Annual Report 2020

[Our new home at Cornell Tech in New York City]

About arXiv

arXiv is a curated research-sharing platform open to anyone. As a pioneer in digital open access, arXiv.org now hosts more than 1.8 million scholarly articles in eight subject areas, curated by our strong community of volunteer moderators who balance content quality and distribution speed. arXiv offers solutions for a broad range of services: article submission, compilation, production, retrieval, search and discovery, web distribution for human readers, and API distribution for machines, together with content curation and preservation. Our emphasis on openness, collaboration, and scholarship provide the strong foundation on which arXiv thrives.

arXiv is organized exclusively for educational and scientific purposes. It is part of Cornell University and reports organizationally to the Dean of Cornell Tech, who acts as arXiv's steward.

Mission

arXiv is an open platform where researchers can share and discover new, relevant, emerging science and establish their contribution to advancing research.

Vision

Our vision is for all researchers around the world to have immediate, free, and open access to established and emerging research in their field.

Values

arXiv is open, above all. The foundation of arXiv is based on open access, transparency, open mindedness, collaboration, and flexibility.

arXiv is a community. Our institutional members, collaborators, moderators, authors, and readers are not passive recipients—they are arXiv.

arXiv is passionate about science—and science is for everyone.

We do more with less, for the purpose of serving researchers and research.

We look out for each other. To meet the challenges of the future, we are collectively passionate about our work.

We value excellence within ourselves and our collaborators.

We embrace the Agile Manifesto, and our favorite part is, "**Individuals and interactions over processes and tools.**"

Table of Contents

Message from Dr. Greg Morrisett, Dean of Cornell Tech

I am honored to serve as the Cornell steward for arXiv because I so firmly believe in the mission: to serve science by making sharing of papers open, fast, reliable, and sustainable. In spite of the fact that arXiv has been around for almost thirty years, there are many challenges in realizing this vision, from scaling as the number of submitted papers grows, to ensuring the underlying systems are resilient to change (be it software, hardware, or people), and to meeting the needs of an increasingly diverse scientific community that spans the globe.

With new leadership comes new ideas about how best to meet these challenges, and I've been delighted by the deep thought and boundless energy that Dr. Eleonora Presani brings as the new Executive Director. It couldn't be easy to start in that position right when the pandemic started and Cornell instituted a hiring freeze, yet somehow Eleonora has managed to not only keep the train running, but to push forward on key initiatives, from technical advances (such as a new classifier running in the cloud) to new funding support (such as gifts from AI2 and Google.) I am grateful for all that Eleonora, Scientific Director Steinn Sigurdsson, and the rest of the arXiv staff have done, and excited to see what they will do going forward.

> "Many of our users think of arXiv as an information system, when in fact, it's a community of dedicated advisors, moderators, and developers who volunteer their time so we can realize our mission."

Many of our users think of arXiv as an information system, when in fact, it's a community of researchers, plus dedicated advisors, moderators, and developers who volunteer their time so we can realize our mission. Without their help and support, arXiv could not function and so I am deeply grateful for all that they do. I am also very thankful for the unwavering support of the Simons Foundation and all of our members. We are very careful about how we spend these precious resources to make sure that arXiv is on a strong fiscal footing and will persist.

Message from Dr. Eleonora Presani, Executive Director

2020 has shown us the true value of what we do at arXiv. For me, 2020 started very well: my Green Card was approved, and I accepted the offer to work as arXiv's first ever executive director at Cornell Tech. But settling into my new position on the day New York City started its lockdown, March 16th, was challenging.

With the deaths of more than two million people, tremendous financial consequences, and the loss of social interactions, the pandemic has changed the world. Universities have not been exempt from these difficulties: budgets have been cut, lessons moved online, campus life restricted, international students losing their opportunities to start new adventures.

Yet, there is one area where this pandemic has brought us together, with passion, determination and purpose. This area is scientific research.

Scientists developed a vaccine in record time. Governments, organizations, and corporations stepped up to coordinate and contribute to the efforts of scientists, and 2020 should be remembered as a year of scientific success and advancement.

> "2020 should be remembered as a year of scientific success and advancement. As I began working here, I realized that I was becoming part of something unique."

