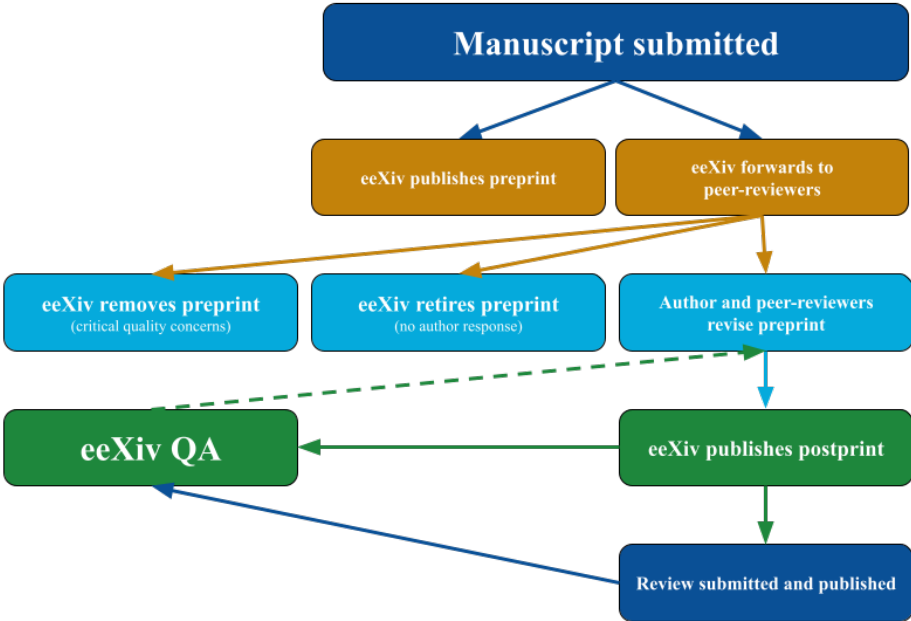# The eeXiv Whitepaper

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## ABSTRACT

In this paper, we present eeXiv, an open-source, open-access project hosted by Team 1280 EECS ("Electrical Engineering and Computer Science"), independent of the department of the same name at UC Berkeley. We aim to rival arXiv as the single largest open-source and open-access research paper repository and as the largest research paper repository on the West Coast, transforming San Ramon Valley High School into a tier-1 research institution. Similar to arXiv, we host electronic preprints and postprints (known as e-prints) approved for posting after a rigorous peer review process. Our repository consists of scientific papers in the fields of mathematics, physics, astronomy, electrical engineering, computer science, quantitative biology, statistics, mathematical finance, and economics, with a focus on papers specific to the FIRST Robotics Competition. eeXiv bypasses the traditional bureaucracy of research publication, which involves lengthy peer review processes and journal approval, by enabling "libre" and "open" publication, dissemination, and consumption of research artifacts.

# 1 Introduction

Many people in academia, particularly those in STEM fields, are well-acquainted with the arXiv repository, hosted by Cornell University. arXiv [1] (pronounced "archive"–the X represents the Greek letter $\chi$) enables free online access to most research papers–regardless of peer review status–in a multitude of scientific disciplines. eeXiv (pronounced "EECS-iv") <https://eexiv.vercel.app/> aims to replicate many of the key goals of the arXiv project and implement a locally managed research repository database in the San Ramon Valley of California, sponsored by the Electrical Engineering and Computer Science (EECS) group of Team 1280 Robotics, based in San Ramon Valley High School (SRVHS). Unlike arXiv, eeXiv *does* have a peer review process, but this process relies on open-source contributors and volunteer experts who donate their time to the curation of our repositories, thus expediting the traditionally lengthy peer review process through crowd-sourcing techniques, in a similar manner to applications like Amazon's Mechanical Turk. [2]

## 1.1 In this paper

The purpose of this paper is primarily to introduce eeXiv from the ground up, as a new tool for researchers and consumers of research, and to compare eeXiv to similar applications, particularly arXiv. We will also discuss briefly the development process, role of volunteer peer-reviewers, and future project goals.

*Contributions.* The idea behind eeXiv was first proposed by SRVHS academic Ananth Venkatesh and later refined by fellow SRVHS colleague Youwen Wu. The first mockup of the eeXiv system, created by Ananth Venkatesh, is retained in a branch of the main repository [3], which now has a proper implementation of the eeXiv system as designed by Youwen Wu [4].

