# ARTICLE

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# Intersectionality of social and philosophical frameworks with technology: could ethical AI restore equality of opportunities in academia?

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Academia is far from a meritocratic distribution of opportunities. This leads to inequalities, lack of diversity, and unfairness. The objective of this conceptual paper is to propose an integrative framework to help the academic community address its pervasive but persistent inequalities of opportunities. The framework emerges from the intersections of Bourdieu, Bronfenbrenner, and Rawls frameworks and propose the use of ethical artificial intelligence (AI) to contextualise merit and recreate true equality of opportunities. More specifically, I argue that academia has structures and doxa that may be inaccessible to individuals from different social origins, and are perpetuated by privileged individuals who achieve positions of power within academia. The privileged individuals inherit and are exposed to opportunities to acquire capital from early life, resulting in the continuation of *status quo* practices and alienation of minorities that do not share—or do not have the ability to acquire—capital. I argue that this process occurs as a result of the social origins of the individual and, as Bronfenbrennian framework suggests, disadvantaged individuals lack both the (inherited) capital, but also lack the ability and opportunities to acquire capital relative to privileged counterparts. I argue that the only way to mitigate this inequitable system is to retrieve the Rawlsian original position of ignorance (veil of ignorance) in the allocation of academic capital based on merit, which can only be objectively quantified relative to social origins of individuals. As opposed to current subjective assessments (e.g., peer-review) or lottery systems, I propose the use of Big Data and ethical AI to reconstruct the position of ignorance and contextualise merit based on the expected merit given individuals' social origins. I also discuss the concept of 'years post-PhD' as it is used to introduce fairness in allocation of academic capital and propose a different and less relativistic landmark that accounts for the years post-first authorship publication. This is a novel conceptual framework which can stimulate further research into the ecology of social justice.

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"For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath."

Matthew 25:29 (KJV)

## Introduction

Academic institutions and academia more generally, have been under criticism due to their lack of equality and diversity (of gender, ethnicity, socioeconomic background, and so on) (Munar et al., 2017; Nielsen, 2017a; Mayer and Rathmann, 2018; Kalpazidou Schmidt and Cacace, 2019). This is a global issue that, despite ongoing debates and targeted policies, continue to affect both developing and developed countries [e.g., (Monroe et al., 2008; Moschkovich, 2017; Nielsen, 2017b; Chitsamatanga et al., 2018; Maximova-Mentzoni and Egeland, 2019; De Angelis and Grüning, 2020). For instance, even in Scandinavian countries which are often perceived as gender-equal societies, female staff representativity at associate professorship and full professorship levels were just ca. 35% and 20% in six major universities in 2017 (Nielsen, 2017b), revealing strong gender biases through the academic career path. This finding in Scandinavia is of course representative of a global pattern (Winchester and Browning, 2015; Chevreul et al., 2018; Treviño et al., 2018).

Other factors beyond sex and gender also contribute to the opportunities of career progression in academia, albeit these are less often acknowledged. These factors are often arbitrary and a consequence of stochasticity, and can therefore be considered as part of the ecological context in which an individual exist. These ecological factors are immediate to—or affective of—the focal individual for which in many cases, the individual has little or no control over but nevertheless affect the individuals' preference for —and potential to succeed at—an academic institution. For example, socioeconomic class, parental education, and country of origin contribute to promote (or hinder) fair equality of opportunities in academia (Björklund and Salvanes, 2011). Even marital status of the parents can influence educational attainment and academic potential, as there is evidence of single-parenting influencing academic achievement (see e.g., Bronfenbrenner and Morris, 1998). In fact, there is strong evidence that ecological factors can significantly skew ones' opportunity for academic achievements. For instance, in a longitudinal study in Finland, parental education significantly affected the proportion of individuals obtaining a Master's degree, PhD, and professorship before or at the age of 49 (Helin et al., 2019). The authors of the study concluded that:

> "[…] Finnish professors born in the years 1964–1966 are highly selected in terms of parental education. A large part of this selection is already present among master's degree holders, but both the PhD and professorship transitions are associated with further selectivity. For example, among master's degree holders whose parents lack post-secondary education, about 1 in 110 became professors, while the same number is 1 in 40 among master's degree holders with at least one university-educated parent."

(Helin et al., 2019, p. 96)

Interestingly, the authors also note (although did not directly measure) the effects of other latent ecological factors that potentially influence individuals' academic achievements:

> "[…] individuals of non-academic backgrounds who nevertheless become professors are more likely than others

to have been advantaged in other ways. It stands to reason that the top of Finnish academia is therefore likely to be even more socially selected than our results may suggest."

(Helin et al., 2019, p. 97)

Therefore, academia is anything but fair, as success is confounded by ecological conditions that determine merit, making the access to opportunities and rise through the academic ranks anything but meritocratic (Zivony, 2019). To date, however, with few exceptions such as career breaks, academic institutions largely disregard most (if not all) of the aforementioned ecological factors that have contributed to ones' opportunities for academic achievements. In this sense, and based on the growing evidence of the importance of ecological factors in shaping individuals' development and opportunities, few could disagree with the statement that academia is overall an unfair system. But what can be done differently?