This is what made 2020 a special year at arXiv. As I began working here, I realized that I was becoming part of something unique. Researchers did not stop writing articles and sharing them on arXiv -- on the contrary, in 2020 we received a total of 30% more submissions than in 2019. We also received more than 3,000 articles related to COVID research, which convinced us to create a special role for a COVID moderator. Knowing that arXiv offers a platform for researchers to share their insights quickly and freely is why the arXiv staff is so passionate about our work.

Before the pandemic, arXiv had plans for expansion, but the global crisis did not work in our favor. Yet, I was welcomed by a passionate group of

people who stepped up to ensure that 2020 would be a transformative year for arXiv. The entire staff of arXiv, as well as a number of volunteers, from Board members to passionate authors, came together to build a new strategy for arXiv. Everyone welcomed a different leadership style with open minds and a lot of enthusiasm. arXiv released several new features this year, started new relationships, and even increased the number of member institutions.

> “This is only the beginning. arXiv is entering the new year with a refined strategy, a strong identity and a thirst for innovation.”

This is only the beginning. arXiv is entering the new year with a refined strategy, a strong identity and a thirst for innovation. This report is in itself a teaser of what the future of arXiv will bring, and I am thrilled to be part of that future.

[arXiv’s offices in Uris at Cornell University]

Message from Dr. Licia Verde Chair of the Scientific Advisory Board and ICREA Research Professor, Universitat de Barcelona

For arXiv, the main two new and unexpected challenges have been 1. onboarding and welcoming the new executive director just as lockdown was happening and 2. the new role of preprints in the COVID era and the responsibility of moderation that this implies. At the beginning of the pandemic, when the writing was on the walls but the world did not really want to see it, arXiv prepared for the worst and hoped for the best. When the pandemic is over, (whenever that may be) the world will be changed, the role of preprints will also be different, but you can be assured that we did our best to make sure that arXiv will still be there to meet the needs (old and new) of the research community it serves.

Message from Carol Hoover, MLIS Chair of the Member Advisory Board and Digital Information Resources Manager, Los Alamos National Laboratory

While the year 2020 was challenging in many ways, 2020 also opened a door for arXiv to a new era with exciting possibilities. In 2020 arXiv hired its first executive director, who mirrors the values and spirit that arXiv has come to represent for researchers all over the world. 2020, and much hard work, brought a revitalized mission and vision, refreshed identity and branding, inclusive membership and governance models, and technical and operational improvements together with a renewed sense of community, collaboration, diversity, and a laser focus on meeting and overcoming challenges that have positioned arXiv for continued success and excellence.

> “With quarantines and major conferences being cancelled, arXiv is as important as ever to sharing research.”
>
> —arXiv Scientific Director and Penn State professor Steinn Sigurdsson

Message from Michael Weissman, Director of Finance, Cornell Tech

With the approval of the Member Advisory Board, arXiv moved to a fiscal year financial calendar beginning July 1, 2020. The attached report [on page 10] details the spending for the first half of the fiscal year, from July 1, 2020 - December 31, 2020. An estimated budget for the FY21 fiscal year is also presented.

Overall, arXiv's financials are strong. arXiv revenue is trending appropriately to budget, with the majority of member contributions to be invoiced in the upcoming month.

Personnel expenses are trending slightly lower, primarily due to the consequences of a university-wide hiring freeze impacting two vacant technical positions.

Non personnel expenses are trending slightly higher, with the exception of travel and legal expenses.

Financials at a glance:

Total Revenue 2020	**2,423,994**
Total Expenses 2020	**2,423,994**
	personnel: 1,532,489
	non-personnel: 891,505
Total Budget 2021	**2,620,873**

