining the role of telemedicine in diabetic retinopathy”, *Journal of*

of AI for eye health.²⁴ It is stressed how the use of AI machine learning technology to shape oculomics-based models reaches high performance in predicting systemic diseases such as neurodegenerative disorders, cardiovascular and metabolic conditions.²⁵ A study examines the analysis of eyes by smartphone, and it considers this technique “a cheap and safe method, thus contributing to public policies on population screening”; the research provides “an update on the use of this resource and its future prospects, especially as a screening and ophthalmic diagnostic tool”.²⁶

GDPR AND AI ACT: SOME LEGAL LIMITATIONS DURING RECRUITMENT PROCEDURE

Since we would like to try to investigate the possibility of fighting discrimination on the grounds of disability in recruitment procedure, it is worthy to stress that nowadays one of the most relevant legal perspectives is the use of new technologies, as well as artificial intelligence tools and machine learning. Although this body of legislation is not analysed in detail in this article, it is necessary to briefly illustrate some of its main provisions.²⁷

The major problem from a juridical point of view in using an automatic machine system to help the employer to recruit new employees is to avoid “unfair

Clinical Medicine, No. 12, 2023, 1; John Bedolla, Jess M. Pines, “Diagnosis in telemedicine”, *Evidence-based emergency care: Diagnostic testing and clinical decision rules* (eds. Jess M. Pines, Fernanda Bellolio, Christopher R. Carpenter, Ali S. Raja), Wiley, Hoboken, 2023, 699.

²⁴ Nicholas Sawers, Nigel Bolster, Andrew Bastawrous, “The contribution of artificial intelligence in achieving the sustainable development goals what can eye health can learn from commercial industry and early lessons from the application of machine learning in eye health programmes”, *Frontiers in Public Health*, No. 9, 2021, 1.

²⁵ L. Zhongwen, Y. Shiqi, W. Shihong, W. Yangyang, Q. Wei, J. Jiewei, op. cit.

²⁶ Manuel Augusto Pereira Vilela, Alessandro Arrigo, Maurizio Battaglia Parodi, Carolina da Silva Mengue, “Smartphone eye examination. Artificial intelligence and telemedicine”, *Telemed Journal and e-Health*, No. 2, 2024, 341.

²⁷ The literature on the topic is massive and we have to limit ourselves to a reduced number of bibliographical references: Ifeoma Ajunwa, Daniel Greene, “Platforms at work. Automated hiring platforms and other new intermediaries in the organization of work”, *Work and Labor in the Digital Age*, Vol. 33, 2019, 61; Eva Lacková, “Fragility of pre-contractual labour relations in the light of algorithmic recruitment”, *Diritti lavori mercati*, No. 2, 2022, 71; Henni Parviainen, “Can algorithmic recruitment systems lawfully utilise automated decision-making in the EU?”, *European Labour Law Journal*, No. 2, Vol. 13, 2022, 225; Raphaële Xenidis, Linda Senden, “EU non-discrimination law in the era of artificial intelligence. Mapping the challenges of algorithmic discrimination”, *General principles of EU law and the EU digital order* (eds. Ulf Bernitz et al.), Kluwer Law International, Alphen aan den Rijn, 2020, 151.

hiring algorithms²⁷: namely, algorithms that use arbitrary criteria or result in inconsistent output; a procedure that can become more opaque and more pervasive than human selection.

As it is well known in literature,²⁸ there are different reasons why an algorithm might give rise to discriminatory outcomes.

If the very structure of the algorithm could be designed to unfairly penalise certain people on the basis of legally protected discriminatory factors, in many cases, where artificial intelligence systems are more complex and have machine learning features, the programmer has no way to completely predict from the outset the content of the algorithm, which will depend on the algorithm's self-learning process. Consequently, since learning takes place through statistical analysis of data sets provided by programmers, possible discrimination may result from poor quality of the data themselves, which could reflect the biases of the context in which they originate and disadvantage underrepresented groups. Through the algorithm's self-learning processes, it is thus possible to give rise to dangerous forms of large-scale consolidation and replication of biases still rooted in social reality.

In any case, due to the very functioning of algorithms, and in particular those used for personnel selection, a frequent mode of discrimination is so-called proxy discrimination. Proxy discrimination is the use, in automated decision-making, of data that are in themselves neutral and yet strongly correlated from a statistical point of view with the protected characteristics of workers.

