RESOLVING WRONGS IN ALGORITHMIC CONTRACTING: APPLICATIONS OF THE DOCTRINES OF UNCONSCIONABILITY

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Algorithmic contracting has introduced unique complexities to the law. Deterministic algorithms and particularly opaque, non-deterministic machine learning and artificial intelligence systems, can exacerbate existing imbalances between contracting parties. In Quoine Pte Ltd v B2C2 Ltd, the doctrine of mistake could not resolve the dispute concerning algorithmic errors, which caused cryptocurrency trades to execute at 250 times market value. A review of equitable unconscionability in Australia, England, and Singapore shows the doctrine must be reshaped to meet the complexities of algorithmic contracting. We argue that statutory adaptations of unconscionability offer a promising path forward. The High Court of Australia's application in Productivity Partners v Australian Competition and Consumer Commission of a 'system of conduct' under section 21(4)(b) of the Australian Consumer Law and the 'sliding scale' balancing of procedural and substantive unconscionability under section 2-302 of the United States Uniform Commercial Code provide potential avenues for addressing imbalances from algorithmic contracting.

I INTRODUCTION

The rise of algorithmic contracting, where agreements are formed and executed through automated processes rather than direct human involvement, presents significant challenges to established contract law doctrines. As increasingly sophisticated machine learning and artificial intelligence ('AI') systems enter this domain, novel forms of algorithmic contracting may produce unfair or exploitative outcomes or wrongs that existing legal remedies may not be able to address. The Singapore Court of Appeal decision in *Quoine Pte Ltd v B2C2 Ltd* ('*Quoine*')

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illustrates the significant legal and commercial stakes involved.[1] In this case, B2C2 Ltd's ('B2C2') algorithmic trading software executed cryptocurrency trades at approximately 250 times the prevailing market rate due to a system error in Quoine Pte Ltd's ('Quoine') platform, leading to a dispute over whether these trades should be voided.

The majority rejected Quoine's arguments based on mistake at common law and in equity, and unjust enrichment, upholding the validity of these algorithmically executed contracts. A key issue in the Court's analysis was determining how to assess mistake in algorithmic transactions. The majority concluded that for deterministic algorithms (where the software will do precisely what it was programmed to do), the relevant knowledge of the mistake is that of the programmer.[2] The timeframe for this assessment extends from the point of programming through to contract formation.[3] In his dissenting opinion, while Jonathan Mance IJ agreed with the majority on the non-application of unilateral mistake at common law,[4] he found that there was a unilateral mistake in equity.[5]

As the nature of the algorithms in *Quoine* was deterministic, the majority was of the view 'that the existing body of law can be meaningfully adapted to deal with the situation at hand'.[6] It also acknowledged that '[a]lgorithmic trading is an area of dynamic change' which might eventually require 'legislative intervention' should a 'more fundamental redesign of the applicable legal framework' become necessary.[7] However, this reasoning sidestepped the more complex question of how legal principles might apply to truly autonomous contracting systems employing non-deterministic algorithms. These are algorithms capable of developing responses independent of their initial programming. Mance IJ's dissenting opinion confronted the tension between established legal principles and emerging technological realities, emphasising that '[t]he law must be adapted to the new world of algorithmic programmes and artificial intelligence'.[8]

This article explores how doctrines of unconscionability may offer a more flexible alternative to existing doctrines of mistake when addressing conceptual challenges arising from algorithmic contracting wrongs. A more flexible approach becomes especially valuable when considering the use of increasingly autonomous, non-deterministic AI-driven contracting systems, where the causal connection between programmer intent and algorithmic behaviour becomes more and more attenuated.

Part II introduces the characteristics of algorithmic contracting before examining the Singapore Court of Appeal's approach to mistake at common law and in equity in

1 [2020] 2 SLR 20 ('*Quoine*').
2 Ibid 54 [98] (Sundaresh Menon CJ for Sundaresh Menon CJ, Andrew Phang Boon Leong, Judith Prakash JJA and Robert French IJ).
3 Ibid 54–5 [99].
4 Ibid 83 [182] (Mance IJ).
5 Ibid 89–90 [195], 94 [206].
6 Ibid 48 [79] (Sundaresh Menon CJ for Sundaresh Menon CJ, Andrew Phang Boon Leong, Judith Prakash JJA and Robert French IJ).
7 Ibid.
8 Ibid 89 [193].

Quoine. We consider the inadequacy of mistake for tackling conceptual challenges presented by non-deterministic algorithms. Part III undertakes an analysis of equitable unconscionability in Australia, England, and Singapore – identifying the core elements of each approach. We consider their potential applications to address algorithmic contracting scenarios where one party's vulnerability is heightened by opaque or unpredictable code or where the design of the algorithmic system inherently creates exploitative outcomes. Finally, Part IV explores two statutory forms of unconscionability that reflect a more flexible approach to unconscionable transactions: first, the concept of 'system of conduct' under section 21(4)(b) of the *Australian Consumer Law* ('*ACL*'),[9] and second, a 'sliding scale' approach of balancing procedural and substantive unconscionability pursuant to section 2-302 of the *Uniform Commercial Code* ('*UCC*') in the United States of America ('US').

We conclude that statutory adaptations of unconscionability can bridge crucial gaps in contract law's response to wrongs arising from algorithmic contracting systems, including where such systems enable exploitative practices. By recalibrating unconscionability for the age of AI, we can better safeguard fairness and integrity in automated contractual relationships.

II WHEN ALGORITHMIC CONTRACTING GOES WRONG

A What Are Algorithmic Contracts?

The once-speculative idea of parties autonomously entering into algorithmic contracts has now become a reality, prompting the need for judicial, legislative, and regulatory responses to address the challenges posed by algorithmic contracting.[10] Variously labelled 'algorithmic contracts',[11] 'automated contracts',[12] 'contracts formed by software',[13] and 'contracts reached through artificial agents',[14] algorithm-based contracting marks the current epoch in automated contracting, a history that

9 *Competition and Consumer Act 2001* (Cth) sch 2 ('*ACL*').

10 See, eg, United Nations Commission on International Trade Law, *UNCITRAL Model Law on Automated Contracting with Guide to Enactment* (Model Law, 2025) <https://uncitral.un.org/sites/uncitral.un.org/files/2424674e-mlautomatedcontracting-ebook.pdf> ('*UNCITRAL Model Law*'); European Law Institute, *EU Consumer Law and Automated Decision-Making (ADM): Is EU Consumer Law Ready for ADM?* (Interim Report, 18 December 2023) <https://www.europeanlawinstitute.eu/fileadmin/user_upload/p_eli/Publications/ELI_Interim_Report_on_EU_Consumer_Law_and_Automated_Decision-Making.pdf>; Lauren Henry Scholz, 'Algorithms and Contract Law' in Woodrow Barfield (ed), *The Cambridge Handbook of the Law of Algorithms* (Cambridge University Press, 2020) 141 <https://doi.org/10.1017/9781108680844.007>. See also Mimi Zou, 'When AI Meets Smart Contracts: The Regulation of Hyper-autonomous Contracting Systems?' in Martin Ebers, Cristina Poncibo and Mimi Zou (eds), *Contracting and Contract Law in the Age of Artificial Intelligence* (Hart Publishing, 2022) 41 <https://doi.org/10.5040/9781509950713.ch-003>.

11 Scholz, 'Algorithms and Contract Law' (n 10).

12 See, eg, *UNCITRAL Model Law* (n 10).

13 Vincent Ooi, 'Contracts Formed by Software: An Approach from the Law of Mistake' [2022] (2) *Journal of Business Law* 97 <http://dx.doi.org/10.2139/ssrn.3322308> ('Contracts Formed by Software').

14 Samir Chopra and Laurence White, 'Artificial Agents and the Contracting Problem: A Solution Via an Agency Analysis' [2009] (2) *Journal of Law, Technology and Policy* 363, 365.

has been suggested to stretch back to vending machines.[15] The term 'algorithmic contracts' has been defined by Lauren Henry Scholz as 'contracts in which one or more parties use an algorithm to determine whether to be bound or how to be bound'.[16] Thus, the rules are implemented by a computer rather than a conscious human being.[17] Scholz noted the difficulty in defining 'algorithm' but nonetheless provided a working definition as being 'a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer'.[18]

Scholz's definition of algorithmic contracting has been adopted by other scholars;[19] however, there is less consensus on what is covered by the definition. For example, Nicholas Liu accepts the term 'algorithmic contracts' for agreements incorporating autonomously generated terms and where offer, acceptance, or both, occur without direct human input or review. However, Liu is careful to note that smart contracts which implement human-determined terms would necessarily be excluded from Scholz's definition.[20] The European Law Institute defines algorithmic contracts more broadly, including contracts where at least one party uses a 'digital assistant' for 'negotiating, concluding, or performing the contract'.[21] 'Digital assistants' are in turn defined as algorithmic decision-making systems that analyse data and perform predefined contractual steps, with or without continued learning capabilities.[22] Vincent Ooi proposes a spectrum of 'contracts formed by software', spanning from software playing a 'passive' role, being no more than a communication device relaying human users' representations without alteration,[23] to playing an 'active' role in using mechanisms like machine learning and AI to aid or largely replace human involvement in contract formation and execution.[24] TT Arvind discusses 'AI-infused contracting' that includes broader categories of algorithmic contracting systems based on machine learning and stochastic processes, and identifies four archetypes of AI-infused contracting, being: making

15 Nick Szabo, 'Smart Contracts: Building Blocks for Digital Free Markets' (Rewritten Article, 25 January 2018) 1 <https://www.truevaluemetrics.org/DBpdfs/BlockChain/Nick-Szabo-Smart-Contracts-Building-Blocks-for-Digital-Markets-1996-14591.pdf>, quoted in Gregory Klass, 'How to Interpret a Vending Machine: Smart Contracts and Contract Law' (2023) 7(1) *Georgetown Law Technology Review* 69, 72 <https://doi.org/10.2139/ssrn.4045711>.

