Util First

1. They don't address that real world policymaking operates under util. For debaters who become policymakers, they must be learn to advocate for colonialism solutions against big threats. Letting them say, "threats are inflated" with one card gives the easy path out and creates bad education since this doesn't fly in real life and zeros the risk of real world spill over. Our model is best to counter SV in the real world on a greater scope. That's an independent voter as we create the best model and you should up us to proliferate it.

2. Discussion of util does not displace focus on structural violence — it allows an injection of complexity and is a better model

Barkawi 12 — Professor Politics at the New School for Social Research (Tarak, "Of Camps and Critiques: A Reply to 'Security, War, Violence'" Millennium - Journal of International Studies, Vol 41 No 1, p 124-130, SagePub, https://sci-hub.ru/10.1177/0305829812451974 //akang)

A final totalising move in 'Security, War, Violence' is the idea that the study of war should be subsumed under the category of 'violence'. The reasons offered for this are: violence does not entail a hierarchy in which war is privileged; a focus on violence encourages us to see war in relational terms and makes visible other kinds of violence besides that of war; and that the analysis of violence somehow enables the disentangling of politics from war and a proper critique of liberal violence.22 I have no particular objection to the study of violence, and I certainly think there should be more of it in the social sciences. However, why and how this obviates or subsumes the study of war **is obscure** to me. Is war not historically significant enough to justify inquiry into it? War is a more specific category relative to violence in general, referring to reciprocal organised violence between political entities. I make no claims that the study of war should be privileged over that of other forms of violence. Both the violence of war, and that of, say, patriarchy, demand scholarly attention, but they are also distinct if related topics requiring different forms of theorisation and inquiry. As for relationality, the category of war is already inherently relational; one does not need the concept of violence in general to see this. What precisely distinguishes war from many other kinds of violence, such as genocide or massacre, is that war is a relational form of violence in which the other side shoots back. This is ultimately the source of war's generative social powers, for it is amidst the clash of arms that the truths which define social and political orders are brought into question. A broader focus on violence in general risks losing this central, distinctive character of the violence of war. Is it really more theoretically or politically adequate to start referring to the Second World War as an instance of 'violence'? Equally, while I am all for the analysis of liberal violence, another broad category which would include issues of 'structural violence', I also think we have far from exhausted the subject of liberalism and war, an important area of inquiry now dominated by the mostly self-serving nostrums of the liberal peace debates. What perhaps is most interesting about Aradau's remarks on violence is that she assumes we know what war is. So, for example, she suggests that we attend to a continuum of violence in which war is considered alongside 'insurrections, revolts, revolutions, insurgencies, rebellions, seditions, disobediences, riots and uprisings'.23 Apparently, on her understanding, these other things are not war, even though most of them typically involve reciprocal, organised violence. This is precisely to take as given the IR disciplinary view of 'real interstate war' that underlies Correlates of War and other mainstream work. This is the definition of war that I sought to critique in 'From War to Security', a critique Aradau has overlooked. I was posing new questions and possibilities for the study of war, not proffering definitive answers about what war is and what it is not, or about where and when it starts and ends. It is, I would suggest, Aradau who is most concerned about hierarchy and privilege, particularly in respect of perceived slights to Critical Security Studies and her demand that any study of war be in dialogue with Critical Security Studies. In this, she overlooks the fact that, conceived another way, with a more holistic vision of the community of relevant scholars, my article was already an engagement with critical inquiry into security relations. Perhaps it was the opening rhetoric of my article that inspired Aradau's ire, my reference to partygoers from Copenhagen and Aberystwyth dancing on graves, or my suggestion that contemporary 'wider agenda' security scholars know rather less about the composition of carrier battle groups than did their traditional predecessors.24 But does anyone seriously doubt that 'wider agenda' scholars are less familiar with histories and sociologies of wars and militaries than were the traditional predecessors, who even so still managed to overlook their significance? These passages were meant to serve a very specific purpose, to denaturalise our images of the new and old security studies, and to open up the reader to the possibility that, with respect to the study of war, **these fields of study share more in common than is conceivable within the current terms of debate.** Neither traditional nor 'wider agenda' security studies are centrally interested in war. Given the significance of war in the human past and present, and the dire state of the study of war in the Anglo-American academy, this seems to me a serious problem for critical thought.

Vote Lincoln East to endorse this model of debate.

Util solves for both their impacts better and turns every reason to prefer

A2 Set-Col FW:

Prefer util because it's what policy makers are actually implementing to solve for Set-Col. Also see with our evidence that Barkawi is not taking the shared experiences of people away overall you see better solvency with util as well as for other people as well.

1. prefer util over colonial violence as it takes into account different ethnicities while their framing is abusive and forces the debate to

be consolidated for one specific minority instead of accounting for everyone
    a. This is important as they encourage teams to race to the bottom where teams are encouraged to push different minorities out of the debate space as a tradeoff for upholding one
1. Their first card (Regilme 24) doesn't mention gen AI at all, it just says in general that AI causes resource extraction. Judges, this is not topical, you should nto vote on this

With that,

Contention 1 is AGRICULTURE.

Lack of education hinders agriculture.

Mitchell-20 [Sydney Mitchell, 11-14-2020, [B.S. Agricultural Communication @ South Dakota State University, Educator @ University of Minnesota], "We Need Agricultural Education", Medium, https://medium.com/@korakelpie/we-need-agricultural-education-8dfdb27728c3. //ejs squad]

In the last few years, there has been a **huge lack** of **ag education** both **in** and outside of **schools**. Because there is a **lack** of **education** about **ag**, there is a **lack** of **students** going into **agricultural careers**. Purdue University estimates that **40%** of **new ag jobs** go **unfilled each year**! This is a problem because in the **next thirty years**, **agriculture** will be one of the most **important industries**. We need to find ways to **increase** our **food production** while decreasing our environmental impact — **agriculture** will be the **solution** to these **problems**. I got the opportunity to hear a speech from the Undersecretary of Agriculture in Trade and Foreign Affairs, Ted McKinney, at the National 4-H Youth Summit on Agri-Science. The most important point that he made is that the biggest problem facing the next generation is finding a way to go from the 7 to the 9. Basically, we need to find a way to go from feeding 7 billion people currently, to feeding 9 billion people in 2050. This will **require** the **next generation** to be **educated** about **agriculture**, and hopefully, go into **ag careers**. One more reason we **need** ag **education** is because many **people aren't aware** of **agricultural careers** or even where their food comes from! One example is a 2017 study that discovered 7% of American adults think that chocolate milk comes from a brown cow. This is not true and shows that there is a lack of ag literacy! Through surveys that I have done of Minnesota students, I discovered that many people think the only career in agriculture is farming. I also found out that 80% of students think that it is important to learn about agriculture, but many don't get the opportunity! We need to **fix** our **ag education problem** soon, or we will have to **face** the **consequences**. Now you might be wondering how we can do this. First, we can start by **increasing ag education** in schools! This is probably the biggest and **best solution** to this problem! We can also do our best to promote agriculture on social media and in our personal lives. If you are involved in ag, share your story! If you want to learn more, go follow some ag-vocates on social media! Another solution is encouraging kids to join organizations like 4-H and FFA. I promise, anyone who joins these organizations learns about more than just agriculture! Lastly, we need to find ways to make ag more exciting! Whether this is through social media, videos, activities, presentations, tours, etc. we need to find ways to make ag exciting so people want to learn about it! Honestly, we don't even want anyone to feel like they're learning.

