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#### Theory of power

#### Robot lives are valuable.

Sari R. R. Nijssen, Barbara C. N. Müller, Rick B. van Baaren, and Markus Paulus (2019). Saving the Robot or the Human? Robots Who Feel Deserve Moral Care. Social Cognition: Vol. 37, No. 1, pp. 41-S2. <https://doi.org/10.1521/soco.2019.37.1.41>

People are prepared to save a robot at the cost of human lives under certain conditions. One of these situations is when we believe the robot can experience pain. This has been indicated in research led by the team of Sari Nijssen of Radboud University, in collaboration with Barbara Müller of Radboud University and Markus Paulus from LMU Munich, which will appear in Social Cognition on 7 February. Robots are now indispensable in our daily lives. They perform all types of specialised, and sometimes dangerous, jobs for us. These include tasks such as detecting and dismantling mines, but robots are also used to assist in domestic affairs and healthcare. This raises interesting questions, such as: how do we view these robots and how do we behave towards them? Behavioral scientist Sari Nijssen: “It is known that military personnel may mourn a robot that is used to clear mines in the army. Funerals are organised for them. We wanted to investigate how far this empathy for robots extends, and what moral principles influence behaviour towards robots. Little research has been done in this area as of yet.“ Robot life versus human life The central question of the research was the extent to which people are prepared to sacrifice robots to save human lives. The test subjects were presented with a moral dilemma and the question of whether they would sacrifice an individual to save a group of wounded people. In the different scenarios, the individual was a person, a robot with human traits, or a robot that was presented as a simple machine. The research indicated that the more the robot was seen as human, the more difficult the dilemma was for the test subjects. When the robot was presented as a conscious being with its own thoughts, experiences, pain, and emotions, the test subjects were less likely to sacrifice the robot in favour of anonymous people. According to Nijssen, this means that people, under certain conditions, endow robots with moral value. “A human-looking robot can cause feelings and behaviours that contrast with the function for which they were developed - to help us. And the question is whether this is desirable for us.

#### Humans abuse robots because they are subordinates.

Bartneck, Christoph and Keijsers, Merel. "The morality of abusing a robot" Paladyn, Journal of Behavioral Robotics, vol. 11, no. 1, 2020, pp. 271-283. <https://doi.org/10.1515/pjbr-2020-0017>

It is not uncommon for humans to exhibit abusive behaviour towards robots. This study compares how abusive behaviour towards a human is perceived differently in comparison with identical behaviour towards a robot. We showed participants 16 video clips of unparalleled quality that depicted different levels of violence and abuse. For each video, we asked participants to rate the moral acceptability of the action, the violence depicted, the intention to harm, and how abusive the action was. The results indicate no significant difference in the perceived morality of the actions shown in the videos across the two victim agents. When the agents started to fight back, their reactive aggressive behaviour was rated differently. Humans fighting back were seen as less immoral compared with robots fighting back. A mediation analysis showed that this was predominately due to participants perceiving the robot’s response as more abusive than the human’s response. Keywords: [abuse](https://www.degruyter.com/search?query=keywordValues%3A%28%22abuse%22%29%20AND%20journalKey%3A%28%22PJBR%22%29&documentTypeFacet=article); [robots](https://www.degruyter.com/search?query=keywordValues%3A%28%22robots%22%29%20AND%20journalKey%3A%28%22PJBR%22%29&documentTypeFacet=article); [human](https://www.degruyter.com/search?query=keywordValues%3A%28%22human%22%29%20AND%20journalKey%3A%28%22PJBR%22%29&documentTypeFacet=article); [morality](https://www.degruyter.com/search?query=keywordValues%3A%28%22morality%22%29%20AND%20journalKey%3A%28%22PJBR%22%29&documentTypeFacet=article); [perception](https://www.degruyter.com/search?query=keywordValues%3A%28%22perception%22%29%20AND%20journalKey%3A%28%22PJBR%22%29&documentTypeFacet=article) 1 Introduction The interactions between humans and robots are not always positive. Some humans verbally and physically abuse robots. Hitchbot, for example, was completely destroyed in Philadelphia, Pennsylvania, when it was trying to catch a lift [[1](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_001_w2aab3b7d153b1b6b1ab2b1b1Aa)]. Robovie, which was operating in kindergartens, schools, shopping malls, and train stations, had to deal with a variety of abusive behaviours, including people obstructing its way and kicking it [[2](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_002_w2aab3b7d153b1b6b1ab2b1b2Aa)]. The K5 Knightscope robot was assaulted by a drunk man in a parking lot in Mountain View, California [[3](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_003_w2aab3b7d153b1b6b1ab2b1b3Aa)]. How to respond to this abusive behaviour is a difficult question, and researchers are trying to run controlled experiments to better understand people’s motivation for abusing robots and what the best response strategies would be. One approach to understanding robot bullying has been to experimentally study what makes people aggressive towards robots [[4](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_004_w2aab3b7d153b1b6b1ab2b1b4Aa),[5](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_005_w2aab3b7d153b1b6b1ab2b1b5Aa),[6](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_006_w2aab3b7d153b1b6b1ab2b1b6Aa)]. However, experiments designed so, i.e. participants have to verbally or physically abuse a robotic agent, may have a hard time passing the ethics board. In addition, people are unlikely to bully robots during a controlled experiment, as they tend to be self-aware and wanting to make a good impression [[7](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_007_w2aab3b7d153b1b6b1ab2b1b7Aa),[8](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_008_w2aab3b7d153b1b6b1ab2b1b8Aa)]. People have been coerced to physically harm a robot [[9](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_009_w2aab3b7d153b1b6b1ab2b1b9Aa)], but in this experiment participants were explicitly instructed to destroy the robots and the robots in question were very simple and cheap. Therefore, the behaviour that was measured may have been obedience rather than robot abuse. It is uncertain whether these results would generalise to robot bullying, or even obedience behaviour with a more advanced and anthropomorphic robot. In short, studies targeting robot abuse are complicated to design, and researchers often have to adopt a proxy for abusive behaviour. An alternative approach is to expose participants to recordings of robot abuse and measure their responses. Previous studies have measured to what extent participants perceived the shown behaviour to be abusive [[10](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_010_w2aab3b7d153b1b6b1ab2b1c10Aa),[11](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_011_w2aab3b7d153b1b6b1ab2b1c11Aa),[12](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_012_w2aab3b7d153b1b6b1ab2b1c12Aa)], empathy with the robot [[13](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_013_w2aab3b7d153b1b6b1ab2b1c13Aa),[14](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_014_w2aab3b7d153b1b6b1ab2b1c14Aa)], and acceptability of the abuse [[15](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_015_w2aab3b7d153b1b6b1ab2b1c15Aa)]. No studies to date, to our knowledge, have directly compared the morality of the abuse of robotic versus human agents. However, such a comparison is needed to place measures into perspective. If a study only observed abusive behaviour towards a robot and concluded with a “three-point-oh-seven” on a five-point empathy scale, then this benchmark is not meaningful by itself. The current study therefore compares the moral acceptability of human and robot abuse directly as well as the moral acceptability of reactive aggression. 1.1 Literature Humans respond to robots as if they are to some extent sentient and humanlike. This goes as far as parallels in how the brain responds to human–human and human–robot interaction (HRI) [[13](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_013_w2aab3b7d153b1b6b1ab2b1c13Aa),[16](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_016_w2aab3b7d153b1b6b1ab2b1c16Aa),[17](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_017_w2aab3b7d153b1b6b1ab2b1c17Aa)], but it also shows in people’s tendency to interact with robots in a social manner [[18](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_018_w2aab3b7d153b1b6b1ab2b1c18Aa)]. Humans talk to robots [[19](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_019_w2aab3b7d153b1b6b1ab2b1c19Aa)] as if they understand what is being said, punish them for being a bad teammate [[20](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_020_w2aab3b7d153b1b6b1ab2b1c20Aa)] but also feel sorry for them when they are being punished [[21](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_021_w2aab3b7d153b1b6b1ab2b1c21Aa)] and even try to prevent them from getting hurt [[21](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_021_w2aab3b7d153b1b6b1ab2b1c21Aa),[22](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_022_w2aab3b7d153b1b6b1ab2b1c22Aa)]. Not all social behaviours are positive. robots have been the targets of verbal and physical abuse in the past [[1](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_001_w2aab3b7d153b1b6b1ab2b1b1Aa),[3](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_003_w2aab3b7d153b1b6b1ab2b1b3Aa),[23](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_023_w2aab3b7d153b1b6b1ab2b1c23Aa),[24](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_024_w2aab3b7d153b1b6b1ab2b1c24Aa)]. What is even more interesting is that robot-directed aggression has been shown to be remarkably persistent [see, e.g. [6](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_006_w2aab3b7d153b1b6b1ab2b1b6Aa),[23](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_023_w2aab3b7d153b1b6b1ab2b1c23Aa),[24](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_024_w2aab3b7d153b1b6b1ab2b1c24Aa),[25](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_025_w2aab3b7d153b1b6b1ab2b1c25Aa)], and researchers have been struggling to come up with adequate robot responses to effectively deter further abusive behaviour. Robots are in many ways the ideal target for abuse, as they are in a clear subordinate position, are not expected to retort in kind, and cannot feel any pain, which absolves the aggressor from any moral consequence [[26](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_026_w2aab3b7d153b1b6b1ab2b1c26Aa)]. This is not to say that robot bullying should be tolerated. From an ethical perspective, some behaviour can be deemed immoral even if it is performed on an entity that is incapable of any suffering, like a robot [[27](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_027_w2aab3b7d153b1b6b1ab2b1c27Aa)]. Since robots are recognised by humans as social actors, abusing them might encourage treating humans in a similar way [[28](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_028_w2aab3b7d153b1b6b1ab2b1c28Aa)]. More generally speaking, the assertion “I can do whatever I desire with a robot” rests upon the idea that all and any actions are acceptable as long as no one gets harmed [[29](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_029_w2aab3b7d153b1b6b1ab2b1c29Aa)], which even in the most libertarian societies is not a commonly shared attitude [[28](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_028_w2aab3b7d153b1b6b1ab2b1c28Aa)]. And from a pragmatic point of view, robot abuse can result in considerable damage to the robot and hazardous situations for the robot, the abuser, any bystanders, and future users [[26](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_026_w2aab3b7d153b1b6b1ab2b1c26Aa)]. Researchers are facing several methodological problems when trying to investigate abusive behaviour towards robots. The biggest practical problem is that the physical abuse could damage or even destroy the robots. Conducting experiments that involve physically abusing robots could therefore be prohibitively expensive, unless a very cheap robot is being used [[9](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_009_w2aab3b7d153b1b6b1ab2b1b9Aa),[30](https://www.degruyter.com/document/doi/10.1515/pjbr-2020-0017/html#j_pjbr-2020-0017_ref_030_w2aab3b7d153b1b6b1ab2b1c30Aa)]. These tend to be very simple in terms of behaviour and appearance, which would potentially bias the results and prevent generalising any findings to more advanced and anthropomorphic robots.