In this paper, I propose a conceptual framework that aims to recreate fairness in academia by considering arbitrary ecological factors that affect an individuals' life and opportunities to achieve merit. I argue that incorporating ecological data when making decisions about the distribution of academic capital—e.g., grants, fellowships, positions—is not only fair and morally necessary, but can also provide a system with fair equality of opportunities to all which in turn, will lead to a more diverse and equitable academic system. To achieve this, I first discuss the concepts proposed by Pierre Bourdieu related to doxa, habitus, and capital, and how they can help explain the inequalities in academia observed today. Next, I expand the argument to include ecological factors not only immediate to the individual at or during early career stages, but also early in life. In doing so, I reach out to the intersectionality of Bourdieu's concepts and the concepts of developmental ecology from Bronfenbrenner (1979, 1995) to show that inheriting and building capital is an ontogenetic process. This is important because it highlights the ways in which early life environmental factors, which are often disregarded in selection processes, can have long-lasting implications to preferences, choices and opportunities in academia. Next, I discuss how academia has tried to overcome unfairness, particularly at early-stages in the academic career, through for example discretisation of career paths using the concept of *years post-PhD*, which I argue is relativistic and fails to account for ecological factors (e.g., differences in academic culture). I then combine the classical theory of moral philosophy and distributive justice by John Rawls (Rawls, 1971) with recent technological advancements in the field of ethical artificial intelligence (AI) to propose a framework which academia could use to perform selection for allocation of academic capital within the academic system, which can recreate fairness. Finally, I anticipate some of the immediate criticism (both practical and conceptual) that the framework proposed here may encounter, and attempt to address these to the best of our current available knowledge. Overall, the conceptual framework proposed here emerges from the intersectionality of Bourdieu, Bronfenbrenner, and Rawls, which can be brought to life with the assistance of cutting-edge technology of ethical AI to ensure equality of opportunities in the distribution of capital by academic institutions. By working at the intersection of social sciences, philosophy, developmental ecology, and AI, the framework proposed here has the potential to stimulate future studies (both theoretical and empirical) in the field of social inequalities.

**A word on terminology**. Before building up to the specific aspects of the conceptual framework, it is necessary to clarify our working definitions of concepts. In the manuscript, I refer to

'equality' in the sense of providing equal opportunities. This can also be referred to as 'equity'. I also adopt the distributive justice framework and assume that a just outcome is a fair outcome so long as there is equality of opportunities (Rawls, 1971; Deutsch, 1975; Jasso, 1980; Cook and Hegtvedt, 1983). The conceptual framework therefore is based on the following:

1. *What is to be distributed?*
   This conceptual framework assumes that the 'academic capital' to be distributed, from the perspective of academia and its institutions, are grants, fellowships, faculty positions, and other career support accessible through open competition or recruitment. The ultimate aim of the conceptual framework proposed here is to ensure that the access to the academic capital is fairly distributed amongst capable candidates, thereby guaranteeing equality of opportunities.

2. *To whom it is to be distributed?*
   This conceptual framework envisages the fair distribution of access to the academic capital by all qualified individuals within the academic system which are eligible to such capital.

3. *How it is to be distributed?*
   This conceptual framework proposes that the fair distribution of academic capital can only be achieved through the contextualisation of an individual and its merit. This can be achieved both through peer-review (which although biased, it is still arguably useful) as well as potentially harnessing the recent technological advances to create an unbiased and independent assessment criterion (described below).

4. *What needs to be discriminated?*
   Academic institutions are discriminating institutions by nature as they select the 'best and brightest' to join their student and staff cohorts. However, I argue that, as is, academia discriminates more than just based on merit per se, but also on confounding ecological factors that are perceived as (or contribute towards) an individual's merit. The framework proposed here aims to mitigate the latter form of academic discrimination, so that the former is made based on a contextualised merit.

Therefore, the framework proposed here aims to ensure equality of opportunities to all qualified and eligible individuals within the academia, through the contextualisation of merit within the social environment in which merit was achieved rather than the boundaries in which merit is judged.

## Bourdieu and the effects of capital on inequalities
Let us first start with concepts from Bourdieu's field theory. The aim of this section is not to provide an extensive review on the topic, which can be found elsewhere both in Bourdieu's own work as well as the work of others (e.g., Bourdieu et al., 1977; Bourdieu, 1989, 1990, 2018; Flemmen et al., 2017; Gilleard, 2020). Instead, this section lays the foundation for the terms later used to discuss and intersect with theories of Bronfenbrenner and Rawls.

Individuals are agents capable of analysing and responding to the environmental and social conditions of their existence with both objectivity and subjectivity. Part of this subjectivity is internalised in the form of unspoken social assumptions and norms which dictate how individuals behave in social contexts and strive on the pursuit of desirable resources. The environment in which individuals strive for the desirable resources is the *field*, where *agents* internalise and develop strategies to navigate the world in which they are immersed. Each field has its own 'rules' for social interactions, or *doxa*, which establishes the (un)acceptable behaviours and expectations of agents in the field. Each

agent enters a field with its *habitus*, which can be thought of a bundle of resources or *capital* that enables the individual to navigate the doxa of a particular field in the pursuit of desirable resources. Capital can be economic (e.g., money), social (e.g., people an individual knows) or cultural (e.g., educational attainment). Once the agent enters the field, its habitus become a symbol of his potential and adequacy to the context and can also be referred to as *symbolic capital* (see e.g., Bourdieu, 1977, 1989; Harker et al., 2016). Bourdieusian concepts are useful to delineate the sources of potential inequalities in health and education. For instance, a recent study of fifteen students in England has shown inequitable patterns of pupils' participation in physics exercises cultivated by the underlying beliefs perpetuated by pedagogical practices in physics education (Archer et al., 2020). As such, the doxa created by pedagogical practices were exclusive not on merit, but on other social factors that constrained equitable access to further education. This likely contributes at least partly the recognised gender inequality in physics classes (Riegle-Crumb and Moore, 2014; Eickerman and Rifkin, 2020). More importantly, this suggests that acquisition of capital can start early in life, but only be realised later in the ontogeny of the individual and the discipline (Towers, 2008; Moss-Racusin et al., 2012).