That's why,

Munch-24 [Daniel Munch [M.S. Agricultural & Food Economics @ Cornell, B.S. Livestock Management & Resource Economics @ UConn, Former Ag Policy Researcher @ U.S. House of Representatives], 3-7-2024, "Over 140,000 Farms Lost in 5 Years", https://www.fb.org/market-intel/over-140-000-farms-lost-in-5-years]//ejs squad

Between 2017 and 2022, the number of farms in the U.S. declined by 141,733 or 7%, according to USDA's 2022 Census of Agriculture, released on Feb. 13. Acres operated by farm operations during the same timeframe declined by 20.1 million (2.2%), a loss equivalent to an area about the size of Maine. Only 1.88% of acres operated and 1% of farm operations were classified under a non-family corporate farm structure. Conducted every five years, the Census of Agriculture collects data on land use and ownership, producer characteristics, production practices, income and expenditures. USDA defines a farm as an operation that produced and sold, or normally would have sold, $1,000 or more of agricultural products during the census year. While the number of farm operations and acres operated declined, the value of agricultural production increased, rising from $389 billion in 2017 to $533 billion in 2022 (40% nominally and 17% adjusted for inflation). These updated numbers highlight the continuing trend of fewer operations farming fewer acres of land but producing more each year. In addition to Ag Census data, USDA releases survey-based estimates on farm numbers once every year. **Using this annual survey data dating back to 1950, the trend of fewer operations farming fewer acres becomes even more obvious. Since 1950, the number of farm operations has declined by 3.75 million (66%) and the number of acres farmed declined by 323 million (27%) – slightly less than twice the size of Texas.** Technological advancements that have increased productivity, such as feed conversion ratios in livestock and yield per acre in crops, have allowed farmers and ranchers to produce more with less **even as the U.S. population more than doubled, going from 159 million in 1950 to 340 million in 2023, and the global population more than tripled (2.5 billion to 8 billion) during the same period.**

Education is a necessity.

Nazarova-24 [Nazarova, 12-02-2024, [Turkmen Agricultural University], "Global Perspectives of Agricultural Education," Aeterna. https://aeterna-ufa.ru/sbornik/AP-2024-12-2.pdf#page=119]//ejs squad

Agricultural education plays a critical role in addressing global challenges related to sustainable development. As the world grapples with issues such as climate change, food security, and resource depletion, agricultural education has emerged as a key component in preparing future generations to meet these challenges. This article explores how agricultural education can promote sustainable farming practices worldwide, highlighting the importance of integrating environmental sustainability into agricultural curricula. The article examines successful models from different countries, detailing how educational systems can equip students with the knowledge, skills, and attitudes needed to drive sustainable agricultural practices that balance productivity with environmental conservation. Agricultural education is the cornerstone of global efforts to address sustainability challenges in the agricultural sector. **As the world faces growing pressures from population growth, climate change, land degradation, and water scarcity, the need for sustainable agricultural practices has never been more urgent.** Agricultural education equips future farmers, researchers, policymakers, and entrepreneurs with the tools they **need to develop innovative and environmentally friendly solutions**. The shift toward sustainable development in agriculture requires a rethinking of traditional farming practices. **Sustainability in agriculture means meeting the food needs of the present generation without compromising the ability of future generations to meet their own needs**. Agricultural education can drive this transition by preparing individuals to not only understand but also apply principles of sustainability in practical ways. By integrating environmental, social, and economic factors into agricultural curricula, educators can shape a new generation of leaders in the agricultural field.

Integration of AI is key.

Bampasidou-24 [Maria Bampasidou [Associate Professor @ LSU, Expertise in Agricultural Finance & Labor Economics], 9-24 "Overcoming 'Digital Divides': Leveraging higher education to develop next generation digital agriculture professionals", https://www.sciencedirect.com/science/article/abs/pii/S0168169924005726] //ejs squad

Digital Agriculture (DA), Agriculture 4.0, Artificial Intelligence (AI) in agriculture, are all terms used to describe the deployment of emerging technologies. Some of these can be thought of as an extension of 'Precision Agriculture' with the use of data intensive AI-based techniques. The increasing use of digital technologies and AI has enormous implications for agriculture as a sector and as a market, affecting the people who work and have an interest in agriculture as well as communities. **The next generation of agricultural professionals, even if not experts in DA and AI, will need to have a better understanding of these technologies along with basic data literacy.** As such it is imperative that higher education (HE) institutions and agricultural programs respond effectively to DA

and **AI**, providing the conditions for their successful uptake and shaping the way these tools and techniques are used. Applications of digital technologies are not new to agriculture. To give some examples, precision farming, yield monitors, and application systems were pioneered in the previous century, as noted by Auernhammer and Schuller in, 1999. Moreover, the last years we have noticed an **accelerated transformation of agricultural programs as they attempt to respond to and anticipate the technological evolution associated with DA; from research programs that employ these technologies, to educational programs that teach the use of these technologies, to extension programs that provide digital 'literacy' to producers. This transformation is shaping a new generation of agricultural professionals equipped with non-routine analytic skills.** Computerization has been associated with a change in skills from routine manual to non-routine analytic (Autor et al., 2003) suggesting that the use of digital tools may have a similar effect. Yet, the **agricultural sector lags behind other sectors with respect to deploying digital technologies and having a competent workforce despite agricultural programs incorporating DA and AI in their research, extension, and education functions. This lag is in part due to skill gaps of its workers relative to other sectors, which is exacerbated by geographical urban/rural, and regional socio-economic divides (Autor, 2019) as well as a non-holistic approach in developing a workforce ready to compete in this digital era.** We argue that, leveraging the tools of the DA transformation, HE must develop the skills and talent needed for the agricultural sector to reap the benefits of digitalization and address its unique workforce development challenges: what we are here calling agriculture's 'digital divides.' To mend these divides will require tackling workforce knowledge and skill disparities that exist between workers, sectors, and geographies. Moreover, curricula should adapt to the needs of the students and the labor markets avoiding disciplinary silos (Johnson et al., 2021). As academic programs introduce curricular changes, students are experimenting more with AI-based tools, more workplaces are requiring knowledge of coding, programming and use of AI-tools, and work practices at the farm level are also shifting towards digital applications.