16 Lauren Henry Scholz, 'Algorithmic Contracts' (2017) 20(2) *Stanford Technology Law Review* 128, 134.

17 Ibid 134–5.

18 Ibid 134.

19 See, eg, Jeannie Marie Paterson and Elise Bant, 'Automated Mistakes: Vitiated Consent and State of Mind Culpability in Algorithmic Contracting' in Elise Bant (ed), *The Culpable Corporate Mind* (Hart Publishing, 2023) 255, 255 <https://doi.org/10.5040/9781509952410.ch-012> ('Automated Mistakes'); Marco Rizzi and Natalie Skead, 'Algorithmic Contracts and the Equitable Doctrine of Undue Influence: Adapting Old Rules to a New Legal Landscape' (2020) 14(3) *Journal of Equity* 301, 301.

20 Nicholas Liu, 'The "Contracting Problem" Revisited: Explaining the Formation of Algorithmic Contracts under the Common Law' in Zvonimir Slakoper and Ivan Tot (eds), *Digital Technologies and the Law of Obligations* (Routledge, 2022) 133, 134 <https://doi.org/10.4324/9781003080596-10>.

21 European Law Institute (n 10) 22.

22 Ibid.

23 Ooi, 'Contracts Formed by Software' (n 13) 100–101. See also Vincent Ooi and Kian Peng Soh, 'Rethinking Mistake in the Age of Algorithms: *Quoine Pte Ltd v B2C2 Ltd*' (2020) 31(3) *King's Law Journal* 367, 369 <http://doi.org/10.1080/09615768.2020.1815939>.

24 Ooi, 'Contracts Formed by Software' (n 13) 102.

transactional decisions, creating self-enforcing contractual mechanisms, managing the contractual lifecycle and producing contractual terms.[25]

There is disagreement among legal scholars on how to reconcile algorithmic contracting with traditional contract law principles. One perspective is that algorithms are 'mere tools' that mechanically execute the contracting parties' will.[26] However, Marco Rizzi and Natalie Skead argue that this approach falls short in capturing the complexity of modern algorithmic contracting systems, as it oversimplifies the active role of machine learning algorithms in negotiating and determining contract terms, and ignores how human parties often cede significant control to algorithms in the contracting process.[27] Scholz suggests that when algorithms remove key decision-making from direct human control, they can only be understood as constructive agents in contract formation.[28] Some propose granting legal personality to sophisticated software to address the mismatch between non-deterministic algorithms and contract law norms.[29] Others reject notions of algorithmic autonomy and agency in contracting, arguing that they mischaracterise automation as self-governance.[30] For example, Jeannie Paterson and Elise Bant contend that while machine learning systems are complex and adaptive, they fall short of exercising autonomous decision-making as requisite for agency theory.[31] They warn that framing algorithms as agents could inappropriately shield businesses from liability for unexpected outcomes.[32] While there is no consensus on the issue of algorithmic autonomy in contracting, errors from algorithmic contracting can be readily evidenced, as in the case of *Quoine*.

B *Quoine* and the Doctrine of Mistake

Redress for errors in algorithmic contracts has primarily been approached through the doctrine of mistake, as demonstrated in *Quoine*. The case was brought before the Singapore Court of Appeal, involving an appeal by Quoine against the Singapore International Commercial Court's ('SICC') decision in favour of B2C2. Quoine operated the QUOINExchange cryptocurrency exchange platform

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25 TT Arvind, 'AI-Infused Contracting and the Problem of Relationality: Is Trustworthy AI Possible?' in Ernest Lim and Phillip Morgan (eds), *The Cambridge Handbook of Private Law and Artificial Intelligence* (Cambridge University Press, 2024) 71, 71 <https://doi.org/10.1017/9781108980197.005>.

26 Liu (n 20) 141. The mere tools theory creates the possibility of emergence – results that could not be foreseen by the algorithm's creator: Scholz, 'Algorithmic Contracts' (n 16) 132.

27 Rizzi and Skead (n 19) 314.

28 Scholz, 'Algorithmic Contracts' (n 16) 132, 165. See also Samir Chopra and Laurence F White, *A Legal Theory for Autonomous Artificial Agents* (University of Michigan Press, 2011) <https://doi.org/10.3998/mpub.356801>.

29 Liu (n 20) 136. See also Laurence B Solum, 'Legal Personhood for Artificial Intelligences' (1992) 70(4) *North Carolina Law Review* 1231; Ignacio N Cofone, 'Servers and Waiters: What Matters in the Law of AI' (2018) 21(2) *Stanford Technology Law Review* 167 <https://doi.org/10.31228/osf.io/2nstf>.

30 See, eg, Eliza Mik, 'From Automation to Autonomy: Some Non-existent Problems in Contract Law' (2020) 36(3) *Journal of Contract Law* 205, 209–10.

31 Paterson and Bant, 'Automated Mistakes' (n 19) 269.

32 Ibid.

('Platform'), and B2C2 traded on this Platform.[33] Both Quoine and B2C2 were considered market-makers on the Platform. B2C2's trading process was entirely automated using its algorithmic trading software.[34] In 2017, due to Quoine's failure to update critical operating systems on the Platform, its Quoter Program (which would normally retrieve external market data to determine the orders that Quoine would place on the Platform) failed to access the requisite data.[35] This failure led to a thinning of the order book, causing B2C2's sell orders to execute at prices roughly 250 times the prevailing market rate in 13 trades concluded between B2C2 and two other users of the Platform ('the Counterparties').[36] Quoine subsequently cancelled and reversed those trades, prompting B2C2 to commence proceedings against Quoine on the grounds that the unilateral cancellation of the trades and reversal of transactions constituted a breach of contract and/or breach of trust.[37] This article only focuses on the contractual issues.

Thorley IJ, hearing the matter at first instance, rejected Quoine's submissions that the contracts were either void based on unilateral or common mistake at common law or voidable based on unilateral mistake in equity.[38] The majority of the Singapore Court of Appeal agreed with the decision of Thorley IJ and dismissed Quoine's appeal.[39] The Court stated that the error that occurred was not 'as to a *term*' of the trading contracts, but rather 'a mistaken *assumption*' on the Platform's operation – specifically, the assumption that the Platform would either function as intended or have adequate safeguards to prevent abnormal trading.[40] This error concerned only the circumstances around the contract's formation rather than a term of the contract itself.[41]

The majority further held that where contracts were based on deterministic algorithms, the relevant inquiry into actual or constructive knowledge of the mistake should be directed at the state of mind of the programmers who determined the output that emanated from the programs, from the time of programming up to the time of contract formation.[42] The doctrine of unilateral mistake would be applicable where the programmer contemplated or ought to have contemplated that a future party would be mistaken and specifically designed the algorithm to exploit such a mistake.[43] The doctrine would similarly apply if the algorithm has been programmed, but the contract has not yet been formed, where the programmer or platform user becomes aware that the party might be mistaken but allows the

33 *Quoine* (n 1) 25 [1] (Sundaresh Menon CJ for Sundaresh Menon CJ, Andrew Phang Boon Leong, Judith Prakash JJA and Robert French IJ).
34 Ibid.
35 Ibid 25 [2], 33 [27].
36 Ibid 33–4 [27], [29].
37 Ibid 25–6 [2]–[3], 35 [33]–[34].
38 Ibid 34 [31]. See *B2C2 Ltd v Quoine Pte Ltd* [2019] 4 SLR 17, 86 [231], 87 [236], 87–8 [239] ('*Quoine [No 1]*').
39 *Quoine* (n 1) 64–5 [128]–[129] (Sundaresh Menon CJ for Sundaresh Menon CJ, Andrew Phang Boon Leong, Judith Prakash JJA and Robert French IJ).
40 Ibid 60–1 [115] (emphasis in original).
41 Ibid.
42 Ibid 54–5 [98]–[99].
43 Ibid 56 [104].

algorithm to continue running to exploit this mistake.[44] Based on the evidence presented, the Court did not find that the programmer of B2C2's algorithm had actual or constructive knowledge of the mistaken belief of the Counterparties that the price of the disputed trades accurately represented or did not deviate significantly from the true market value or price of the cryptocurrencies.[45] Moreover, the majority found that there was no evidence that B2C2 or its programmers took advantage of the mistake, precluding an equitable remedy.[46] The requisite criteria for unilateral mistake at common law or in equity were not satisfied.[47]

Mance IJ's dissent found that there was a unilateral mistake in equity.[48] The Court, thus, had jurisdiction in equity where the non-mistaken party lacks the requisite mental state for common law relief, including where the 'reasonable person, knowing of the relevant market circumstances, *would* have known that there was a fundamental mistake'.[49] Mance IJ contended that the doctrine of unilateral mistake should not be applied in a way that disregards circumstances typically considered crucial to its application, simply because the parties relied on computer systems that lack consciousness or intent. Instead, Mance IJ highlighted that the law must evolve to accommodate new technological realities of algorithmic programming and AI, '[giving] rise to the results that reason and justice would lead one to expect'.[50]

Mance IJ endorsed the test proposed by Quoine, which assesses 'what an honest and reasonable trader would have understood, given knowledge of the particular circumstances'.[51] He pointed out that the SICC omitted a critical aspect of the case – whether the surrounding circumstances or the state of the market offered a rational explanation for the abnormal pricing or 'whether the only possible conclusion was that some fundamental error had taken place, giving rise to transactions which the other party could never rationally have contemplated or intended'.[52] Mance IJ posited that any reasonable trader, as B2C2 did in this case, 'would at once have identified' that there had been 'a fundamental computer system breakdown as the cause of the transactions'.[53] This error could have been remedied without causing harm to B2C2 or third parties. The considerations in favour of reversing the transactions outweighed any faults or mistakes that led to the system's failure.[54]

Most commentators tend to agree that the Court in *Quoine* adopted a restrictive interpretation of both common law and equitable doctrines of mistake, though they differ on the implications of such an approach. Alexander Loke opines that the majority's opinion is consistent with the theoretical basis of the mistake doctrine

44 Ibid 54–5 [99].
45 Ibid 61–4 [116]–[126].
46 Ibid 63 [124].
47 Ibid 64 [128].
48 Ibid 83 [183], 89–90 [195], 94 [206] (Mance IJ).
49 Ibid 91–2 [200] (emphasis in original).
50 Ibid 89 [193].
51 Ibid 91 [198].
52 Ibid 89 [192].
53 Ibid 90 [195].
54 Ibid.

at common law, as it follows naturally from the objective theory by confining the doctrine to only mistakes relating to the terms of the agreement.[55] Harsimar Dhanoa notes that Thorley IJ's and the majority's approach in *Quoine* wrongly assumes that the relationship between the programmer and the contracting party is separate.[56] It would be more appropriate to view such a relationship as one similar to a lawyer and client relationship, where the focus remains on the contracting party's knowledge rather than the agent's knowledge.[57] This is particularly relevant when considering the contracting party's involvement in selecting and deploying specific algorithms, especially when using commonly available algorithmic tools.[58] Ooi offers a potential middle ground by suggesting an approach that places the risk of software failure on the party deploying the algorithm, except in cases where it would be unreasonable for the counterparty to exploit an obvious mistake.[59] Ooi argues that such an approach would align with the decision in *Quoine*, and promote commercial certainty whilst not imposing undue burdens on the parties.[60]

C Beyond Deterministic Algorithms?