#### THUS, robots deserve moral consideration.

#### Link

#### Robots are and will be used in warfare

Michael C. Horowitz Fall 2016 <https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons> “The Ethics & Morality of Robotic Warfare: Assessing the Debate over Autonomous Weapons“

Given the use of drones by the United States and others against terrorists and insurgents around the world, there is a tendency to conflate the entire category of military robotics with specific cases of drone strikes. However, it is a mistake to focus solely on the drone strike trees and miss the vast military robotics forest. For example, as current platforms, like the RQ-4 Global Hawk, and next generation experimental technologies, like the X-47B (United States) and Sharp Sword (China), demonstrate, drones are potentially useful for much more than simply targeted strikes, and in the future could engage in an even larger category of military missions. Moreover, the focus on drone strikes presumes that military robotics are only useful in the air. But there are a variety of missions–from uninhabited truck convoys to the Knifefish sea mine detection system to Israel’s unmanned surface patrol vehicle, the Protector–in which robotic systems can play a significant role outside the context of airborne-targeted killings.[5](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote5_hix6wja) Within the realm of military robotics, autonomy is already extensively used, including in autopilot, identifying and tracking potential targets, guidance, and weapons detonation.[6](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote6_idm6cq7) Though simple autonomous weapons are already possible, there is vast uncertainty about the state of the possible when it comes to artificial intelligence and its application to militaries. While robots that could discriminate between a person holding a rifle and a person holding a stick still seem to be on the horizon, technology is advancing quickly. How quickly and how prepared society will be for it, though, are open questions.[7](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote7_ctwlh5p) A small number of weapon systems currently have human-supervised autonomy. Many variants of the close-in weapon systems (CIWS) deployed by the U.S. military and more than two dozen militaries around the world, for example, have an automatic mode.[8](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote8_dlnwgse) Normally, the system works by having a human operator identify and target enemy missiles or planes and fire at them. However, if the number of incoming threats is so large that a human operator cannot target and fire against them effectively, the operator can activate an automatic mode whereby the computer targets and fires against the incoming threats. There is also an override switch the human can use to stop the system. Nearly all those discussing autonomous weapons–from international organizations to governments to the Campaign to Stop Killer Robots–agree that LAWS differ fundamentally from the weapons that militaries employ today.[9](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote9_nodlf77) While simple at first glance, this point is critical: when considering the ethical and moral challenges associated with autonomous weapons, the category only includes weapons that operate in ways appreciably different from the weapons of today.[10](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote10_dp7r20p) From a common sense perspective, defining an autonomous weapon as a weapon system that selects and engages targets on its own makes intuitive sense. Moreover, it is easy to describe, at the extremes, what constitutes an autonomous weapon. While a “dumb” bomb launched by a B-29 in World War II is not an autonomous weapon, a hunter-killer drone making decisions about who to target and when to fire weapons via algorithm clearly is. In between these extremes, however, is a vast and murky gulf–from incremental advances on the precision guided weapons of today to humanoid robots stalking the earth–that complicates our thinking about the ethical and moral challenges associated with LAWS and the implications for just war theory. In 2012, the U.S. Department of Defense (DoD) defined an autonomous weapon as “A weapon system that, once activated, can select and engage targets without further intervention by a human operator.”[11](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote11_0u45054) The DoD further distinguished between autonomous weapons, human-supervised autonomous weapons (that is, autonomous weapons that feature a human “on the loop” who possesses an override switch), and semiautonomous weapons, or “a weapon system that, once activated, is intended to only engage individual targets or specific target groups that have been selected by a human operator.”[12](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote12_ob6j3k1) NGO groups, such as Human Rights Watch, have generally adopted similar definitions.[13](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote13_0g25eps) This essay does as well, considering lethal autonomous weapon systems as weapon systems that, once activated, are designed to select and engage targets not previously designated by a human.[14](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote14_lpflmyw) Defining what it means to select and engage targets is complicated, however. For example, if homing munitions are considered to “select and engage” targets, then autonomous weapons have existed since World War II. Resolving the definitional debate is beyond the scope of this essay. But even if there is not a clear agreement on exactly what constitutes an autonomous weapon, breaking down LAWS into three “types” of potential autonomous weapons–munition, platforms, and operational systems–can potentially help move the discussion forward, revealing the ethical, moral, and strategic issues that might exist for each.[15](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote15_cnk33wd) At the munitions level, there are already many semiautonomous weapons today. The advanced medium range air-to-air missile (AMRAAM), for example, deployed by the United States and several militaries around the world, is a “fire and forget” missile: after it is launched, it uses internal navigation and radar to find and destroy a target. AMRAAM engagements generally happen beyond visual range, with the pilot making the decision to launch an AMRAAM based on long-range radar data, not visual cues. The AMRAAM is not considered inherently problematic from an ethical perspective, nor is it considered an autonomous weapon.[16](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote16_zxdaitq) Some fully autonomous weapons at the munitions level arguably already do exist, though, including the Israeli Harpy, a loitering cruise missile designed to detect and destroy a certain type of radar.[17](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote17_c3eixt2) The next level of military system aggregation is the platform. An example of an autonomous weapon system platform would be a ship or plane capable of selecting targets and firing munitions at those targets on its own. There are almost no platform-level LAWS currently deployed, but the CIWS systems that protect ships and military bases from attack are arguably an exception. Like the AMRAAM, countries have used these weapon systems for decades without opposition. However, an example of a platform-level LAWS that does not currently exist–and which no military appears to be planning to build–is an autonomous version of the MQ-9 Reaper (United States) or the CH-4 (China) drones. Imagine a drone identical from the exterior, but with software that allows it, after activation by a human operator, to fly around the world and target a particular individual or groups of individuals and fire missiles at them, much as human-piloted drones do today.[18](https://www.amacad.org/publication/ethics-morality-robotic-warfare-assessing-debate-over-autonomous-weapons#footnote18_1zz46l0) The broadest type of LAWS would be a military operations planning system in which a machine learning system would substitute, in a way, for military leaders and their staff in planning operations. No LAWS at the operational level appear to exist, even in research and development, though it is possible to imagine militaries wanting to leverage potential insights from machine learning models as they conduct planning. In this scenario, upon deciding to fight a war–or perhaps even deciding whether to fight a war–a human would activate an autonomous battle system that could decide the probability of winning a war and whether to attack, plan an operation, and then direct other systems–whether human or robotic–to engage in particular attacks. This category is the furthest away from reality in terms of technology and is the one that most invokes images of robotic weapon systems in movies such as The Terminator or The Matrix.