Somitsch, Eric, Senior Director, Solution Management, Agribusiness | SAP, "How Farmers Harvest New Insights with Generative AI." 20**23.** SAP. 2023. https://www.sap.com/japan/insights/viewpoints/how-farmers-harvest-new-insights-with-generative-ai.html#:~:text=For%20agricultural%20companies%2C%20generative%20AI,business%20goals%20%E2%80%93%20including%20sustainability%20targets.. //ejs squad

With the added capabilities of generative AI, farmers and their advisors can more quickly and directly access agronomic data and analysis, enabling them to make near-real-time decisions about soil treatments, seed varieties, and market conditions. Using chatbots, farmers can ask natural language questions in their native languages (When should I plant this crop? How much and what kind of fertilizer should I apply?) and get answers that any farmer, regardless of their training or background, can understand. For agricultural companies, generative AI can gather and crunch even more granular and timely information and analysis that help them improve their products, customer service, and processes and operations to better meet business goals – including sustainability targets. While the promise is there, agricultural companies will need to carefully navigate four key areas as they implement generative AI: Data quality and model training Risks associated with the application of generative AI, such as false information The need to ensure that IT systems and operational processes are set up to use generative AI Developing trust in these systems and their results so that farmers use the technology This article describes two examples of generative AI in use today and discusses how companies can reap the benefits and reduce the risks in each of these four areas.

The industry has the potential to grow.

Jain-25 [Anurag Jain, 01-25-2025, [B.S. CS + Engineering @ Vellore Institute of Technology, Lead Product Manager @ OyeLabs], "The Role of AI in Education - Benefits, Use Cases & Examples," OyeLabs. https://oyelabs.com/role-of-ai-in-education-benefits-use-cases/#:~:text=At%20Oyelabs%2C%20we're%20passionate,delivery%2C%20and%20efficient%20administrative%20processes.] ejs squad

What role does AI play in improving education? As technology continues to evolve, AI is becoming a key part of how we teach and learn. **From personalized lessons** to **virtual tutors**, **AI** is **making education smarter**, more **accessible**, and

more engaging. It **helps teachers adjust lessons** to **meet each student's needs**, **ensuring everyone** can **learn** at their **own pace**. AI-powered tools, like chatbots and adaptive learning systems, offer instant feedback, making the learning process more interactive and effective. **The global AI in education market reflects** this **momentum**, with **Grand View Research projecting** a **36% compound annual growth rate (CAGR)** from **2022** to **2030**. This growth highlights the expanding role of AI in addressing challenges like accessibility, scalability, and efficiency.

Agriculture is an American necessity.

Coleman et al.-03 [Eddie Coleman [M.S. Military National Resource Strategy @ National Defense Univ., M.S. Business Administration @ Boston Univ., BS Business Administration @ Arkansas State Univ.], Lonnie Stith [Colonel U.S. Army Ret.], Peter Stavrakis [Ph.D Political Science @ University of Wisconsin-Madison], 2003, "2003 Agribusiness Group Paper," NDU. https://web.archive.org/web/20090110210617/http://www.ndu.edu/icaf/industry/reports/2003/pdf/2003_AGRIBUSINESS.pdf //ejs squad]

"*Agribusiness is to the United States what oil is to the Middle East.*" This single **statement encapsulates** the **criticality** of **agribusiness to** the **United States** — to **our economy, our way of life,** and **our national power**. No other industry crosses such a broad and diverse constituency — every person living in the US is touched by and benefits from agribusiness. History demonstrates that a nation able to feed its own citizens is inherently stronger and thus able to provide a safer and more secure society. Conversely, a nation dependent on other nations for food is inherently more vulnerable and subject to the whims of external forces. **Agribusiness is a key component of** our **national power**, and is **one of the few industries** that **produces net exports each year**. **Further**, the **abundance** of **American agriculture provides food for much of** the **world through** our **foreign aid** and **humanitarian assistance programs**. **Agribusiness** is a **source** of **great strength** for **our nation**.

This soft power is crucial.

Seymour-21 [Margaret Seymour, 3-19-2021, [B.S. Computer Science @ Oregon State University, B.S. Marketing @ Grand Valley State University], "Building Soft Power Back Better?" Foreign Policy Research Institute. https://www.fpri.org/article/2021/03/building-soft-power-back-better/ //ejs squad]

The Biden administration has multiple competing priorities: COVID-19 and its **economic** impacts, long-ignored racial fissures, and a growing tenuous relationship with truth, reality, and trust among the populace, just to name a few. President Joseph Biden also has the challenge of representing theUnited States on the foreign stage. In that capacity, he is **charged with crafting** a **new foreign policy—one that champions** a **balance of hard** and **soft power**, **tailored for** the **most efficient use of resources** and the **most effective results**. He is off to a good start; in his interim national security guidance released in early March, President Biden acknowledges the role of soft power resources in building and maintaining U.S. strength, even if he doesn't call the concept out by name. He posits, Achieving these goals rests on a core strategic proposition: The United States must renew its enduring advantages so that we can meet today's challenges from a position of strength. We will build back better our economic foundations; reclaim our place in international institutions; lift up our values at home and speak out to defend them around the world; modernize our military capabilities, while leading first with diplomacy; and revitalize America's unmatched network of alliances and partnerships. **Focusing on economic strength, alliances**, and **institutions** and **exporting American values** and ideals are **good starts to restoring American soft power abroad**—a **critical component of American leadership**. In fact, the post-WWII world order, and, more recently, the post-Cold War international system with the United States emerging at the sole superpower, was only possible through U.S. soft power. **Historically**, the **United States** has **maintained** its **power** and **influence abroad**, in part, **due to** its **appeal**. This **appeal must be restored**. This is not a call for a post-Trump 180, the path away from soft power and towards a hard power-dominant foreign policy is decades-long. True reinvigoration is going to require not only a criticism of the past four years, but also deep introspection on President Biden's own contribution to the trend as a senator and vice president. In other words, **building** a **smart power approach** to **foreign policy** is **going to take** more than simply rejoining a few international accords or hosting some impressive state dinners. Frankly, it's going to take more time than this administration has, even with the possibility of a second term. But if we take Biden at his promise to serve as a transitional leader, we can certainly start rebuilding the foundation of a foreign policy approach that will serve generations of Americans and citizens abroad for decades. This starts with rebuilding relationships. Based on Biden's picks for high-level positions, it appears that he understands the power of relationships, choosing long-term confidants and establishment experts. Biden values trust and interpersonal history—and this approach must be applied to international relations. President Biden campaigned on his personal relationships