The significance of the 'deterministic' nature of the algorithm underlying B2C2's trading software in *Quoine* was emphasised repeatedly in the judgment and was critical to the Court's rejection of Quoine's arguments related to unilateral mistake. The Court defined deterministic algorithms as those bound by the parameters set by the programmer. These were algorithms that were considered to generally only do what the programmer had programmed them to do, and to always produce 'precisely the same output given the same input'.[61] As the trading software in question was found to be incapable of 'develop[ing] its own responses to varying conditions',[62] the Court was readily able to confine the enquiry into knowledge to that of the programmer's state of mind. The programmer, unlike the parties, was seemingly deemed to have 'knowledge of or direct personal involvement in' the contract formation,[63] assessed from the point of programming up to the point of contract formation.[64]

In our view, the Court's approach to the attribution of knowledge and intention is less problematic in terms of deterministic algorithms that are purely mechanical in their operation, whereby 'each time a certain set of input is presented, the algorithm does the same computations and gives the same results as any other time

55 Alexander Loke, 'Mistakes in Algorithmic Trading of Cryptocurrencies' (2020) 83(6) *Modern Law Review* 1343, 1347 <https://doi.org/10.1111/1468-2230.12574>.
56 Harsimar Dhanoa, 'Making Mistakes with Machines' (2021) 37(1) *Santa Clara High Technology Law Journal* 97, 113.
57 Ibid.
58 Ibid 113–4.
59 Ooi, 'Contracts Formed by Software' (n 13) 117.
60 Ibid 98, 110.
61 *Quoine* (n 1) 29 [15] (Sundaresh Menon CJ for Sundaresh Menon CJ, Andrew Phang Boon Leong, Judith Prakash JJA and Robert French IJ). See also 54 [98].
62 Ibid 29 [15].
63 Ibid 54 [98].
64 Ibid 54–5 [99].

the set of input is presented'.[65] Such systems are analogous to 'a robot assembling a car' or 'a kitchen blender'[66] – as machines that 'do and only do what they have been programmed to do'.[67] In such cases, the causal link between programmer intent and algorithmic output remains intact, making attribution of knowledge relatively straightforward.

However, this approach becomes increasingly strained when applied to non-deterministic systems,[68] often associated with machine learning models, that may yield different outputs from the same input. Many modern AI systems are 'hybrid' systems, combining elements of both deterministic and non-deterministic systems. Besides ethical, security and quality concerns, the challenge of unpredictability arises where such systems autonomously 'learn' and modify their behaviour based on new data, often in ways not foreseeable by their original programmes. This becomes even more difficult when algorithms are generated or modified by other algorithms, as is increasingly common with generative AI and automated code synthesis tools.[69]

Focusing on the programmer's state of mind 'at the time the relevant part of the program was written'[70] may not be feasible with non-deterministic, machine learning systems that have greater autonomous capabilities. Thorley IJ, who delivered the first-instance decision of *Quoine* before the SICC, anticipated that the law would develop as legal disputes arise from 'cases where computers have replaced human actions … where the computer in question is creating artificial intelligence and could therefore be said to have a mind of its own'.[71]

The majority of the Court of Appeal approached the dispute from the law of mistake and held that there was no unilateral mistake at common law or in equity, and no common mistake at common law. The dissenting judge, Mance IJ, held that there was unilateral mistake in equity and also considered the doctrine of unconscionability. While accepting that unconscionability would not be relevant insofar as 'bringing about the transactions',[72] Mance IJ presents another view of unconscionability in the context of unilateral mistake in the case. He notes that it would be clearly unconscionable 'for a trader to retain the benefit of transactions

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65 *Dictionary of Algorithms and Data Structures* (online at 14 August 2025) 'deterministic algorithm' <https://www.nist.gov/dads/HTML/deterministicAlgorithm.html>.

66 *Quoine [No. 1]* (n 38) 79 [209] (Simon Thorley IJ).

67 Ibid 78 [208].

68 See *Dictionary of Algorithms and Data Structures* (online at 14 August 2025) 'non-deterministic algorithm' <https://xlinux.nist.gov/dads/HTML/nondetermAlgo.html>.

69 Kodamasimham Krishna, Dheerender Thakur and Harika Sree Meka, 'Enhancing Software Engineering Practices with Generative AI: A Framework for Automated Code Synthesis and Refactoring' (2024) 13(01) *World Journal of Advance Engineering Technology and Sciences* 672, 675, 678 <https://doi.org/10.30574/wjaets.2024.13.1.0463>.

70 *Quoine [No 1]* (n 38) 79 [211] (Simon Thorley IJ), quoted in *Quoine* (n 1) 86 [185] (Sundaresh Menon CJ, for Sundaresh Menon CJ, Andrew Phang Boon Leong, Judith Prakash JJA and Robert French IJ).

71 *Quoine [No 1]* (n 38) 78 [206]. For an evaluation on whether the mistake doctrine may apply in these situations, see Mark Giancaspro, '"I, Contract": Evaluating the Mistake Doctrine's Application Where Autonomous Smart Contracts Make "Bad" Decisions' (2023) 45(1) *Campbell Law Review* 53, 68.

72 *Quoine* (n 1) 93 [204].

which he would – and did – at once recognise as due to some major error as soon as he came to learn of them'.[73]

We explore in the next Parts whether doctrines of unconscionability may indeed offer alternative recourses for addressing some of the conceptual challenges for contract law arising from algorithmic contracting, especially those employing machine learning models in non-deterministic or hybrid systems.

III REASSESSING EQUITABLE UNCONSCIONABILITY

In this Part, we review doctrines of equitable unconscionability as developed in Australia, England, and Singapore and examine their potential applicability to resolve wrongs arising from algorithmic contracting. While Australia and Singapore have adopted the doctrine which originated in England, the development in each jurisdiction has taken on very different paths with general descriptions of a 'broad' doctrine in Australia and a 'narrow' doctrine in Singapore.

A The *Amadio* Doctrine in Australia

Australia adopted the equitable doctrine of unconscionable dealing originating from the English case of *Fry v Lane*,[74] which was affirmed by the High Court of Australia in *Blomley v Ryan*.[75] A subsequent High Court decision in *Commercial Bank of Australia Ltd v Amadio* ('*Amadio*') marked the modern application of the doctrine and contains two main elements.[76] First, a party to a transaction must be under some special disadvantage when dealing with the other. Mason J reiterated the importance that the disadvantage needs to be 'special' to disavow any suggestion that a difference in the parties' bargaining power would be sufficient. In this regard,

> the disabling condition or circumstance is one which seriously affects the ability of the innocent party to make a judgment as to his own best interests, when the other party knows or ought to know of the existence of that condition or circumstance and of its effect on the innocent party.[77]

While it appears that special disadvantage has been expanded to include emotional dependence in *Louth v Diprose*[78] and *Thorne v Kennedy*[79] where there was 'pressure and manipulation of a relationship of dependence',[80] unconscionability cases are fact specific and depend on the context of each case.

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73 Ibid 93 [205].
74 (1888) 40 Ch D 312 ('*Fry v Lane*').
75 (1956) 99 CLR 362. Fullagar J in this case sets out the non-exhaustive list of circumstances which may amount to a special disability: at 405.
76 (1983) 151 CLR 447 ('*Amadio*').
77 Ibid 462.
78 (1992) 175 CLR 621.
79 (2017) 263 CLR 85 ('*Thorne*').
80 Andrew Robertson and Jeannie Paterson, *Principles of Contract Law* (Lawbook Co, 7th ed, 2025) 823 [36.70], citing *Thorne* (n 79).

Second, the defendant must take advantage of that special disadvantage. Key to this element is that the defendant must know the disadvantage of the other party[81] and having this knowledge, exploits the special disadvantage and vulnerability of the plaintiff.[82] In the most straightforward case, actual knowledge of the disadvantage will be sufficient to establish the knowledge element; this would include 'wilful ignorance' – wilfully shutting one's eyes to the obvious vulnerability of the plaintiff.[83] On whether in the absence of actual knowledge, constructive knowledge is sufficient to establish unconscionable dealing, the High Court has been less clear.[84] In *Amadio*, Mason J stated that it would be sufficient if the defendant 'is aware of the possibility that that situation may exist or is aware of facts that would raise that possibility in the mind of any reasonable person'.[85] However, in *Kakavas v Crown Melbourne Ltd*,[86] the High Court took a stance that Mason J's statement in *Amadio* cannot be taken as supporting that constructive notice of the special disadvantage was sufficient; instead, the special disadvantage must be 'sufficiently evident' to the stronger party.[87] The Court also introduced an additional element that the stronger party must have acted with 'a predatory state of mind'.[88] This more stringent requirement has been criticised by some commentators.[89] However, the status of this additional element is uncertain with the Court failing to either endorse or expound on it in subsequent decisions.[90] Nevertheless, what an analysis of the cases does elucidate is that some level of knowledge, at least constructive knowledge, is required to establish unconscionable dealing. As noted in *Thorne v Kennedy*, the doctrine also clearly requires some level of 'victimisation', 'unconscientious conduct', or 'exploitation'.[91] Upon proof of the above two requirements, a rebuttable presumption arises that the transaction is unfair, and the onus shifts to the defendant to prove that the transaction was 'fair, just and reasonable'.[92]

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81 *Amadio* (n 76) 474 (Deane J).