# 2 Understanding eeXiv

eeXiv is perhaps the single largest and most impactful project ever undertaken by Team 1280 Robotics "The Ragin' C-Biscuits" of SRVHS. Within the robotics team, the newly-formed Electrical Engineering and Computer Science (EECS) group decided to embark on this epic quest to secure for our team the Blessings of Liberty [5] and an open repository for the storage and retrieval of vital research documents. EECS looked to the pioneer in digital research cataloging, arXiv, as a basis for the new eeXiv system, which trades the "arX" in arXiv for "eeX," pronounced "EECS" as a tribute to its creators. The goals of the eeXiv project are audaciously bold and unapologetically revolutionary. In this section, we attempt to describe to the uninitiated the purpose of a universal, open-access and open-source research repository, and what the role of eeXiv is in enabling such a repository.

## 2.1 eeXiv nomenclature

In this section, we break down several key terms that are crucial to understanding the eeXiv system and other research repositories.

*preprint.* fully written paper submitted for review, regardless of review status

*postprint.* research paper that has successfully passed at least rudimentary review, regardless of publication status

*e-print.* electronically-published *preprint* or *postprint*

*open-access.* content that is free both in cost and in thought ("libre") for everyone to download, analyze, and redistribute

*open-source.* content that allows, encourages, and actively relies upon contributions from community members

*tier-1 research institution.* highest research rating by the Carnegie Classification of Institutions of Higher Education

## 2.2 The research database

At the core of eeXiv is a centralized, optimized, and comprehensive database of metadata for all e-prints and their revisions ever published or cataloged on our site. This database does not contain the source files for each revision– these are stored separately and served through a versatile and external Content Delivery Network (CDN) to ensure low download times regardless of user location. The eeXiv research database allows analysis of all papers published to our platform, including the automatic creation of citations, analysis of revision histories, and author profiles. In this sense, the research database is critical to supporting eeXiv academia and researchers all over the world. It provides a single source of truth for all research publications and their connections, enabling researchers and analysts to quickly search for relevant papers in a multitude of scientific disciplines. An advantage of storing only the *metadata* of cataloged documents as opposed to their plain text contents is that the process of searching through even millions of documents can be completed locally in a fraction of a second, enabling search engine speeds on inconsistent hardware.

## 2.3 eeXiv's innovative technology

*Efficiency at its core.* The main database from which eeXiv pulls metadata is designed to be easy to use, to be lightweight, and to avoid incurring additional cost or overhead. To that end, the eeXiv "database" is stored within a TypeScript file located from the project files. This avoids any extraneous network requests and allows extremely fast and network-free data requests. The database also exposes a set of asynchronous functions which employ multi-threading to fetch data in the background to avoid freezing the user's document viewing experience.

*Modern and efficient web design.* eeXiv combines the best of both the "classic" web design ethos to which arXiv belongs, with lightweight content generated at the server for low download sizes and fast loading speeds, and "modern" web design, with responsive and feature-rich dynamic pages. This is done through advanced web technology powered by the Rust Programming Language, which pre-renders static HTML pages to be loaded at blazing fast speeds, and selectively generates dynamic pages which update and allow responsive interactivity only when necessary.

*Smart caching.* eeXiv never loads the same content twice. If you search for the same term or open the same document more than once, eeXiv will locally cache the data from that request so subsequent visits are near-instantaneous.

*Web3 ready.* Unlike other similar websites, many of which were established by research institutions in the fledgling days of web development, eeXiv has been created with the goal of being fully ready for the new internet age (dubbed Web3). Utilizing popular and innovative technologies such as Turbopack, Next.js, React, Web Workers, Service Workers, and more, eeXiv is ready for Web3, which will center around decentralized services and the blockchain.

## 2.4 Peer review process

What truly separates eeXiv from related applications is its unique peer review process. eeXiv fulfills the role of both a research repository and traditional scientific journal, while following commonly-accepted standards for and being certified as neither. To merge these two typically disparate functions into a single application, eeXiv relies on a network of peer-reviewers, also referred to as "volunteer contributors," to parse through eeXiv's massive research output (equivalent to several institutions of higher education combined) and provide quality feedback on preprints, error correction for postprints, and overall quality control to ensure the

best articles are promoted in search results and other application functions.