with key international leaders, which is critical, but the administration must also craft **relationships with populations** and **other non-state actors**. While the new administration understands the potential threat from non-state actions, it would be well-advised to also

consider the potential opportunities in non-state groups and craft a national security strategy that acknowledges the growing power and role of such groups. For example, this strategy must include a prioritization of immigration and refugee programs, such as the Special Immigration Visa Program. While the Trump administration infamously decreased the levels of immigrants admitted under this program, the United States has arguably never fulfilled its responsibilities to the men and women who have assisted missions in Afghanistan and Iraq. Not only should the Biden administration reintroduce the Iraqi Special Immigrant Visa (SIV) Program, but it also should offer a permanent fix to the Afghan program as well as create a new program to reward our allies in the Syrian conflict. Such programs would establish the United States as a leader in refugee rights and protections. The success of future conflicts will be heavily reliant on the ability to gain and maintain the trust of civilian populaces. Without interpreters, translators, and other host-nation citizens, the success of U.S. missions abroad would and will continue to be threatened. More than that, **failing to uphold promises to allies abroad threatens American legitimacy** and **standing** in the **international community**. In the **new world order** described by the administration, these **wicked international problems** "**respect no borders** or walls, and **must be met with collective action**." While the COVID-19 pandemic has made the **increasingly** global nature of the international order abundantly clear, biological **disease isn't** the **first** challenge to transcend borders. **Counterterrorism**, the **threat** of **nuclear war**, **economic structures,** and **climate change** **all present challenges not to a single state** or **region**, but **to an entire international structure.** These **problems can only be addressed with global solutions.**

C2: Avian Flu aka H5N1

Over reliance on ineffective stockpiles makes H5N1 existential - Carr ‘21

Carr, Teresa (Teresa Carr is a Colorado-based investigative journalist and a senior contributor for Undark). “Could an Old Drug Protect against a New Pandemic? | Published by Journal of Health Economics and Outcomes Research.” *Jheor.org*, 1 Oct. 2024, jheor.org/post/2706-could-an-old-drug-protect-against-a-new-pandemic. Accessed 26 Feb. 2025.*ejs squad

Since reports emerged earlier this year that **dairy cows across the country had been infected with H5N1 bird flu**, the prospect that **the virus could evolve to** spark **another pandemic** has stoked serious concern. But unlike Covid-19, the flu is an old, well-known foe. And health authorities have reassured the public that the **U.S.** has **squirreled away** millions of doses of the **flu med**ication **oseltamivir**, known under the brand name Tamiflu. As health policy expert Leana S. Wen wrote in a Washington Post opinion piece, the drug “works against seasonal flu and is expected to work well against H5N1.” While **oseltamivir may help in cases of severe flu, some experts are concerned that the U.S. is banking far too much on a so-so drug while failing to prioritize research on new treatments**. Relatively few people have been infected with bird flu, so scientists must rely, in part, on **oseltamivir’s** track record against seasonal flu to make educated guesses about how well the drug would work against H5N1. But research shows that it **doesn’t work** particularly well **for** most people with **garden-variety flu and doesn’t keep people out of the hospital.** In fact, for standard-risk patients the **drug’s effectiveness has proved “kind of crappy,”** said Shira Doron, an infectious disease physician at Tufts Medical Center. And even if it is effective against H5N1, “influenza strains are **unpredictable** in **when** they **develop resistance**,” said infectious disease clinician and researcher Andrew Pavia, who advises government and professional organizations on influenza and pandemic preparedness. In other words, **what works today might not work tomorrow**. But promising alternatives are scarce, said Pavia. And largely because **antiviral flu drugs haven’t been terribly profitable for drug companies**, he said, there are few treatments in the pipeline. For standard-risk patients the drug’s effectiveness has proved “kind of crappy.” Both Doron and Pavia emphasized that the current risk to Americans — excluding farmworkers — from bird flu is low. At least so far, the disease appears to be hard to catch and rarely spreads from person to person. Since 2022, the U.S. Centers for Disease Control and Prevention has recorded only 15 probable cases. All but one were mild and involved farmworkers who were in direct contact with infected animals. However, **with a couple genetic shifts, the U.S. variant could evolve into a more virulent and widespread virus.** “We are vulnerable,” said Pavia. “And we should **have a deeper bench in reserve.”** Oseltamivir has a controversial past. Governments around the world have spent billions of dollars to stockpile the drug since the early 2000s based on evidence that it reduced the risk of serious complications such as pneumonia for people with seasonal flu. But as revealed in The BMJ’s open data campaign, and by reporting by The Guardian, and other outlets, scientists asserted that the drug’s manufacturer, Roche, had withheld unfavorable data. **Evidence of the drug’s benefit, they say, hinged on cherry-picked, mostly unpublished trials funded by Roche.** According to the BMJ, in 2013, after years of pressure from the journal and Cochrane, a not-for-profit organization that conducts systematic reviews of medical treatments and devices, Roche finally released the full set of data it had on oseltamivir. Findings from Cochrane’s updated review incorporating the tranche of new data did not inspire much confidence: The drug **shortened** seasonal flu **symptoms by** about **half a day for adults and a day for children**, but **didn’t reduce complications** or keep people out of the hospital. It also **increased the risk of nausea and vomiting**. “We are vulnerable. And we should have a deeper bench in reserve.” Canadian researchers also concluded that oseltamivir did not reduce hospitalizations in an analysis of 15 clinical trials published in JAMA Internal Medicine last year. Today, most experts agree that the best use of the drug is for people who are seriously ill or are at higher risk for complications. While there is little data from randomized clinical trials focused exclusively on that group, said Pavia, the overall weight of the evidence supports a significant benefit for high-risk or hospitalized patients. **There’s** also **no** randomized **clinical trial data on antivirals and H5N1**. “In the **absence of a randomized controlled clinical trial, I would never claim to guess what the effectiveness of that Tamiflu would be at preventing severe disease**, hospitalization, and death,” said Doron, who along with Pavia is a member of a working group dedicated to avian flu at the Infectious Diseases Society of America. But, she said, evidence from some observational studies suggests the drug could be lifesaving for people hospitalized with severe bird flu. In a 2010 study, for example, researchers used a global H5N1 registry to look at outcomes for 308 patients, about half of which got oseltamivir. The dataset wasn’t ideal — some information was missing, and treatment regimens varied. Still, after statistically adjusting for uncertainties, the researchers concluded that the drug cut the mortality rate by about half. But over the last 14 years, **the virus has continued to evolve**. One way to predict if oseltamivir will work against current variants is to look for specific **genomic sequences that indicate susceptibility to antiviral drugs,** said Benjamin Anderson, an assistant professor of environmental and global health at the University of Florida. It’s reassuring, he said, that a recent study of viruses isolated from cows and cats infected in the U.S. outbreak found no genetic mutations that would confer antiviral resistance. However, he added in an email, **“the influenza virus can mutate and we need to constantly [monitor] those changes to make sure resistance does not develop.”** In addition, to date, **avian** flu viruses have proved susceptible to oseltamivir and the same is true of the most recent strains, according to research by St. Jude Children’s Research Hospital. Based on those laboratory findings, scientists have a “pretty good” sense that oseltamivir would have some effectiveness against the infections caused by the current H5N1 strains, said Anderson. Exactly how effective is an open question. If oseltamivir worked about as well against H5N1 as it does seasonal flu, it could potentially benefit high-risk, very ill patients; for others, the **drug wouldn’t necessarily do much to ease symptoms or keep them out of the hospital.** So far, the U.S. has only seen mild H5N1 infections, which oseltamivir may not help, said Doron. Still, oseltamivir is a safe drug, she said, and given the uncertainties over how severe a case of H5N1 could become, use of the antiviral makes sense. Public health authorities agree. The CDC advises treating known and suspected cases with oseltamivir as soon as possible. (The drug works best against seasonal flu when started within 48 hours of symptom onset.) As a preventive measure, the agency also **recommends treating close contacts of those who get infected**. Those recommendations come out of abundance of caution, said Pavia. “You have a drug that is active in the test tube that makes a difference with other strains of influenza,” he said. “So, it's been given to patients who probably would recover well without it.” If **H5N1 were to evolve into a pandemic virus, public health recommendations would probably echo those for seasonal flu, prioritizing use of oseltamivir for patients at highest risk**, said Pavia. “Which, of course,” he said, “brings up the question of ‘Why don’t we have something better?’” **Oseltamivir** is one of the best-studied antiviral flu treatments, but **not the only one.** First approved as the brand name drug Tamiflu in 1999, oseltamivir belongs to a class of medications called neuraminidase inhibitors, which keep the virus from escaping infected cells and navigating to other cells. **The drugs target only one of the two types of proteins in Type A flus such as H5N1 and the seasonal** flu, so they **can’t completely neutralize** the virus, said Hui-Ling Yen, an influenza researcher in the School of Public Health at the University of Hong Kong. Two other neuraminidase inhibitors exist — an inhaled drug and an intravenous one — but neither has been proven to work against severe seasonal flu, so the CDC doesn’t typically recommend them for H5N1. "Why don’t we have something better?" The **newest flu drug on the market, baloxavir marboxil** (also known as Xofluza), was **approved** in the U.S. in **2018** and works by **blocking** an **enzyme** that the **virus uses** to make **copies** of itself. In terms of how quickly they alleviate symptoms, oseltamivir and baloxavir are on par, said Yen. But baloxavir is better at reducing the viral load — that is, the amount of virus circulating in the blood — she said, potentially shortening how long an infected person is contagious. One of **the biggest concerns** with antivirals **is that** as **flu viruses multiply**, they **can evolve to become resistant to treatments.** While such