#### Impact

#### Using another being to shield yourself is immoral.

18, E. L. M., Lieblich, E., & Lieblich, E. (2021, May 19). Dispatch from Israel on Human Shields: What I Should've Said to a Dad on the Playground. Just Security. https://www.justsecurity.org/76220/dispatch-from-israel-on-human-shields-what-i-shouldve-said-to-a-dad-on-the-playground/.

Launching rockets or hiding weapons near civilians is reprehensible. You traumatize people by using weapons next to them. If you know that the other side is likely to return fire, you either intend that people be harmed for a public relations gain, or you’re at least indifferent to it. If you think that the other side won’t respond because of your proximity to civilians, you are using those people as human shields. Whoever does so is “responsible,” either by occasioning harm to civilians, or by using them as means. In this sense, yes, Gaza armed groups are certainly responsible for putting civilians in harm’s way. Such actions are both unlawful and immoral. But the other position, described in the New York Times and implied by my neighbor in the park, is also wrong to the core. That Hamas is responsible in the sense described above doesn’t in itself absolve Israel from the consequences of its own actions. The easy part is the law. Under International Humanitarian Law (IHL), the fact that one party violates its obligations – among them the obligation not to use civilians as human shields – [does not release](https://ihl-databases.icrc.org/applic/ihl/ihl.nsf/Article.xsp?action=openDocument&documentId=4BEBD9920AE0AEAEC12563CD0051DC9E) the other party from its own obligations. Additionally, law [prohibits “reprisals” against civilians](https://ihl-databases.icrc.org/applic/ihl/ihl.nsf/Article.xsp?action=openDocument&documentId=0D8292177AFD9AD0C12563CD0051D8B7), which means that a party cannot break IHL rules that protect civilians to try to compel the other party to cease its violation. Both provisions reflect the basic idea that people “on the other side” have individual rights, and these are not forfeited because of the conduct of the political entity that controls them. The prohibition on reprisals also reflects the imperative that people cannot be used as means to the end of compelling someone to stop their violations. The position is also wrong from a moral perspective. To start unpacking this, [a thought experiment is helpful](https://www.law.upenn.edu/live/files/2836-margalit-and-walzerisrael-civilians-and-combatants). Would the dad in the park hold the same position if those were Israeli children being endangered by Hamas’s location? I can imagine his answer. “It’s different,” he would say, because the IDF’s job is to protect our children, not theirs. The thing is that morality doesn’t accept a diminution of civilian lives. While it’s obviously true that the IDF’s job is to protect Israeli children, this means only that soldiers have committed to risk themselves to do so, not that they can transfer this risk to others. Can a bodyguard justify harming innocent third parties only because she has committed, and is under a duty, to protect her boss? “But they are not innocent,” the likely response would be. “They support Hamas.” But this argument doesn’t do any work. First, it lumps everyone on the other side into one monolithic collective. In fact, nobody knows who supports Hamas and who doesn’t, least of all in the fog of war. Second, even if we could know this, bad political choices in whom to support are just that – bad political choices. We can condemn them, object to them, and if they become actions we may directly oppose them. But it’s preposterous to claim that bad political choices alone affect a person’s basic rights, including the right not be killed.

#### Sending robots in because they are a convenient proxy for humans is like deploying a robotic meat shield and decreases their value to life. A robot thinks, and if the neg gets its way, there will be millions of them. Destroying one is like murder. Destroying millions is like genocide.

#### Genocide is a crime against life in and of itself.

Berel Lang, © 2005 Genocide and Human Rights A Philosophical Guide Editors John K. Roth Professor of Philosophy Emeritus at the State University of New York, Albany, is the author among other books of *Act and Idea in the Nazi Genocide* and, in 2013, *Primo Levi: The Matter of a Life*. the Edward J. Sexton Professor Emeritus of Philosophy at CMC,

A different title that I decided *not* to use for this chapter would have been more explicit—but also offensive: *“What’s so bad about genocide, anyway?*”1 That wording sounds flippant, and the topic of genocide warrants something more than that. The flippancy, however, has a serious side to it. Although what is bad or wrong in genocide is often regarded as self-evident, it is in fact far from that; the assumption that it is obvious has led to both overuse and misuse of the term and to distortions in understanding its meaning. The question of the evil in genocide—what is so bad about it—is, at any rate, my subject here, with my premise the claim that genocide is indeed “so bad”: evil, if any human act is or can be. Nobody is likely to find this assessment surprising or contentious. On any ranking of crimes or atrocities, it would be difficult to name an act or event regarded as more heinous. Genocide arguably appears now as the most serious offense in humanity’s lengthy—and, we recognize, still growing—list of moral or legal violations. The evil in genocide ought to make an impact on philosophy. The following reflections show some of the ways in which philosophical work can respond to that proposition.

#### Method

#### The method is to stop deployment of lethal autonomous weapons in warfare. Bans work.

 Editor in Chief Laura Helmuth  Managing Editor Curtis Brainard Copy Director Maria-Christina Keller Creative Director Michael Mrak  EDITORIAL  Chief Features Editor Seth FletcherChief News Editor Dean VisserChief Opinion Editor Michael D. Lemonick et. Al “Don’t Let Robots Pull the Trigger Weapons that kill enemies on their own threaten civilians and soldiers alike” By [THE EDITORS](https://www.scientificamerican.com/author/the-editors/) on March 1, 2019

The killer machines are coming. Robotic weapons that target and destroy without human supervision are poised to start a revolution in warfare comparable to the invention of gunpowder or the atomic bomb. The prospect poses a dire threat to civilians—and could lead to some of the bleakest scenarios in which artificial intelligence runs amok. A prohibition on killer robots, akin to bans on chemical and biological weapons, is badly needed. But some major military powers oppose it. The robots are no technophobic fantasy. In July 2017, for example, Russia's Kalashnikov Group announced that it had begun development of a camera-equipped 7.62-millimeter machine gun that uses a neural network to make “shoot/no-shoot” decisions. An entire generation of self-controlled armaments, including drones, ships and tanks, is edging toward varying levels of autonomous operation. The U.S. appears to hold a lead in R&D on autonomous systems—with $18 billion slated for investment from 2016 to 2020. But other countries with substantial arms industries are also making their own investments. Military planners contend that “lethal autonomous weapons systems”—a more anodyne term—could, in theory, bring a detached precision to war fighting. Such automatons could diminish the need for troops and reduce casualties by leaving the machines to battle it out. Yet control by algorithm can potentially morph into “out of control.” Existing AI cannot deduce the intentions of others or make critical decisions by generalizing from past experience in the chaos of war. The inability to read behavioral subtleties to distinguish civilian from combatant or friend versus foe should call into question whether AIs should replace GIs in a foreseeable future mission. A killer robot of any kind would be a trained assassin, not unlike Arnold Schwarzenegger in The Terminator. After the battle is done, moreover, who would be held responsible when a machine does the killing? The robot? Its owner? Its maker? With all these drawbacks, a fully autonomous robot fashioned using near-term technology could create a novel threat wielded by smaller nations or terrorists with scant expertise or financial resources. Swarms of tiny, weaponized drones, perhaps even made using 3-D printers, could wreak havoc in densely populated areas. Prototypes are already being tested: the U.S. Department of Defense demonstrated a nonweaponized swarm of more than 100 micro drones in 2016. Stuart Russell of the University of California, Berkeley, a prominent figure in AI research, has suggested that “antipersonnel micro robots” deployed by just a single individual could kill many thousands and constitute a potential weapon of mass destruction. Since 2013 the United Nations Convention on Certain Conventional Weapons (CCW), which regulates incendiary devices, blinding lasers and other armaments thought to be overly harmful, has debated what to do about lethal autonomous weapons systems. Because of opposition from the U.S., Russia and a few others, the discussions have not advanced to the stage of drafting formal language for a ban. The U.S., for one, has argued that its policy already stipulates that military personnel retain control over autonomous weapons and that premature regulation could put a damper on vital AI research. A ban need not be overly restrictive. The Campaign to Stop Killer Robots, a coalition of 89 nongovernmental organizations from 50 countries that has pressed for a such a prohibition, emphasizes that it would be limited to offensive weaponry and not extend to antimissile and other defensive systems that automatically fire in response to an incoming warhead. The current impasse has prompted the campaign to consider rallying at least some nations to agree to a ban outside the forum provided by the CCW, an option used before to kick-start multinational agreements that prohibit land mines and cluster munitions. A preemptive ban on autonomous killing machines, with clear requirements for compliance, would stigmatize the technology and help keep killer robots out of military arsenals. Since it was first presented at the International Joint Conference on Artificial Intelligence in Stockholm in July, 244 organizations and 3,187 individuals have signed a [pledge](https://futureoflife.org/lethal-autonomous-weapons-pledge/) to “neither participate in nor support the development, manufacture, trade, or use of lethal autonomous weapons.” The rationale for making such a pledge was that laws had yet to be passed to bar killer robots. Without such a legal framework, the day may soon come when an algorithm makes the fateful decision to take a human life.