arXiv Annual Financial Plan

	FY21 (July 2020 - June 2021)		FY22 (June 2021 - July 2022)
REVENUE	*(Budget)*	*(Actuals, 12/31)*	*(Budget)*
Member Contributions	$ 550,000	$ 145,051	$ 550,000
Simons Foundation Funding	$ 400,000	$ 300,000	$ 400,000
Cornell Contribution (Direct)	$ 225,000	$ 219,130	$ 225,000
Cornell Contribution (In Kind)[2]	$ 654,655	$ 277,118	$ 707,827
Other Gifts	$ 180,000	$ 56,623	$ 180,000
Developmental Reserve Funding[1]	$ 414,339	$ 28,163	$ 558,046
TOTAL REVENUE	$ 2,423,994	$ 1,026,085	$ 2,620,873
EXPENSES			
Personnel Expenses			
Executive and Scientific Directors	$ 322,154	$ 160,522	$ 346,001
Technical Staff	$ 859,600	$ 255,655	$ 941,025
Operational Staff	$ 350,735	$ 179,187	$ 382,064
Total Personnel Expenses	*$ 1,532,489*	*$ 595,363*	*$ 1,669,090*
Non-Personnel Expenses			
Services - Technical	$ 121,550	$ 127,861	$ 125,197
Services - Professional	$ 19,200	$ 22,467	$ 19,776
Services - Legal	$ 25,000	$ 500	$ 25,750
Meetings and Travel	$ 58,650	$ 1,775	$ 60,410
Other General Expense	$ 12,450	$ 1,000	$ 12,824
Indirect Costs[2]	$ 654,655	$ 277,118	$ 707,827
Total Non-Personnel Expenses	*$ 891,505*	*$ 430,721*	*$ 951,782*
TOTAL EXPENSES	**$ 2,423,994**	**$ 1,026,085**	**$ 2,620,873**
TOTAL NET OPERATING	**$ -**	**$ -**	**$ -**

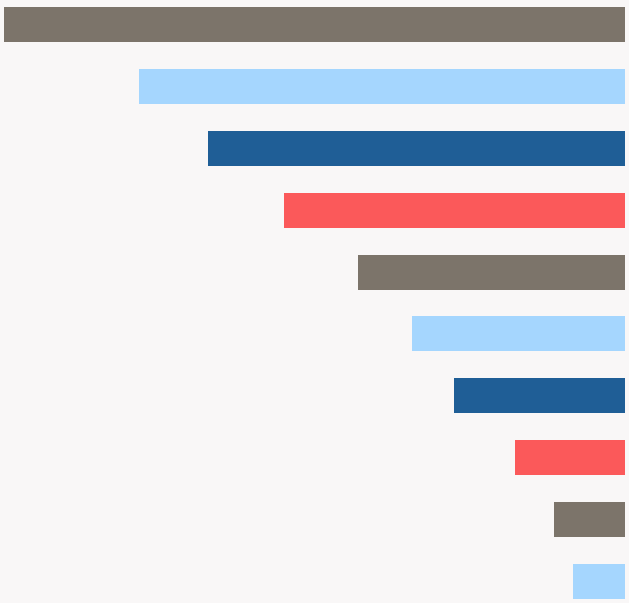
[1] *Anticipated drawing of funds from developmental reserves to fund operational deficit.*

[2] *Indirect costs covered by Cornell include those for Administration, Staff Support (Finance/Budget, HR, Facility, and Staff IT), Facilities (utility and other facility related cost for building), maintenance, custodial, utility, and other facility related costs for the building.*

arXiv in Numbers

Most submissions in a month:

17,000 June 2020



1.89 billion downloads

4.2 million monthly active users

1.8 million articles

300,000 hits per hour

16,000 submissions per month

243 members

190 moderators

153 categories

26 board members

12 staff members

243 members from 30 countries

Thank you to our supporters

Major Funding

Simons Foundation

Allen Institute for Artificial Intelligence

Google, Inc

Platinum

California Institute of Technology

Imperial College London

Massachusetts Institute of Technology

University of Cambridge

Consortia

Big Ten Academic Alliance, USA

Consortium arXiv-DH and HGF, Germany

Jisc, United Kingdom

National Institute of Informatics, Japan

The Center for Direct Scientific Communication, France (CCSD)

University of California Digital Libraries, USA

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CERN-European Organization for Nuclear Research
Columbia University
Cornell University
DESY (HGF - Helmholtz Association, German Research Centers)
Ecole Polytechnique Fédérale de Lausanne (EPFL)
ETH Zurich
Georgia Institute of Technology
Kyoto University
Max Planck
New York University
Princeton University
Stanford University, and SLAC
University College London
University of Amsterdam
University of California, Berkeley
University of Illinois at Urbana-Champaign
University of Oxford
University of Tokyo

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National Taiwan University
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University of Maryland
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University of Waterloo
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Commissariat à l'Énergie Atomique (CEA)
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International Centre for Theoretical Physics (ICTP)
Italian Institute for Astrophysics (INAF)
KTH Royal Institute of Technology
Nagoya University
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University of Warwick
University of Washington Libraries
University of Zurich, Institute of Theoretical Physics
UPMC (Universite Pierre and Marie Curie)
Uppsala University