mutations have been rare with oseltamivir, studies show that they happen more often in people taking baloxavir, said Pavia. That **doesn't** have much of an **effect** on **most** people whose **immune systems** will clear the virus, said Pavia. But it could pose a **problem for those with compromised immunity** such as **cancer patients** who could harbor the resistant virus longer and possibly pass it on to others. Should seasonal flu, H5N1, or any other variant develop resistance to oseltamivir and baloxavir, providers and their patients would have **extremely limited options.** "Suffice it to say that we're vulnerable," said Pavia. When it comes to H5N1, so far, the **analyses of U.S. strains have been reassuring.** "The prevalence of resistance mutations was very, very low," he said. "But," he added, "it's not zero." And Pavia said it's not clear what it **would take for one of those mutations to catch hold.** Pavia pointed to the example of SARS-CoV-2, the virus that causes Covid-19, which developed resistance to treatment with **monoclonal (laboratory-made) antibodies within a matter of months each time** researchers developed a new version. One reason for the lack of alternatives is that **antivirals** are **tricky to develop**, said Anderson. Viruses **can't replicate** on their **own** but **rely** on **hijacking** a **living cell's** inner workings to make **copies** of **themselves**. That makes it hard to target a virus without harming the host cell. "Some **antivirals are pretty harsh**," said Anderson. The goal is to find something that works without really severe side effects, he said. "For antivirals, it's a much harder thing to come up with." One of the biggest concerns with antivirals is that as **flu viruses multiply,** they can **evolve to become resistant to treatments.** By comparison, it's easier to develop antibiotics to treat bacterial infections, he said. Bacteria are single-celled organisms that live on their own, and there are several approaches for taking them out that don't damage healthy cells. It would be **great to have a better flu drug,** said Pavia. One that **helps someone recover quickly**, that still **works well even if started after** they've been sick for several days. But **antivirals — expensive to develop** and **taken for** a **short** time — **aren't big money makers**, he said. Several factors **disincentivize** drug **companies from developing antivirals for future pandemics**, according to a 2023 Government Accountability Office report: It's **difficult** to **predict** the **timing** and **scale of demand** for the drugs and **developers prefer to focus on the existing market. Once a pandemic hits, political and social pressure to keep prices low limits profits**. And so, **devoting years** and **possibly billions of dollars to finding a new option hasn't been a priority for drug companies.** "Would it make enough money to justify that investment by a large pharma company that's doing very well, thank you, in other areas of the market?" asked Pavia. "Probably not." When it comes to preparing for the next pandemic, public **health authorities** tend to **focus what's available**, rather than **what's ideal**, said Anderson. "There's a balance between what exists and then what needs to be developed," he said. "It's always easier to default to what exists." Currently, oseltamivir exists and is available. Although the exact contents of the U.S. Strategic National Stockpile are not publicly disclosed, federal officials said that **we have tens of millions of courses of oseltamivir** as well as hundreds of **thousands of courses of baloxavir.** Even if oseltamivir is not a sure-fire antiviral, it will likely have some effect, said Anderson. In a pandemic preparedness plan, he said, "we're going to include that as part of one of our tools, as well as vaccination, **as well as other things, other strategies that would be a part of that plan**." "There's a balance between what exists and then what needs to be developed. It's **always easier to default to what exists."** As things stand, Americans could be caught **flatfooted in the face of pandemic of H5N1 or other form of flu,** said Pavia, who has consulted for the CDC on seasonal and pandemic influenza issues. What the country needs is more and better flu treatments that the government could stockpile before the next pandemic. But that would require people to take the threat seriously, he said, and "Congress being willing to invest in things that we might need but might never use." It would also, he added, require better incentives for pharmaceutical companies to develop novel antiviral treatments. Meanwhile, on Sept. 6, the CDC reported the first case in the U.S. outbreak without a known exposure to sick or infected animals. The Missouri patient, who had underlying medical conditions, was hospitalized and has since recovered according to the agency. "We don't know if the Missouri case is evidence of human to human transmission, Pavia wrote in response to a follow-up email on the development. "If it is, it could suggest that there is more undetected transmission out there." The big unknown is whether this case is an anomaly or portends wider spread of the disease. If America, and possibly the world, is on the cusp of a major H5N1 outbreak, then certainly society would be better served with a more robust arsenal of antivirals, said Pavia — "perhaps sooner rather than later."

