A COMPROMISED KNOWLEDGE BASE - ACADEMIC PUBLISHING IN CRISIS AND THE IMPACT OF ARTIFICIAL INTELLIGENCE

THE ROLE OF OPEN ACCESS AND INSTITUTIONAL INCENTIVES IN SHAPING MODERN PUBLISHING PRACTICES

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By
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On my Honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General Research Problem: Addressing Fraud within Academia

How can academic institutions and stakeholders effectively identify, categorize, and mitigate fraudulent practices in scholarly publishing to uphold research integrity?

The knowledge that we build on today is grounded in published research from academic conferences, prestigious journals, and papers from world-renowned professors. These types of research then ultimately help form the basis of any new claims and advancements that are created in a general literature review by new researchers. However, this foundational knowledge is becoming increasingly at risk, and the information necessary to partake in an ethical search for information is being corrupted. And with the recent rise of large-language models like ChatGPT and Claude, this issue is seen as one that will only become more widespread and complex (Meyer et al., 2023).

The use of AI is expected to dramatically accelerate the ways fraud can emerge and spread in academia (Ihekweazu, Zhou, & Adelowo, 2023). This effect of AI usage will be particularly noticeable within the scientific community, seeing as many predatory journals and conferences already exploit the academic publishing process. Many times, these outlets often lack rigorous peer review, making it easier for fraudulent or low-quality research to be published and, consequently, disseminated. And while some organizations exist like Retraction Watch or Pubpeer (two popular online forums) that help spot and flag fraudulent research, these efforts are often limited in scope and reach.

There also exists a clear need for a distinction between academic fraud being committed by individuals (professors, researchers, students) versus organizations (universities, libraries). Many bad single actors can partake in fraud like producing plausible yet deceptive research outputs rapidly, including fabricated data, false authorship, and citations that look legitimate but

lack substance. This is typically a direct result of the ‘publish or perish’ model that stems from many organizational pressures forced on professors from universities, funding agencies, and institutions. These pressures create a competitive environment where publishing frequently in high-impact journals is often prioritized over the quality and rigor of research, leading to the many types of fraud mentioned (Smith & Jones, 2023). And given the increasing prevalence of these issues and the effects these problems have on the academic knowledge base, this project seeks to provide a comprehensive approach to both understanding and mitigating academic fraud.

Technical Research Topic: Developing a Taxonomy and Analytical Tools to Detect and Classify Fraudulent Activities in Academic Publishing Using AI-Driven Techniques

How can we classify types of academic fraud and develop targeted analytical tools to proactively identify instances?

Determining whether a paper is “fraudulent” becomes challenging due to the blurred line between what is acceptable and what constitutes fraud, particularly when conducting literature reviews or crafting research papers. This ambiguity often stems from evolving academic standards and the subjective interpretation of ethical guidelines. Retraction Watch, for example, currently lists out 127 reasons for which a paper may be deemed “retractable” (Retraction Watch, n.d.). In understanding that there are many facets to understanding and addressing this problem, our team’s technical topic will first look to create a detailed taxonomy to help contextualize and recognize the scope of the many problems in this space. These problems include (but are not limited to): falsified data and results, citation manipulation, small epsilon research contributions,

AI-generated papers, and intellectual theft among many others. An important part of this taxonomy will also involve understanding the scale and prevalence of each type of fraud we identify, as well as evaluating the effectiveness of current tools available to detect them. By taking this additional step in our research, we will be able to categorize who is most affected by these various types of academic fraud. This step in our research will help us to identify the key patterns and indicators of fraudulent activity on both an individual and organizational level, enabling us to develop targeted detection methods.

Once we have a clear understanding of where these problems exist, we will proceed to develop an analytical tool that targets a specific area of our taxonomy. This tool will incorporate the initial exploration of advanced concepts, theories and methods to detect the various types of fraudulent activities involving AI, including: signal detection theory, graph theory, and time series methods. It is important to our team that this is the order in which we complete these two tasks as we want our findings from the taxonomy to drive the tool we develop. The current iteration of our plan envisions the tool as some software platform designed for academic institutions, journals, and funding agencies to detect and monitor fraud. Users of the tool could include peer reviewers, research administrators, and journal editors, who will employ its features to flag potential anomalies in submitted work.

Throughout both the creation of the taxonomy and the development of the tool, we will also be participating in active research into various case studies that also highlight instances of academic fraud and the effectiveness of existing detection methods.

STS Topic: The Impact of Open Access and Organizational Incentives on Academic Integrity in Publishing

How have open access models and institutional incentives contributed to increased fraud and compromised integrity in academic publishing?