82 Ibid. See also Rick Bigwood, *Exploitative Contracts* (Oxford University Press, 2003) 249 <https://doi.org/10.1093/oso/9780198260639.001.0001>.

83 *Amadio* (n 76) 467 (Mason J), 479 (Deane J); *Kakavas v Crown Melbourne Ltd* (2013) 250 CLR 392, 439 [157]–[160] (French CJ, Hayne, Crennan, Kiefel, Bell, Gageler and Keane JJ) ('*Kakavas*').

84 Ying Khai Liew and Debbie Yu, 'The Unconscionable Bargains Doctrine in England and Australia: Cousins or Siblings?' (2021) 45(1) *Melbourne University Law Review* 206, 220–4 ('the reason for this is that … judges tend to speak in terms of "actual knowledge", "constructive knowledge" and "constructive notice" – but these are slippery terms': at 220).

85 *Amadio* (n 76) 467.

86 *Kakavas* (n 83).

87 Ibid 439 [158], [160] (French CJ, Hayne, Crennan, Kiefel, Bell, Gageler and Keane JJ).

88 Ibid 439 [161].

89 See, eg, Rick Bigwood, 'Still Curbing Unconscionability: *Kakavas* in the High Court of Australia' (2013) 37(2) *Melbourne University Law Review* 463; Warren Swain, 'The Unconscionable Dealing Doctrine: In Retreat?' (2014) 31(3) *Journal of Contract Law* 255. See also Mark Leeming, 'Equity and Trusts: Unconscionable Transactions' (2023) 97(1) *Australian Law Journal* 13 <http://dx.doi.org/10.2139/ssrn.4932243>.

90 See, eg, *Thorne* (n 79). See also *Australian Securities and Investments Commission v Kobelt* (2019) 267 CLR 1 ('*Kobelt*').

91 *Thorne* (n 79) 103 [38] (Kiefel CJ, Bell, Gageler, Keane and Edelman JJ).

92 *Amadio* (n 76) 474 (Deane J)

While unconscionability in the above cases occurs pre-formation of contract, the judgments refer to both the unconscionable receipt, as well as the passive retention of the benefit. In *Amadio*, Deane J stated that '[u]nconscionable dealing looks to the conduct of the stronger party in attempting to enforce, or *retain the benefit of*, a dealing with a person under a special disability in circumstances where it is not consistent with equity or good conscience that he should do so'.[93] This has led to the view that unconscionability can operate post-formation in cases where a party was not aware of the other party's special disadvantage when entering into the contract or in cases of gratuitous gifts. The unconscionability lies not in the procurement of, but in the retention of the benefit. This view finds support in the obiter statements of two senior judges. Allsop P in *Aboody v Ryan*[94] refers to 'unconscionability later arising' and that 'the taking or retaining of the benefit' lies at the heart of the doctrine of unconscionability. In *Nitopi v Nitopi*, Bell CJ opined that a gift could be set aside if its retention, as opposed to its procurement, was unconscionable.[95] Opponents of this expanded view argue that the doctrinal basis of unconscionability is to provide relief against a stronger party's exploitation of the special disadvantage of the weaker party's impaired consent, which occurs '*at the moment of transaction formation itself*'.[96]

B The Modern Doctrine in England

Originally established in the 17th century to protect expectant heirs and reversioners from being exploited,[97] the doctrine of unconscionability, or unconscionable bargains, was extended to the 'poor and ignorant' in the late 19th century case of *Fry v Lane*.[98] 'Poor' and 'ignorant' were subsequently interpreted in *Cresswell v Potter* ('*Cresswell*') to include 'a member of the lower income group' and one who is 'less highly educated' respectively.[99] In *Cresswell*, Megarry J set out three criteria as follows: first, the complainant was 'poor and ignorant'; second, the transaction was at 'a considerable undervalue'; and third, the complainant did not receive independent advice.[100]

A different test emerged in *Alec Lobb (Garages) Ltd v Total Oil Great Britain Ltd* ('*Alec Lobb*'),[101] which outlined three specific requirements. First, one party must be at a serious disadvantage relative to the other, such that the circumstances exist in which an unfair advantage could be taken. Second, this weakness was

93 *Amadio* (n 76) 474 (emphasis added).
94 (2012) 17 BPR 32,359, 32,375 [65], 32,378 [80] (Bathurst CJ and Campbell JA agreeing) (NSW Court of Appeal).
95 (2022) 109 NSWLR 390, 396–400 [21]–[34].
96 Rick Bigwood and Pauline Ridge, 'Unconscientious Retention of Benefit: Can Unconscionability "Supervene" in Unconscionable Dealing Cases?' (2024) 18(1) *Journal of Equity* 1, 29 (emphasis in original) <https://search.informit.org/doi/10.3316/informit.T202411170000440175276292 2>, relying also on the authority of the New Zealand Supreme Court decision, *Gustav and Co Ltd v Macfield Ltd* [2008] 2 NZLR 735.
97 See generally *Earl of Chesterfield v Janssen* (1751) 2 Ves Sen 125; 28 ER 82 (Court of Chancery).
98 *Fry v Lane* (n 74) (Kay J).
99 [1978] 1 WLR 255, 257 (Megarry J).
100 Ibid.
101 [1983] 1 WLR 87 ('*Alec Lobb*').

exploited by the other party in some morally culpable manner. Third, the resulting transaction must go beyond being hard or improvident; it must be overreaching and oppressive.

The third element in *Alec Lobb* establishes a significantly higher threshold than the 'considerable undervalue' criterion articulated in *Cresswell*. It reflects not just a transactional imbalance but also the presence of substantive unfairness, making the doctrine more challenging to establish.[102] According to Ying Khai Liew and Debbie Yu, the requirement of 'overreaching and oppressive' requires more than mere unfairness, unjustness, or unreasonableness. It may be linked to the exploitation requirement whereby the transaction must arise from a deliberate act of exploitation by the defendant. Thus, the three elements are not mutually exclusive, and the presence of one element can impact on the court's finding of the others. Collectively, they emphasise aspects of the doctrine that would, as a whole, '[shock] the conscience of the court'.[103]

The English and Australian equitable doctrines of unconscionability share notable similarities. In Australia, the first element is described as a 'special' disadvantage, whereas in England, it is referred to as a 'serious' disadvantage. Despite the difference in terminology, case law indicates that the circumstances satisfying this element are broadly equivalent in both jurisdictions.[104] Both jurisdictions adopt a wide-ranging approach, recognising that the situations leading to special or serious disadvantage can vary greatly 'and are not susceptible to being comprehensively catalogue[d]'.[105] Furthermore, both approaches require the stronger party to have exploited the weaker party's special or serious disadvantage in a morally culpable manner, though the degree of knowledge required to establish this requirement differs between the two jurisdictions. In England, the requirement of exploitation requires a higher level of knowledge. In *Fineland Investments Ltd v Pritchard*, the England and Wales High Court noted that the unconscionable bargains doctrine applies, inter alia, where A has 'knowingly taken advantage' of the bargaining weakness suffered by the other party.[106]

C The Reformulated 'Narrow' Doctrine in *BOM v BOK* in Singapore

Until 2012, the status of unconscionability as a vitiating factor in Singapore has been considered 'not wholly clear'.[107] In 2010, the Singapore High Court in *E C Investment Holding Pte Ltd v Rideout Residence Pte Ltd* went so far as to state

102 Nelson Enonchong, 'The Modern English Doctrine of Unconscionability' (2018) 34(3) *Journal of Contract Law* 211, 213–14.

103 Liew and Yu (n 84) 210, citing *Alec Lobb* (n 101) 95 (Peter Millet QC).

104 Liew and Yu (n 84) 214.

105 *Amadio* (n 76) 474 (Deane J).

106 [2011] EWHC 113 (Ch), [72] (Alison Foster QC).

107 See Andrew Phang Boon Leong and Goh Yihan, 'Duress, Undue Influence and Unconscionability' in Andrew Phang Boon Leong (ed), *The Law of Contract in Singapore* (Academy Publishing, 2012) 777, 883 [12.219].

that unconscionability did not form part of the law of Singapore.[108] However, this position changed with the landmark decision in *BOM v BOK*.[109]

The Singapore Court of Appeal in *BOM v BOK* expressed concerns that unconscionability, as a legal doctrine (as distinct from a rationale), lacked clear legal criteria and guidance, potentially leading to uncertainty and unpredictability.[110] Nevertheless, the Court was prepared to recognise that a 'narrow' doctrine of unconscionability applied in Singapore. Under this doctrine, two elements must be established. First, the plaintiff must demonstrate that he was suffering from an infirmity – whether physical, mental, or emotional – 'of sufficient gravity as to have acutely affected the plaintiff's ability to "conserve his own interests"'.[111] This infirmity must also have been evident or ought to have been evident to the other party to the transaction. Second, it must be shown that the defendant exploited this infirmity to procure the impugned transaction. Once these elements are satisfied, the burden shifts to the defendant, who must prove that the transaction was fair, just, and reasonable.

When considering the English approach, the Singapore Court of Appeal rejected the second and third requirements in *Cresswell*, namely, whether the sale was at a considerable undervalue and whether the vendor had independent advice. While these factors are not mandatory in Singapore, the Court acknowledged that they remain '*very important factors*' for consideration.[112] Furthermore, the Court modified the *Cresswell* criterion of 'poor' and 'ignorant' to the more specific requirement of 'infirmity'.[113] It also emphasised the requirement from *Alec Lobb* that the stronger party must have exploited the claimant's special weakness – an element absent in *Cresswell*.