Capital is an essential aspect of the relationship between the individual and its social environment because it is the means through which an individual can endure in the pursuit of a desirable resource. It is well-known that all forms of capital contribute to inequalities (Abel, 2008; Pinxten and Lievens, 2014) and education attainment (DiMaggio and Mohr, 1985; Andersen and Hansen, 2012). Importantly, capital is not necessarily predictive of individuals' merit. Bourdieu and others have recognised with theoretical and empirical studies that capital (including cultural capital) is transmitted from parents to children in a form of 'capital inheritance' that differentially benefits future generations, including (but not limited) to education attainment (Bourdieu et al., 1977; DiMaggio and Mohr, 1985; De Graaf et al., 2000; Sullivan, 2001, but see also Tzanakis, 2011). Thus, affluent classes have access to capital (either inherited or built) that favour their amalgamation into the upper levels of the system, whereas those with little or no capital (e.g., lower class), or born under a different set or social norms (e.g., immigrants) may fail to understand the doxa of a new field (often constructed by the affluent), fail to acquire capital that can facilitate their career progression (e.g., build social networks), and can be marginalised, further accentuating the struggle for capital in a structured social context (e.g., Behtoui and Neergaard, 2010). Organisations, including academic institutions, are social constructions with shared structures, hierarchy, and policies but also with informal social codes and expectations which are shared by the social group, which constitutes the organisational culture (Schutz, 1970; Mendoza, 2007). For an individual to succeed, there is the need for a strong social acceptance and conformity to the academic social norms which, those from affluent background, might be more familiar with peers or families from academic backgrounds and even inherit from parents with academic degrees or professions the mannerism needed to succeed in the academic context (De Graaf et al., 2000; Sullivan, 2001). Conversely, individuals from underrepresented groups and groups of humble social classes often lack the same opportunities (above and beyond their competencies), which have long-term implications to their ability to survive and thrive in the academic system (Sigl, 2016). An example of the consequences of such dynamics can be observed in a recent study of the Swedish academic system (Behtoui and Leivestad, 2019), where the authors found that:

"[…] given the same work experience and compared to the reference group (born in Sweden with at least one Swedish-

born parent), individuals born in Eastern Europe, Asia, Africa, and South America are, firstly, more likely to be unemployed and, secondly, if they are employed, to have a lower income (lower position)."

At present, none of these factors are fully acknowledged in academic faculty positions, but instead the narrative of 'work should stand above all else' are perpetuated for those who (unconsciously) benefit from the status quo. As a result, the more distant an aspiring individual's original social and environmental contexts are from those in the positions of power in academia, the more difficult it is for this individual to be successful in the academic system. This is because such mismatch in social origins can lead to a larger perceived lack of both capital and the opportunities to *acquire* capital that is valued by those in the position of power in academia (e.g., recommendation letter from a famous colleague). As capital is built through life, it is expected that there is a cumulative (negative) effect for individuals belonging to minorities and less affluent communities over time which leads to long-term consequences to the retention of a diverse workforce in high positions within the academic system (Gluck, 1987).

## Bronfenbrenner the possible confounding effects of the developmental environment in academic merit

Bourdieu recognised that social origin has an important, yet unaccounted impact on individuals' academic success (Bourdieu, 1988). One can ask, then, why has academia not devised a way to explicitly control the well-known confounding effects of social origin in decisions of allocation of capital and faculty positions? Ecological factors such as for example socioeconomic status and income, parents' education, neighbourhood, political landscape of the region or country, quality of schools, access to mentorship and so on shape the opportunities that individuals have to develop and fully engage with educational skills that support the realisation of individuals' full (academic) potential (Bronfenbrenner, 1979; DiMaggio and Mohr, 1985; Bronfenbrenner and Morris, 1998; Sullivan, 2001). This, in the short-, mid- and long-terms can have important consequences for individuals' opportunities to progress in their university education (e.g., PhD), acquiring supportive network of peers and mentors and securing jobs in academia (Björklund and Salvanes, 2011; Helin et al., 2019); i.e., acquiring capital. A longitudinal study in the US has shown that children growing in poverty have significantly lower academic achievements as measured by scores in standardised tests (Hair et al., 2015). This is evidence that poverty decreases the immediate opportunities for education in the environment of a developing individual (e.g., lack of educational resources, motivation) (see e.g., Gorski, 2017), that can translate into mid- and long-term access to opportunities to further education (cultural capital) (Johnson et al., 2016). Other ecological comorbidities of poverty such as poor health (Wickham et al., 2016), stress (Blair and Raver, 2016) and violence (Aber, 1994; Hashima and Amato, 1994) can lead to social discrimination and further academic disengagement (Osypuk et al., 2019; Verkuyten et al., 2019), reinforcing the unfavourable nature of the developmental ecological environment on educational attainment and the acquisition of capital. Over time, the consequences of such unfavourable environment can cumulate and strongly disfavour individuals' opportunities to academic achievements (Bronfenbrenner, 1995; Black et al., 2017; Chan et al., 2017; Daelmans et al., 2017; Lo et al., 2017; Shonkoff et al., 2017). Of course, the opposite side of this story is also true: children developing in favourable ecological conditions, with inherited capital, have far more and better opportunities to fully engage with educational material, concentrate on mastering academic skills, networking, and gaining opportunities to develop new skills. As a result, these individuals are surrounded by an environment far better—both in quality and also in quantity—of opportunities than those individuals from poverty (White, 1982; Battle and Lewis, 2002), leading to large cumulative differences between the academic achievements of individuals on different sides of this socioeconomic spectrum. A compounding factor is the interactive nature of ecological factors in determining the opportunities of an individual. For instance, in the UK at least, poverty is not independent of ethnicity[1] or gender[2], whereby non-white and/or females are less favoured and therefore, less likely to have access to opportunities. It is at least intriguing that non-white and/or females are the same groups that have been historically denied access to education as well as to academic positions. Thus, on average, some groups have historically been less likely to experience ecological factors that nourish and develop (academic) skills compared to other groups and these differences, I shall argue, likely contribute to some groups' success in the current academic system. Note that the rules by which academic capital are allocated have themselves been historically shaped by individuals in high academic positions which have been privileged. This forges a self-perpetuating process which on the one hand, selects individuals that experienced favourable ecological conditions and on the other hand, forges and enforces rules that guaranteed that individuals that experienced these favourable ecological conditions continue to receive support in the next generations. In this context, one can ask: to what extent are individuals' differences in academic achievement a reflection of intrinsic merit? Is it fair to expect an individual to be as competitive as other given striking different social contexts and developmental environments from which these individuals have been shaped throughout their lives?