#### Robots ought to be protected.

“Do Robots Deserve Human Rights? Discover asked the experts.” https://www.discovermagazine.com/technology/do-robots-deserve-human-rights By [Lauren Sigfusson](https://www.discovermagazine.com/author/lsigfusson)Dec 5, 2017 10:45 AM

Are robots equivalent to humans? No. Robots are not humans. Even as robots get smarter, and even if their smartness exceeds humans’ smartness, it does not change the fact that robots are of a different form from humans. I am not downgrading what robots are or will be, I am a realist about what they are: technologies to support humanities. Should robots be given rights? Yes. Humanity has obligations toward our ecosystem and social system. Robots will be part of both systems. We are morally obliged to protect them, design them to protect themselves against misuse, and to be morally harmonized with humanity. There is a whole stack of rights they should be given, here are two: The right to be protected by our legal and ethical system, and the right to be designed to be trustworthy; that is, technologically fit-for-purpose and cognitively and socially compatible (safe, ethically and legally aware, etc.).

#### Role of the Ballot

#### Thus, the ROB is to vote for the debater that protects the most lives- the value of robot lives cannot be determined so we must protect the most total lives, human and robot.

#### Vote aff lmao.

## Advocacy

#### Thus, the advocacy – Resolved: States ought to ban lethal autonomous weapons in warfare – by this I mean that we stop using them or repurpose them, not destroy them. Even if we do destroy them, that’s better than sending them off to fight our wars.

## Solvency

#### Bans work – the Chemical Weapons Convention proves - Terrorists pursuing bioweapons and LAWs are stopped by ban, extinction fails.

Freedberg 19 Sydney J. Freedberg Jr. (deputy editor for Breaking Defense).3/11/2019, Should We Ban ‘Killer Robots’? Can We? https://breakingdefense.com/2019/03/should-we-ban-killer-robots-can-we/

Having said that,” Scharre continued, “I think that the kind of arms control that Stuart Russell is advocating for is actually more feasible.” If someone’s building [vast swarms of lethal mini-drones](https://breakingdefense.com/2019/03/genocide-swarms-assassin-drones-the-case-for-banning-lethal-ai/), you don’t have to see the code to know they have to be fully autonomous: There’s no practical way, Scharre told me, for humans to review and approve “a million targets.” Conversely, such mini-drones are only truly threatening in vast numbers. “A country or an individual… might be able to build a few hundred of these,” Scharre said, “but if you’re going to build millions of them, there’s no way to hide that.” So how would you find them? The best model is probably the Chemical Weapons Convention, which, unlike many other treaties — the Biological Weapons Convention, the landmine ban, and so on — has a robust enforcement mechanism. The scope of the problem is similar. Lethal chemicals like [chlorine](https://www.cdc.gov/niosh/topics/chlorine/) and [phosgene](https://emergency.cdc.gov/agent/phosgene/basics/facts.asp) are widely used in legitimate industry, so you can’t ban them outright any more than mini-drones; they’re relatively easy to turn into weapons, again like drones; and yet only rogue states like Syria and Iraq have used them since the end of World War I. Much of the reason militaries abandoned poison gas is that a weapon that blows with the wind is hard to control — yet another similarity with AI, since even “narrow” machine-learning algorithms modify themselves in ways [beyond human understanding](https://breakingdefense.com/2017/07/artificial-stupidity-learning-to-trust-the-machine/). But there is also a robust monitoring regime, run by the Organisation to Prevent Chemical Weapons, which has about 250 inspectors who can rapidly respond to reported violations. Such “challenge inspections” are a crucial tool, said [Irakli Beridze](https://www.itu.int/en/fnc/Pages/bios/BERIDZEIrakli.aspx), a Georgian-born veteran of both OPCW and the [UNICRI chem, bio, radiological, & nuclear program](http://www.unicri.it/topics/cbrn/) — with service in Afghanistan, Iraq, Libya, and Syria — who now runs the Centre for AI & Robotics at UNICRI, the United Nations Interregional Crime and Justice Research Institute. (Beridze emphasized he was only expressing his personal opinion as an expert, not as a UN official). Mini-drone production would be easier to hide than chemical plants — for one thing, it doesn’t stink like a lot of [toxic chemicals](https://www.thoughtco.com/how-do-chemical-weapons-smell-604295) — but investigative techniques have advanced since the CWC entered into force in [1997](https://www.armscontrol.org/factsheets/cwcglance). It might even be possible, Beridze said, to set an AI to catch an AI: use artificial intelligence to crunch big data — social media or parts orders, for example — and correlate subtle clues no human inspector could catch. Robust inspections, however, are only one part of the solution, he told me. Countries need not only to sign the treaty but use their own intelligence agencies and domestic law enforcement to watch for violations. And, after initial reluctance in the private sector, “buy-in and participation of the chemical industry… was absolutely essential,” he said. “Otherwise this treaty would not work.” Once compliance became a norm in the chemical industry, in large part because of the moral stigma that attached to chemical weapons, it became much harder to produce poison gas in militarily significant amounts. Given [widespread anxiety in the tech community about lethal AI](https://breakingdefense.com/2018/04/a-treaty-to-ban-autonomous-intelligence-weapons/), it should be possible to reach a similar consensus among drone manufacturers — eventually. Getting private industry, law enforcement, and national governments on board, even simply making them aware of the problem, would take years. “We don’t have too much time,” Beridze warned. In a few years, “we will have a widespread technology where criminals can use [small drones](https://breakingdefense.com/tag/drones/) [for] mass terrorist attacks, assassinations, contract killing, you name it.”

#### Only a prohibition solves – stigma solves circumvention

Goose 15 Stephen Goose (Executive Director, Arms Division, Human Rights Watch) The Case for Banning Killer Robots, 11/24/2015, https://www.hrw.org/news/2015/11/24/case-banning-killer-robots#

Some oppose a preemptive and comprehensive prohibition, saying it is too early and we should "wait and see" where the technology takes us. Others believe restrictions would be more appropriate than a ban, limiting their use to specific situations and missions. Some say existing international humanitarian law will be sufficient to address the challenges posed. The point of a preemptive treaty is to prevent future harm and with all the dangers and concerns associated with fully autonomous weapons, it would be irresponsible to take a "wait and see" approach and only try to deal with the issue after the harm has already occurred. Once developed, they will be irreversible; it will not be possible to put the genie back in the bottle as the weapons spread rapidly around the world. The notion of a preemptive treaty has been done before. The best example is the 1995 CCW protocol that bans blinding laser weapons. After initial opposition from the U.S. and others, states came to agree the weapons would pose unacceptable dangers to soldiers and civilians. The weapons were seen as counter to the dictates of public conscience and nations came to recognize their militaries would be better off if no one had the weapons than if everyone had them. These same rationales apply to fully autonomous weapons. While some rightly point out that there is no "proof" there cannot be a technological fix to the problems of fully autonomous weapons, it is equally true there is no proof there can be. Given the scientific uncertainty that exists, and given the potential benefits of a new legally binding instrument, the precautionary principle in international law is directly applicable. The principle suggests the international community need not wait for scientific certainty, but could and should take action now. Fully autonomous weapons represent a new category of weapons that could change the way wars are fought and pose serious risks to civilians. As such, they demand new, specific law that clarifies and strengthens existing international humanitarian law. A specific treaty banning a weapon is also the best way to stigmatize the weapon. Experience has shown that stigmatization has a powerful effect even on those who have not yet formally joined the treaty, inducing them to comply with the key provisions, lest they risk international condemnation. A regulatory approach restricting use to certain locations or to specific purposes would be prone to longer-term failure as countries would likely be tempted to use them in other, possibly inappropriate, ways during the heat of battle or in dire circumstances. Once legitimized, the weapons would no doubt be mass produced and proliferate worldwide; only a preemptive international treaty will prevent that. The call for a ban on development of fully autonomous weapons is not aimed at impeding broader research into military robotics or weapons autonomy or full autonomy in the civilian sphere. It is not intended to curtail basic AI research in any way. Research and development activities should be banned if they are directed at technology that can only be used for fully autonomous weapons or that is explicitly intended for use in such weapons.