Significantly, the Singapore Court of Appeal rejected the 'broader' doctrine of unconscionability found in *Amadio*, criticising it as 'too broad a manner inasmuch as it affords the court too much scope to decide on a subjective basis'.[114] However, this assessment is contested by Rick Bigwood, who argues 'that the *Amadio* formulation, both in its form and in its actual applications in subsequent cases, is *narrower* than the Court's (modified) 'narrow' formulation of unconscionability in *BOK (CA)*'.[115] Bigwood further opines that 'the distance between the *Amadio* and *BOK (CA)* formulations of unconscionability is much smaller' than what the Court had assessed.[116]

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108 [2011] 2 SLR 232, 257 [49] (Quentin Loh J). For a discussion of this case, see generally Nelson Enonchong, 'The State of the Doctrine of Unconscionability in Singapore' [2021] *Singapore Journal of Legal Studies* 100.

109 [2019] 1 SLR 349.

110 Ibid 390 [122] (Andrew Phang Boon Leong JA for the Court).

111 Ibid 397 [141].

112 Ibid 398 [141].

113 Ibid 397–8 [141]–[143].

114 Ibid 394 [133] (emphasis omitted).

115 Rick Bigwood, 'Knocking Down the Straw Man: Reflections on *BOM v BOK* and the Court of Appeal's "Middle-Ground" Narrow Doctrine of Unconscionability for Singapore' [2019] *Singapore Journal of Legal Studies* 29, 47 (emphasis in original).

116 Ibid.

In response, Burton Ong defends the Singapore Court of Appeal's decision to adopt a narrow formulation of the doctrine for Singapore.[117] Comparing Deane J's articulation of the Australian doctrine in *Amadio* with the Court of Appeal's approach in *BOM v BOK*, Ong argues that the Court of Appeal was merely rejecting the linguistic breadth of the *Amadio* formulation. While acknowledging Bigwood's point about how subsequent Australian cases have narrowed the scope of *Amadio*, Ong maintains that the Singapore Court opted for a more straightforward and less open-ended formulation, given it was building upon 'an almost-clean slate' of local jurisprudence.[118]

Following the Court of Appeal's decision in *BOM v BOK*, the courts in Singapore have applied this 'narrow' doctrine of unconscionability and adopted the criteria of 'infirmity' outlined in *BOM v BOK*.[119] The majority in *Quoine* cited the decision in *BOM v BOK* in preferring a 'narrow' approach to unconscionability, which 'limits excessive subjectivity in determining what amounts to unconscionable conduct, and instead promotes certainty and predictability for contracting parties'.[120]

D Application to Non-deterministic Algorithmic Contracting

The application of equitable unconscionability to non-deterministic or hybrid algorithmic-based contracting necessitates a reassessment of traditional elements, particularly special or serious disadvantage and the requisite knowledge of exploitation. These challenges are especially pronounced when the contracting process is mediated by machine learning algorithms that entail 'black box' models. The black box problem relates to the opacity of AI and machine learning models (typically those with non-deterministic characteristics) where the internal logic or reasoning behind a decision cannot be understood, even by the developers who created the model.[121] This opacity compounds a cascading knowledge problem across all levels of interaction with the algorithmic system: programmers, implementers, and end-users, which significantly affects the identification of special disadvantage and the attribution of knowledge under the unconscionability doctrine.

For programmers or developers, a growing challenge lies in the emergent behaviour of complex and adaptive AI systems, especially those associated with neural networks, multi-agent systems, and evolutionary algorithms.[122] Emergent

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117 Burton Ong, 'Unconscionability, Undue Influence and Umbrellas: The "Unfairness" Doctrines in Singapore Contract Law after *BOM v BOK*' [2020] *Singapore Journal of Legal Studies* 295, 300–4.

118 Ibid 303.

119 In these cases, unconscionability was not proved: see, eg, *Center for Competency-Based Learning and Development Pte Ltd v SkillsFuture Singapore Agency* [2024] SGHC 121; *Ho Dat Khoon v Chan Wai Leen* [2023] SGHC 326; *NCL Housing Pte Ltd v Sea-Shore Transportation Pte Ltd* [2021] SGHC 29; *Yip Fook Chong v Loy Wei Ezekiel* [2020] SGHC 84; *Liew Kum Chong v SVM International Trading Pte Ltd* [2019] SGHC 163.

120 *Quoine* (n 1) 59 [110] (Sundaresh Menon CJ for Sundaresh Menon CJ, Andrew Phang Boon Leong, Judith Prakash JJA and Robert French IJ).

121 See generally Cynthia Rudin, 'Stop Explaining Black Box Machine Learning Models for High Stakes Decisions and Use Interpretable Models Instead' (2019) 1(5) *Nature Machine Intelligence* 206 <10.1038/s42256-019-0048-x>.

122 'Emergent Behavior', *AI Ethics Lab* (Web Page) <https://aiethicslab.rutgers.edu/e-floating-buttons/emergent-behavior/>.

behaviour can be understood as 'complex patterns, behaviours, or properties that arise from simpler systems or algorithms interacting with each other or their environment, without being explicitly programmed or intended by the designers'.[123] While programmers may create and design the model's architecture and select the training data, they may not directly control the patterns the model learns or how it generalises to new inputs. This creates sources of uncertainty and risk. Once trained, the model may exhibit behaviours that were not anticipated or understood by the programmer, even with efforts to make algorithmic decision-making systems more explainable.[124] As such, programmers may not have clear knowledge of how the model will behave, especially in new scenarios.

Implementers or operators, such as financial institutions and platforms, often rely on third-party models or systems. They may not have access to the underlying code, training data, or decision logic. Even when they do, they may lack the technical expertise to understand and interpret the model's behaviour. Yet, they are the parties who choose to deploy these systems in commercial settings and stand to benefit from the systems' use. As Eliza Mik puts it:

> Operators are persons (natural or corporations) who initiate and control the program and benefit from its operations. Although operators may not have created or designed the program themselves, they have chosen which program to use and/or have provided its specifications.[125]

End-users, such as customers of the implementers, interact only with the interface of the system and are rarely informed that the terms, prices, or decisions they receive are generated by non-deterministic algorithms. End-users typically lack the ability to interrogate or challenge the basis of the algorithmic contracting system.[126] While asymmetry of information and power between parties exists in many contractual relationships, we suggest that an implementer's decision to employ non-deterministic machine learning systems that involve 'black box' models may introduce a special form of cognitive and informational disadvantage for end-users.

The notion of a 'special disadvantage' under the *Amadio* doctrine can cover a range of circumstances that affect a person's ability to conserve their own interests.[127] The High Court of Australia has extended this principle to varied disadvantages in cases such as *Louth v Diprose* and *Thorne v Kennedy*. A similar assessment could apply under the English doctrine articulated in *Alec Lobb*, though the English courts have also emphasised that special disadvantage may manifest in diverse forms. By contrast, Singapore's 'narrow' doctrine from *BOM v BOK* confines its

123 Ibid.

124 See generally Ribana Roscher et al, 'Explainable Machine Learning for Scientific Insights and Discoveries' (2020) 8 *IEEE Access* 42200 <https://doi.org/10.1109/ACCESS.2020.2976199>.

125 Eliza Mik, 'Much Ado about Artificial Intelligence or: The Automation of Contract Formation' (2022) 30(4) *International Journal of Law and Information Technology* 484, 501 <https://doi.org/10.1093/ijlit/eaad004> ('Much Ado about Artificial Intelligence'). See also 504–5.

126 Alberto R Salazar V, 'Unconscionability, Smart Contracts, and Blockchain Technology: Are Consumers Really Protected against Power Abuses in the Digital Economy?' (2021) 9 *International Journal on Consumer Law and Practice* 74, 86.

127 *Amadio* (n 76) 474–5 (Deane J).

application to the restricted concept of 'infirmity'. Here, the special disadvantage for end-users arising from non-deterministic algorithmic contracting systems may not stem from a personal infirmity, but from an acute systemic asymmetry in information and understanding of these systems' capabilities, limitations, and risks due to their complexity and design.

The second limb of the doctrine in *Amadio* requires that the stronger party knew or ought to have known of the weaker party's special disadvantage. In algorithmic contexts, actual knowledge may be difficult to establish, particularly where the system's behaviour is unpredictable or poorly understood. Moreover, the implementer may not interact directly with the user and may not know their individual characteristics. Particularly in settings where a business, as an implementer, is engaging with many users indirectly or remotely (for example, interactions that are initiated by an end-user selecting terms on a platform), the implementer may not have actual knowledge of each user's individual circumstances. These factors can make it difficult to establish that a party had actual knowledge of, and subsequently exploited, the other party's special disadvantage.

We argue that constructive knowledge (what a reasonable person in the implementer's position ought to have known) provides a more flexible and appropriate standard here. In this context, courts may need to shift from a case-specific inquiry to a systemic one. Rather than asking whether the implementer knew of the plaintiff's special disadvantage, the question becomes whether the implementer knew or ought to have known that the system is likely to be difficult to understand and contest and would likely impair the ability of a class of end-users to protect their interests. The idea is that constructive knowledge can arise from foreseeable risks, even if they are not tied to a particular individual.

Constructive knowledge in this context extends to awareness of systemic risks associated with the use of black box algorithms. Courts would ask whether a reasonable implementer of AI and machine learning-based contracting systems, informed by prevailing standards in algorithmic accountability and risk management for deployers of such systems, ought to have foreseen the likelihood of harm to end-users if adequate safeguards were not in place. This approach aligns with the broader equitable principle that those who benefit from a transaction must not do so at the expense of a party whose ability to protect their own interests was impaired in circumstances known or reasonably knowable to the stronger party.

Consider the example of an insurance company implementing AI and machine learning models to price and contract with end-users on travel insurance policies. The algorithm processes real-time data, such as travel advisories, weather patterns, and social media sentiment.[128] Its processes may produce different outputs for

128 In the context of blockchain-based 'smart contracts' (travel insurance contracts are a prominent use case), oracles are critical components in these automated systems that rely on external data to trigger contractual outcomes, eg to approve or deny a travel insurance claim. If the oracle provides inaccurate, delayed or manipulated data, the contract may execute incorrectly, resulting in an erroneous denial of coverage or an unintended payout. See also Morgan N Temte, 'Blockchain Challenges Traditional Contract Law: Just How Smart Are Smart Contracts?' (2019) 19(1) *Wyoming Law Review* 87, 96, 101–2 <https://doi.org/10.59643/1942-9916.1409>.

identical inputs, and the system continuously updates its models based on new data but lacks any transparent audit trails for decision-making. In this scenario, the insurance company ought to know that the risks of such a pricing system can result in unpredictable and arbitrary decisions for customers who lack the means to understand or challenge them. Its decision to deploy such systems, knowing that they are likely to be highly opaque to users, could constitute constructive knowledge where there is a lack of monitoring or oversight safeguards or where there is a failure to provide users with meaningful information about how such decisions are made.