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CSIC - Spanish National Research Council
Freie Universität Berlin
Hebrew University of Jerusalem
Humboldt-Universität zu Berlin
Johns Hopkins University
Joint Institute for Nuclear Research (JINR)
KEK High Energy Accelerator Research Organization
Leiden University (Leiden Institute of Physics)
Los Alamos National Laboratory
McGill University
Monash University
Penn State University
Physical Research Laboratory
Radboud University
Tel Aviv University
Texas A&M University
TU Wien
Universität Basel
Universität Erlangen-Nürnberg
Universität Frankfurt am Main
Universität Hannover
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University of California, Riverside
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University of Cape Town
University of Central Oklahoma
University of Geneva
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University of Kansas
University of Nebraska
University of New Hampshire
University of North Texas
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University of Nottingham
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University of Pittsburgh
University of Tsukuba
University of Virginia
University of Western Australia
University of Witwatersrand
University of York
Utrecht University
Villanova
Vrije Universiteit Brussel
Washington State University
Weizmann Institute of Science
Western University

Societies

American Astronomical Society
American Institute of Physics Publishing
American Mathematical Society
American Physical Society
Association for Computing Machinery
Deutsche Physikalische Gesellschaft
Institute of Physics Publishing

Affiliates

Arm Research Ltd
Austrian Science Fund
Microsoft Corporation
NWO - Dutch Research Council

Giving Week

1400+ arXiv enthusiasts made our 2020* online giving campaign a success. In sum, individuals donated more than US$43,500 during a single week in October. We acknowledge that these are challenging times, and we're humbled to know that so many people worldwide were inspired to support arXiv's mission to empower researchers to share and advance scientific knowledge.

- Roughly 30% more in revenue was raised during this campaign compared to the same campaign last year.
- Almost twice as many people donated during this campaign compared to last year.
- The largest donation was US$1,000.
- 20 donors gave more than US$100.
- Nearly 25% of the funds raised were given in amounts less than US$20.
- 71 gifts have been set up as recurring donations.
- Individual donations complement arXiv's diverse funding sources.
- arXiv's operational budget is also supported by more than 243 member libraries and research organizations, corporate donors, the Simons Foundation, and Cornell University.

*Due to COVID-19, arXiv's spring giving campaign was canceled.

Strategic Goals

Throughout its long history, arXiv has become an essential part of many scientists' research workflows. Modernizing arXiv's infrastructure, adopting new technologies, and addressing new needs of the community is essential to arXiv's mission.

In 2020, arXiv focused on three main goals, which will remain pillars for several years to come:

Sustainability

ensure that arXiv remains in operation well into the future, by safeguarding a sufficient long term operational budget and enhancing arXiv's resiliency.

Relevance

quickly match arXiv's service to the needs of an ever-evolving scientific community. Offering the same service for decades requires that it remains up to date and is relevant for current needs.

Innovation

cultivate opportunities to collaborate, innovate, and create new features or services that can facilitate the life of researchers and cater to their needs.

These three goals, **sustainability**, **relevance** and **innovation** are the core motivation for arXiv to start the new decade and prepare to celebrate its 30th anniversary with a renewed approach. This new approach manifests in a set of strategic plans to restructure and renew arXiv while maintaining its core values and service in terms of *governance, platform, identity and membership.*

Sustainability

arXiv experienced many significant changes over the past several years. From a governance perspective, our administrative home moved from the Cornell University Library to Cornell Information Sciences to Cornell Tech. The long-time program director retired. Multiple staff members moved on to other positions, and new staff members were hired. All of these changes have posed some challenges, but arXiv has taken these opportunities to start anew.

Strategic Planning Process

In March 2020, under the leadership of arXiv's first ever executive director, we began a Strategic Planning Process, which included the scientific director, advisory board chairs, and staff. Through this endeavor, the mission and vision were developed, and various strategies were explored for future development.

> **Mission:** arXiv is an open platform where researchers can share and discover new, relevant, emerging science and establish their contribution to advancing research.