I shall be careful here because the above-mentioned relationships can be nothing but spurious correlations between unrelated variables. For instance, the fact that poverty is unevenly distributed across ethnicities may not be casually related with the lack of academic opportunities to individuals from low socioeconomic background or underrepresented ethnicities. The lack of diversity and equality in academia can, in theory, be caused by other factors. For instance, preference for an academic career may be unevenly distributed in the population which, by measuring the outcome (i.e., inequalities), I could have erroneously identified an inequality of opportunities when in reality it is the result of unequal preferences. However, social and environmental factors also shape preferences (Slaney and Brown, 1983; McWhirter, 1997), and it is at least plausible that social and environmental factors contribute to the unequal outcomes observed in academia both in terms of preference and 'performance'. This will only be truly uncovered with data, and this is one of the values of this paper: to stimulate further empirical work on the topic. I nevertheless shall proceed based on the assumption founded on recent data which suggests an association between an individuals' ecological context and the academic opportunities that these individuals can attain, be that a result of initial career preference, inequalities during the academic path, or both. (see e.g., Sullivan, 2001; Helin et al., 2019).

**Discretisation of academic paths and the concept of relative to opportunity**. Academic institutions are aware of the unfairness of their processes. In fact, one might claim that academic institutions have tried to adapt and accommodate the differences in social origins into the systems for allocation of academic capital. Research councils and trusts have discretised the academic career to allow for a relatively 'fair' competition amongst applicants. For

example, the Early Career Fellowship offered by the Leverhulme Trust imposes as eligibility criteria (as of January 2021)

'…Applications are invited from those with a doctorate who submitted their doctoral thesis for viva voce examination not more than four years prior to the application closing date. Hence those who formally submitted their doctoral thesis for viva voce examination before 25 February 2017 are not eligible unless they have since had a career break'[3].

In a similar initiative to attain fairness, academic institutions have incorporated the concept of *relative to opportunity*, whose goal is to evaluate candidates in light of their achievement relative to the opportunities that a given candidate has had in their career path. For example, the Australian Research Council (ARC) has incorporated the 'Research Opportunity and Performance Evidence (ROPE)' into funding calls as a way to ensure

'that all eligible researchers, from universities and the wider research sector, including industry have fair and equitable access to the research funding available through the National Competitive Grants Programme (NCGP)'[4]

The concept of relative to opportunity is perhaps the closest to the framework proposed here in theory but not in practice, largely because the current definition of relative to opportunity is subjective and therefore, intrinsically biased. This subjectivity emerges from the fact that, the selection criteria rely on subjective assessment of panel members and reviewers—which are humans with their own biases, limitations, prejudices, and cultural background—to judge whether the achievements of a candidate given their career stage and (described) opportunities is outstanding and worth supporting. How can assessors judge whether a candidate maximised the full potential of their opportunities relative to another candidate? More generally, how can an assessor *know* or *guess* what is the full potential of opportunities in the first place?

The truth is, they cannot, and thus the entire premise that current methods of selection rely on an unattainable concept of relative to opportunities. As mentioned above, the more distant an applicant is from the social origins of the panel or reviewer members, the more likely it is that the reviewers and panel members are incapable of fully assess the achievements of the applicant relative to opportunities. This subjectivity is what differentiates the current definition of relative to opportunities from the framework proposed in this paper, the latter which strives to use ethical AI and data to control for relative opportunities (i.e., 'objective fairness') rather than relying on the good will and cultural awareness of panel members and reviewers. Given the current subjectivity in selection processes, it is difficult to envisage that the parties involved in the process of allocation of academic capital—with their cultural differences, backgrounds, biases, limitations, and ecological influences—promote a fair assessment of candidates that have themselves diverse backgrounds, biases, limitations and so on. Ultimately, numbers will inevitably play a role, and candidates with a more substantial list of achievements (e.g., more papers) are inevitably selected forward—generating the present crisis in academia (Lee, 2014; Yamada, 2019). Instead, if academic institutions take into account the social origins of individuals, the assessment can be made (more) fair because the achievements of individuals are judged in light of empirical data, and the achievements of applicants can be judged relative to the expectation from a candidate that has experienced the same overall social origin. In this way, outstanding achievements are truly standardised, and the academic achievements become more about what candidates achieved given their availability of capital in their social context and less about the amount of capital achieved per se. For example, in Slovenia, ca. 8% of 25–34-year-old with tertiary