Beyond AI legal and regulatory frameworks, the relevant safeguards will also depend on the specific circumstances in which the implementer is operating the algorithmic contracting systems. For example, the dispute in *Quoine* highlights the need for market-makers such as Quoine to have in place effective systems that could have avoided the errors in the orders that were sent. Such systems are now mandated in the European Union. Article 17(1) of the *EU Markets in Financial Instruments Directive*[129] requires an investment firm that engages in algorithmic trading to establish systems and risk control mechanisms to 'prevent the sending of erroneous orders or the systems otherwise functioning in a way that may create or contribute to a disorderly market'. The systems need to be fully tested and properly monitored. Further obligations are imposed for firms engaging in high-frequency algorithmic trading techniques[130] and market-making strategies.[131] In Australia, the Australian Securities and Investments Commission's Regulatory Guide 241 on *Electronic Trading* sets out similar requirements for trading participants to establish arrangements to manage risks associated with trading using algorithmic programs.[132]

Finally, the taking advantage or exploitation of the plaintiff's special disadvantage traditionally implies some degree of opportunism or moral culpability. In algorithmic contracting, exploitation may occur without direct intent. An algorithmic contracting system may be designed to maximise profit or efficiency, but in doing so, it may systematically disadvantage end-users who are unable to understand or challenge

129 *Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on Markets in Financial Instruments and Amending Directive 2002/92/EU and Directive 2011/61/EU (Recast)* [2014] OJ L 173/349. For commentary, see Alessio Azzutti, 'AI Trading and the Limits of EU Law Enforcement in Deterring Market Manipulation' (2022) 45 *Computer Law & Security Review* 1 <https://doi.org/10.1016/j.clsr.2022.105690>.

130 Article 17(2) requires the firm, inter alia, to store accurate and time sequenced records of all its placed orders, including cancellations of orders, executed orders and quotations on trading venues and make them available to the regulatory authority upon request.

131 Article 17(3) requires the firm to carry out market-making continuously during a specified proportion of the trading venue's trading hours to provide liquidity on a regular and predictable basis to the trading venue.

132 Australian Securities and Investments Commission, *Electronic Trading* (Regulatory Guide No 241, August 2022) <https://www.asic.gov.au/regulatory-resources/find-a-document/regulatory-guides/rg-241-electronic-trading/>. See also the *ASIC Market Integrity Rules (Securities Markets) 2017* (Cth) which sets out market integrity rules that apply to participants using automated order processing. See also Branko Stajic, 'Learnt, but Not Taught: Autonomous Trading Agents and Australia's Financial Market Laws' (LLB Honours Thesis, UNSW Faculty of Law & Justice, 2025).

its outputs. In such cases, the court may need to consider whether the implementer's failure to mitigate foreseeable risks, such as by providing explanations, human oversight, or opt-out mechanisms, amounts to exploitation.

The equitable unconscionability doctrine offers a promising framework for redressing algorithmic wrongs. However, its application must be adapted to account for the structural asymmetries introduced by non-deterministic algorithmic contracting systems which can create a special disadvantage for end-users. Its application should also be willing to attribute constructive knowledge to implementers who do not adequately address the risks of opaque AI systems that they deploy. Modifications of existing principles to meet such challenges could be realised through statutory solutions. The next Part analyses two such examples of statutory unconscionability, namely the concept of 'system of conduct' under section 21(4)(b) of the *ACL* and a 'sliding scale' approach to procedural and substantive unconscionability adopted by US courts in relation to section 2-302 of the *UCC*.

IV STATUTORY FORMS OF UNCONSCIONABILITY

A 'System of Conduct' under the *Australian Consumer Law*

The statutory doctrine of unconscionability is primarily found in section 21 of the *ACL*, which provides that:

> (1) A person must not, in trade or commerce, in connection with:
> (a) the supply or possible supply of goods or services to a person; or
> (b) the acquisition or possible acquisition of goods or services from a person;
> engage in conduct that is, in all the circumstances, unconscionable.

Unconscionable conduct is not defined under the statute. However, subsection 21(4) of the *ACL* contains a set of interpretive principles to guide the application of the concept. Further, section 22 lists factors that the court may consider in determining whether a person has contravened section 21. Courts have often referred to indicators of unconscionable conduct, such as '[dishonesty], trickery, predatory or overbearing behaviour, choice or the absence of choice, disadvantage, vulnerability and exploitation'.[133] Typically, cases have involved the exploitation of a position of vulnerability or a lack of understanding on the part of a targeted consumer or small business group.[134] A common thread in these cases is the presence of a 'stronger party' exploiting the vulnerability of a weaker party. Although sections 21 and 22 do not mention any special disadvantage or knowledge requirement,[135] as noted by Paterson and Bant, case law shows that the defendant's culpable state of mind continues to play a key role in determining when the exercise of stronger bargaining power becomes unconscionable.[136]

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133 *Kobelt v Australian Securities and Investments Commission* (2018) 352 ALR 689, 724 [192] (Besanko and Gilmour JJ).

134 See *Thorne* (n 79); *Kobelt* (n 90).

135 *ACL* (n 9) ss 21–2.

136 Elise Bant and Jeannie Marie Paterson, 'Systems of Misconduct: Corporate Culpability and Statutory Unconscionability' (2021) 15(1) *Journal of Equity* 63, 69 ('Systems of Misconduct').

Applications of unconscionable conduct under the *ACL*, as well as under the former sections 51AB and 51AC of the *Trade Practices Act 1974* (Cth), have traditionally focused on concerns about the exploitation of vulnerable consumers during pre-contractual stages. However, unlike the equitable doctrine of unconscionability, which is confined to pre-contract formation conduct, section 21 of the *ACL* extends its scope to examine unconscionable conduct in broader contexts, encompassing relationships in trade or commerce regardless of their stage.[137] Specifically, in determining whether conduct to which a contract relates is unconscionable, section 21(4)(c) allows the court to consider 'the terms of the contract' and 'the manner in which and the extent to which the contract is carried out'.

Further, section 21(4)(a) explicitly states Parliament's intention that section 21 is not limited by the unwritten law. This means that the statutory doctrine of unconscionable conduct can develop independently of equitable principles.[138] As such, it enables the *ACL* to address challenges posed by modern contexts, such as algorithmic-based contracting, without the constraints imposed by the traditional requirements of unconscionability in equity as discussed earlier.

Section 21(4)(b) of the *ACL* offers considerable potential to address wrongs arising from algorithmic contracting systems that are implemented by a benefiting party wherein the system involves a 'deliberate strategy on the part of the contravener'.[139] According to section 21(4)(b):

> It is the intention of parliament that:
>
> …
>
> (b) this section is capable of applying to a system of conduct or pattern of behaviour, whether or not a particular individual is identified as having been disadvantaged by the conduct or behaviour …

Bant and Paterson argue that the 'systems conduct' contained in section 21(4)(b) can allow unconscionable conduct to capture corporate misconduct in circumstances where attribution of knowledge would traditionally be difficult to establish.[140] This has led to the development of the concept of 'systems intentionality', where the system employed by a corporation may reveal the requisite intention.

In *Productivity Partners Pty Ltd v Australian Competition and Consumer Commission* ('*Productivity Partners*'),[141] the concept of systems intentionality attributed intent to the appellant company by virtue of the altered system it

137 *Kobelt* (n 90) 37 [83], 40 [93] (Gageler J), 94 [279], 102 [295] (Edelman J). For the application of statutory unconscionable conduct to provide relief in the public interest, see *Australian Competition and Consumer Commission v Quantum Housing Group Pty Ltd* [2020] FCA 474.

138 *Australian Securities and Investments Commission v National Exchange Pty Ltd* (2005) 148 FCR 132, 140 [30] (Tamberlin, Finn and Conti JJ); *Australian Competition and Consumer Commission v Quantum Housing Group Pty Ltd* (2021) 285 FCR 133, 135 [4], 152 [78], 155 [91] (Allsop CJ, Besanko and McKerracher JJ) (Full Court).

139 May Fong Cheong, *Australian Contract Law: Principles and Cases* (Lawbook Co, 2nd ed, 2025) 654 [18.550], citing *Stubbings v Jams 2 Pty Ltd* (2022) 276 CLR 1, 30–2 [76]–[80] (Gordon J) ('*Stubbings*'); *Productivity Partners Pty Ltd v Australian Competition and Consumer Commission* (2024) 419 ALR 30, 61 [108], 62 [111] (Gordon J) ('*Productivity Partners*').

140 Bant and Paterson, 'Systems of Misconduct' (n 136) 81–4.

141 *Productivity Partners* (n 139).

implemented. Here, 'system' refers to an internal method of working.[142] Productivity Partners Pty Ltd ('Productivity Partners') was an educational college providing online vocational education and training funded through a Commonwealth government scheme whereby the Commonwealth would pay a student's fees directly to the institution on the basis that the student would then incur a debt to the government. Notably, fees are paid by the Commonwealth to the institution after a census date. The High Court was primarily concerned with the conduct of Productivity Partners in changing its process for enrolment by removing system controls which ameliorated two risks. The first risk concerns course advisor misconduct. Second was the risk of unsuitable enrolment whereby the student would remain enrolled past the census date where they would incur a debt. The Australian Competition and Consumer Commission ('ACCC') sought to establish that the system implemented by Productivity Partners in removing the controls constituted unconscionable conduct under section 21 of the *ACL*.[143]

The Court found in favour of the ACCC. Productivity Partners' unconscionable conduct was not referable to any specific pre-contractual stage, nor did it primarily concern the method it used in enrolling students. Rather, the inquiry of the Court was directed to the system the college had in place for mitigating the risks for enrolled students. The risks that the system controls were designed to reduce 'were not mere possibilities'; rather, these risks 'were known to be "manifest"' and 'commonplace'.[144] It was the 'sharp practice' of implementing the enrolment system with the removed controls, in light of those risks to the enrolled students, that was the basis for the Court's finding of unconscionable conduct.[145] As Edelman J stated:

> The removal of the two system controls meant that the College [Productivity Partners], by its revised system, intended that the end of increasing profitability be achieved by an increase in unsuitably enrolled students or students whose enrolment was the subject of agent misconduct.[146]

As further explained by Edelman J in *Productivity Partners*, unconscionable conduct by way of systems liability can be proved 'either by proof of a pattern of behaviour or by "direct evidence as to the internal structure and elements of the system"'.[147] Bant and Paterson point out that such an approach may be particularly relevant when dealing with large corporations, such as in business-to-consumer ('B2C') transactions.[148] For example, systems intentionality could be used in circumstances where a corporation implements a system by removing checks that would detect potential algorithmic errors.