*Comparison with traditional peer review.* Similar to scientific journals, eeXiv relies solely on "volunteer contributors" who are luminaries in their respective fields of study, drawing on the best of the best to prune through a dynamic, ever-changing wall of content and greatly reduce time to publication.
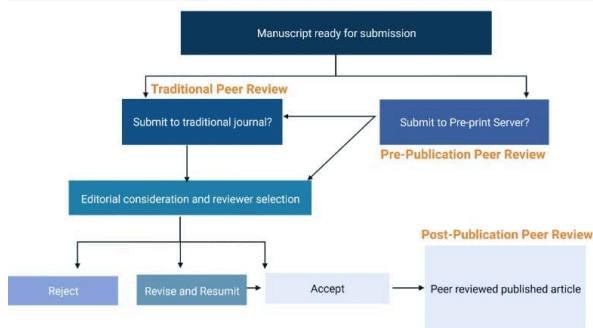


Figure 1: An overview of the traditional peer review process, with a separate branch representing the augmentation of this process by traditional research repositories

*Role of research repositories.* As can be seen in **Fig. 1** [6], online repositories for research (which typically publish pre-prints) allow readers to access articles prior to the official acceptance or revision process that occurs when articles are brought up for consideration in a journal. eeXiv, by contrast, merges the preprint process into the existing review pipeline, allowing a streamlined process from preprint to postprint that reduces review time by relying on a network of peer-reviewers.

*Holding the bureaucracy accountable.* In the United States, the bureaucracy is traditionally held accountable through various means, among them the controversial use of executive orders by the President and congressional oversight. Both of these processes suffer from obvious issues; executive orders tend to evoke authoritarian politics and congressional oversight is cor-

rupted by the "revolving door" and "iron triangles" with industry [7].

*Academic bureaucracies.* As with government, academia suffers many of the same problems of bureaucratic bloat and inefficient resources and processes to address them. One of the most frustrating parts of the academic bureaucracy, particularly in research publication, is the process of peer, scholarly, and journal review. Each of these processes is carried out by faceless organizations, often in a "single blind" or "double blind" fashion, thus lacking transparency and accountability [8]. As a result of these issues, the review process can often take months, much too long considering the rate at which research output is produced and made accessible online [9]. Additionally, even with this lengthy review process, research is often wrought with inaccuracies and inconsistencies, which has already led to the resignation of two presidents [10], [11] at tier 1 "research universities."

*Democratizing research.* Journals and other bureaucratic entities are governed by their own rules, much like the executive branch of the United States government remains tied to the Deep State. "Draining the swamp" in the context of academia means restructuring peer review for an online-first world where speed and transparency are prioritized and plagiarism and authenticity are mere societal constructs. eeXiv's decentralized, crowdsourced, and adaptable peer review structure enables faster, more transparent, and democratized publication of more research papers, advancing the woke Diversity, Equity, and Inclusion (DEI) agenda that has taken higher education by storm [12] while also disseminating research at a faster rate than ever before.

## 3 Related Work

The flagship example of a system similar to the proposed eeXiv application described in this paper, and the system that eeXiv is based on

(both in name and in substance) is the arXiv research repository, hosted by Cornell. arXiv's description of its platform is given below [13]:

> arXiv is a curated research-sharing platform open to anyone. As a pioneer in digital open access, arXiv.org now hosts more than two million scholarly articles in eight subject areas, curated by our strong community of volunteer moderators.

arXiv touts the largest collection of e-prints of any research repository in the world, recruiting researchers from a broad range of services: article submission, compilation, production, retrieval, search and discovery, web distribution for human readers, and API access for machines, together with content curation and preservation.

## 3.1 Comparisons

*Internal governance.* arXiv operations are maintained by the arXiv Leadership Team [13] and arXiv staff at Cornell University. This inherently leads to woke tendencies in academia [12] influencing article selection. Additionally, arXiv does not free researchers from the bureaucratic maze of publication, but instead only adds electronic pre-prints as an option for those whose papers have not been reviewed. eeXiv, on the other hand, relies on a network of peer-reviewers and a constant stream of submissions which are both reviewed and published, eliminating the need for any journal or special interest to interfere with original research.

*Hosting strategies.* Registered users may submit articles to be announced by arXiv. There are no fees or costs for article submission. Submissions to arXiv are subject to a moderation process that classifies material as topical to the subject area and checks for scholarly value. Material is not peer-reviewed by arXiv–the contents of arXiv submissions are wholly the responsibility of the submitter and are presented "as is" with-out any warranty or guarantee [13]. eeXiv takes a different approach, carefully vetting papers but also publishing non-traditional research artifacts, including code (in the form of executables and tarballs) and drawings. eeXiv commentary is strictly objective and does not classify papers by topic (except for searching), instead seeking to solicit a broad range of opinions on various academic disciplines from a community of scholars. eeXiv thus lowers the bar for publication while increasing publication quality.

*Cataloging.* arXiv catalogs are poorly maintained and, though searchable, lack the sophistication and depth of the eeXiv knowledge base. A key difference between arXiv and eeXiv is that eeXiv, due to its large network of researchers and scholars, is able to create a wiki-like knowledge base to track not just papers and authors, but also topics, institutions, author affiliations, and more. This is a constantly growing knowledge base that better contextualizes articles for readers and greatly increases application ease of use, while improving search functionality.