education possess a PhD while in Colombia or South Africa, this value is lower than 1%[5]. A key question emerges: do individuals obtaining a PhD in Slovenia and Colombia experiencing the same opportunities? With the data, it is reasonable to assume that there are far more opportunities—and support (both social and economic)—for completing a PhD in Slovenia than in Colombia. Thus, it could be implied that obtaining a PhD in Colombia poses, on average, significantly more challenges than obtaining a PhD Slovenia. Thus, someone obtaining a PhD in Colombia may very well have achieved more given their social origins *relative to* a similar individual obtaining a PhD in Slovenia. As it stands, however, academic institutions ignore or leave to the benevolence of panel members and reviewers (which are often from yet a different cultural background) to decide whether candidates from Colombia and Slovenia are comparable. If only academic institutions were to consider indicators of achievements relative to individuals' social origins (in this case, average education by title per country) in the selection process for allocating academic capital, then applicants would be judged based on the expectations for a candidate that experienced the same ecological contexts (i.e., the candidate from Colombia (Slovenia) would be judged based on the opportunities available in their own country). Note that this argument does not favour one applicant at the expense of another. Candidates from Colombia do not gain 'free' points and candidates from Slovenia are not penalised—that too, would be arbitrary and unfair. Both candidates are compared against a hypothetical candidate which experienced similar social origins and only then, academic merit can be evaluated objectively. It may well be that a candidate from Colombia achieved less than expected given available opportunities and capital. But at least this candidate was judged based on a fair expectation; candidates were judged based on *contextualised merit*.

Critics may argue that the standards for getting a PhD should be similar across the world, and therefore obtaining a PhD in Slovenia, US, UK, Colombia or anywhere should not matter. To this, I have two points. First, even in leading academic countries such as the US, UK, and China, PhD structure varies widely in many ways, including the time span, teaching, training and so on. Thus, it is unlikely that that PhD programmes provide the same opportunities for students within countries, let alone around the world. But even if the structure of the PhD candidature were the same, there is an entire ecological aspect of the society surrounding the individual undertaking the PhD that contribute (or discourages) to the individuals' motivations throughout the degree. In Slovenia for instance, there may well be a social expectation—or at least a sense of normalcy—from the society for those who obtain a PhD (e.g., Arzenšek et al., 2014) whereas in Colombia, obtaining a PhD can be seen as an achievement reserved to the highly gifted of the society (this is based on anecdotal experience from the author, who is Latin American) or can lead to emigration of skilled workers to other (developed) countries (see Pellegrino, 2001 for discussion). As such, not only the social context influences the likelihood of any given student to progress to the PhD in the first place, but also the public perception and public policies that support a student to pursue such degree (e.g., less scholarships or funding for research). Thus, it may well be that the simple fact of obtaining a PhD in an unsupportive social context is an achievement in itself, but which might be taken somewhat for granted in cultures with more supportive social contexts during the selection processes for academic capital.

Overall, the point is that, academic institutions might be unconsciously skewing the distribution of individuals that are awarded access to academic capital by overlooking and subjectivizing (i.e., leaving to the judgement of reviewers and panel members) the contributions of ecological factors that have affected individuals' opportunities during their life prior to the application; i.e., social

origins. This is alarming because the current selection process ignores surmounting scientific evidence from social sciences and child development and psychology literatures (e.g., DiMaggio and Mohr, 1985; Bronfenbrenner and Morris, 1998; De Graaf et al., 2000; Dotterer and Lowe, 2011; Tzanakis, 2011; Wang et al., 2020) and, therefore, can be considered obsolete in many aspects.

**Years post-PhD: is there a better indicator of career stage?** The concept of relative to opportunity described above is often linked to the discretisation of academic career paths using the PhD as a landmark; the concept of 'years post-PhD'. The underlying rationale is that a scientist with one-year experience post-PhD has had different experiences and opportunities than an established scientist with twenty years or more of career in the field. Therefore, comparing some metric of their performance such as the number of first-author papers directly is blatantly unfair.

However, this discretisation is rather arbitrary and ineffective. For one, the length and structure of PhDs vary widely between countries and the career paths before and after the PhD also vary widely between and within countries as well as between individuals. For example, after an undergraduate degree some individuals obtain a master's degree while others move straight to the PhD. While these are different strategies, they offer different opportunities to the individuals that can influence their competitiveness for academic capital later in their career. In our current system, with the arbitrary landmark of 'post-PhD', it is in theory more profitable for a candidate to obtain multiple master's degrees, or at least extend the length of a master's degree already underway, provided that this will increase the number of publications to the individual. Likewise, during the PhD, is advantageous to an individual to extend the length of the PhD to as long as possible (given the constrains of funders and/or the academic institutions) as this allows the individual to maximise publication numbers prior to the start of the post-PhD years. In doing so, the individuals can become more competitive after graduation, placing the individual in a better position to obtain jobs, fellowships, and to advance in academia. Combine this with the obsessive focus on publications and awards in the current academic context, and we have a system that is unfair. In fact, challenges with the definition of career stage based on years post-PhD have received attention in the literature because career path after graduation is strongly affected by ecological factors (e.g., job availability, family commitments) (Bosanquet et al., 2017). While there has been claims that self-definition of career stage could be a better estimate of career status (Bosanquet et al., 2017), the subjective nature of self-definitions may be criticised due to vulnerability to exploitation. I propose that a fair and objective metric for career stage is years post-first authorship publication. In many academic fields, the first author is considered to have contributed the most to the study, from experimental design through to manuscript writing (Riesenberg and Lundberg, 1990). This implies that the individual has gained enough skills to lead a research quest from start to publication, and therefore is, in theory, a functional unit within the academic environment and capable of continuing to publish in the same or different settings independently. This definition accounts for differences in postgraduate programmes worldwide while eliminating the relativistic nature of years post-PhD.