#### No impact to cheating and enforcement checks

Egel 3/26 Naomi Egel (Ph.D. candidate in government at Cornell University and the Janne Nolan Nuclear Security Visiting Fellow at the Truman Center for National Policy) and Jane Vaynman is an assistant professor of political science at Temple University, 3/26/2021, RECONSIDERING ARMS CONTROL ORTHODOXY, warontherocks, https://warontherocks.com/2021/03/reconsidering-arms-control-orthodoxy/

The common wisdom on arms control is that states only sign treaties they plan to comply with anyway and cheating that does occur should both be met with clear punishment and is also a sign of agreement failure. When Donald Trump’s administration withdrew from the Open Skies Treaty, it [claimed](https://2017-2021.state.gov/on-the-treaty-on-open-skies/index.html) that it did so in response to Russia’s violations of the treaty. Today, some analysts [argue](https://www.politico.com/news/magazine/2021/02/07/new-start-treaty-framework-cyber-466607), the United States ought to somehow address Russian cheating before negotiating a new arms control agreement, even though the United States has already withdrawn from the 1987 Intermediate-Range Nuclear Forces Treaty where the violations occurred. Yet the history of arms control experience suggests that cheating does not necessarily derail prospects for future agreements, and there have actually been innovations in the design of agreements that allow states to address the consequences of cheating while still maintaining the overall architecture of a negotiated deal. Cheating on arms control agreements is not a new phenomenon. For example, the Soviet Union violated the SALT II agreement, both by developing the SS-25 missile and by encrypting missile test data that was supposed to be shared for verification purposes. The Soviet Union also [violated](https://www.jstor.org/stable/2538756?seq=1#metadata_info_tab_contents) the 1972 Anti-Ballistic Missile Treaty by developing the Krasnoyarsk radar system in the late 1970s and early 1980s. At the time, many [claimed](https://www.jstor.org/stable/1148479) that the United States needed to address Soviet cheating and respond to these violations by withdrawing from these agreements before committing to any future deal. However, neither of these violations led to the collapse of either agreement. Moreover, the United States and the Soviet Union began negotiations on what would become the 1987 Intermediate-Range Nuclear Forces Treaty and the 1990 START I agreement despite outstanding violations of prior agreements and the tensions they produced. Instead, the United States and the Soviet Union were able to reach agreement on the Intermediate-Range Nuclear Forces Treaty — a significant bargain that banned all nuclear and conventional ground-launched ballistic and cruise missiles that had a range of between 500 and 5,500 kilometers — in 1987. Soviet treaty violations were only finally addressed in 1989. The implications of cheating and the options available for addressing it vary, but there is reason for optimism. Despite a [tendency](https://thehill.com/opinion/national-security/493998-how-to-lose-a-war-without-firing-a-shot-ignore-our-enemies-arms-control-violations) to [focus](https://www.europeanleadershipnetwork.org/commentary/not-a-good-season-for-arms-control/) on the negative [effects](https://www.politico.com/news/magazine/2021/02/07/new-start-treaty-framework-cyber-466607) of violations, the consequences of cheating depend partially on how the other parties respond. The Assad regime’s violations of the Chemical Weapons Convention in Syria, for example, did not lead to a flood of states violating the agreement and using chemical weapons in war. Nor did North Korea’s withdrawal from the Treaty on the Non-Proliferation of Nuclear Weapons lead to a rush of states pursuing nuclear weapons. Although instances of cheating on agreements are never desirable, the [public identification](https://www.cambridge.org/core/journals/international-organization/article/spotlights-harsh-glare-rethinking-publicity-and-international-order/97AD0D19A1E5DF5F3D6CC5B98EA1009F) of such violations combined with serious efforts to enforce the rules of the agreements demonstrate that the regime is working as intended and provides value in policing threats that arise. Even when parties violate agreements, it may still be worthwhile to maintain them. This is the case if an agreement can still offer information that is more difficult to obtain or reveal otherwise. Despite concerns over Russian compliance with the Open Skies Treaty dating back to at least [2010](https://2009-2017.state.gov/t/avc/rls/rpt/170924.htm), the United States has still [gained](https://media.nti.org/documents/Memo_from_George_Shultz_Bill_Perry_and_Sam_Nunn_on_Open_Skies_Treaty.pdf) transparency and predictability regarding Russian military forces that it now lacks after having withdrawn from the treaty. Specifically, information [gained](https://www.washingtonpost.com/politics/2020/05/24/us-plans-withdraw-open-skies-treaty-thats-miscalculation/) via Open Skies was [critical](https://www.fischer.senate.gov/public/_cache/files/b2df2cf7-3828-4d81-aa57-2963ce8d70b0/sd-response-to-senator-fischer-regarding-the-open-skies-treaty-osd070739-18.pdf) for the United States in addressing Russian activities in Ukraine in 2014. Information gained through a treaty monitoring process is also easier to share with both allies and adversaries, allowing Washington to raise concerns or make claims in international disputes without revealing its own intelligence sources and methods. The implication here is not that cheating should be allowable, but rather that is not as clear cut of a problem as is often portrayed.

## Underview

#### Aff gets 1AR theory – otherwise the neg can be infinitely abusive and there’s no way to check back. 1AR theory is drop the debater and competing interps – the 1ARs too short to be able to rectify abuse and adequately cover substance. No RVI because you have 6 minutes to go for them whereas I only have a 3-minute 2AR to respond so I get crushed on time skew.

#### Spec shells are invalid – there is precedent like the Geneva protocol, the Protocol on Prohibitions or Restrictions on the use of Incendiary Weapons, the Hague Convention’s Laws of War: Declaration on the Use of Bullets Which Expand or Flatten Easily in the Human Body – thus topic lit should be sufficient. Having a spec aff makes disads like lionfish/starfish disads obsolete and has a net benefit – one spec aff is better than 10 nontopical disads. Adding an “in warfare” doesn’t really change the meaning of the resolution because we assume that LAWs are killing people in war instead of killing fish in the ocean.

#### T-ban shells are invalid – ban means “prohibiting something” and the Protocol on Prohibitions or Restrictions on the use of Incendiary Weapons prohibits the usage of incendiary weapons – thus my interpretation of the resolution is ok.

#### Role of the Ballot not self-serving – can fall under fwks like util just with the added condition of saving robot lives

#### None of my cards justify destroying lethal autonomous weapons- read carefully. They advocate banning them in warfare.

## 1ar evidencec

#### Nukes fail to cause extinction.

Nuclear Weapons Don’t Matter For nearly three‐​quarters of century, the world has been told it is perched precariously on Rube Goldberg’s precipice, perennially at risk of plunging into apocalyptic devastation. But oddly enough, both we and the weapons are still here. October 15, 2018 • Commentary By [John Mueller](https://www.cato.org/people/john-mueller) Adjunct Professor of Political Science, Ohio State University; Senior Fellow, Cato Institute

