

Ethics: What is the Research Scenario in the Brazilian Conference BRACIS?

Luiz Paulo Carvalho¹, Lucas Murakami¹, José Antonio Suzano²,
Jonice Oliveira¹, Kate Revoredo³, Flávia Maria Santoro⁴

¹IC/UFRJ – Rio de Janeiro, RJ – Brazil

²DMA/UFRJ – Rio de Janeiro, RJ – Brazil

³Humboldt University of Berlin – Berlin – Germany

⁴DICC/UERJ – Rio de Janeiro, RJ – Brazil

luiz.paulo.carvalho@ppgi.ufrj.br, lucasmurakami@ufrj.br

jose.suzano@matematica.ufrj.br, jonice@dcc.ufrj.br,

kate.revoredo@hu-berlin.de, flavia@ime.uerj.br

Abstract. *Artificial Intelligence (AI) presents many ethical dilemmas, such as explainability, bias, military uses, surveillance capitalism, employment, and jobs. In the scientific context, AI can lead us to a crisis of reproducibility spread across several areas of knowledge and guide mathematicians to solve high complexity problems. Both companies and government forward their guidelines, recommendations, and materials combining Ethics and AI. In this paper, we investigate the involvement of the Brazilian academic-scientific community with moral or ethical aspects through its publications, covering the Brazilian Conference on Intelligent Systems (BRACIS) as the most prominent Brazilian AI conference. Through a Literature Systematic Review method, we answer the main research question: what is the panorama of the explicit occurrence of ethical aspects in the BRACIS, ENIAC, and STIL conference papers? The results indicate a low occurrence of ethical aspects and increasing behavior over the years. Ethical deliberation was fruitful, constructive, and critical among these few occurrences. Whether in the Brazilian or international context, there are spaces to be filled and open opportunities for exploration along this path.*

1. Introduction

In 1956 the summer Dartmouth workshop took place, the birthplace of the contemporary idea of contemporary Artificial Intelligence (AI) [Coeckelbergh 2020]. Since then, AI has accumulated diverse concepts, contexts and perspectives, such as science, technology [Coeckelbergh 2020], ideology [Vesa and Tienari 2020], discipline [Goul et al. 1992], and religion [Harris 2017]. Our scope is AI in the academic-scientific context.

Between 2012 and 2021, we noticed a growing interest in AI[†]; through articles, conference papers, books, among others. AI shares space of interest in areas outside engineering, computing, or mathematics, enriching works in social sciences, medicine,

[†]Due to space limitations, we have gathered secondary data as complementary information in an open online document, available at: <https://4658.short.gy/q2jRcf> [accessed 15-august-2022]

arts, humanities, and psychology, among others. The plurality of dialogues between disciplines has increased. Considering the Brazilian computing-related scientific events in 2021, at least one publication, in over twenty events, resorted to AI elements [†].

Emphasizing the Brazilian academic context, since 2018, we have found AI and Data Science courses. Since 2020 the first bachelor's degree dedicated exclusively to AI [†]. AI is also heavily disseminated through computing curricula and courses [†].

As technology has its relevance brokered and disseminated through society, associated ethical dilemmas arise [Moor 2005] – also extending to AI. In the early 2020s, [Denning and Denning 2020] list a series of ethical dilemmas directly related to AI, such as explainability, bias, military uses, fakes, surveillance capitalism, employment, and jobs, among others. Exemplifying in the scientific context, AI is allowing inappropriate duplication and fabrication of images in scientific papers [Gu et al. 2022]; [Checco et al. 2021] consider the idea of AI-assisted peer review; AI can lead us to a crisis of reproducibility spread across several areas of knowledge [Gibney 2022]; guide mathematicians to solve high complexity problems [Chirigati 2022].

The Brazilian Computer Society (*Sociedade Brasileira de Computação* – SBC) dedicates a special issue of its magazine, *Computação Brasil*, entirely to Ethics and AI [Sá 2022]. Given the importance of AI in Brazilian society, government entities are submitting legal norms framing and restricting its use, such as Bill 21/2020 ¹.