One possible issue that emerges from this concept, which is worth mentioning here, is for disciplines that use alphabetical ordering in authorship list in manuscripts. In those cases, two alternatives are possible: (1) consider the landmark as years post-first publication, if authorship in manuscript of this disciplines involves equal amount of work for all listed authors or (2) formalise the authorship contribution statement and consider

years post-publication of a work with significant contribution. Whether or not the alternative discretisation landmarks are useful and fair will require further studies, for example, comparing the estimated experience and career forecast of individuals in discretised distributions using post-PhD *versus* post-first authorship publication (or the discipline-specific variants). Nonetheless, the landmarks proposed here remove the relativistic nature of the concept of post-PhD years and inherently account for differences in PhD structure and career paths between individuals across contexts.

## Rawls and the theory of justice applied to academia: can we make things fair?
Career discretisation and the use of landmarks only marginally address the pervasive inequalities of opportunities in academia. To achieve true fairness, there exists a need for an overhaul on the current model in which academia is based upon that goes beyond simple subdivision of the career path into classes. In this section, I describe how an adapted Rawlsian theory of justice (Rawls, 1971) coupled with current technological advances and ethical AI could provide a new framework to drive academia to true equality of opportunities in the future. While conscious that absolute fairness may be impossible to attain, I argue that with an appropriate framework, academic institutions can at least move towards objective fairness.

Before discussing the details of the framework, I shall first describe the basic concepts and principles underpinning Rawls' theory of justice, which form to varying degrees the backbone of the framework proposed later. I then discuss how Rawls' theory can be adapted and used within the academic context, and discuss a practical route for the application of the framework, which is possible thanks to recent technological advances that can automate data analysis and scoring of applicants independently of humans (e.g., AI and Machine Learning). Note that the aim in this section is not to take Rawls' theory of justice as face-value to create a 'one-size-fits all' abstract principle. Instead, the aim to build bridges between the original concepts laid out in Rawls' theory of justice with the urgent need for a fair system of allocation in academia. Having said that, I present an overview of Rawls' theory to provide the background knowledge to readers that may not be familiar with, or come from different disciplines other than philosophy. I judge this to be of value because it gives due credit to previous work, but also provide the rationale for the reader to grasp the concepts proposed in this manuscript.

**Rawls' original position and fair inequalities.** Rawls recognised that unjust utilitarian societies are arbitrary and disregard individuals' ecological conditions, both of which principles of justice should attempt to regulate.

> "In this way the intuitions of society favour certain starting places of others. These are especially deep inequalities. Not only are they pervasive, but they affect men's initial chances in life; yet they cannot possibly be justified by an appeal to the notions of merit of desert. It is these inequalities, presumably inevitable in the basic structure of any society, to which the principles of social justice must in the first instance apply" (p. 7).

> "Utilitarianism does not take seriously the distinction between persons." (p. 24).

Rawls' theory of justice uses a concept known as the *original position*, from which individuals are to decide the principles of justice that constitute a fair society without any knowledge of each individuals' roles, talents, and position within such society

('*veil of ignorance*'). This precludes individuals to tailor principles of justice as to benefit the groups to which the individual belongs.

> "The principles of justice are chosen behind a veil of ignorance. This ensures that no one is advantaged or disadvantaged in the choice of principles by the outcome of natural chance or the contingency of social circumstances. Since all are similarly situated and no one is able to design principles to favour his particular condition, the principles of justice are the result of a fair agreement or bargain." (p. 11)

Rawls' also propose the principles of justice that underpin a just (hence fair) society, from which rational individuals in the original position would agree upon. Briefly, the principles state that (1) each person is to have an equal right to the most extensive scheme of equal basic liberties (e.g., freedom of speech) compatible to the same scheme of liberties for others and (2) social and economic inequalities are to be arranged that (a) is to the greatest benefit to the least advantaged (the difference principle) and (b) is attached to positions open to all under conditions of fair equality of opportunity (the equal opportunity principle). Interestingly, note that, from principle 2a, there is a potential for inequalities to exist that are just, as long as these inequalities are to the benefit of the least advantaged in the society.

**The impossibility of the original position in real academic institutions**. Rawls' concept of the original position changes the setting for individuals deciding the principles of a just society. This is because individuals lack information of their own place within the society and thus cannot tailor the principles for self-benefit. The key here is that individuals become *ignorant* of their role within the society due to the *removal of prior information*. However, in academia (as in any real-life setting), this concept of the original position is impossible to be encountered in practice. Candidates for, say, a fellowship are required to submit a list of their past achievements in support of the application. As a result, academic institutions are never free of information about candidates that can bias the distribution of academic capital (i.e., conditions for the original position are never met). Even if proposals are submitted anonymously, the project proposal itself contains information about the project as well as the applicant. For instance, virtually all manuscripts and many grant proposals are written in English, which is not the first language for many applicants and consequently, imposes barriers to effective writing communication (especially in early career stages) (Hyland, 2019). These barriers can be overcome, but the solution introduces additional ecological factors that further aggravates the issues raised here. For instance, effective English writing will depend upon age at exposure to second language, access to resources and education in the second language, opportunities to write in the second language, quality of feedback received from peers that are native speakers and so on (see e.g., Tucker et al., 1976; Nikolov and Djigunovic, 2006; Saville-Troike and Barto, 2016), which are ecological factors that did and will continue to affect individuals' careers. Thus, the original position of complete ignorance is not attainable in practice.