The unleashed power of the atom,” Albert Einstein wrote in 1946, “has changed everything save our modes of thinking, and we thus drift toward unparalleled catastrophe.” Winston Churchill noted in 1955, however, that [nuclear deterrence](https://www.foreignaffairs.com/articles/united-states/2013-02-11/lost-logic-deterrence) might produce stability instead and predicted that “safety will be the sturdy child of terror, and survival the twin brother of annihilation.” Einstein’s view became the touchstone of the modern peace movement. Churchill’s view evolved into mainstream Western nuclear strategy and doctrine. Both argued that the nuclear revolution had fundamentally transformed international politics. Both were wrong. Since the 1940s, nuclear weapons have greatly affected defense budgets, political and military posturing, and [academic theory](https://www.foreignaffairs.com/articles/2009-11-01/nukes-we-need). Beyond that, however, their practical significance has been vastly exaggerated by both critics and supporters. Nuclear weapons were not necessary to deter a third world war. They have proved useless militarily; in fact, their primary use has been to stoke the national ego or to posture against real or imagined threats. Few states have or want them, and they seem to be out of reach for terrorists. Their impact on international affairs has been minor compared with the sums and words expended on them. The costs resulting from the nuclear weapons obsession have been huge. To hold its own in a snarling contest with the Soviet Union during the Cold War, the United States spent $5–$10 trillion maintaining a vast nuclear arsenal — resources that could have been used more productively on almost anything else. To head off the imagined dangers that would result from nuclear proliferation, Washington and its allies have imposed devastating economic sanctions on countries such as Iraq and [North Korea](https://www.foreignaffairs.com/articles/north-korea/2017-12-04/what-we-really-know-about-north-koreas-nuclear-weapons), and even launched a war of aggression — sorry, “preemption” — that killed more people than did the nuclear bombs dropped on Hiroshima and Nagasaki. For nearly three‐​quarters of century, the world has been told it is perched precariously on Rube Goldberg’s precipice, perennially at risk of plunging into apocalyptic devastation. But oddly enough, both we and the weapons are still here. The time has long since come to acknowledge that the thinkers of the early nuclear age were mistaken in believing that the world had been made anew. In retrospect, they overestimated the importance of the nuclear revolution and the delicacy of the balance of terror. This spurred generations of officials to worry more about nuclear matters than they should have and to distort foreign and security policies in unfortunate ways. Today’s policymakers don’t have to repeat the same mistakes, and everybody would be better off if they didn’t. THE ATOMIC OBSESSION Over the decades, the atomic obsession has taken various forms, focusing on an endless array of worst‐​case scenarios: bolts from the blue, accidental wars, lost arms races, proliferation spirals, [nuclear terrorism](https://www.foreignaffairs.com/articles/2004-01-01/how-stop-nuclear-terror). The common feature among all these disasters is that none of them has ever materialized. Either we are the luckiest people in history or the risks have been overstated. The cartoonist and inventor Rube Goldberg received a Pulitzer Prize for a [1947 cartoon](https://www.cbsnews.com/pictures/the-wacky-inventions-of-rube-goldberg/3/) showing a huge atomic bomb teetering on a cliff between “world control” and “world destruction.” In 1950, the historian John Lewis Gaddis has noted, no U.S. official could imagine “that there would be no World War” or that the superpowers, “soon to have tens of thousands of thermonuclear weapons pointed at one another, would agree tacitly never to use any of them.” And in 1951, the great philosopher Bertrand Russell put the matter simply: Before the end of the present century, unless something quite unforeseeable occurs, one of three possibilities will have been realized. These three are: — 1. The end of human life, perhaps of all life on our planet. 2. A reversion to barbarism after a catastrophic diminution of the population of the globe. 3. A unification of the world under a single government, possessing a monopoly of all the major weapons of war. The novelist and scientist C. P. Snow proclaimed it a “certainty” in 1960 that several nuclear weapons would go off within ten years, and the strategist Herman Kahn declared it “most unlikely” that the world could live with an uncontrolled arms race for decades. In 1979, the dean of realism, Hans Morgenthau, proclaimed the world to be moving “ineluctably” toward a strategic nuclear war and assured us that nothing could be done to prevent it. A 1982 essay by the author Jonathan Schell asserted that the stakes were nothing less than the fate of the earth and concluded that soon “we will make our choice.” Schell continued: “Either we will sink into the final coma and end it all or, as I trust and believe, we will awaken to the truth of our peril … and rise up to cleanse the earth of nuclear weapons.” In the spirit of the times, the following year, a chart‐​topping pop song traced the dangers of accidental nuclear war, and the year after, Brown University students passed a referendum demanding that the university health service stockpile suicide pills for immediate dispensation to survivors in the event of a nuclear attack. Disasters were certainly possible, and a healthy appreciation of the dangers nuclear weapons posed eventually led to the development and spread of best practices in strategy and safety. But prudence in controlling tail‐​end risks sometimes evolved into near hysteria. Nuclear exchanges were assumed to be easy to start, hard to stop, and certain to end up destroying life on earth. Nuclear proliferation has been a perennial source of fear. During the 1960 U.S. presidential campaign, John F. Kennedy predicted that there might be “ten, 15, or 20” countries with a nuclear capability by the next election, and similar declarations continue. And since 9/11, nuclear terrorism has been the nightmare of choice. Ever since the dropping of the bomb, in short, Armageddon and apocalypse have been thought to be looming just over the horizon. Such fears and anxie‐​ties were understandable, especially at first. But they haven’t been borne out by the lived record of the nuclear era. WHAT ABOUT THAT LONG PEACE? Fine, one might concede. In retrospect, perhaps the risks were exaggerated. But at least there is a retrospect — which there might not have been without nuclear weapons, since they staved off a third world war, right? Actually, no. Nuclear strategy — a theoretical and nonexperimental enterprise — has been built on a grand counterfactual: the notion that without the prospect of nuclear devastation hanging over its head, the postwar world would have collapsed into a major conflict yet again. But this turns out to be just a story, and less history than fable. The nuclear‐​deterrence‐​saved‐​the‐​world theory is predicated on the notion that policymakers after 1945 were so stupid, incompetent, or reckless that, but for visions of mushroom clouds, they would have plunged the great powers back into war. But the catastrophic destruction they experienced in their recent war (one they had tried to avoid) proved more than enough to teach that lesson on its own, and there is little reason to believe that nuclear weapons were needed as reinforcement. Moreover, the Soviet Union never seriously considered any sort of direct military aggression against the United States or Western Europe. After examining the documentation extensively, the historian Vojtech Mastny concluded that the strategy of nuclear deterrence was “irrelevant to deterring a major war that the enemy did not wish to launch in the first place.” He added: “All Warsaw Pact scenarios presumed a war started by NATO.” In 1987, George Kennan, the architect of containment himself, had agreed, [writing in these pages](https://www.foreignaffairs.com/articles/1987-03-01/containment-40-years-later), “I have never believed that [Soviet leaders] have seen it as in their interests to overrun Western Europe militarily, or that they would have launched an attack on that region generally even if the so‐​called nuclear deterrent had not existed.” Moscow’s global game plan stressed revolutionary upheaval and subversion from within, not Hitlerian conquest. Given Russia’s calamitous experience with two world wars, a third was the last thing Soviet policymakers wanted, so nuclear deterrence was largely irrelevant to postwar stability. Nor has anyone ever come up with a compelling or even plausible rationale for using such weapons in conflicts short of total war — because there simply aren’t many targets that can’t be attacked as effectively with conventional weapons. Nuclear weapons have also proved useless in conventional or guerrilla warfare, lousy at compellence (think Saddam Hussein refusing to leave Kuwait), and not very good at deterrence (think the Yom Kippur War or Argentina’s seizure of the Falklands). There are circumstances in which such weapons would come in handy — say, in dealing with a super‐​aggressive, risk‐​acceptant fanatic leading a major country. But that has always been a remote possibility. The actual contribution of nuclear weapons to postwar stability, therefore, has been purely theoretical — extra insurance against an unlikely calamity. HOW ABOUT PROLIFERATION AND TERRORISM? Great powers are one thing, some might say, but [rogue states](https://www.foreignaffairs.com/articles/north-korea/armed-and-dangerous) or terrorist groups are another. If they go nuclear, it’s game over — which is why any further proliferation must be prevented by all possible measures, up to and including war. That logic might seem plausible at first, but it breaks down on close examination. Not only has the world already survived the acquisition of nuclear weapons by some of the craziest mass murderers in history (Stalin and Mao), but proliferation has slowed down rather than sped up over time. Dozens of technologically sophisticated countries have considered obtaining nuclear arsenals, but very few have done so. This is because nuclear weapons turn out to be difficult and expensive to acquire and strategically provocative to possess. They have not even proved to enhance status much, as many expected they would. [Pakistan](https://www.foreignaffairs.com/articles/south-asia/2017-06-16/how-normalize-pakistans-nuclear-program) and Russia may garner more attention today than they would without nukes, but would Japan’s prestige be increased if it became nuclear? Did China’s status improve when it went nuclear — or when its economy grew? And would anybody really care (or even notice) if the current British or French nuclear arsenal was doubled or halved? Alarmists have misjudged not only the pace of proliferation but also its effects. Proliferation is incredibly dangerous and necessary to prevent, we are told, because going nuclear would supposedly empower rogue states and lead them to dominate their region. The details of how this domination would happen are rarely discussed, but the general idea seems to be that once a country has nuclear weapons, it can use them to threaten others and get its way, with nonnuclear countries deferring or paying ransom to the local bully out of fear. Except, of course, that in three‐​quarters of a century, the United States has never been able to get anything close to that obedience from anybody, even when it had a nuclear monopoly. So why should it be true for, say, Iran or North Korea? It is far more likely that a nuclear rogue’s threats would cause its rivals to join together against the provocateur — just as countries around the Persian Gulf responded to Saddam’s invasion of Kuwait by closing ranks to oppose, rather than acquiescing in, his effort at domination. If the consequences of proliferation have so far proved largely benign, however, the same cannot be said for efforts to control it. During the 2008 U.S. presidential campaign, Senator Barack Obama of Illinois repeatedly proclaimed his commitment to “do everything in [his] power to prevent Iran from obtaining a nuclear weapon — everything,” and his opponent, the Republican senator from Arizona John McCain, insisted that Iran must be kept from obtaining a nuclear weapon “at all costs.” Neither bothered to tally up what “everything” entailed or what the eventual price tag of “all costs” would be. All they needed to do was consider the fate of one country to understand the potentially disastrous consequences of such thinking. The [Iraq war](https://www.foreignaffairs.com/reviews/capsule-review/2008-05-03/architects-delusion-europe-america-and-iraq-war) had been sold as an act of preventive counter‐​proliferation, with President George W. Bush pointedly warning that “the United States of America will not permit the world’s most dangerous regimes to threaten us with the world’s most destructive weapons.” A nuclear Iraq was considered unacceptable because it would “hold [its] neighbors hostage.” Put aside for a moment the fact that Saddam had actually mothballed his covert weapons of mass destruction programs years earlier, so that the war turned out to be unnecessary by its own rationale. Imagine that Saddam, with his resentful population and unreliable army, had managed to acquire a modest nuclear capability. What would have happened then? What could and would he have done with the weapons? Something worse than launching the war to prevent Iraq from going nuclear, which, along with its aftermath, has killed hundreds of thousands of people and destabilized an entire region? As for nuclear terrorism, ever since al Qaeda operatives used box cutters so effectively to hijack commercial airplanes, alarmists have warned that radical Islamist terrorists would soon apply equal talents in science and engineering to make and deliver nuclear weapons so as to destroy various so‐​called infidels. In practice, however, terrorist groups have exhibited only a limited desire to go nuclear and even less progress in doing so. Why? Probably because developing one’s own bomb from scratch requires a series of risky actions, all of which have to go right for the scheme to work. This includes trusting foreign collaborators and other criminals; acquiring and transporting highly guarded fissile material; establishing a sophisticated, professional machine shop; and moving a cumbersome, untested weapon into position for detonation. And all of this has to be done while hiding from a vast global surveillance net looking for and trying to disrupt such activities. Terrorists are unlikely to get a bomb from a generous, like‐​minded nuclear patron, because no country wants to run the risk of being blamed (and punished) for a terrorist’s nuclear crimes. Nor are they likely to be able to steal one. Notes Stephen Younger, the former head of nuclear weapons research and development at Los Alamos National Laboratory: “All nuclear nations take the security of their weapons very seriously.” The grand mistake of the Cold War was to infer desperate intent from apparent capacity. For the war on terrorism, it has been to infer desperate capacity from apparent intent. DON’T DO STUPID STUFF For nearly three‐​quarters of century, the world has been told it is perched precariously on Rube Goldberg’s precipice, perennially at risk of plunging into apocalyptic devastation. But oddly enough, both we and the weapons are still here. Understanding their actual impact and putting them into the proper context would enable policymakers to view nuclear matters more sensibly. In practice, that would mean retaining the capabilities needed to respond to the wildly unlikely nightmare scenario of having to deter a possible future Hitler while pruning nuclear arsenals and stepping back from dangerous strategies and postures. It would mean [working with North Korea](https://www.foreignaffairs.com/articles/north-korea/2018-10-03/learning-love-kims-bomb) to establish a normal condition in the region and worrying about reducing its nuclear capabilities later. There is nothing wrong with making nonproliferation a high priority — indeed, it would do a favor to countries dissuaded from pursuing nuclear weapons by saving them a lot of money and pointless effort. However, that priority should be topped by a somewhat higher one: avoiding policies that can lead to massive numbers of deaths under the obsessive sway of worst‐​case fantasies.