In this work, we investigate the involvement of the Brazilian academic-scientific community with moral or ethical aspects through its publications. We consider the largest AI academic-scientific event the Brazilian Conference on Intelligent Systems (BRACIS). The main question that guides this research is: *what is the panorama of the explicit occurrence of ethical aspects in the BRACIS conference?* We analyzed the proceedings of BRACIS, ENIAC (National Meeting of Artificial and Computational Intelligence), and STIL (Symposium in Information and Human Language Technology). As a methodology, we used a Systematic Review of Literature (SLR) [Kitchenham 2004]. Additionally, the investigation has a meta-research perspective, analyzing research-related ethical aspects, such as Informed Consent (IC) and Ethics Committee (EC).

To the best of our knowledge, indicating our innovative intention, there is no other proposal than this present work. As the results indicate, there is a low occurrence of ethical aspects, with an increasing behavior over the years. Of these few occurrences, ethical deliberation was fruitful, constructive, and critical. We see a potential for greater dialogue between ethics and AI as a hot topic, nationally or internationally.

We structure this work as follows. Section 2 presents the theoretical foundation and related work; Section 3 presents the research methodology; Section 4 presents the results and discussion; Section 5 concludes this work.

2. Theoretical foundations

Ethics, as part of Moral Philosophy, studies practice, including customs, traditions, and habits, through Moral [Ferraz 2014]. Moral, in turn, is a system of norms, principles, and values related to the regulation of behavior between individuals, and of these with

¹<https://4658.short.gy/Ya37MJ> [accessed 15-august-2022, in Brazilian Portuguese]

the collectivity [Vázquez 2018]. Morality manifests collectively as collective morals, or morality; and deals with concepts like “good”, “bad”, “malignant”, “benign”, as value judgments. In technical or technological scientific communications, it is common to qualify as practical-utility values, e.g., this algorithm is “good” as it enables the expected primary requirements based on the minimum parameters. The algorithm can, even so, present racial discrimination bias, reinforcing the racism phenomenon, and still be technically “good”; however, harmful, risky, malignant, and a vehicle of pain for a whole part of the population when it comes to value judgment.

The outline of what would become computer ethics emerged in the 1940s [Bynum 2018]. Computer ethics awakens by considering the entirely new ethical problems that would not exist if computers had not been invented [Bynum 2018]. For example, ethical dilemmas involving autonomous vehicle cases and AI are widely present in the literature [Coeckelbergh 2020, Floridi 2021]. We synthesized a scenario in the complementary material [†], exposing some current intricacies.

Despite its speculative philosophical character, ethics can be framed as the science of moral behavior [Vázquez 2018]. As it depends on cultural, historical, and social aspects [CNS 2016], there is a realistic limitation, with an existentialist character, in the scope of its generalization, called middle-range generalization [Wieringa 2014]. Therefore, there is a disposition to frame computational ethics as case-related [Barger 2008]. For example, [Coeckelbergh 2020] is case-based and solely dedicated to ethics and AI. For this reason, some Brazilian AI phenomena and events will be specific, even unique.

AI differs significantly from the traditional computing. [Barger 2008] presents examples that potentially qualify computer ethics as a unique kind of ethics, and AI has already contemplated all these elements and surpassed them. Just autonomous vehicles contemplate, extend, and complement this reasoning [†]. Furthermore, one of the central dilemmas arises [Feenberg 2017], the control and translation of values into our lives.

The moral act, considered ethically, needs to be free, rational, conscious, and accountable [Vázquez 2018]. For example, animals are absent from the possibility of ethical consideration regarding their low and limited rationality. There was a consensus that only people could be endowed with a moral conscience until recently AI developments, e.g., in 2022, a Google engineer who directly operated LaMDA, an AI, claimed that it developed an independent conscience and thinking [Pascual 2022].