# 4 Future Work

The eeXiv project, in its current stage, is still in the alpha phase of development. Work has just begun, at rapid pace, on implementing all of its objectives. However, it will likely require significant effort from the open-source community to prepare eeXiv for production. We present this whitepaper to highlight the inception of eeXiv as a rival to arXiv and a novel application to cut through research bloat, but acknowledge that there is still much work to be done.

## 4.1 Planned Features

*Peer review infrastructure.* eeXiv relies on a network of peer-reviewers who review papers specific to a certain topic or academic discipline. These assignments are made by Team 1280 EECS. Currently, no suitable infrastructure exists for separating peer-reviewers from authors

and providing a unique portal for peer-reviewers to leave comments, as the site is completely static. We plan on implementing mailing lists that will run from a separate cron job or task, independently of the site, to send email to peer-reviewers. Peer-reviewers may then submit their reviews to a database or via email. The details of this process are still in the works.

*References and data analysis.* eeXiv will likely need to include more advanced data analysis features in the future, which will leverage the eeXiv knowledge base to connect authors, papers, and topics, probably by using citation data. Author pages should show papers written by that author, papers should include citation maps, and topics should include relevant papers. We also hope to implement BibTex citation exports for all research artifacts published on our site as soon as possible to improve ease of use.

## 4.2 Research output

As eeXiv grows, we hope to solicit more research papers, both past and present, to increase our research database and rival arXiv as the single largest open-source and open-access research repository. To do this, we will need to rely extensively on massive Team 1280, SRVHS, and related alumni networks, while also leveraging faculty connections and existing paper data from similar research databases. We may at some point implement an arXiv crawler to automatically produce new research without respect for copyright laws, but this will require a peer review network large enough to handle this volume of research output.

# 5 Notes on Crowdsourcing

As mentioned in the paper above, crowdsourced peer review is critical to the functioning of eeXiv and its efficiency. eeXiv borrows from the Silicon Valley mindset of "move fast and break nothing" to deliver the most efficient, performant, and reliable research publication database ever created. In keeping with that spirit, we understand the expectation that our peer-reviewers be reliable and efficient in reviewing and critiquing submitted papers.

## 5.1 Volunteer contributors

Volunteer contributors to eeXiv are selected on the basis of merit, in accordance with the Pendleton Civil Service Act [14]. The EECS governance body of the eeXiv system plays only a small role in the selection of volunteer contributors, by affirming their intellectual vitality and personal greatness, as required to ensure a diverse and robust network of peer-reviewers. Selected peer-reviewers are academics, scholars, and revolutionaries. We look for persistence, passion, and a desire to give back. It doesn't matter whether you seek to challenge the status quo in your field or if you're the latest in a long tradition of educational excellence: You stand up and you stand out.

## 5.2 Review pipeline

When papers are submitted to eeXiv, they are automatically tagged as "draft," "in review," or "peer reviewed." Papers tagged as "draft" will be automatically forwarded to relevant peer-reviewers based on their topic and the necessity for scholarly input. Preventing conflicts of interest and other bureaucratic assignment procedures are not priorities; we seek to expedite the peer review process as much as possible. When volunteer contributors begin to review a paper, it is automatically retagged as "in review," and later, when suggestions are applied or dismissed, as "peer reviewed." Volunteer contributors should actively critique submitted papers, while also offering suggestions and corrections. They should submit a review summary of two paragraphs or less, which will be forwarded to all relevant authors. Authors and peer-reviewers will then consult and resolve outstanding issues before the review process is exhausted.

*Quality control.* As eeXiv processes an enormous amount of scholarly work, it is crucial to us that this work, regardless of review status, meets a certain standard of quality. This is why we will sparingly ask volunteer contributors to review existing peer-reviewed articles for potential corrections if an issue is raised by our readers and scholarly community or during times of low article submission.

# 6 Conclusion

In the midst of an ocean of technical debt, disorganized research, and a fractured scholarly community, Team 1280 EECS proposed its most daring project yet, with a GDP multiplier effect spread out across not only SRVHS but the surrounding San Ramon Valley community. arXiv's longstanding and unquestioned reign as the champion of open research was systematically and effectively dismantled through woke San Francisco values, a determined Silicon Valley capitalist mindset, and the sheer human capital at the disposal of EECS. In less than a quarter of the time it takes a typical research paper to be reviewed, EECS created a rival to arXiv capable of hosting more research at faster speeds, promoting original scholarly inquiry and cutting through bureaucratic bloat. eeXiv will thus remain one of the most significant contributions to academia worldwide for decades to come.

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