> **Vision:** Our vision is for all researchers around the world to have immediate, free, and open access to established and emerging research in their field.

arXiv also hosted its very first virtual board meeting, where members of the Scientific Advisory Board and Member Advisory Board from four different continents gathered to hear about updates, plans, challenges and opportunities — and provide their valuable insights. The meeting was intense and fruitful, with discussions ranging from big picture strategy to daily operations like moderator recruitment. Many of our board members have volunteered in this capacity for more than a decade, and we're grateful that they continually inspire the staff to serve authors, readers, and open science.

Governance Assessment

arXiv's current organizational structure includes the executive director, scientific director, the scientific advisory board (SAB), and the membership advisory board (MAB). This year, that structure was examined to ensure that it met arXiv's needs regarding advisory expertise and efficiency in decision making. It was determined that the governance model would benefit from more clarity in structure, roles, and responsibilities. This is an ongoing process that will ultimately strengthen arXiv's ability to thrive.

Operational Stability

As the COVID-19 pandemic progressed during 2020, arXiv continued to serve readers and authors by providing the stable and reliable platform they trust. The pandemic's unique challenges helped us see operational priorities in a new light, and we took specific steps to reinforce arxiv's resiliency during the coronavirus crisis.

Over the course of several weeks in April and May, the arXiv IT team participated in a series of drills with support from the arXiv admin team to test for response preparedness and recovery workflows in emergency situations. The drills included software errors, deployment failures, distributed denial of service attacks, component outages, and infrastructure failure.

More than **190** moderators from **22** countries across the globe have continued to sift through thousands upon thousands of submissions.

Additional activities to support operational stability included:

- Moving from on-site servers to cloud services,
- Establishing cloud mirrors to add redundancy,
- Auditing software modules, and
- Working toward code redundancy and transparency throughout the entire arXiv codebase.

A Committed Community

More than 190 moderators, representing 22 countries across the globe, have continued to sift through thousands upon thousands of submissions, ensure quality, and post research on arXiv.org despite significant disruptions to their personal and professional lives due to the pandemic. Members of the Scientific and Member Advisory Boards also continue to honor their commitment to arXiv, meeting with our executive director, corresponding via email, and contributing their perspectives on operations and aspirations for 2021 and beyond. This is a testament to the astounding effectiveness of arXiv's community.

"In times like this, we need global collaboration in research and shared knowledge among different disciplines," says Eleonora Presani, arXiv Executive Director. "arXiv allows researchers from different backgrounds and geographical locations to quickly share their findings and push forward for the discoveries we need. It is an ideal platform for researchers to communicate with each other when speed is of extreme importance."

"In times like this, we need global collaboration in research. arXiv allows researchers from different backgrounds and geographical locations to quickly share their findings and push forward for the discoveries we need."

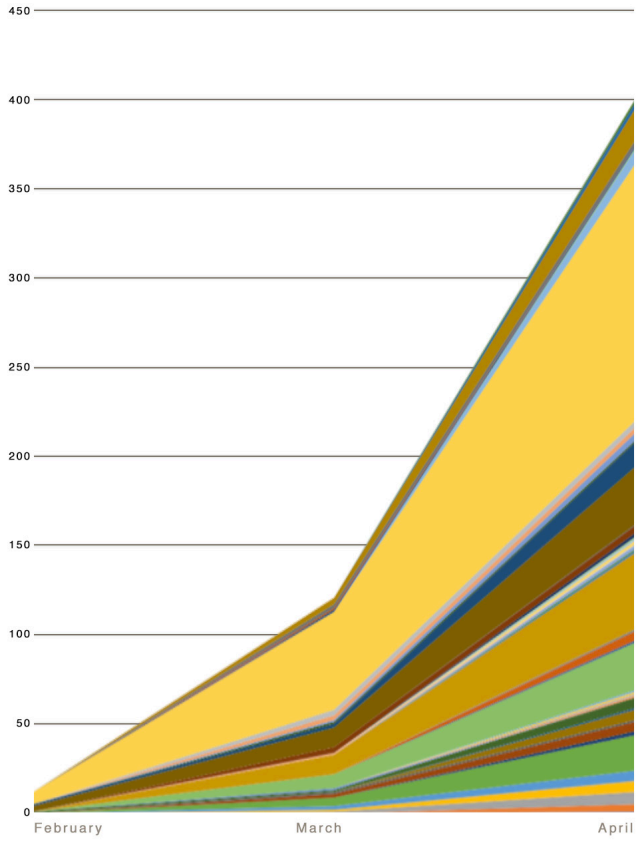
—Eleonora Presani

Relevance

> “In the context of a pandemic like the one we’re experiencing, it is crucial to get information to people quickly, and arXiv provides a shared infrastructure and community to get scientific research to those that can make a difference.”
>
> —Greg Morrisett, Dean of Cornell Tech