Albeit sparse Italian case law on the subject of automated discrimination in the workplace seems to confirm this hypothesis. The reference, in particular, is to the well-known decision of the Court of Bologna²⁹ in the case involving three labour organizations³⁰ that started an action against the home delivery platform Deliveroo in a case of discrimination against riders on union grounds, described as a ruling that “has been welcomed by most of the literature notably because of its unprecedented nature at European level and, above all, due to the conclusions reached and the reasons leading to the latter”³¹

In the case in question, the company employed an algorithm, called Frank,³² that automatically processed a reputational score based on riders' cancellations of

²⁸ Ifeoma Ajunwa, *The quantified worker. Law and technology in the modern workplace*, Cambridge University Press, 2023, 75.

²⁹ Trib. Bologna 31. 12. 2020, in *Rivista Italiana di Diritto del Lavoro*, 2021, No. 2, II, 175.

³⁰ The local trade unions of Cgil transport federation (Filt), Filcams and Nidil of Bologna.

³¹ Ilaria Purificato, “Behind the scenes of Deliveroo's algorithm: the discriminatory effect of Frank's blindness”, *Italian Labour Law E-journal*, No. 1, Vol. 14, 2021, 170.

³² It was a system used by the Deliveroo platform to manage the delivery riders' workflows.

slots booked with little notice: on this score depended the allocation of the rider's time slots, as riders with the highest score had granted access to the first of the time slots provided by the platform and this allowed them to register themselves into all preferred schedules. Therefore, in concrete terms, the score influenced the work possibilities for workers without distinguishing between absence reasons.

According to the Court, which largely accepted the unions' reconstruction, there had been discrimination on union grounds, since delivery drivers, who had participated in a strike, exercising their constitutionally guaranteed right,³³ would have been unfairly penalized. According to the judge, in particular, the cause of discrimination was found precisely in the "algorithm's blindness" to different situations, which may therefore require different treatment by the platform.

As it was described above, anti-discrimination discipline of the European Union is capable of providing an effective form of protection for all cases of less favourable treatment based on factors such as disability.

There are, however, other normative instruments which, although not designed for the context specific to algorithmic selection, can be applied in this area and studied as tools to prevent discrimination and protect the right to work.

One of the main legal tools to consider is the GDPR. The most relevant provisions for our aim are art. 15 on the right to access, art. 16 on the right to rectification, art. 17 on the right to erasure (or "to be forgotten") and art. 22 on the right not to be subject to automated decisions.

According to art. 15 "the data subject shall have the right to obtain from the controller confirmation as to whether or not personal data concerning him are being processed and, where that is the case, access to the personal data" and to some specific information, including the categories of personal data concerned, the recipients to whom the personal data have been or will be disclosed, and the existence of automated decision-making, including profiling. The data subject has also the right to receive meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject. If any relevant personal information is inaccurate art. 16 give the data subject the right to have incomplete personal data completed and art. 17 assures that data subject data could be erased, when specific grounds apply.

The main important rule in automated individual decision-making, "profiling" included, is surely contained in art. 22; according to this provision "the data subject shall have the right not to be subject to a decision based solely on automated processing, including profiling which produces legal effects concerning him or her

³³ Art. 40 of the Italian Constitution grants every worker the right to strike.

or similarly significantly affects him or her”. It is an important legal principle also described in recital n. 71 of GDPR, which precises that “profiling” consists of any form of automated processing of personal data evaluating the personal aspects relating to a natural person as, for instance, to analyse or predict aspects concerning the data subject’s performance at work. Even if there are who proposes that “article 22(1) is better characterized as conferring upon data subjects a right that they may exercise at their insistence, rather than establishing a general ban on individual decisions based solely on automated processing”,³⁴ various arguments, such as the general logic of GDPR, the human intervention safeguard and the specific risks related to recruitment processes suggest that art. 22 introduces a real prohibition, with some specific exceptions provided by the GDPR. Consequently “employers can employ automated decision-making if some exceptions listed in GDPR Article 22(2) apply and if safeguards required in GDPR Article 22(3) are implemented”³⁵.