#### Bioweapons don’t work.

Biological weapons are overrated as a military threat, expert says Publication Date: October 30, 2002 MIT News https://news.mit.edu/2002/anthrax-1030

Despite public fear about the potential use of biological weapons containing germs for diseases like anthrax or smallpox, such weapons never have been considered major arms by military strategists, Senior Fellow Jeanne Guillemin told a colloquium at [MIT's Dibner Institute for the History of Science and Technology](http://dibinst.mit.edu/) on Oct. 22. "I'm not sure biological weapons are on par with nuclear weapons," said Guillemin, a professor of sociology at Boston College. "There was a debate after the war [World War II] about whether biological weapons are weapons of mass destruction. I think we should continue this debate." At the session, titled "Anthrax, Smallpox, and the Invention of the 'Large Area Concept' in the History of Biological Weapons," Guillemin explained that the large area concept developed during the Cold War involved targeting cities and industries, with the major impact on civilian populations. "Biological weapons are more dangerous to civilians than to soldiers," she said, noting that soldiers are vaccinated, trained and carry face masks and other protective gear. Biological weapons - which could contain germs that cause diseases such as anthrax, smallpox, brucellosis or tularemia - are not effective tactical military weapons. They do not immediately harm enemy soldiers on the battlefield, or destroy artillery, tanks or munitions supplies. And each germ has its drawbacks. Smallpox, for example, is highly contagious, so it could harm friendly soldiers. Anthrax is not contagious, but if it gets in the soil for long periods of time, it can kill cattle and other animals. In addition, the efficacy of biological weapons hinges on several factors, including how many germs survive the explosion of the small bomb in which they are contained, whether the wind is blowing in the correct direction and strongly enough to carry the germs over a target, what constitutes a lethal dose, and how many people will get infected or die. Depending on the germ, as few as 1 to 4 percent of the exposed population may get infected, and estimates of mortality rates vary. "If the wind is blowing one way you have a weapon. If not, you don't," said Guillemin. Biological weapons date back to the Middle Ages when plague-ridden bodies were catapulted into castles. In more recent history, during World War II the United Kingdom took a lead role in inventing the first major biological weapons program, putting anthrax and other pathogens into bombs and sprays. The incentive for this program, later shown to be unfounded, was the fear that the Germans were embarked on this same path. "The British coined the large area concept," Guillemin said. "Even before that, U.S. scientists realized that their biological weapons program would be shut down unless they could try to match the scale of nuclear weapons." Until the U.S. offensive program ended in 1969, she said, hundreds of laboratory and field tests were conducted to perfect germ agents for large-scale attacks on cities. In the 1970s, in secret defiance of the 1972 Biological Weapons Convention, the U.S.S.R. created a program on the same - if not greater - scale, Guillemin said. Guillemin was a member of a team of scientists who visited the former Soviet Union in 1992 to interview the families of persons who had died in the 1979 anthrax epidemic in the city of Sverdlovsk. At first, the Soviets blamed the deaths on infected meat, but on the basis of her epidemiological work, an aerosol emission from a nearby secret military facility proved to be the source of the outbreak, the largest of anthrax inhalation in recorded history. An estimated 68 of 5,000 persons exposed died from the 2-3 grams of anthrax affecting the area. This research, published in Science in 1994, provided the first evidence that humans could come down with anthrax as long as six weeks after inhaling the dangerous spores. Consequently, in last year's anthrax postal attacks, persons who had been exposed took antibiotics for as long as three months. Guillemin's book, "Anthrax: The Investigation of a Deadly Outbreak," published by the University of California Press in 1999, chronicles how the mystery of the Sverdlovsk epidemic was solved.

#### Bioterrorism doesn’t work.

Karwa, Manoj MD; Currie, Brian MD, MPH; Kvetan, Vladmir MD, FCCM Bioterrorism: Preparing for the impossible or the improbable, Critical Care Medicine: January 2005 - Volume 33 - Issue 1 - p S75-S95 doi: 10.1097/01.CCM.0000151070.56915.22

Objective: To review the current literature surrounding the history of bioterrorism, the relative risk of a bioterrorist attack, methods of surveillance for biological agents, identification and management of various biological agent casualties, as well as the role of the intensivist in managing a bioterrorist attack. Methods: Internet and Medline search (from 1966 to 2004) for articles relating to bioterrorism, biological agents, biological warfare, hospital preparedness, disaster management, and intensive care. Conclusions: There are few instances of a successful large-scale biological weapons attack in history. Weaponization of biological agents for aerosol dispersal is difficult and has often proved to be the rate-limiting step for a successful attack. Although a successful biological attack is currently unlikely, it is still feasible. More importantly, the threat of one is likely to cause much panic in the public, while a successful attack would overburden the current healthcare infrastructure. Intensivists will need to have specific knowledge of identifying and managing casualties from various biological agents. In addition, they will need to play an integral part in the preparedness of their institutions and communities for managing a bioterrorist event.