Gen AI is assisting drug discovery for H5N1 - Pasquini '24

Pasquini, Nina (Nina Pasquini is a metro intern for The News & Observer. She is a graduate of Harvard University). "Using Generative AI to Predict Viral Mutations and Develop Vaccines | Harvard Magazine." *Harvard Magazine*, 8 Oct. 2024, www.harvardmagazine.com/2024/11/ai-medicine-predicting-viral-evolution-vaccines. Accessed 26 Feb. 2025.//ejs squad

In medicine, "There's a **quiet revolution happening at the moment,"** says professor of systems biology Debora Marks. Most **people** have become **familiar with artificial intelligence** through chatbots such as ChatGPT, which function by predicting the next word in a sequence based on patterns learned from vast amounts of Internet text. But **researchers at Harvard Medical School** are **applying generative AI's** predictive capabilities **to biological and evolutionary data, creating models that** can **predict viral evolution, design never-before-seen proteins, and anticipate the effects of genetic mutations.** "The **coming together** of these **new AI** methods with the **power** of **evolutionary information** and **biological data**," Marks says, "is giving us an opportunity to do things that were really closed doors before." Researchers in Marks's lab made a breakthrough in the use of AI to study biological data in 2021, when they developed EVE, short for Evolutionary model of Variant Effect. They **trained EVE to detect patterns** of genetic **variation across** the **genomes** of **hundreds of thousands of nonhuman species**—then to **predict**, **based** on **that data**, whether similar **human genetic mutations** would **cause disease**. This addressed a longstanding challenge in biological research: though scientists have developed increasingly advanced technology for sequencing human genomes, they have struggled to discern the significance of many of the genetic variations they identified. Which are benign, and which are disease-causing? In a 2021 paper, Marks and colleagues found that EVE could make that distinction in genes related to conditions such as cancer and heart rhythm disorders. During the COVID pandemic, Marks and her lab colleagues realized this technology could also help them respond to the quickly evolving virus. They adapted EVE to create EVEscape, a tool designed to predict viral variants before they emerge. EVEscape consists of two parts: an AI model trained on evolutionary sequences—which reveal how similar viruses have evolved in the past—and biological and structural information about the current virus. Had EVEscape been used at the beginning of the pandemic, lab members reported in a 2023 paper, it would have **anticipated** the **most frequent mutations** and the most **consequential variants** of the **COVID virus** that **actually developed** and **spread. This** work **is a major break from traditional vaccine and therapeutic design, which relies on** either **costly and slow experiments** based on animal testing, or data generated during a **disease outbreak** in **humans**. The limitations of the traditional approach became evident during the pandemic, says Noor Youssef, a researcher who works with Marks. "We've **had to resort to these annual boosters**, where **every year** we're **getting** a **new vaccine** that **matches the current strain**," she says. "What **these generative models allow us to do is see ahead of time where the virus is going to evolve, so you can make a vaccine that is future-proof"—responsive to** both **current and potential future variants.** Marks and her colleagues have modified EVEscape to create EVEvax, which designs vaccines tailored to predicted mutations, and are **using** this **technology** to **develop** a **vaccine** for **sarbecovirus**, the subgenus that includes SARS-Cov-2. The new vaccine would be effective against COVID and other commonly circulating coronaviruses that cause the common cold. **They** have also **received funding** from Project CEPI (the Coalition for Epidemic Preparedness Innovations) **to develop a long-lasting vaccine for bird flu.** That disease hasn't yet spread widely in humans—but **when it does, it will likely evolve rapidly to overcome human immunity.** The scientists aim to

develop a vaccine responsive to those **future changes as early as next spring.** "There are already FDA-approved vaccines in the freezer, **based on the strains from a few years ago."** Youssef says. But with the help of EVEscape, "You can have something in the freezer that's going to work for the strains that are around now—but also **work against things that might arise in the future."** Generative AI has also enabled researchers to **design new proteins, such as antibodies that attack certain viral mutations.** Using the AI technology from EVE and EVEscape, the Marks lab **developed AI models** that are **trained** on **protein sequences.** These models **generate new sequences tailored to designated** goals—**and** also **assess whether those predicted sequences will result in functional proteins.** Similarly, when ChatGPT is trained on text data, it not only **learns what words are associated with each other, but** also the **structure** of **language**: how grammar rules constrain the shape of its outputs. Like large language models, **AI protein design models are "going to try to understand the biochemical constraints that underpin the function of those proteins,**" says Pascal Notin, a machine-learning specialist in the Marks lab. In addition to creating new virus-specific antibodies, these protein-design models can be used to combat genetic diseases that cause a loss or malfunction of enzymes, proteins that catalyze biochemical reactions and enable the body to break down biological waste. Patients with such conditions are typically treated with enzyme replacement therapy (ERT); the AI tools can help design more stable, **effective enzymes** for such **treatment**. Marks says these models signal a fundamental shift in how research is conducted because, for the first time, "we've been **able** to make **predictions without [the preliminary experimentation]** process"—predictions that can then be **tested and refined by more focused experiments.** Researchers have long had access to the data on which such models are trained: the billions of DNA and RNA sequences that make up the genomes of hundreds of thousands of species and viral strains. But this trove of data was simply too large for individuals to fully parse. By detecting patterns and making predictions, **generative AI has enabled scientists to unlock that data's value**. "Evolutionary information, **human population sequencing**, and **viral sequencing**," Marks emphasizes, "are much more powerful than anybody thought they would be."