The main question that is necessary to understand is what could be the exact meaning of decision based “solely on automated processing” in algorithmic recruitment systems. Literature discussions were generally divided into a narrow and a broad approach. By adopting the narrow approach, it could be possible to define a “solely automated” processing only where there is no human involvement whatsoever in any phase of the process. As it was well-explained “systematic and teleological arguments seem to support the broad approach”.³⁶ By adopting this broader approach, decisions could be defined as “purely automated” even if humans are only nominally involved, as is often the case with many algorithmic recruitment systems.

Some Italian juridical decisions as well as the interpretation of the Italian authority of private data suggest that a broad approach of the definition of “solely automated” process could be the right one. According to the Court of Palermo a “solely automated” process exists even when humans are involved at the beginning phase or during the process, when the final decision is taken by the algorithm.³⁷

³⁴ Luca Tosoni, “The right to object to automated individual decisions. Resolving the ambiguity of article 22(1) of the General data protection regulation”, *University of Oslo Faculty of Law Research Paper*, No. 7, 2021, 25..

³⁵ H. Parviainen, op. cit., 232.

³⁶ *Ibidem*, 236.

³⁷ Trib. Palermo 20. 6. 2023, in *Rivista giuridica del lavoro e della previdenza sociale*, No. 3, II, 2023, 415, commented by Annamaria Donini, “La tutela del diritto di informazione collettiva sui sistemi automatizzati attraverso il procedimento di repressione della condotta antisindacale”. According to the Court *‘sistemi automatizzati utilizzati dalla resistente [Foodinho s.r.l.] risultano sistemi integralmente automatizzati, atteso che in essi l’intervento umano dedotto (e non dimostrato) comunque non interverrebbe*

Very similar were the decisions taken by the Court of Torino³⁸ and by the Italian authority on private data.³⁹

The EU Court of Justice in late 2023 made his very first decision on art. 22 GDPR.⁴⁰ According to its statement art. 22 “lays down a prohibition in principle, the infringement of which does not need to be invoked individually by such a person” (pt. 52), and consequently “the adoption of a decision based solely on automated processing is authorised only in the cases referred to in that Article 22(2)” (pt. 53); according to the Court the concept of decision “refers not only to acts which produce legal effects concerning the person at issue but also to acts which similarly significantly affect him or her” (pt. 44).

The broad scope of the concept of decision is confirmed by recital n. 71 of GDPR that the Court considers essential for the interpretation of art. 22: the purpose pursued consists of protecting individuals against the particular risks to their rights and freedoms represented by the automated processing of personal data, including profiling. Those particular risks are, under the recital n. 71, likely to weigh on the legitimate interests and rights of the data subject, in particular considering of discriminatory effects on natural persons on the basis of racial or ethnic origin, political opinion, religion or beliefs, trade union membership, genetic or health status or sexual orientation. It is therefore important, still according to that recital, to provide suitable safeguards and to ensure fair and transparent processing in respect of the data subject, in particular through the use of appropriate mathematical or statistical procedures for the profiling and the implementation of technical and organisational measures appropriate to ensure that the risk of errors is minimised. According to the EU Court of Justice “constitutes automated individual decision-making within the meaning of that provision, where a third party, to which that probability value is transmitted, draws strongly on that probability value to establish, implement or terminate a contractual relationship with that person” (pt. 73).

nella fase finale, bensì eventualmente solo in quella dell’inserimento dei dati o dell’attivazione del sistema medesimo, in cui la successiva elaborazione e trattamento dei dati ed eventuale decisione finale sono affidati integralmente ad automatismi algoritmici o informatici’ (“the automated systems used by the defendant, Foodinho S.r.l., are fully automated, because any alleged human intervention does not occur in the final phase, but only during data entry or system activation; the subsequent processing and treatment of the data, and any final decisions, are entirely entrusted to algorithmic or computerised automatisms” [English translation by the authors]).

³⁸ Trib. Torino 12. 3. 2024, in *Foro italiano*, No. 4, I, 2024, 128.

³⁹ Garante per la protezione dei dati personali, registro dei provvedimenti n. 675 del 13. 11. 2024, provvedimento n. 10074601 “Foodinho s.r.l.”.

⁴⁰ EU Court of Justice, C-634/21, *Schufa*, 7 December 2023.