COVID Response

Throughout 2020, COVID papers were submitted to arXiv at breakneck speed. In response, arXiv secured funding from Google to support a COVID-specific moderator. The moderator worked alongside existing moderators and staff to ensure the minimum quality standards were met. To help readers find these papers quickly, we launched a quick search link to all coronavirus and COVID-19 research hosted on arXiv.org. Additionally, an external link to medRxiv and bioRxiv preprints about the coronavirus and COVID-19 was added.



COVID-19 related submissions increased exponentially across all categories between February and April 2020.

Strengthening arXiv's Identity

arXiv is a highly valued tool that is known primarily through its digital presence. In 2020, arXiv embarked on an identity project to ensure that arXiv's brand reflects its true nature as a professional, innovative tool created by and for researchers.

Through this process, we:

- assessed user feedback collected since 2016
- surveyed board members and 7,000 additional users about their perceptions of arXiv
- gathered ten diverse community members to serve as advisors during the six month brand development process
- contracted with a professional designer to produce a logo

To guide our branding efforts we focused on this direction: **arXiv is a place of connection,** linking together people and ideas, and connecting them with the world of open science. After many rounds of revision and refinement, arXiv's first brand guide was produced.

Improved Author Experience

arXiv made a number of improvements to the author experience, such as integrating a new classifier and an updated TeX compilation service with error highlighting. Additionally, content curation continued uninterrupted amidst increasing submissions and additional challenges wrought by COVID-19.

Classifier Updates

The correct categorization of scholarly works helps readers find the information they seek — and assures authors that their research will be found by the right audience. In May, arXiv released a new user-driven classification tool to help authors choose the correct category for their papers during the submission process. When submitting to arXiv, authors select a category for their paper, such as computational geometry or quantum physics. Now, in real time, the automated classifier double checks that selection by comparing the paper to those already hosted on arXiv.org. If the author's selection doesn't match the classifier's recommendation, an alternate category is proposed. The author can review the suggestion, accept or decline it, and continue the submission process.

> "I think this is a great addition. Since the feature has been in operation submitters tend to classify things for my category correctly more often."
>
> —Frank Simon, Max Planck Institute for Physics

In the past, only moderators had access to the automated classifier recommendations, after submission, and that added time to the process and often led to delays.

"I think this is a great addition, and I am already seeing positive effects," said Frank Simon, Max Planck Institute for Physics, Munich, Germany and arXiv moderator, about the classifier. "Since the feature has been in operation, submitters tend to classify things for my category (physics.ins-det) correctly more often."

An important change for authors: the arXiv submission size limit is now **50MB** without the need for an oversize request.

A new classifier is released

In October 2020, arXiv released a classifier based on an algorithm developed by Papers with Code. The classifier is now based on two open source models, ULMFiT and fastText, trained on over 1.6 million abstracts and 120 thousand full text articles, respectively. The new arXiv classifier code is publicly available on github, and this transparency is one key difference between the new classifier and its predecessor.

TeXLive 2020 update and error highlighting

In October, the arXiv development team released the TeX Live 2020 update. TeX is an open source markup language that allows precision formatting of various aspects of academic writing, including mathematical formulas and bibliographies. arXiv's previous major release was based on TeX Live 2016.

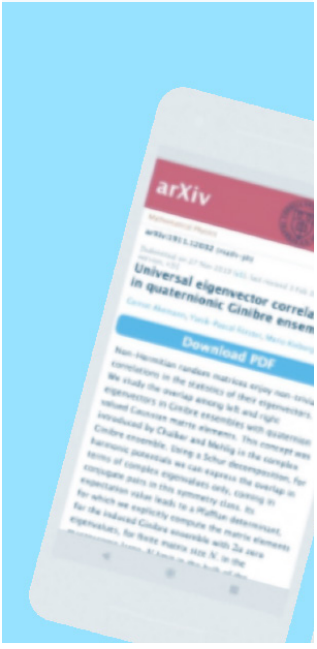
Additionally, compilation errors detected during the submission process are now highlighted with different colors. Authors can quickly scan a summary of errors, understand their severity, and follow links to relevant arXiv help pages. This AutoTeX log highlighting feature was specifically requested by arXiv authors and will likely improve their experience.