We rigorously resort to ethics to cover the AI moral evaluation [Vázquez 2018, p. 153]. AI is a product of human activity and a social object constituted and created by people in a historical-social activity. It does not exist alone, but through and for people and the values involved. Inanimate objects cannot be the object of moral evaluation. As code, AI is an inanimate object. When materialized and running, it is an animated object and will potentially affect the lives of others. Many AIs generate, directly or indirectly, consequences that affect other individuals, other social groups, or societies.

Metascience (or meta-research) is the scientific study of science [Ioannidis et al. 2015]. The involvement of ethics in scientific culture is plural in the research application or epistemology. For example, the morality of well-established scientific communication determines that the methodology and scientific method must be explicitly and objectively indicated [Recker 2021], i.e., the omission of these elements

constitutes a moral fault and impairs the quality of scientific communication parameters. One of the paths of scientific progress is to discover, elicit, analyze and evaluate scientific thinking-doing. Methods, reporting, reproducibility, evaluation, and incentives are the Metascience major areas; studying how to perform, communicate, verify, evaluate, and reward research [Ioannidis et al. 2015].

2.1. Related Works

There is a significant amount of communication, whether formal (e.g., scientific or academic) or informal (e.g., such as through books on ethics and AI). For example, scholars published more than ten books on the subject between 2020 and 2022[†], e.g., renowned authors such as [Floridi 2021] or [Coeckelbergh 2020]. The scientific community dedicates events solely to ethics and AI, such as the Artificial Intelligence, Ethics, and Society (AIES)²; and the Artificial Intelligence in Business and Ethics (AIBE)³. Not to mention the many articles and conference papers directly related.

Relevant related works are other Literature Reviews (LR) on ethics and AI, preferably systematic. As [Kitchenham 2004] protocol determines, encompassing the SLRs competing with our proposal, i.e., secondary and tertiary research dealing with ethical aspects in AI scientific communications. To the best of our knowledge, as an innovative nature of this present work, there is no SLR within our scope.

We noticed an abundance of LR relating to ethics and AI, especially in the medical field [Saheb et al. 2021]. As we are dealing with the computational academic-scientific context, we limit ourselves to the materials of this area of knowledge. Moreover, even with this limitation, we restricted the search period to 2020 – 2022. We searched for LRs in Brazilian Portuguese, with no articles or conference papers in the results.

In English, we will briefly address some of the many found. [Kumeno 2020] presents an SLR on the challenges of using machine learning in software engineering, and announces open challenges related to ethics and regulation in engineering practice and the significant growth in the volume of AI-related publications through the 2010s.

[Gordon and Pasvenskiene 2021] deals with human rights for robots (AIs), and one of the findings is that several authors base their critical views on misleading ethical and philosophical assumptions. They expose the lack of multidisciplinary perspectives with good epistemological quality.

[Harris and Anthis 2021] present an SLR regarding inquiries, such as *Should AI be considered morally? How to do it?*. They also deals with human rights for AI. Several of the cited authors argue that the insufficient moral consideration of sentient artificial entities, such as the subroutines or simulations run by a future super-intelligent AI, could lead to astronomical amounts of suffering. The authors' conclusions indicate the need for better dialogue between ethics, morals, and AI.

Comprehensively, [Khan et al. 2022] presents a broad SLR on ethics and AI, addressing its principles and challenges. They indicate a lack of ethical knowledge and vague principles as significant challenges for considering ethics in AI. Finally, [Hyrynsalmi et al. 2020] brings the combination of ethics and blockchain, a currently

²<https://www.aies-conference.com/2022/> [accessed 15-august-2022]

³<https://aibesummit.com/> [accessed 15-august-2022]

“hot topic” of applied computing. There is increasing attention to blockchain, and bitcoin, whereas there seems to be a lack of usable ethical tools, methods, and frameworks for blockchain ethics.