Even if the decision was made in a case concerning a credit information agency, this concept could be easily applied to the algorithmic recruitment systems, since both are included in recital n. 71, and the main principle of the “Schufa decision” is that art. 22 must be necessarily interpreted with a broad approach.

The EU AI Act, which was approved for regulating artificial intelligence systems in the European Union, contains a few more tools useful for monitoring algorithmic recruitment systems. According to recital n. 57 “AI systems used in employment, workers management and access to self-employment, in particular for the recruitment and selection of persons [...] should also be classified as high-risk, since those systems may have an appreciable impact on future career prospects, livelihoods of those persons and workers’ rights”.

According to art. 5 on prohibited AI practices in the European Union the use of an AI system that exploits any of the vulnerabilities of a natural person or a specific group of persons due to their age, disability or a specific social or economic situation, with the objective, or the effect, of materially distorting the behaviour of that person or a person belonging to that group in a manner that causes or is reasonably likely to cause that person or another person significant harm must be forbidden (art. 5(1) lett. b).

Art. 6 (together with the annex III) describes on which conditions an AI systems shall be considered to be high-risk. The annex III clarifies that “AI systems intended to be used for the recruitment or selection of natural persons, in particular to place targeted job advertisements, to analyse and filter job applications, and to evaluate candidates” have to be considered as high-risk AI systems, since those systems may have an appreciable impact on future career prospects, livelihoods of those persons and workers’ rights.

It is important to remember that the AI EU regulation specified as AI systems could, in some circumstances as when biometric data are used, can lead to biased results and entail discriminatory effects and the risk of such biased results and discriminatory effects is particularly relevant regarding age, ethnicity, race, sex or disabilities.

In the EU AI Act framework, high-risk systems are subject to a risk management system, which is a ‘planned continuous iterative process’ that covers the entire life of the product, from its design to its placing on the market and, subsequently, its use in different contexts. To comply with this obligation, the supplier (the entity that develops causes the AI system to be developed and places it on the market) must identify and analyse known and reasonably foreseeable risks to the health, safety, and fundamental rights of citizens, both when the system is used in accordance with its intended purpose and under conditions of improper but reasonably foreseeable use.

What is more important, it is required that the human supervisor must be aware of the so-called “automation bias” or the tendency to rely on the output of an AI system without discussing its contents, particularly in relation to “high-risk AI systems used to provide information or recommendations for decisions to be made by natural persons”.

The EU AI Act implements a clear distribution of responsibilities between the provider and deployer of AI systems. The deployer must ensure that the input data are relevant and sufficiently representative. This is the more relevant provision in the context of algorithmic personnel selection. It is an important employer’s duty to ensure that only data that may be relevant to the job aptitude of the candidate are processed and taken into account, preventing, on the contrary, the system from receiving input data that are unrepresentative, distorted or in any case refer to irrelevant characteristics of the worker.

Even if the GDPR and EU AI Act contain some important legal issues to try to avoid automated discriminatory decisions, what is still missing is the possibility to get inside the algorithm to be able to specifically assess how directly or indirectly discriminatory references are being processed.

In fact, national and European patent laws do not provide specific rights of access to the algorithm to protect workers from discrimination in selection processes; and even if national legislation (or national jurisprudence) allows an employee to know the code that concerns him or her, it is very difficult to understand it without the possibility of knowing the entire algorithmic code (usually covered by the secret patent).

In other words, despite these relevant bodies of law, anti-discrimination legislation provides a useful and effective toolbox to protect applicants from the unlawful use of biometric data during the recruitment process.

DISCUSSION

We asked a popular system of AI assistant: “Can you perform early detection and monitoring of systemic diseases if I upload an optical coherence tomography (OCT) image of my eye?” This is the answer: “I can now analyse and describe OCT images, identifying visible features such as retinal layer structure, thinning or swelling, and signs that may be associated with certain eye diseases (e.g. macular degeneration, diabetic retinopathy, glaucoma). I can help interpret general findings in a way that aligns with what is known in current ophthalmology. [...] systemic disease indicators in the eye are subtle and complex, and interpreting them safely requires collaboration with healthcare professionals. [so] I can: describe what’s

visible structurally; point out any notable abnormalities or patterns that could warrant further evaluation; suggest if what's visible is commonly associated with particular eye or systemic conditions (based on medical literature). If you're interested in the future of this field, tools like those mentioned in the study (oculomics plus AI) are actively being developed, and retina-based health screening could become a common tool in personalized medicine! Would you like to upload an OCT image for a general interpretation?"