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142 '[A] "pattern" connotes the external observation of events': *Unique International College Pty Ltd v Australian Competition and Consumer Commission* (2018) 266 FCR 631, 654 [104] (Allsop CJ, Middleton and Mortimer JJ).

143 *Productivity Partners* (n 139) 35 [3] (Gageler CJ and Jagot J).

144 Ibid 50–1 [67].

145 Ibid 109 [307] (Gleeson J).

146 Ibid 92 [248].

147 Ibid 91 [243], quoting Elise Bant, 'Systems Intentionality: Theory and Practice' in Elise Bant (ed), *The Culpable Corporate Mind* (Hart Publishing, 2023) 183, 201 ('Systems Intentionality') <https://doi.org/10.5040/9781509952410.ch-009>.

148 Bant and Paterson, 'Systems of Misconduct' (n 136) 79–80.

Given that consumers are unlikely to understand or have the power to negotiate algorithmic contract terms,[149] systems intentionality could also apply in circumstances where an implementer, knowing this risk, implements systems that fail to alert users to the meaning of the terms or where such a system is removed by a corporation. For another example, consider a scenario where an algorithm routinely produces contractual terms skewed against consumers from lower socio-economic backgrounds, using data analytics that correlate certain attributes with higher willingness-to-pay or lower likelihood to challenge unfair terms. Even if no single company executive subjectively intended to prey on this demographic, the resulting system may be considered unconscionable under section 21 of the *ACL*. The statutory doctrine, informed by the concept of systems intentionality, attributes culpability to the company's systemic approach.[150] If the company either removed safeguards that would prevent such outcomes or failed to implement them despite recognising the risk of exploitation, the statutory doctrine of unconscionability can offer redress. The conduct of the college in *Productivity Partners* constituted such exploitation. In that case, Gordon J cited Bant's explanation of systems intentionality[151] and stated:

> … the College's system was designed (or rather a system of controls was dismantled) to achieve a particular end. The College dismantled a system of controls it knew minimised exploitation of students and did so to increase the College's profits. The Court can and should infer that the College intended this end from the design of its system.[152]

Similarly, going back to the insurance example introduced earlier, section 21 would offer a stronger avenue of recourse than existing equitable principles of unconscionable dealing. The insurer's reliance on a complex algorithm alone can be viewed as part of a 'system of conduct' where this is paired with the failure to implement safeguards or alternatively removing such safeguards. Even if the insurer lacks direct, subjective intent to charge unfair premiums, its business model and technological infrastructure create an environment ripe for exploitative outcomes against consumers. The statutory doctrine will likely enable a court to take a holistic view of such conduct. The court need not identify a single 'bad actor' but can instead find that the insurer's practices and policies, including the lack of controls or oversight over its algorithmic pricing systems lead to outcomes that are against good conscience.

This makes establishing unconscionable conduct more straightforward than the equitable doctrine. While the equitable doctrine requires a party's knowledge of a special disadvantage, the statutory doctrine under section 21(4) of the *ACL* can find unconscionability in the mere fact that a firm's systems and practices would

149 See Salazar V (n 126). See also Chase Webber, 'A "Duty to Write" Smart Contracts that Unsophisticated Users Have a "Duty to Read"' (2023) 24(1) *Minnesota Journal of Law, Science and Technology* 37.

150 Bant and Paterson, 'Systems of Misconduct' (n 136).

151 *Productivity Partners* (n 139) 61 [109], quoting Bant, 'Systems Intentionality' (n 147) 187: 'corporations *manifest* their intentions through the systems of conduct that they adopt and operate, both in the sense that any system *reveals* the corporate intention and in the sense that it *embodies* or *instantiates* that intention' (emphasis in original).

152 *Productivity Partners* (n 139) 62 [111].

obviously, and foreseeably, lead to vulnerable consumers being taken advantage of. Section 21(4)(b) of the *ACL* does not require knowledge, nor does it require that a particular individual is identified as having been disadvantaged. Further, there need not have been loss or damage from the system of conduct.[153]

We can see how the flexibility of the statutory doctrine allows it to offer a much more promising avenue of redress in the context of non-deterministic algorithmic systems.[154] It can address systemic issues in algorithmic design and implementation. It does not require proof of individual knowledge or intent. The scope of section 21(4) also enables the court to examine both procedural and substantive unconscionability, which is a key feature of the US courts' approach to statutory unconscionability under section 2-302 of the *UCC*.

B The *UCC* and the 'Sliding Scale' of Procedural and Substantive Unconscionability

Section 2-302 of the *UCC* provides that a court may, if it finds a contract or clause unconscionable at the time it was made, refuse the enforcement of a contract, enforce the remainder of the contract without the unconscionable clause, or limit the application of the unconscionable clause.[155] In *Williams v Walker-Thomas Furniture Co*,[156] '[t]he US Court of Appeals for the District of Columbia defined an unconscionable contract as one involving "an absence of meaningful choice on the part of one of the [contracting] parties together with contract terms unreasonably favourable to the other party."'[157] The two-pronged analysis thus considered whether, in the light of the general commercial background and the commercial needs of the particular trade or case, the clauses involved are so one-sided as to be unconscionable under the circumstances existing at the time of the making of the contract, the principle being the prevention of oppression and unfair surprise.[158]

In applying this two-pronged analysis, US courts had traditionally required evidence of both procedural and substantive unconscionability. Procedural unconscionability or 'unfair surprise' is concerned with the bargaining process to ensure that a party's consent is not impaired when the contract is entered into. Substantive unconscionability or 'substantive oppression'[159] focuses on the bargain

153 *Stubbings* (n 139) 31 [76] (Gordon J).

154 One limitation is that the statutory doctrine under section 21 of the *ACL* only applies in 'trade or commerce' and so parties using algorithmic contracts outside of trade or commerce are only able to rely on the equitable doctrine.

155 For a historical account of section 2-302 and the 'story of modern unconscionability' in the United States of America, see Charles L Knapp, 'Unconscionability in American Contract Law: A Twenty-First-Century Survey' in Larry A DiMatteo et al (eds), *Commercial Contract Law: Transatlantic Perspectives* (Cambridge University Press, 2013) 309 <https://doi.org/10.1017/CBO9781139235662.019>.

156 350 F 2d 445 (DC Cir, 1965) ('*Williams*').

157 Brian M McCall, 'Demystifying Unconscionability: A Historical and Empirical Analysis' (2020) 65(4) *Villanova Law Review* 773, 787 <https://doi.org/10.2139/ssrn.3543682>, quoting *Williams* (n 156) 449 (Wright J).

158 McCall (n 157) 787.

159 The terms 'unfair surprise' and 'substantive oppression' appear in the Official Comment of section 2-302. See Babette E Boliek, 'Upgrading Unconscionability: A Common Law Ally for a Digital World' (2022) 81(1) *Maryland Law Review* 46, 52–3, 55.

struck by the parties, that is, whether the terms are inherently unfair regardless of how the contract was formed.

In more recent times, US courts have employed 'a sliding scale' approach that could invalidate a contract or a term of the contract if the evidence as a whole weighs towards finding unconscionability.[160] Both procedural and substantive unconscionability are still required but the overwhelming proof of one type of unconscionability may compensate for the sparsity of evidence of the other.[161] For example, the Supreme Court of California in *Armendariz v Foundation Health Psychcare Services Inc*[162] stated:

> … the more substantively oppressive the contract term, the less evidence of procedural unconscionability is required to come to the conclusion that the term is unenforceable, and vice versa.[163]

This approach was adopted by the California Court of Appeals in *A&M Produce Co v FMC Corp*,[164] articulating that procedural unconscionability focuses on an inequality of bargaining power resulting in no negotiation and an absence of meaningful choice and 'unfair surprise' due to 'the contract's terms being "hidden in a prolix printed form drafted by the party seeking to enforce the disputed terms"'.[165] Substantive unconscionability speaks to the prevention of 'oppression' from '"overly-harsh" or "one-sided results," alongside objectively unreasonable or unexpected reallocations of risk'.[166] The Court applied the sliding scale, stating that 'enforceability of the clause is tied to the procedural aspects of unconscionability … such that the greater the unfair surprise or inequality of bargaining power, the less unreasonable the risk reallocation which will be tolerated'.[167] In *Carboni v Arrospide*, the Court of Appeal focused on substantive unconscionability and stated that 'there is a sliding scale relationship between the two concepts: the greater the degree of substantive unconscionability, the less the degree of procedural unconscionability that is required to annul the contract or clause'.[168] This case concerned a 200 per cent interest rate on a $99,000 loan imposed on a consumer who was unable to secure a loan elsewhere. The Court noted that the interest rate was ten times the standard rate and 'that even if the procedural aspect of unconscionability in this case was slight, the substantive unconscionability was severe'.[169]

This more malleable 'sliding scale' approach means that courts are more willing to declare agreements unconscionable in circumstances where the contract in question is – by its terms or because of how it was negotiated – fundamentally