A new license option

Authors now have a new license option for their submitted works, the CC BY-NC-ND. This is the Creative Commons Attribution-NonCommercial-NoDerivs license, which stipulates that others can share the work only with proper attribution and no commercial or derivative works can be made from it.

The CC BY-NC-ND license was added to arXiv's selections because many authors submit works that have already been accepted to journals, which each have their own unique policies regarding copyright and article reuse. With this option, authors can comply with the policies of some journals, while also extending permissions to arXiv and others to openly share their work.

In response to a user survey, mobile-friendly design changes were made to arXiv.org, increasing ease of use.



Content Curation and User Support

The four person arXiv operations team handles about 600 submissions per day, performing quality control checks and facilitating moderation by 190 volunteers.

> "The submission process was much easier than before because of the Author Guide."
>
> —Anonymous arXiv author

They also address user help inquiries, ranging from account management and technical troubleshooting to copyright violations and author disputes.

This year, arXiv updated its submittal agreement terms and conditions and instructions for submissions. These agreements clarify the submitter's representations and warranties, the license granted to arXiv, the waiver of rights and indemnification, and management of copyright.

The arXiv Author Guide was launched to help reduce the number of help tickets associated with submission questions. Authors activate the guide by simply clicking a button from their user account page or on subsequent pages of the submission process. Once launched, the guide highlights and explains elements likely to be unfamiliar to new arXiv authors — and also provides links to more detailed information in the help section of arXiv.org.

Additionally, arXiv

- Worked with the moderation health committee to identify moderation needs
- Expanded student employee roles
- Refined workflows, policies, and documentation
- Hosted a meeting of the Subject Area Chairs for Small Sections
- Transitioned to a new support software

Membership

Membership is critical to arXiv -- not just in terms of funding but also for stakeholder engagement, stability, and independence. The program, started almost 10 years ago, accomplishes four very important objectives:

- Provides opportunities for stakeholders around the world—libraries, universities, and research institutions—to invest in arXiv
- Contributes to governance through the Member Advisory Board (MAB)
- Raises 25% of the current operating budget
- Fulfill the Simons Foundation matching funds requirement

This year, arXiv, in collaboration with the Member Advisory Board, reassessed the membership program and plans to implement changes in 2021 in order to meet goals for sustaining arXiv's growth.

2020 Membership:

243 libraries and institutions

6 consortia

7 societies

> “The strike is an idea that grew out of discussions among Black physicists and astronomers, and, importantly, one thing that it offers us is a day of rest.”
>
> —Dr. Chanda Prescod-Weinstein, professor of physics at the University of New Hampshire and co-organizer

Contributing to the Conversation

The pandemic interfered with our desire to network in person. However, we found many opportunities to listen and respond to our community of researchers.

In June, we learned of the #strike4blacklives, a movement to pause business as usual on a single day and acknowledge systemic racism in academic communities around the world. arXiv’s US-based staff decided to participate in the strike, joining thousands of scientists around the world and many organizations including Science, Nature, the American Physical Society, the American Astronomical Society, MIT, the Perimeter Institute, and more. By cancelling the announcement of new papers on June 9, we publicly recognized that arXiv is an essential, daily tool for many people, and Black researchers are faced with the simultaneous tasks of writing and reading papers, while also fighting for their rights.

arXiv also engaged with the community by presenting at the 2020 American Astronomical Society, SCOAP3 Governing Council, IVY+ Libraries Lightning Talks, and Open Access Week at Princeton University.

As part of Cornell University’s Open Access Week, arXiv hosted a panel discussion about open access in the COVID-19 era with executive director Eleonora Presani; John Inglis, co-founder of bioRxiv and medRxiv and executive director of Cold Spring Harbor Laboratory Press; and Sebastian Kohlmeier, CORD-19 project manager and senior manager, Semantic Scholar, Allen Institute for Artificial Intelligence.