One of the main issues related to the right to justice is the efficiency of legal protection: in other words, the effectiveness of guaranteed rights. The notion of disability has to be interpreted broadly, as the aim of the anti-discrimination legislation is to extend its effects as far as possible. In the light of a purposive and teleological interpretation, genetic features and genetic heritages are elements that enrich the meaning of non-discrimination on the grounds of disability, a way of ensuring the "effet utile" of the Directive 2000/78/EC. GDPR and EU AI Act are undoubtedly supporting elements to achieve the protection of workers with disabilities: but none of them is a labour law body and they are not designed to guarantee specific protection to workers. Additionally, the effectiveness of anti-discrimination legislation, which is based on a "purposive judicial approach",⁴¹ presumptions, statistical data and a partial reversal of the burden of proof, is crucial to workers' access to justice. It must be considered that, in most countries, workers have access to anti-discrimination proceedings in labour courts with judges experienced in labour law: and the legal context is often quite different when it comes to issues of privacy or the misuse of artificial intelligence. These are the main reasons for the focus on anti-discrimination legislation, which has been shaped to take into particular account the needs of the workers; for this reason, the Directive covers also the most delicate phase of the recruitment selection.

The development of technology and machine learning may have serious implications for the protection of genetic features. Particularly if it is possible to predict a high risk of developing chronic diseases and disabilities by examining biometric data, even remotely, especially when this analysis is carried out with the support of artificial intelligence.

The threat posed by the collection and use of biometric data is already significant, and the outlook is certainly not encouraging. The threat posed by the collection

⁴¹ An implication of the purposive approach is, e.g., an adoption of a particularly broad interpretation of the notion of reasonable accommodation: not only in light of the provision in art. 5, Dir. 2000/78/EC, but also of the UN Convention on the Rights of Persons with Disabilities (2006). For a purposive approach to EU social legislation see, e.g., Nicola Countouris, Mark Freedland (eds.), *Resocialising Europe in a time of crisis*, Cambridge University Press, Cambridge, 2013.

of biometric data is irreversible, as irreversible are the effects of the collection. It is a threat to the protection of the human person, and to the protection of the working person in particular, which will therefore spread like a wave into the future: unless effective and lasting barriers are put in place in time.

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RADNO PRAVO I DELOTVORNOST ANTIDISKRIMINACIONOG PRAVA EU U POGLEDU DISKRIMINACIJE NA OSNOVU INVALIDITETA U POSTUPKU ZAPOŠLJAVANJA: SLUČAJ GENETSKIH KARAKTERISTIKA

Rezime

Sudska praksa Suda pravde EU u oblasti zabrane diskriminacije ističe značaj koji za Direktivu 2000/78/EZ ima koncepcija “nelišavanja” važnog elementa njene delotvornosti (*effet utile*). Ova perspektiva je posebno bitna u kontekstu diskriminacije na osnovu invaliditeta u zapošljavanju i zanimanju. Članak ukazuje, takođe u svetlu tehnološkog i naučnog razvoja veštačke inteligencije, na vezu između invaliditeta i genetskih karakteristika, kao činioca diskriminacije u pravnom okviru EU, naročito u postupku zapošljavanja. Istraživanje je zaokruženo analizom zaštite genetskih karakteristika na osnovu Opšte uredbe EU o zaštiti podataka (2016) i Zakona EU o veštačkoj inteligenciji (2024).

Ključne reči: diskriminacija, zapošljavanje, delotvornost, invaliditet, genetske karakteristike, veštačka inteligencija, mašinsko učenje, postupak zapošljavanja, privatnost

Bibliography

Ajunwa I., *The quantified worker. Law and technology in the modern workplace*, Cambridge University Press, 2023.

Ajunwa I., Greene D., “Platforms at work. Automated hiring platforms and other new intermediaries in the organization of work”, *Work and Labor in the Digital Age*, Vol. 33, 2019.