And, drug discovery happens at universities - Dror '22

Dror, Ron (Computer Science and, by courtesy, Molecular and Cellular Physiology and Structural Biology) "About." AI for Structure-Based Drug Discovery, Stanford University, 2024, aisbdd.stanford.edu/about. Accessed 22 Feb. 2025.//ejs squad

Dramatic recent **progress in** both **a**rtificial **i**ntelligence and structural biology has **created** tremendous **opportunities for using machine learning** methods not only **to** predict three-dimensional structures of drug targets but also to **design** safer, more effective **drugs**. Since 2015, multiple **research groups at Stanford** have been **developing machine learning methods** to leverage structure for the design of both biologics and small-molecule therapeutics. Current research directions include prediction of ligand binding poses, affinities, functional effects, and off-target properties; virtual screening; generative models for drug candidates; methods to achieve selectivity; and design of antibodies to optimize their developability. **The Artificial Intelligence for Structure-Based Drug Discovery program provides opportunities for exchange of ideas between Stanford researchers d**eveloping groundbreaking machine learning methods that leverage molecular structure and industry scientists who wish to apply such methods to bring better drugs to the market efficiently. In order to maximize the real-world impact of their research, Stanford researchers welcome input from industry partners—for example, on which problems to tackle or which software features to add. Industry partners also benefit through exposure to cutting-edge research, a forum to ask questions about deployment of algorithms and software, and opportunities to network with both Stanford researchers and other industry partners.

And, the next pandemic will come from the U.S. - Weintraub '23

Weintraub 23 [Karen Weintraub (National Editor that covers a wide range of medical issues, including infectious diseases, genetics, neuroscience and cancer), 22-7-2023, The next pandemic could spring from the US meat supply, new report finds, https://www.usatoday.com/story/news/health/2023/07/22/deadly-covid-style-pandemic-could-easily-start-in-us-report-finds/70442786007/] ejs squad

The next global pandemic could come from the United States. That's the sobering message of a report from Harvard Law School and New York University, examining how humans, livestock and wild animals interact here. Many familiar – and terrifying diseases – originated in animals, including HIV/AIDS, Ebola, Zika, pandemic flu and COVID-19. Some started in other countries, typically on the African or Asian continents. These so-called zoonotic diseases are often blamed on poor hygiene, lack of government oversight, or unsafe practices in those places. While Americans often think "it couldn't happen here," regulations are so loose and interactions so frequent, researchers found, that a virus or another contagious bug could easily jump from animals to people in the U.S., sparking a deadly outbreak. "There really is this false sense of security and unfounded belief that zoonotic disease is something that happens elsewhere," said Ann Linder, one of the report's lead authors and associate director of policy and research with the Brooks McCormick Jr. Animal Law & Policy Program at Harvard Law School. "In fact, I think we're more vulnerable than ever in many ways." The report, also led by NYU's Center for Environmental and Animal Protection, highlights several areas of vulnerability, including commercial farms where millions of livestock come into close contact with each other and their handlers; the wild animal trade in which animals are imported with few or no health checks; and the fur trade in which minks and other animals are bred for their coats, with little safety oversight. "Through globalization, we've erased seas and mountains and other natural boundaries of disease," said Linder, an expert in law and animal policy. "We're mixing animals and pathogens across different continents and circulating at a dizzying and ever-increasing pace." About **10 billion** land **animals** are **raised in the U.S.,** a number which is increasing by about 200 million a year, according to the report. Pigs and poultry, for instance, are raised in **higher numbers** in the United States **than** almost **anywhere else** in the world, the report found, and are the most likely vectors for a particularly lethal outbreak of the flu. Industry representatives were quick to defend the safety of their practices. "According to the CDC, the likelihood of spreading an avian disease to a human in the United States is extremely rare," Ashley Peterson, National Chicken Council senior vice president of scientific and regulatory affairs, said in an emailed statement. A pork industry group did not immediately return a request for comment. Workers on pig and poultry farms are particularly vulnerable because of a lack of regulations protecting them, said Delcianna Winders, an associate professor of law and director of the Animal Law and Policy Institute at Vermont Law and Graduate School in Royalton. "There is virtually no regulation of on-farm raising of animals. There's limited **regulation** of the slaughterhouse but it **is** extremely **inadequate and** it's **getting worse**," said Winders, who was not involved in the report, but researches a similar area. "Right now, the federal government is deregulating slaughter, **rather than increasing oversight.**" Because the mink and larger fur industry does not produce food, it is even less regulated, Linder said. A different study published last week in "Proceedings of the National Academy of Sciences," found "that mink, more so than any other farmed species, pose a risk for the emergence of future disease outbreaks and the evolution of future pandemics." Other studies have shown that mink are susceptible to SARS-CoV-2, the virus that causes COVID-19, and outbreaks were detected on 18 American mink farms during the pandemic's first two years. At least four Americans, two of whom worked on mink farms, were believed to have been infected by the animals. Challis Hobbs, Executive Director of the Fur Commission USA, a trade group, said "we unequivocally assert our commitment to the health and safety of our animals, our workforce, and the communities in which we operate." The industry, working with the federal government and state agencies, vaccinated 95% of the U.S. mink population beginning summer 2021, he said. The cost was entirely covered by the mink farmers, who also are helping to fund a SARS-CoV-2 surveillance project on mink farms. "Despite claims from animal rights advocates," he said, "there is no significant threat to the general public from U.S. farmed mink. About 220 million live wild animals are imported into the United States every year for pets and other purposes, many without health or safety checks, Linder said. If someone wants to bring a dog or cat into this country, there's a process, Linder said. "But if I'm a wildlife importer and I want to bring in 100 wild mammals from South America, I can do that with very little regulation of any kind." Perhaps the earliest Ebola case, which sparked the outbreak in West Africa from 2013 to 2016, was blamed on bush meat. It's illegal to import bush meat to the United States, but it's not illegal to import the same live animals that bush meat comes from, she said. "There are wide gaps." Both Linder and Winders also highlighted the lack of industry transparency. "So much of this is hidden from public view," Winders said. "There's so much we don't know because we're not monitoring." Winders said she's concerned about how much money the government spends subsidizing and protecting industries she believes put the American public at risk. She hopes Congress will take advantage of this year's reenactment of the Farm Bill to limit subsidies and impose new safety regulations on animal industries. "Don't we see the writing on the wall?" Winders asked.

"Scientists are telling us there's a looming threat of a zoonotic outbreak that could make COVID look like a cakewalk, and we're still just ignoring it, even after what we've gone through over the last couple of years."