Innovation

> “I’m excited to see the research community rise to the challenge of a rich, multifaceted dataset with so much real-world practicality, and the new questions this will raise.”
>
> —Alex Alemi, Senior Research Scientist at Google, regarding the arXiv dataset on Kaggle

At the time of its founding, arXiv disrupted conventional scientific publishing by inventing a mechanism for researchers to share their research quickly, electronically, and without peer review. The popularity of this approach is evident in the ever-growing number of submissions and downloads at arXiv.org.

Now approaching its 30th anniversary in 2021, arXiv is keen to continue its tradition of innovation. arXiv aims to adapt quickly to researchers’ needs by creating new features and services that will make research life easier, more productive, and more enjoyable. To do this, we are cultivating opportunities to listen deeply to the community’s needs and collaborate in meaningful, impactful ways.

arXivLabs Framework for Collaboration

arXiv launched a new, formalized framework enabling innovative collaborations with individuals and organizations. arXivLabs, a concept developed years ago, acts as a conduit for collaboration. Now, it appears as a physical space on the article record page, and, importantly, sets guidelines for collaborations between arXiv and third parties, ensuring that partners share arXiv’s values of openness, community, excellence, and user data privacy. arXiv readers will now find a new feature, below existing content on the article record page, that reflects the new framework. The arXivLabs tabs highlight different experimental tools developed by collaborators and will be updated as new tools become available. These add value and functionality for both readers and authors.

“Members of our community want to contribute tools that enhance the arXiv experience, and we value that kind of community engagement,” said Eleonora Presani, arXiv Executive Director.

Integrated Tools for Readers and Authors

With the arXivLabs framework, new integrated tools are being added to arXiv record pages. For example, arXivLabs launched a new Code tab, a shortcut linking arXiv articles with their associated code. This Code feature was developed by Papers with Code, a free

> I am very excited about this partnership as arXiv and CORE are both fully embracing the same vision of openness to research for all."
>
> —Petr Knoth, founder of CORE

resource for researchers and practitioners to find and follow the latest Machine Learning papers and code. When a reader activates the Code tool on the arXiv abstract record page, the author's implementation of the code will be displayed in the tab, if available, as well as links to any community implementations. This instant access allows researchers to use and build upon the work quickly and easily, increasing code accessibility and accelerating the speed of research.

Additionally, from an article abstract page, readers can simply activate the CORE Recommender to find additional open access research on similar topics. The Recommender, part of the arXivLabs toolset, was developed by CORE, a global aggregator of open access scientific content, which provides access to millions of full texts. CORE's mission is to aggregate all open access research outputs from repositories and journals worldwide and make them available to the public. In this way, CORE facilitates free unrestricted access to research for all.

"I am very excited about this partnership as arXiv and CORE are both fully embracing the same vision of openness to research for all," said Petr Knoth, founder and head of CORE. "This partnership will further improve open access infrastructure. It will help arXiv users to discover open access research papers relevant to their work from across the whole network of open access repositories."

> With large data sets, there is generally an expectation that there are likely to be overlooked discoveries, connections, innovative tools or perspectives, which may lead to additional insights, not just in the original subject, but across other fields of study, enabling yet more discovery and innovation,"
>
> —Steinn Sigurdsson, arXiv Scientific Director

Machine-Readable arXiv Dataset

The sheer number of arXiv research papers is both beneficial and challenging. To help make arXiv research more accessible on a large scale, we now offer a free, open pipeline on Kaggle to the machine-readable arXiv dataset: a repository of 1.7 million articles, with relevant features such as article titles, authors, categories, abstracts, full text PDFs, and more. Our hope is to empower new use cases that can lead to the exploration of richer machine learning techniques that combine multi-modal features towards applications like trend analysis, paper recommender engines, category prediction, co-citation networks, knowledge graph construction, and semantic search interfaces.

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> “We can all have a voice and a stake in arXiv. It’s very important, a fantastic forum, and we don’t ever want to be at a point where it is privatized.”
>
> —Sumati Surya, Scientific Advisory Board member

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> “At our institution people tell us they couldn’t do without it. Supporting arXiv is a ‘no brainer’ for us.”
>
> —Carol Hoover, Digital Information Resources Manager, Los Alamos National Laboratory

[Aerial rendering of arXiv’s new home with Cornell Tech in New York City]

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[Krishna Ramanujan, science writer and arXiv reader, observing the solar eclipse]