Bedolla J., Pines J. M., “Diagnosis in telemedicine”, *Evidence-based emergency care: Diagnostic testing and clinical decision rules* (eds. Jess M. Pines, Fernanda Bellolio, Christopher R. Carpenter, Ali S. Raja), Wiley, Hoboken, 2023.

Belavusau U., Henrard K. (eds.), *EU anti-discrimination law beyond gender*, Bloomsbury Publishing, London, 2018.

Bounds A., “Oculomics: a window to the health of the body”, *Pysiscsword.com*, 2 July 2024.

- Canotilho M., Marques S. M. T., “Article 21. Non-discrimination”, *The Charter of Fundamental Rights of the European Union. A commentary* (eds. Alessandra Silveira, Larissa Araujo Coelho, Maria Ines Costa, Tiago Sergio Cabral), UMinho Law School, Braga, 2024.
- Castro Lemos V., de Azevedo Barros M. B., Guimarães Lima M., “Chronic diseases and health conditions in adolescents. Sex inequalities”, *Revista brasileira de epidemiologia*, Vol. 26, 2023.
- Countouris N., Freedland M. (eds.), *Resocialising Europe in a time of crisis*, Cambridge University Press, Cambridge, 2013.
- Cullen M. R., Lemeshow A. R., Russo L. J., Barnes D. M., Ababio Z., Habtezion A., “Disease-specific health disparities: A targeted review focusing on race and ethnicity”, *Healthcare*, No. 4, Vol. 10, 2022.
- De Paor A., “Genetic Discrimination in Employment: The Relevance of the United Nations Convention on the Rights of Persons with Disabilities”, *The United Nations Convention on the Rights of Persons with Disabilities. Comparative, regional and thematic perspectives* (eds. Charles O’Mahony, Gerard Quinn), Intersentia, London, 2015.
- De Paor A., “Disability and genetics: new forms of discrimination?”, *Routledge handbook of disability law and human rights* (eds. Peter Blanck, Eilionoir Flynn), Routledge, London, 2016.
- De Paor A., *Genetics, disability and the law. Towards an EU legal framework*, Cambridge University Press, Cambridge, 2017.
- De Paor A., O’Mahony C. P., “The need to protect employees with genetic predisposition to mental illness? The UN Convention on the Rights of Persons with Disabilities and the case for regulation”, *Industrial Law Journal*, No. 4, Vol. 45, 2016.
- Donini A., “La tutela del diritto di informazione collettiva sui sistemi automatizzati attraverso il procedimento di repressione della condotta antisindacale”, *Rivista giuridica del lavoro e della previdenza sociale*, No. 3, II, 2023.
- Eklund H., Kilpatrick C., “Article 21. Non-Discrimination”, *Charter of Fundamental Rights of the European Union* (eds. Steve Peers, Tamara Hervej, Jeff Kenner, Angela Ward), Bloomsbury Publishing, London, 2021.
- Ellis E., Watson P., *EU anti-discrimination law*, Oxford University Press, Oxford, 2012.
- European Union Agency for Fundamental Rights, *Preventing unlawful profiling today and in the future: a guide*, Publications Office of the European Union, Luxembourg, 2018.
- Fredman S., *Discrimination law*, Oxford University Press, Oxford, 2022.
- García García G., Iyengar A., Kaze F., Kierans C., Padilla-Altamira C., Luyckx V. A., “Sex and gender differences in chronic kidney disease and access to care around the globe”, *Seminars in Nephrology*, No. 2, Vol. 42, 2022.
- Hinton D. R., Sadun A. A., Blanks J. C., Miller C. A., “Optic-nerve degeneration in Alzheimer’s disease”, *The New England Journal of Medicine*, No. 8, Vol. 315, 1986.
- Hoffman S., “Big data and the Americans with Disabilities Act”, *Hastings Law Journal*, No. 4, Vol. 68, 2017.