And, pandemics happen every 5 years - 2025 is the brink - COVID started EXACTLY 5 YEARS AGO. - Davies '20

[Sally Davies (Dame Sally Davies is master of Trinity College, Cambridge, and a former chief medical officer for England), former chief medical officer for England and master of Trinity College, Cambridge, 9-26-2020, "The next pandemic is on its way. Coronavirus must help us prepare for it", https://www.theguardian.com/commentisfree/2020/sep/26/next-pandemic-coronavirus-prepare] // ejs squad

We are at a crossroads. As the impacts of Covid-19 continue the world over and the second wave moves through Europe, we have a choice to make. Will we simply respond to the here and now, or do we take a moment to stop, look up and see beyond the horizon of this pandemic towards the next one? Because there will be a next one. **Covid-19 is neither the first nor the last health emergency we will face**. My fellow **scientists estimate that we will face a pandemic** or health emergency **at least once every five years from here on**. **There is a chance that this is the optimistic scenario. The reality could be far worse.** Recognising this, **we can, and must, say "never again"**. We must do better to identify the next health threat, respond to that threat before it becomes an epidemic or pandemic, and if it does, recover in a way that does not exacerbate health, economic and social inequalities.

A2 bias and indigenous

T-Preserves dialects "AI can also detect patterns in the language that might take human linguists years to uncover.

For example, Google's 'Woolaroo' project uses AI to help communities document their endangered languages by allowing users to take photos of objects and receive translations in their native tongue. **This kind of technology makes language preservation accessible**, even to those who may not be linguists themselves."

New techniques solve---they address "hidden" bias too.

Adam **Zewe 24**, 12/11/2024, Writer at MIT News, Researchers reduce bias in AI models while preserving or improving accuracy, DOA: 3/05/2025, https://news.mit.edu/2024/researchers-reduce-bias-ai-models-while-preserving-improving-accuracy-1211)//ejs squad

Machine-learning models can fail when they try to make predictions for individuals who were underrepresented in the datasets they were trained on.

For instance, a model that predicts the best treatment option for someone with a chronic disease may be trained using a dataset that contains mostly male patients. That model might make incorrect predictions for female patients when deployed in a hospital.

To improve outcomes, engineers can try balancing the training dataset by removing data points until all subgroups are represented equally. While dataset balancing is promising, it often requires removing large amount of data, hurting the model's overall performance.

MIT researchers developed a new technique that identifies and removes specific points in a training dataset that contribute most to a model's failures on minority subgroups. By removing far fewer datapoints than other approaches, **this technique maintains the overall accuracy of the model while improving its performance regarding underrepresented groups.**

In addition,**the technique can identify hidden sources of bias in a training dataset that lacks labels.** Unlabeled data are far more prevalent than labeled data for many applications.

This method could also be combined with other approaches to improve the fairness of machine-learning models deployed in high-stakes situations. For example, it might someday **help ensure underrepresented patients aren't misdiagnosed due to a biased AI model.**

"Many other algorithms that try to address this issue assume each datapoint matters as much as every other datapoint. In this paper, we are showing that assumption is not true. There are specific points in our dataset that are contributing to this bias, and we can find those data points, remove them, and get better performance," says Kimia Hamidieh, an electrical engineering and computer science (EECS) graduate student at MIT and co-lead author of a paper on this technique.

She wrote the paper with **co-lead authors** Saachi Jain PhD '24 and fellow EECS graduate student **Kristian Georgiev**; Andrew Ilyas MEng '18, PhD '23, a **Stein Fellow at Stanford University**; and **senior authors** Marzyeh Ghassemi, **an associate professor in EECS and a member of the Institute of Medical Engineering Sciences and the Laboratory for Information and Decision Systems**, and Aleksander Madry,**the Cadence Design Systems Professor at MIT.** The research will be presented at the Conference on Neural Information Processing Systems.

Removing bad examples

Often, machine-learning models are trained using huge datasets gathered from many sources across the internet. These datasets are far too large to be carefully curated by hand, so they may contain bad examples that hurt model performance.

Scientists also know that some data points impact a model's performance on certain downstream tasks more than others.

The MIT researchers combined these two ideas into an approach that identifies and removes these problematic datapoints. They seek to solve a problem known as worst-group error, which occurs when a model underperforms on minority subgroups in a training dataset.
The researchers' new technique is driven by prior work in which they introduced a method, called TRAK, that identifies the most important training examples for a specific model output.

For this new technique, they take incorrect predictions the model made about minority subgroups and use TRAK to identify which training examples contributed the most to that incorrect prediction.

"By aggregating this information across bad test predictions in the right way, we are able to find the specific parts of the training that are driving worst-group accuracy down overall," Ilyas explains.

Then they remove those specific **samples and retrain the model** on the remaining data.

Since having more data usually yields better overall performance,**removing just the samples that drive worst-group failures maintains the model's overall accuracy while boosting** its **performance** on minority subgroups.

A more accessible approach

Across three machine-learning datasets, their method outperformed multiple techniques. In one instance, it boosted worst-group accuracy while removing about 20,000 fewer training samples than a conventional data balancing method. **Their technique also achieved higher accuracy than methods that require making changes to the inner workings of a model.**

Because the MIT method involves changing a dataset instead, it would be easier for a practitioner to use and can be applied to many types of models.

It can also be utilized when bias is unknown because subgroups in a training dataset are not labeled. By identifying datapoints that contribute most to a feature the model is learning, they can **understand the variables it is using to make a prediction.**

"This is a tool anyone can use when they are training a machine-learning model. They can look at those datapoints and see whether they are aligned with the capability they are trying to teach the model," says Hamidieh.

AI literacy fosters change

Murray 22 - Scott Murray [Communications Officer at MIT Institute for Data, Systems, and Society; Content Strategist, Writer, Communications Leader] . "How artificial intelligence can help combat systemic racism", MIT News | Massachusetts Institute of Technology, 3-16-2022. https://news.mit.edu/2022/how-ai-can-help-combat-systemic-racism-0316, Accessed 3-5-2025 //ejs squad

"**Models** in my view can **inform policy and strategy that we as humans have to create**. Computational models can **inform and generate knowledge**, but that doesn't equate with change." It takes additional work — and additional expertise in policy and advocacy — to use knowledge and insights to strive toward progress.

One **important lever of change**, he argues, will be **building a more AI-literate society through access to information and opportunities to understand AI and its impact** in a more dynamic way. He hopes to see **greater data rights and greater understanding** of how societal systems impact our lives.

"I was **inspired by the response of younger people** to the murders of George Floyd and Breonna Taylor," he says. "Their tragic deaths **shine a bright light on the real-world implications of structural racism and has forced the broader society to pay more attention** to this issue, which **creates more opportunities for change**."