Seeing as there has been a direct rise in the number of retractions and general fraudulence in academia (Else, 2023), it is important to understand how we have gotten to this point. Much of this issue can be traced back to systemic flaws in the publishing landscape, where open access models and institutional incentives have reshaped the dynamics of academic integrity. And while there are many individual bad actors in play contributing to this landscape, much of the blame comes from the workings and interactions between large organizations. Some of these groups involved include researchers, publishers, universities, libraries, and funding agencies, all of whom play key roles in this publishing ecosystem.

Understanding the transition to "Open Access" is critical to examining the relationships between these groups because it has fundamentally transformed the academic publishing landscape. Initially introduced to democratize knowledge and increase accessibility, open access publishing promised to make research available to all, regardless of institutional or financial barriers. However, large commercial publishers have leveraged this model in ways that often prioritize profit over research integrity (Butler, Matthias, Simard, Mongeon, & Haustein, 2023). For instance, the introduction of Article Processing Charges (APCs), fees paid by researchers or their institutions to make articles publicly accessible, has created new financial incentives within the system. With the average global per-article charge at $1,626 (Morrison & Brutus, 2021), publishers now have a vested interest in accepting more papers to increase revenue, unlike the closed-access model where revenue relied primarily on fixed subscription fees paid by libraries, limiting the incentive to expand publication volumes. This financial pressure has, in turn, compromised the peer review process, as publishers prioritize quantity over quality, weakening

the checks that ensure the integrity of published research. These shifts highlight why understanding the transition to open access is essential to addressing the systemic issues affecting academic publishing today.

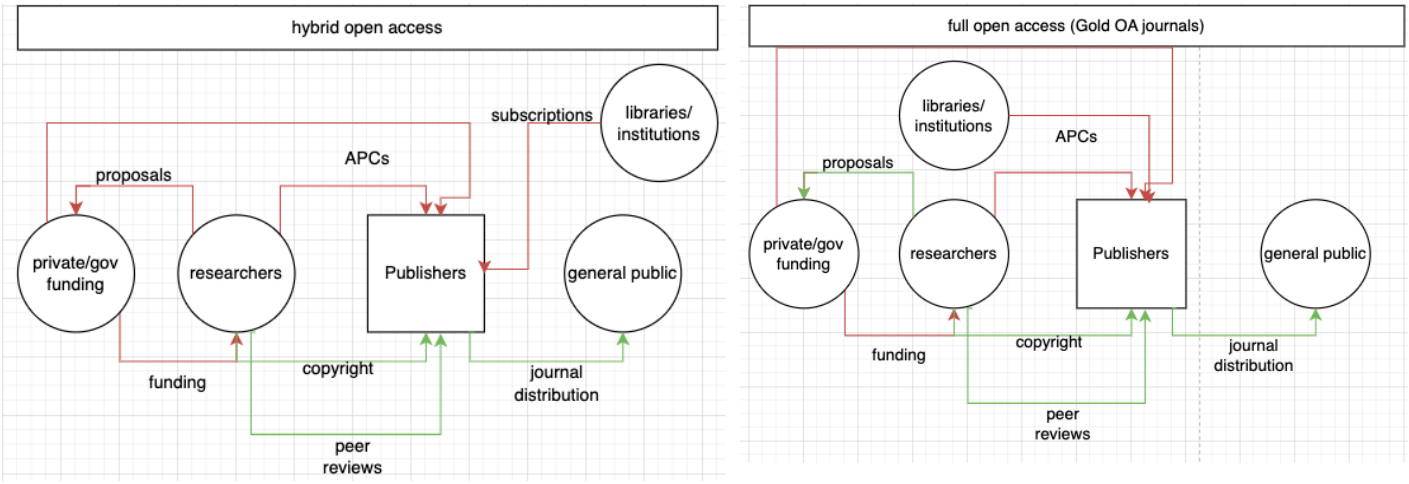
The complex motivations within the publishing industry reveal conflicts and factors that influence the behavior of both institutions and individuals. Open access was originally proposed as a more equitable model that would foster greater availability of research, but today, its application in the context of commercial publishing has turned out to have negative effects that contradict the essence of free scholarship and its fair availability. Article Processing Charges (APCs) have now become standard practices for most institutions to comply with the open access requirements, but in addition to that, they are also an economic burden on libraries, as many institutions must reallocate budgets to support these fees. Libraries are often expected to fund APCs for their researchers while still maintaining costly subscriptions to non-open access journals, a situation exacerbated by hybrid models that charge both APCs and subscription fees for the same journal content (Gilliland et al., 2021). For example, a study analyzing the financial strategies of major academic publishers revealed that between 2015 and 2018, authors paid over $1 billion in article processing charges (APCs) to the five largest commercial publishers (Butler, Matthias, Simard, Mongeon, & Haustein, 2023).