3. Methodology and research method

To facilitate the knowledge extraction, we divide the research question into sub-questions in Table 1. We synthesize the procedure and quantitative results in Figure 1 and Table 2. Respecting similarities, we follow the same protocol as [Carvalho et al. 2022]. An extensive selection process involving five researchers follows the analysis. We recorded the results from the consensus of all those involved, step by step. We will detail each of the steps below, showing the rigor of the process.

Table 1. Research sub-questions and answers for the main question

ID	Questions	Answers
RQ1	What technological domains are involved?	Open answer. Technological domains are research dependent
RQ2	Do the occurrences of ethics refer to ethics as meta-research, application, or both?	Meta-research, Application, Both
RQ3	Quantitative analysis of ethics committees and terms of consent	Interpretative. About Ethics Committee and Informed Consent Form/Term
RQ4	Which research institutes or universities in the country stood out in ethics-related research?	Research institutions/universities
RQ5	What is the methodological research approach?	Quantitative, Qualitative, Pragmatic, Interpretative or Literature Review
RQ6	What ethical principles or foundations are covered?	Open answer. Ethical principle or foundations
RQ7	What are the main limitations and difficulties explicitly associated with the ethical aspect?	Interpretative. Cited limitations and difficulties
RQ8	What is the research application environment?	Open answer. Where the research took place
RQ9	Specifically, what are the AI models, techniques or methods used?	Open answer. Applied AI models, techniques or methods

Regarding the **identification step**, we analyzed ten years of main tracks publications, full and short papers, from BRACIS, ENIAC, and STIL. Considering an extensive online search, we could not find the 2012 ENIAC proceedings. STIL is biannual. We considered all publications beyond the main track in any years with proceedings as a collection, regarding extensive search in the aggregated material. We cover these three events for their longevity, adherence to the AI theme, and textual content and discourse space available to appreciate ethical aspects potentially.

Table 2. RSL quantitative results

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	Total(%)
STIL		39		35		31		53		51	209	100.00%
ENIAC		63	97	47	65	84	82	93	65	72	668	100.00%
BRACIS	42	43	72	57	86	74	96	149	90	77	786	100.00%
All papers	42	145	169	139	151	189	178	295	155	200	1663	100.00%
Only IC	0	0	0	0	0	0	2	0	0	2	4	0.24%
Only EC	0	0	0	0	1	1	0	1	2	2	7	0.42%
IC + EC	0	0	0	0	1	0	0	0	0	0	1	0.06%
No (%)	0	0	1 (0,6%)	2 (1,4%)	3 (2%)	4 (2,1%)	4 (2,2%)	5 (1,7%)	5 (3,2%)	9 (4,5%)	33	1,44%
Yes (%)	0	1 (0,7%)	1 (0,6%)	0	0	0	0	1 (0,3%)	2 (1,3%)	4 (2%)	9	0,30%
All (%)	0	1 (0,7%)	2 (1,2%)	2 (1,4%)	3 (2%)	4 (2,1%)	4 (2,2%)	6 (2%)	7 (4,5%)	13 (6,5%)	42	1,7%