- Italian Data Protection Authority, "Cryptocurrencies: on iris in exchange for data, privacy watchdog warns Worldcoin", 21 March 2024, www.garanteprivacy.it.
- Jenkins A. J., Joglekar M. J., Hardikar A. A., Keech A. C., O'Neal D. N., Januszewski A. S., "Biomarkers in Diabetic Retinopathy", *Review of Diabetic Studies*, No.1–2, Vol. 12, 2015.
- Jeong S., Lee D. H., Rezende L. F. M., Giovannucci E. L., "Different correlation of body mass index with body fatness and obesity-related biomarker according to age, sex and race-ethnicity", *Scientific Reports*, Vol. 13, 2023.
- Kohner E. M., Hamilton A. M., Saunders S. J., Sutcliffe B. A., Bulpitt C. J., "The retinal blood flow in diabetes", *Diabetologia*, No. 1, Vol. 11, 1975.
- Kovačević L., "Gender Perspective of Development of Labour Law", *Gender perspectives in private law* (eds. Gabriele Carapezza Figlia, Ljubinka Kovačević, Eleonor Kristoffersson), Springer, Heidelberg, 2023.
- Lacková E., "Fragility of pre-contractual labour relations in the light of algorithmic recruitment", *Diritti lavori mercati*, No. 2, 2022.
- Land M. R., Patel P. A., Bui T., Jiao C., Ali A., Ibnamasud S., Patel P. N., Sheth V., "Examining the role of telemedicine in diabetic retinopathy", *Journal of Clinical Medicine*, No. 12, 2023.
- LaVeist T. A., Isaac L. A., *Race, ethnicity, and health. A public health reader*, Wiley, Hoboken, 2012.
- Niccol A., *Gattaca*, Sony Pictures Releasing, 1997.
- Parviainen H., "Can algorithmic recruitment systems lawfully utilise automated decision-making in the EU?", *European Labour Law Journal*, No. 2, Vol. 13, 2022.
- Patterson E. J., Bounds A. D., Wagner S. K., Kadri-Langford R., Taylor R., Daly D., "Oculomics: a crusade against the four horsemen of chronic disease", *Ophthalmology Therapy*, Vol. 13, 2024.
- Pereira Vilela M. A., Arrigo S., Battaglia Parodi M., da Silva Mengue C., "Smartphone eye examination. Artificial intelligence and telemedicine", *Telemed Journal and e-Health*, No. 2, 2024.
- Purificato I., "Behind the scenes of Deliveroo's algorithm: the discriminatory effect of Frank's blindness", *Italian Labour Law E-journal*, No. 1, Vol. 14, 2021.
- Regitz-Zagrosek V., Gebhard C., "Gender medicine: effects of sex and gender on cardiovascular disease manifestation and outcomes", *Nature Reviews Cardiology*, Vol. 20, 2023.
- Rossi L. S., Casolari F. (eds.), *The principle of equality in EU law*, Springer, Heidelberg, 2017.
- Sawers N., Bolster N., Bastawrous A., "The contribution of artificial intelligence in achieving the sustainable development goals what can eye health can learn from commercial industry and early lessons from the application of machine learning in eye health programmes", *Frontiers in Public Health*, No. 9, 2021.
- Siwicky B., "AI innovator talks personalized treatment, telehealth enhancement and ethics", *Healthcare IT news*, 22 January 2024, <https://www.healthcareitnews.com>.

- Somayaji R., Chalmers J. D., “Just breathe: a review of sex and gender in chronic lung disease”, *European Respiratory Review*, Vol. 31, 2022.
- Tian Y. E., Cropley W., Maier A. B., Lautenschlager N. T., Breakspear M., Zalesky A., “Heterogeneous aging across multiple organ systems and prediction of chronic disease and mortality”, *Nature Medicine*, Vol. 29, 2023.
- Tosoni L., “The right to object to automated individual decisions. Resolving the ambiguity of Article 22(1) of the General Data Protection Regulation”, *University of Oslo Faculty of Law Research Paper*, No. 7, 2021.
- Xenidis R., Senden L., “EU non-discrimination law in the era of artificial intelligence. Mapping the challenges of algorithmic discrimination”, *General principles of EU law and the EU digital order* (eds. Ulf Bernitz *et al.*), Kluwer Law International, Alphen aan den Rijn, 2020.
- Zhongwen L., Shiqi Y., Shihong W., Yangyang W., Wei Q., Jiewei J., “Transformative applications of oculosomics-based AI approaches in the management of systemic diseases: A systematic review”, *Journal of Advanced Research*, 2024.
- Zhuoting Z. *et al.*, “Oculosomics. Current concepts and evidence”, *Progress in Retinal and Eye Research*, Vol. 106, 2025.

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