There have been ethical criticisms of the status quo allocation of academic capital (Conix et al., 2021; Roumbanis, 2021) and alternative ways in which capital can be distributed have been created, largely attempting to restore fairness into the process (Chawla, 2021). An example is the distribution of academic capital through a lottery system, which arguably removes inherent biases in decision-making (Roumbanis, 2019). A modified version of such lottery model has been adopted in New Zealand and received with reasonable acceptance, although not for all types of research grants (Liu et al., 2020). By using randomness to select amongst qualified proposals, the lottery system adopts a fair process of selection. However, this lottery system is only fair if the academic institutions enforce that the pool of candidates and proposals from which the lottery is drawn from is a pool of candidates that have had true equality of opportunities. Otherwise, the lottery system will simply replicate the unfairness of the academic system as a whole. For example, suppose that the candidate pool in the lottery reflects gender inequalities of academia and say that this inequality has ratio 70:30 male:female scientists. In this context, even a fair lottery system will, on average, award 2.5 times more grants to male than to female scientists, thereby propagating the unfairness of the system even if the process of selection is fair. In other words, while the process of decision-making for the allocation of distributive shares is fair (lottery), the pool from which the process is drawing from reflects a historically unfair academic environment, ultimately leading to unfairness. To my knowledge, the system implemented in New Zealand uses anonymised project proposals during a pre-selection peer-review assessment, which helps remove some of the biases in the pre-selection process but does not necessarily control for biases in candidate pool (e.g., gender inequalities) or other information contained in the application itself (e.g., non-native writers) (Liu et al., 2020).

**Can ethical AI restore fairness and equality of opportunities in the academic system?** Based on the overarching idea of Rawls' theory of justice, I propose a novel framework that could be implemented in practice to integrate the ecology of human development into the process of distribution of academic capital. In this framework, collecting *more* data from the ecological conditions experienced by individuals can in fact be used to compensate for ecological factors known to influence academic achievements. This is perhaps counterintuitive given the concept of the veil of ignorance which aims to *remove* information from individuals thereby allowing for a fair agreement of principles. It is perhaps even more paradoxical given the idea that we should *decrease* (rather than increase) the amount of data collected from individuals in order to generate fair judgements. Yet, I argue that collecting more information is perhaps one of the ways in which academic institutions can compensate for the impossibility to access the original position and achieve fair equality of opportunities. This is because documenting known ecological factors that have influenced equality of opportunity in the immediate and broader (e.g., country, cultural values) context of an individual is the only course of action that allows for an expectation of academic achievement relative to opportunity to be built. In other words, academic institutions cannot make fair judgements unless the information about the causes of unfairness is known. Such system require that the academic institutions collect data on, for example, ethnicity, average income, country of education, native language and so on for every applicant, which is then processed using algorithms to minimise human biases (although in the present time, algorithms too have biases (Noble, 2018) which further research should eliminate in the future). With this pool of information, academic institutions could account for and compare individuals' academic opportunities and merit of *given* the ecological context that different applicants developed. The algorithm uses data from the same ecological context of a given individual to generate an expected prediction of academic performance from which a standardised score of the applicant relative to the ecological context can be generated ('ecological score' of the applicant, Fig. 1). In parallel, an anonymised version of the project is then peer-reviewed and scored using traditional
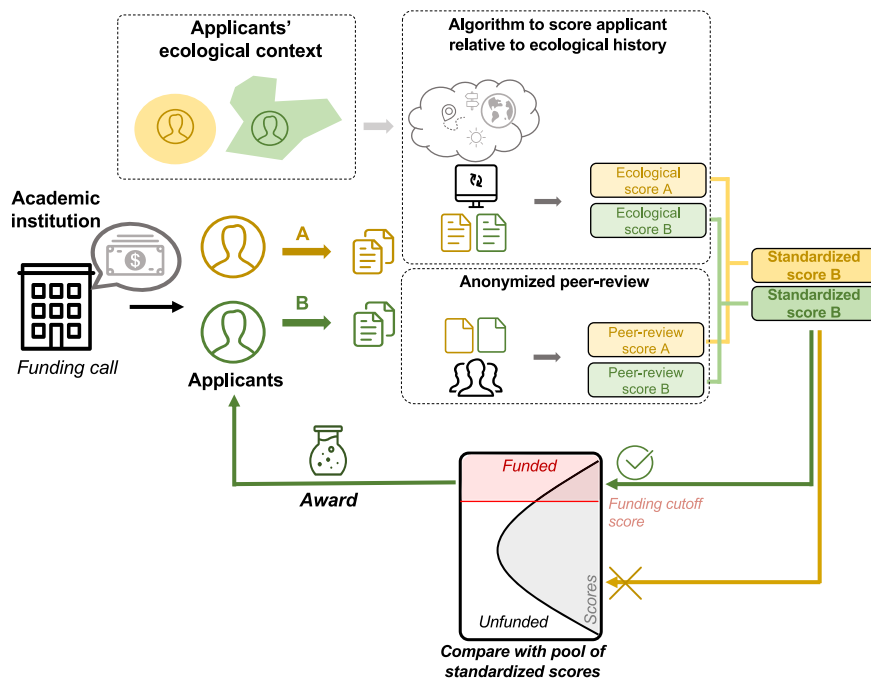
**Fig. 1 Overview of the framework.** A schematic example of the conceptual framework proposed here, in which academic institutions could implement a fair system to allocate academic capital amongst applicants (e.g., grants, fellowships).

peer-review process for methodological merit ('peer-review score', Fig. 1). Both scores are then combined to create a standardised score for the application ('total standardised score', Fig. 1), which can then be used for decision-making. The final score represents a fair process through which academic institutions respect and comply to the concept of *equality of opportunity* (or relative to opportunity).