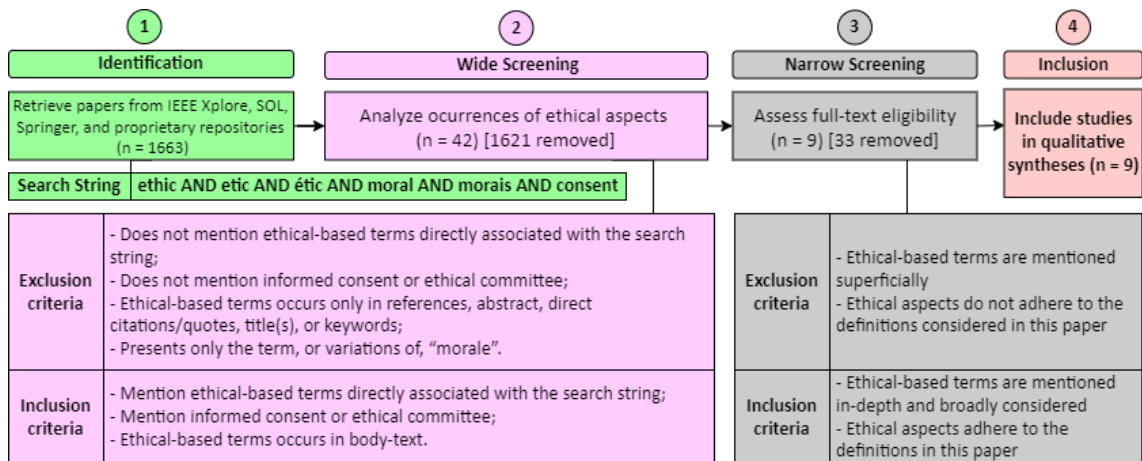


Figure 1. Diagram of the literature review process

Figure 1 shows the repositories from which we extracted all publications, the amount analyzed by year and by event, and the search string. We adapted the search string for terms in English and Brazilian Portuguese. After collecting all relevant publications, we proceeded to the **wide screening step**. Table 2 depicts the quantitative results. We analyzed the 1663 total publications and extracted them based on the search string, exclusion and inclusion criteria.

Although secondary, we also consider IC and EC as intrinsic elements of research ethics. When exposed, they indicate a direct concern with ethical research aspects. Considering EC, we include the results of the string search since the formal and official term is **ethics** committee. Regarding open science principles, results are available online ⁴.

We analyze the 42 publications in the **narrow screening step**. We extracted publications with relevant and pertinent occurrences of ethical aspects. [Bock et al. 2021], in a similar work oriented to ethics and Information Systems, expresses the same semantic difficulty. We deal with this challenge similarly, with systematic reviews and discussion, to mitigate threats to validity.

For example, “In these processes, the consumer claims for compensation for material or moral damages against an airline company due to failures in its services.” [Dal Pont et al. 2020]. There is an occurrence of the search string (moral). Even so, the ethical aspect is limited in pertinence and relevance, which makes us incapable of extracting ethics-related knowledge. It is important to note that, unlike the “search process”, the “study selection” and “quality assessment” are subjective and vary according to the SLR, theme, and researcher’s perception [Kitchenham 2004].

The **inclusion step** considered nine publications presenting relevant and pertinent ethical aspects for qualitative synthesis [Moura et al. 2021, Broder and Berton 2021, Ferreira et al. 2021, Gonçalves and Cozman 2021, Pavan et al. 2020, Viana and Alcântara 2020, dos Santos and Paraboni 2019, Carvalho et al. 2014, Nunes et al. 2013]. Four researchers extracted data in order to answer the questions in Table 1. Concluded the initial extraction, a different researcher

⁴<https://4658.short.gy/7CWs1E> [accessed 15-august-2022]

reviewed it. In the end, there was a consensus phase to agree on the results. Then comes the **qualitative synthesis**, following some recommendations by [Wohlin 2014].

4. Results and discussion

Starting with the **wide screening** results, which present a panoramic, broad and quantitative view. The behavior of the occurrence of ethical aspects follows an increasing behavior over the years, reaching 6.5% in 2021. In a decade of BRACIS, 42 papers depicted ethical aspects, and only 1.7% of 1663 were analyzed.

Less than 1% involved IC/EC. As one possible explanation for this result, BRACIS publications emphasize technical aspects and contributions. Many resort to available online databases, artificial or not, for training models or other experiments, as in [Moura et al. 2021, Nunes et al. 2013]. Among the 42 results of the wide screening, 21 (50%) show involvement or participation of human beings. Of these, IC/EC is absent in 9 ($\approx 43\%$); 4 ($\approx 19\%$) indicates IC only, i.e., 8 ($\approx 38\%$) papers properly involve EC.