#### Climate Change AI doesn’t automatically work to reduce emissions.

AI can fight climate change but there's a catch: Optimization doesn't automatically equal emissions reduction Luminaries of AI such as Yoshua Bengio gathered in Vancouver last month to champion ways machine learning can mitigate global warming. Despite energy, enthusiasm, and brilliant ideas, the work may still need lots of regulation to make sure greenhouse gas emissions are reduced. By [Tiernan Ray](https://www.zdnet.com/meet-the-team/us/tiernan1/) | January 15, 2020 -- 16:25 GMT (08:25 PST) | Topic: [Artificial Intelligence](https://www.zdnet.com/topic/artificial-intelligence/) <https://www.zdnet.com/article/ai-can-fight-climate-change-but-theres-a-catch-optimization-doesnt-automatically-equal-emissions-reduction/>

The good news for planet earth is that [artificial intelligence](https://www.zdnet.com/article/what-is-ai-heres-everything-you-need-to-know-about-artificial-intelligence/) has some brilliant tools that may help slow or reverse global warming. The bad news is that not much will happen unless AI somehow finds the right goals, what's known as the "objective function." A [workshop on AI in climate change in mid-December](https://www.climatechange.ai/NeurIPS2019_workshop.html) gathered hundreds of scholars in Vancouver during the NeurIPS AI conference, including some of the Illuminati of [machine learning](https://www.zdnet.com/article/what-is-machine-learning-everything-you-need-to-know/). The event was sponsored by Google's DeepMind, Microsoft, and [ElementAI](https://www.elementai.com), the AI software and services firm co-founded by [Yoshua Bengio](https://mila.quebec/en/person/bengio-yoshua/), a star in the field of [deep learning](https://www.zdnet.com/article/what-is-deep-learning-everything-you-need-to-know/). Organizers were from [Climate Change AI](https://www.climatechange.ai), a group of volunteer researchers from institutions around the world. [What is artificial general intelligence?](https://www.zdnet.com/article/what-is-artificial-general-intelligence/)  Everything you need to know about the path to creating an AI as smart as a human. [Read More](https://www.zdnet.com/article/what-is-artificial-general-intelligence/) The participants discussed numerous ways to implement neural networks for climate science, including real-time weather predictions, making buildings more energy-efficient, and designing better materials for solar panels. Here's the catch: All of the projects specify some task to be optimized that is not directly tied to reducing greenhouse gas emissions. But reduction of green house gas emissions is the stated goal of all global warming mitigation, and without it, it's not clear meaningful change can happen. [A report last year](https://www.ipcc.ch/sr15/) by the Intergovernmental Panel on Climate Change of the United Nations started that "without increased and urgent mitigation ambition in the coming years, leading to a sharp decline in greenhouse gas emissions by 2030, global warming will surpass 1.5°C in the following decades, leading to irreversible loss of the most fragile ecosystems, and crisis after crisis for the most vulnerable people and societies." The keynote speaker at the event, Jeff Dean of Google, [put the problem bluntly](https://slideslive.com/38922391/computation-systems-vs-climate-change). He offered a chart, based on data from the IPCC report, showing how the planet has to take steps to reduce annual carbon dioxide emissions by as much as 10% a year, amounting to hundreds of "gigatonnes" worth of reduction in CO2, whereas the world is currently increasing CO2 by a couple percent per annum. This has to happen in the next decade to avoid those irreversible effects the IPCC speaks of. "We are effectively running out of time to take action," said Dean. Also: [The Internet of Wild Things: Technology and the battle against biodiversity loss and climate change](https://www.techrepublic.com/article/the-internet-of-wild-things-technology-and-the-battle-against-biodiversity-loss-and-climate-change/) (TechRepublic cover story) | [Download the free PDF version](https://www.techrepublic.com/resource-library/downloads/the-internet-of-wild-things-technology-and-the-battle-against-biodiversity-loss-and-climate-change-cover-story-pdf/) (TechRepublic) Many of the fifty two papers accepted for the workshop are breathtaking in the ingenuity with which they apply machine learning to climate issues, but they are far from the task of actually reducing greenhouse gas emissions. Google's Jeff Dean put up a slide of data on the needed carbon emissions reductions, based on work of the U.N.'s Intergovernmental Panel on Climate Change. "We are effectively running out of time to take action," said Dean. Google For example, [a paper authored by scientists at GE Global Research](https://arxiv.org/abs/1911.04227), the Georgia Institute of Technology, and others, and given a "best paper" recommendation, employs something called an "invertible residual network," a technique that was developed at Google's DeepMind in recent years. The I-ResNet program can ingest pictures of clouds at 1 kilometer in resolution and, going pixel by pixel, categorize what type of cloud it is -- "Altostratus," "Nimbostratus," "Deep Convection," etc. Types of clouds in the world affect climate models, so you can't actually model climate with great accuracy without knowing about which types are present and to what extent. Graphic from the paper "Cumulo: A Dataset for Learning Cloud Classes," by Valentina Zantedeschi et. al. Valentina Zantedeschi et. al. Such work has the potential to improve forecasting, but on its own it obviously is far from actually proposing action that will lead to a reduction in greenhouse gases. A lot of the work has that quality: it is laying the groundwork for years of research but it's not always clear how an optimization will lead to emissions reductions. Featured [These hackers built an elaborate online profile to fool their targets into downloading malware](https://www.zdnet.com/article/these-hackers-posed-as-an-aerobics-instructor-online-to-trick-their-targets-into-downloading-malware/) [I live in a state where it's legal to buy weed, but not high-end gaming PCs](https://www.zdnet.com/article/i-live-in-a-state-where-its-legal-to-buy-weed-but-not-high-end-gaming-pcs/) [The best mobile hotspots: Work securely from just about anywhere](https://www.zdnet.com/article/best-hotspot/) [The best VPNs: Top VPN services reviewed and compared](https://www.zdnet.com/article/best-vpn/) In fact, the organizers, lead by [David Rolnick](http://www.davidrolnick.com), a postdoctoral research fellow at the University of Pennsylvania, [published a 100-page report this past summer](https://arxiv.org/pdf/1906.05433.pdf) that is chock full of fascinating projects, such as improving energy grid forecasting, or better forecasting of road traffic, or how to design better agriculture. In every one of those cases, a single optimization may not lead to any emissions reduction. For example, improving the "shared mobility" culture, such as Uber and Lyft, by making it more efficient, can potentially lead to more miles driven overall, as [Lynn Kaack](https://scholar.google.fr/citations?user=jsy-VxMAAAAJ), a scholar with ETH Zürich points out in a piece on machine learning in transportation. This is known as the "Jevons Paradox," which they describe as a "situation where increased efficiency nonetheless results in higher overall demand." In other words, optimizing something for the purposes of productivity or for the sake of increased profits can actually worsen the greenhouse gas situation. ZDNet reached out to panelists and to Rolnick and the other organizers by email. Representatives for Yoshua Bengio, and Andrew Ng of LandingAI, said that they could not respond in time for this article. The other organizers did not reply to multiple emails. However, there is interesting perspective to be gained from the panel discussion that was held that day, involving Bengio and Ng and Dean, along with Carla Gomes of Cornell University and Lester Mackey of Microsoft. One of the organizers, [Priya Donti](https://priyadonti.com), a doctoral student at Carnegie Mellon in computer science and public policy, asked the panelists an insightful question: How can AI as a discipline incentivize work on climate change given that the focus for the discipline is often on the number of papers published versus the tons of carbon reduced? Bengio replied, "change your objective function," which elicited a lot of laughter. "The sort of projects we're talking about in this workshop can potentially be much more impactful than one more incremental improvement in GANs, or something." Carla Gomes, center, who runs the "Computational Sustainability" program at Cornell University, flanked by Andrew Ng of LandingAI, left, and Lester Mackey of Microsoft, right. AI, said Gomes, has been "unfortunately developed for a single objective," and for ethical AI, she suggested, "we should really develop systems that can understand the impacts across different dimensions." Climate Change AI It was a wry observation about the field, but the panelists acknowledged a deeper problem, that merely making good neural networks won't lead to emissions reduction on its own. Rolnick asked the panelists what should be done about AI that improves fossil fuel discovery, thereby potentially leading to a Jevon's Paradox of increased CO2. Bengio replied, again, to much laughter, "public shaming." Gomes replied that AI has "unfortunately developed for a single objective [...] we should really develop systems that can understand the impacts across different dimensions." Even that may not be enough. AI may need some external forces to direct and shape its optimizations. That may mean aligning the cost benefits of "smarter everything" -- IoT, [smart cities](https://www.zdnet.com/topic/smart-cities/), ride sharing, etc. -- with the goal of emissions reduction. And that may require increased regulation, if private enterprise can't commit itself in earnest. It's easy to be both thrilled with the work on display in December and also discouraged by the lack of imminent progress in emissions reduction. However, one of the invited speakers, [Felix Creutzig](https://www.mcc-berlin.net/en/about/team/creutzig-felix.html), who is an author of the IPCC report, had a more upbeat view of the big picture. Creutzig was asked by an audience member if the field is just fooling itself, "wasting time digressing from the important issues that are going wrong in policy?" "I would be not too pessimistic about it," he replied. "We have technologies that are already available" such as electric vehicles, "and there is a lot of pressure to change, so I wouldn't be too pessimistic about anything not happening." Update: Following the publication of the article, organizer Priya Donti was in touch via email. Donti writes that "there is still much work to be done, both within and outside of machine learning" and that the kinds of work shown at the workshop need to be "applied in parallel to (or to accelerate) action of other kinds, such as policy." Donti also refers to multiple "practical challenges" for the field. "These include forging meaningful connections between ML practitioners and those from other relevant fields, unifying and standardizing data from disparate sources, integrating proposed solutions with legacy systems, and changing incentives within the ML field to encourage impactful work on climate change."