Another aspect within this system includes Transformative Agreements (TAs), which are contractual agreements between institutions, such as universities or libraries, and publishers, designed to shift subscription-based journals toward open access. However, most TAs impose extremely high charges in dollars that wealthy libraries can afford, while smaller and poorer institutions cannot. As a result, a hierarchical structure of access has emerged in which richer institutions obtain open access for their researchers whilst poorer-funded institutions are deprived

or have helplessly placed their researchers' works behind paywalls (Demeter & Istratii, 2020). The two-largest commercial publishers, Springer and Elsevier, have adopted TAs as well which allow them to control the content of their academic work and increase profits, thus safely neutralizing open access as a business threat. These developed diagrams help showcase the distinctions between hybrid open access and full open access models, two commonly transitioned to models in which these issues occur:

Figure 1

Transitions to Hybrid and Full Open Acesss



Note. This figure demonstrates the interactions between different groups in the hybrid and full open access publishing models. The hybrid model relies on both APCs and subscription fees, while the full open access model eliminates subscriptions, relying solely on APCs for funding.

To help contextualize this problem, I will use the California University library agreements as a case study. The UC's entrance into Transformative Agreements (TAs) with leading publishers seeks to promote the visibility of the research outputs, support the movement

towards open access by paying Article Processing Charges (APCs) on behalf of its scholars, and enhance the reputation of the institution through more citations. However, this strategy also further aggravates the systemic problems of academic publishing. The use of TAs encourages publishers to pursue the number of articles published rather than the quality of articles, leading to the commercialization of editorial boards. This situation is beneficial to early adopter institutions that are richer while smaller ones that are poor are strained financially, creating a cycle of inequalities. Journals like Design Studies and Critical Public Health witnessed resignations of editorial boards recently due to their grievance with these practices (Bell et al., 2021), which requires a re-examination of the TAs. It is necessary for the UC system to analyze if indeed these TAs promote open access or rather support the publishing company's control, as well as identify more affordable and just models for academic publishing.

From an Actor-Network Theory (ANT) perspective, the dynamics surrounding Transformative Agreements (TAs) and Article Processing Charges (APCs) at the UC system illustrate the ongoing process of assembling a network of actors—researchers, publishers, institutions, and financial agreements—who are constantly negotiating and reshaping academic publishing practices. Rather than simply existing as static roles, these actors actively influence and are influenced by one another. For instance, publishers use financial incentives and policy adjustments, such as the introduction of APCs, to persuade institutions to adopt TAs, presenting these agreements as a solution to open access demands. Institutions, in turn, balance competing pressures to maintain prestige, ensure accessibility, and manage budgets, which often leads to their endorsement of TAs to meet both internal and external demands. Researchers navigate these agreements by aligning their work with institutional funding and publication requirements, while also advocating for recognition and access opportunity. By the creation of this system in which

actors and stakeholders continually influence and respond to one another, society and culture within academic publishing emerge as dynamic outcomes of these interactions.

In taking future steps on this topic, I plan to explore stakeholder perspectives on the pressures introduced by Transformative Agreements (TAs) and Article Processing Charges (APCs). To gain insights into how individual motivations and organizational incentives align or clash within the broader publishing ecosystem, I will conduct informal interviews with researchers, scholarly communications teams, and institutional administrators, as I have been doing this semester under the guidance of my capstone professor. These informal discussions allow me to gather valuable qualitative data without requiring the formal Institutional Review Board (IRB) approval process, which would not be feasible within the project timeline. Additionally, I will supplement these interviews with quantitative data on levels of APC and TA expenditures at different institutional levels. The combined qualitative and quantitative information as described above would provide a more holistic understanding of how financial mechanisms and institutional policies impact the behaviors and decisions of key stakeholders in academic publishing.

Conclusion

In the first part of my project, I hope to lay the foundation to then be able to fully understand the problem at hand. After identifying potential problems, we then hope to create a tool that can proactively detect and categorize instances of academic fraud by leveraging AI-driven techniques. These efforts are aimed at addressing the broader issue of how systemic pressures, such as financial incentives and organizational policies, challenge ethical standards and equity in academic publishing. While going about this process, I hope that my simultaneous research from my STS project will be able to uncover the effects of TAs and APCs and how the

pressures they create impact the ethical standards and integrity of academic publishing. By integrating insights from both the technical and STS projects, I hope to provide a comprehensive understanding of the systemic issues in scholarly publishing and offer solutions that support fair, accessible, and trustworthy research practices.

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