Data extracted from Online Social Networks characterize, even if indirectly, human beings' involvement in the research [Carvalho et al. 2021], with identified or identifiable personal data. In most cases, it is impossible to collect IC; then, the involvement of an EC is even more recommended, as any subsequent negative consequences will have joint support and co-responsibility.

Specific supervised learning techniques commonly involve “annotators”, it counts as human involvement and should involve EC and IC [CNS 2012, CNS 2016].

So the **narrow screening** and **qualitative synthesis** follow, depicting the in-depth and joint results. We answer the research questions in Table 1 in an orderly fashion, presenting the resulting knowledge as the main contribution of this present work.

Regarding the **technological domain (RQ1)**, it is mainly software. The two exceptions, one deals with logical properties of sufficientarian aggregation functions [Viana and Alcântara 2020]; the other deals with the interpretive study of two philosophical currents of thought on AI, Neat and Scruffy [Gonçalves and Cozman 2021]. The software subdomains varied without predominance in the remaining seven.

The **ethical occurrence type (RQ2)** deals with the epistemological type of ethical aspect manifestation in research. If the occurrence involves the respective research or the researcher's involvement, it configures meta-research, e.g., the occurrence of EC. It is an application if the ethical aspect has an external character, enacted through (and not in) research, e.g., it is meta-research if it does not need EC and presents a statement/explanation of why EC is not involved. Eight papers involved applied ethical aspects. Only [Ferreira et al. 2021] presents both.

[Ferreira et al. 2021] questions: “[...] can we work in such direction without propagating to our algorithms (and data) historical errors as structural and explicit racism?”. There is implicit meta-research content in this sentence and much of the paper's concluding section. It demonstrates a call for moral advancement and socially sensitive technological progress, teasing: “Are our data and algorithms performing as expected regardless of users' race? can the algorithm produce more errors when black people are under analysis?” [Ferreira et al. 2021]. As an explicit meta-research occurrence, the authors indicate

that the resulting dataset cannot be shared in compliance with the Brazilian General Data Protection Law (*Lei Geral de Proteção de Dados – LGPD*) [Brasil 2018].

Eight of the nine analyzed papers do not need **IC/EC (RQ3)**. Those that use any data do so from pre-fabricated, artificial, or publicly available online data. An unusual result, as we expected that relevance and adherence would occur in papers involving human participation, concrete social aspects and ethical appreciation.

The only paper in which IC/EC should be present involves both extracting data from Twitter and annotators [dos Santos and Paraboni 2019]. Whether the research authors made the annotation or external human participants was unclear. We covered these two topics at the beginning of this section on the results of wide screening.

University of São Paulo (USP) and Federal University of Bahia (UFBA) (RQ4) stood out. USP figuring in three of the nine papers [dos Santos and Paraboni 2019, Pavan et al. 2020, Gonçalves and Cozman 2021]. UFBA is involved in two, both with explicit and provocative social critical content [Ferreira et al. 2021, Moura et al. 2021].

Regarding **research methodologies (RQ5)**, a paper may present more than one. Furthermore, we noticed an essential flaw in scientific communication as some omit or neglect this information [Recker 2021]. We could infer this data from some with a certain amount of research information, avoiding extrapolating to avoid errors. Therefore, we were unable to extract this information in [Moura et al. 2021, Viana and Alcântara 2020]. There was no occurrence of qualitative research.

Five of the nine papers follow a quantitative methodology. Two present pragmatic approach [Nunes et al. 2013, Pavan et al. 2020]. [Gonçalves and Cozman 2021], unlike others, presents interpretive research with historical content.

About **ethical doctrines, principles, theories or constructs (RQ6)**, concerns knowledge elements from ethics, e.g., as machine learning for AI. Fairness is present in three papers [Ferreira et al. 2021, Broder and Berton 2021], and [Viana and Alcântara 2020] also mentions justice, utilitarianism, egalitarianism, sufficientarianism.