160 Ibid 56.
161 But see McCall (n 157) 812.
162 24 Cal 4th 83 (2000). This case concerned a one-sided employment arbitration agreement which required arbitration of employee claims but not employer claims.
163 Ibid 114 (Mosk J, George CJ, Kennard, Baxter and Werdegar JJ joining, Brown and Chin JJ concurring).
164 135 Cal App 3d 473 (1982) ('*A&M Produce Co*').
165 Boliek (n 159) 58, quoting *A&M Produce Co* (n 164) 486 (Weiner J, Reed J joining, Staniforth APJ concurring).
166 Boliek (n 159), quoting *A&M Produce Co* (n 164) 487 (Weiner J, Reed J joining, Staniforth APJ concurring).
167 *A&M Produce Co* (n 164) 487 (Weiner J, Reed J joining, Staniforth APJ concurring).
168 2 Cal App 4th 76, 83 (White PJ, Merrill and Chin JJ agreeing) (Ct App, 1991).
169 Ibid 86.

unjust to one party.[170] Some scholars have argued that this new approach responds to major law and economics critiques that highlight consumers' inability to appropriately price the terms of contracts and the collective action problems that prevent them from resisting unfair provisions.[171] McCullough distils this critique further. She contends that where an offeror has reason to believe that a reasonable person in the offeree's position would not understand the meaning of terms in the contract, the offeror cannot impose on the offeree terms either that a reasonable person would not expect, or that, even if expected, would impose costs on third parties similarly situated to the offeree.[172] This emphasis on consumer knowledge and what a reasonable consumer would understand (or rationally choose not to read) underscores the courts' increasing willingness to align with real-world contracting practices.[173]

Algorithmic contracts can manifest procedural unfairness particularly in B2C transactions as analysed above, particularly where machine learning systems are used to generate terms or pricing. Based on the 'sliding scale' approach to section 2-302 of the *UCC*, it may constitute an 'unfair surprise' where consumers are presented with contractual terms generated by an opaque algorithm and have no ability to negotiate or comprehend the terms. The diminished understanding of consumers relative to businesses that implement opaque algorithmic contracting systems, paired with any knowledge about the consumers' vulnerabilities, could amount to procedural unconscionability.[174]

Substantive unconscionability, meanwhile, may be evident where the algorithm produces terms that are disproportionately harsh or exploitative to the other party, such as excessive fees or discriminatory pricing. In cases involving algorithmic errors or unfair outcomes, strong evidence of substantive unfairness may compensate for weaker procedural concerns, and vice versa. This flexibility is particularly useful in non-deterministic systems, where the algorithm's outputs may be unpredictable and not easily attributable to a single human decision-maker. Courts would need to assess what constitutes a disproportionately detrimental outcome in this context.

The sliding scale approach under section 2-302, which considers both the procedural aspects and the substantive outcomes, renders it suitable for resolving different types of 'wrongs' arising from algorithmic-based contracting. Moreover, under section 2-302, courts are permitted to consider the 'commercial setting, purpose and effect' of the contract or any clause.[175] This opens the door to

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170 See Boliek (n 159). Boliek's study analysed a dataset of over 7,000 unconscionability court decisions with extensive data analysis of 814 court decisions on unconscionability claims. The research reports 'a small but significant success rate of unconscionability claims involving certain online contract terms': at 89.

171 See, eg, Colleen McCullough, 'Unconscionability as a Coherent Legal Concept' (2016) 164(3) *University of Pennsylvania Law Review* 779, 805.

172 Ibid.

173 Ibid 823.

174 Lauren Scholz, 'Law and Autonomous Systems Series: Toward a Consumer Contract Law for an Algorithmic Age', *Oxford Business Law Blog* (Blog, 17 April 2018) <https://blogs.law.ox.ac.uk/business-law-blog/blog/2018/04/law-and-autonomous-systems-series-toward-consumer-contract-law>.

175 *Uniform Commercial Code* § 2-302(2) ('*UCC*').

examining the role of algorithmic systems in shaping the transaction, including whether the implementer took reasonable steps to ensure fairness, transparency, and accountability. If the system's design or deployment contributed to an unconscionable outcome, the court may refuse enforcement, sever the offending clause, or limit its application.

Its interpretive flexibility and evolving judicial application make section 2-302 a viable tool for addressing the unique risks of algorithmic contracting, particularly in cases involving non-deterministic AI systems that produce unexpected and/or unfair results. The willingness of the US courts to apply section 2-302 (and equivalent provisions under state laws) to transactions beyond sales contracts,[176] including electronic contracting, software contracts,[177] and clickwrap contracts,[178] indicates its relevance for algorithmic contracting.

It may be argued that the 'sliding scale' approach to section 2-302 is already mirrored in how Australian courts have applied section 22 of the *ACL*, which lists a range of factors that point to 'unconscionable conduct' under section 21. Section 22 includes both procedural and substantive factors,[179] and each 'form[s] part of the totality of the circumstances mandatorily to be taken into account' to determine whether the conduct 'is in all the circumstances, unconscionable'.[180]

Section 2-302 has a temporal limitation: it only considers the unconscionability of a contract or clause at the time it was made. This can be restrictive in addressing the full lifecycle of algorithmic contracting. In contrast, section 21 of the *ACL* applies to unconscionable conduct at any stage of the parties' relationship in trade or commerce. This broader scope allows Australian courts to address wrongful conduct that emerges during the performance or enforcement of a contract, not just at inception. For example, an algorithmic system might dynamically adjust pricing or terms post-formation, exploiting consumer vulnerabilities through automated renewals, penalty fees, or service withdrawals based on opaque criteria.

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176 The *UCC* (n 175) section 2-302 applies specifically to sales contracts under article 2. However, the courts have applied it to guarantees (*Blount v Westinghouse Credit Corp*, 432 SW 2d 549, 554–5 (Williams J for the Court) (Tex Ct Civ App, 1968)), insurance contracts (*Truta v Avis Rent a Car System Inc*, 193 Cal App 3d 802 (1987)) and leases of chattels (*Electronic Corp of America v Lear Jet Corp*, 286 NYS 2d 711 (Sup Ct, 1967)). See A H Angelo and E P Ellinger, 'Unconscionable Contracts: A Comparative Study of the Approaches in England, France, Germany, and the United States' (1992) 14(3) *Loyola of Los Angeles International and Comparative Law Journal* 455, 495.

177 See, eg, *Shema Kolainu – Hear Our Voices v Providersoft LLC*, 832 F Supp 2d 194 (ED NY, 2010) (under New York law, software licensing contract containing disclaimer of all warranties was not procedurally unconscionable to licensees). See also Andrew Rodau, 'Computer Software: Does Article 2 of the *Uniform Commercial Code* Apply?' (1986) 35(4) *Emory Law Journal* 853 (software is a good and article 2 should be extended to apply to software licensing transactions).

178 See *Feldman v Google Inc*, 513 F Supp 2d 229 (ED Pa, 2007) (agreement covering advertising on internet website was not substantively unconscionable, under California law, by requiring that suit against the web operator be brought in California, providing for disclaimer of all warranties and requiring that alleged billing errors be called to operator's attention within 60 days). See Cory S Winter, 'The Rap on Clickwrap: How Procedural Unconscionability is Threatening the E-commerce Marketplace' (2008) 18(1) *Widener Law Journal* 249.

179 See eg, section 22(1)(b) of a substantive concern and section 22(1)(c) of a procedural concern.

180 See *Paciocco v Australia and New Zealand Banking Group Ltd* (2016) 258 CLR 525, 587 [189] (Gageler J); *ACL* (n 9) s 21(1).

Section 21's temporal flexibility enables courts to respond to such systemic or ongoing patterns of conduct that may only reveal their unconscionable nature over time. Here, we suggest that the *ACL*'s broader scope resonates with the idea that equity looks at all aspects of a transaction. As Mance IJ noted in *Quoine*, if it is immediately obvious that a mistaken transfer has occurred, a party's failure to return the benefit of the transaction as soon as he came to learn of the error would be as unconscionable as playing some positive part in bringing about the transaction.[181] The conscience of equity would prevent the unjust *retention*, other than the procurement, of the benefits obtained.

In summary, both section 21 of the *ACL* and section 2-302 of the *UCC* offer statutory mechanisms to address a broader range of unconscionable conduct, overcoming the traditional limitations of common law and equitable doctrines. The integration of procedural and substantive factors makes them particularly responsive to unconscionability that arises from algorithmic contracting.

V CONCLUSION

The advent of algorithmic contracting has introduced unique complexities into the legal landscape. Deterministic algorithms, operating under predefined rules, may still produce unforeseen and unfair outcomes. Non-deterministic machine learning and AI systems with significant opacity can further exacerbate any imbalance between contracting parties. The use of black box algorithms by a more powerful party can no longer be treated as a neutral technological choice. By recognising the role of algorithmic opacity in shaping contractual relationships, and by holding implementers to a reasonable standard of risk mitigation, the law of unconscionability can remain responsive to the realities of algorithmic contracting. As Mik argues, operators who choose to use opaque technologies must bear the risks of doing so.[182] In this sense, the black box problem is not a barrier to legal attribution. It is a factor that shifts the burden of risk onto the party who chose to use the technology.

In the Australian context, the cumulative effect of both the statutory and equitable unconscionability doctrines is to offer a set of avenues for redress for addressing wrongs arising from algorithmic-based contracting, particularly in the B2C context. In transactions where a significant power imbalance exists between the parties, and where the defendant corporation possesses some knowledge of the disadvantage, the result of an algorithmic wrong may be the substantively unfair trigger that prompts the courts to consider the procedurally unfair background of the transaction. In a statutory context, as Paterson and Bant powerfully argue, corporate systems liability under section 21(4) of the *ACL* (as expounded in *Productivity Partners*) allows the necessary intent to be attributed to corporations where their systems in deploying algorithmic contracts result

181 *Quoine* (n 1) 93–4 [205]–[206].
182 Mik, 'Much Ado about Artificial Intelligence' (n 125) 503.

in exploitative outcomes for the other party.[183] The sliding scale approach of procedural and substantive unconscionability under section 2-302 of the *UCC* also offers a responsive and flexible statutory adaptation. These promising pathways can help to ensure that contract law doctrines remain relevant and responsive to modern contracting systems that increasingly employ machine learning and other advanced technologies, thereby safeguarding the interests of parties who may be disadvantaged by the opacities and complexities inherent in these systems.

183 Paterson and Bant, 'Automated Mistakes' (n 19).