This does not restore our ability to access the original position described in Rawls' theory but allows us a fair outcome. This is because even though the original position is inaccessible in practice, the above framework would be preferred by a rational individual (as in Rawls' theory of justice) in an imperfect original position. For instance, imagine that, in the original position, individuals know and are forced to accept that societies have inequalities, that other individuals are aware of these inequalities and will attempt to benefit from them, but each individual does not know which side of these inequalities (e.g., rich vs. poor) they will belong to. The fair outcome—the outcome that all individuals can and will agree upon—is that of a fair process through which individuals are judged, based on the inequalities that are present in the society. For an individual in the lower side of inequalities (e.g., poor), the best possible outcome a priori of knowing its place in this inequality is to demand that (s)he is to be judged relative to the inequalities that (s)he will have experienced, and not based on the average experience of the society (let alone the average amongst those on the other side of the spectrum). In this way, the individual capacity to perform above the expected from the individuals' environment is measured, rather than the capacity of an individual to perform relative to the average of the society. This approach, if adopted widely across academic institutions, is what I argue will make academia a system of fair equal access to opportunities. Note that the above framework agrees with the principles originally laid out by Rawls' theory of justice because ensures that each person is guaranteed to have an equal right to apply (*Principle 2b*) and access (*Principle 1*) academic capital and that any eventual inequalities ought to be beneficial to academia as a whole, given that the entire process of judgement and selection is fair (*Principle 2a*).

**Potential immediate criticism**

Applicants may not be willing to share detailed background information for various reasons, including for example fear of discrimination. However, it is difficult to envisage the design of a fair system that makes fair judgements but which does not take into account factors that are the source of such injustices. In other words, how can an academic institution correct for unfairness (in a fair and objective way) if academic institutions are not given the data necessary to account for the source of such unfairness?

Another criticism and limitation of the framework proposed here is that, with the aid of technology, the academic institutions should not have access to (all of the) ecological information of the applicant, and therefore the applicants' data should remain private and if shared at all, confidential. This opens up for the possibility of 'cheating' behaviour where applicants claim to have had ecological conditions that they did not, for which veracity of claims cannot be checked. Academic cheating is not exclusive of this framework (McCabe et al., 2001; Anderman and Murdock, 2011) and thus, it is not a fatal limitation of this approach in particular, but an issue in all aspects of human interactions. As it stands, the costs of the lack of diversity and opportunities arguably outweighs the costs of potential cheaters in the system, although this limitation should be addressed once an application of this framework is put into practice.

Another source of criticism, and perhaps more difficult to rebut, is that this framework is likely to make the entire selection process 'too personalised' and the cut-off point for collecting information may be obscure. Academic institutions may raise questions such as: what are the factors that influence academic opportunities and merit in the first place? How much detail should we record for each individual? To answer these questions, I propose a pragmatic approach to this matter, based on research in social sciences and psychology. An ecological factor should be recorded if and only if there is substantial scientific evidence demonstrating the role of such ecological factor on the opportunities for an individual to develop. Earlier, I used the example of poverty, which can have major impact on individuals' academic potential (Johnson et al., 2016). Thus, socio-economic status of an

applicant during development should be collected during the application process. Similar procedure should be followed in the decision pertaining other ecological factors of human development (see for instance, Bronfenbrenner, 1979; Bronfenbrenner and Morris, 1998 for discussion on human developmental ecology). It will be important for practical applications to be implemented—even if as pilot experiments—to provide information on the computational limitations that may constrain the amount of data that can be collected and processed.

## Conclusion

I presented a new conceptual framework born at the intersection of social justice, developmental ecology, and sociology and reliant upon ethical AI. The model aims to provide a way in which academia can restore fairness in the distribution of capital. I presented the intersectionality in philosophical and sociological thinking that underpins the proposed framework and discussed the major criticisms that the framework can face in practical settings. The framework strives to create a conducive academic environment with fair equality of opportunities to all.

## Data availability

All data analysed are contained in the article.

## Notes

1 https://www.ethnicity-facts-figures.service.gov.uk/uk-population-by-ethnicity/demographics/people-living-in-deprived-neighbourhoods/latest)
2 https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/articles/persistentpovertyintheukandeu/2015#:~:text=1.,to%20roughly%204.6%20million%20people.&text=A%20higher%20proportion%20of%20women,data%20became%20available%20in%202008
3 https://www.leverhulme.ac.uk/early-career-fellowships
4 https://www.arc.gov.au/policies-strategies/policy/arc-research-opportunity-and-performance-evidence-rope-statement
5 Education at Glance (2020); https://doi.org/10.1787/69096873-en

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The author declares no competing interests.

## Ethical approval
Not applicable.

## Informed consent
Not applicable.

## Additional information
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