Although [Ferreira et al. 2021] cites the term ethics in the title, the paper primarily revolves around computer vision and morals. Terms associated with ethics are fairness and prejudice, algorithmic racism, and technological racial bias, as sociotechnical phenomenon. The authors conclude “All results consistently highlighted detection errors were greater with black passengers.”, which indicates a fact.

Only [Nunes et al. 2013] presented explicit **ethical limitations and difficulties (RQ7)**. The research analyzes moral harassment in electronic messages. Irony is a complex phenomenon concerning expression processing. As certain terms or combinations are context-dependent, complexity grows. For example, “watch the *Ópera do Malandro*”. Some results generate ethical questions, such as the system erroneously accusing an ironic message without moral harassment content of containing moral harassment; or when moral harassment, even serious, is ignored by the system, unable to detect it.

There is variation in the specific **application contexts (RQ8)**, among all the papers, to some degree. For example, [Nunes et al. 2013] deal with generic organizational context, [Carvalho et al. 2014] targets the public organizations context.

Applied research mainly deals with the application and/or comparison of **AI models, techniques, or methods (RQ9)**. Similar to the result of RQ8, there was a significant variation, considering the technological sub-domain (RQ1) and application context variation (RQ8). For example, the difference usage between images or videos [Moura et al. 2021, Ferreira et al. 2021], applying YOLO (You Only Look Once); and texts [dos Santos and Paraboni 2019, Pavan et al. 2020], applying Support Vector Machine (SVM) or Random Forest (RF).

5. Final remarks

Through the SLR protocol [Kitchenham 2004], we studied the panorama of ethical aspects of the last decade, 2012–2021, of BRACIS, ENIAC, and STIL. We present both a broad and in-depth analysis. The intersection between ethics and AI has become increasingly necessary and relevant as the use of intelligent systems in different contexts grows. The multiple moral facets involving AI, and subsequent values, make up fertile ground for ethics. AI is key to several applications that bring benefits or risk prevention to people's lives; on the other hand, it shall lead to significant job losses, privacy risks, and concentration of power [Gonçalves and Cozman 2021].

The qualitative synthesis exposed papers with rich ethical or moral considerations. The results indicate a tiny number of ethical aspects in only 1.7% of the 1663 analyzed papers. The proportional trend indicates growth over the years, although it is still relatively slow compared to the concrete relevance that AI plays in today's society [Sá 2022]. Despite only nine papers (0.3%) adherent, we noticed a dormant promising potential for future discussions and gaps or opportunities that already published papers could have addressed. For example, [Carvalho et al. 2014] deals with corruption, a topic dear to ethics. Even so, the discourse remained mainly on a technical aspect.

The qualitative synthesis results follow. The papers presented ethical aspects with relevance, significance, and high variation in the technological domain involved; application context; and AI models, techniques, and methods. Most of them deal with the occurrence of ethical aspects such as application; without ethical limitations or difficulties; and present quantitative methodology. Only [dos Santos and Paraboni 2019] presents external involvement/participation of human beings without involving IC/EC. USP and UFBA stand out, the former quantitatively; the latter qualitatively.

From the meta-scientific perspective and if advancing the BRACIS ethical aspects is in the community interest, we propose: i) greater rigor related to IC/EC in appropriate research; ii) recommend that applied research indicate ethical considerations, mainly related to consequences; iii) establish communications and instructional actions on ethics and AI; iv) encourage a culture of ethical aspects, e.g., suggesting that scientific communications, if possible, present a section for ethical considerations.

It is beyond our scope to classify research, effectively and concretely, as ethical or moral. We analyzed the scientific communication of the respective research, i.e., if the research involved and not mentioning EC in the text is a slip in scientific communication.

As traditional to SLR, there are limitations, and threats to validity [Petersen et al. 2015]. To mitigate threats to validity, we make the wide screening results available online for verification and reproducibility; we performed all steps by more

than one researcher, validated by a different one, and all conclusive results underwent deliberation and consensus. Considering the domain of AI in Brazil, we covered BRACIS, ENIAC, and STIL. Future work may extend the communication spaces.

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