

**Written Statement of Robert Playter
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U.S. Senate AI Insight Forum: Risk, Alignment, & Guarding Against Doomsday Scenarios
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Leader Schumer, Senator Rounds, Senator Heinrich, Senator Young, and distinguished members of the Senate, thank you for the opportunity to participate in this important AI Insight Forum. Boston Dynamics, founded over 30 years ago by a Massachusetts Institute of Technology professor and his students, including myself, is at the forefront of an industry in which advanced mobile robots will become more common in both industrial and public spaces. From the outset of our research, we envisioned a future in which robots could move with the physicality and grace of people and animals and thereby become much more useful than fixed-place robots common in factories. We are best known for making the first legged robots capable of negotiating steps, stairs, rough terrain and all manner of obstacles with ease. About five years ago, we turned from decades of research towards commercialization. Today, we offer two advanced mobile manipulation robots, Spot, a quadruped robot used in factories, energy production, construction, entertainment and public safety, and a box-moving robot, Stretch, used in the logistics industry. Headquartered in Waltham, MA, with a growing workforce of approximately 750 employees, we proudly design and manufacture our robots in the United States.

As we began to sell these advanced technologies into society, we established an [ethical framework](#) for their use, implemented via provisions in our terms and conditions of sale, and have engaged with policymakers across the country to understand and collaborate on a broad range of policy topics to expand on that ethical vision. The emergence of robots with unprecedented mobility and “intelligence” brings great promise for enhancing human life but also brings great apprehension in a skeptical public. In the next decade, mobile robots will become increasingly common in public, in our places of work and our homes. These robots will demonstrate unprecedented levels of autonomy and mobility, enabled by advances in artificial intelligence. The willingness of the public to accept these new machines is dependent upon trust in the technology to protect their privacy, physical safety, and well-being. As stewards of this new technology and the innovative businesses they enable, we seek to build the public’s trust in this new and highly anticipated class of robots. I am honored and grateful for the opportunity to share my perspectives on advanced robotics, and its growing intersection with AI. This is a timely and important topic for policymakers engaged on the benefits and risks of AI.

“Artificial Intelligence” Means Different Things

In the context of robots and their intersection with AI, it is important to recognize that there are distinctions between types of AI. For example, so-called “Narrow AI” involves intelligent systems that specialize in capabilities as varied as computer vision, natural language processing or motion control and are designed for different purposes such as cameras to read license plates, chat-bots, or robots that produce extraordinary mobility. The technology underlying these advances varies widely and progress along one narrow set of AI skills does not necessarily portend significant progress in other aspects of AI. Our Atlas robot can do a backflip and dance with something approaching human-like skill, but it won’t tie shoelaces for years or maybe decades, something we generally learn as a child. In fact, a common

misconception is to attribute broad artificial intelligence to any machine that demonstrates surprisingly sophisticated behavior.

A so-called “Artificial General Intelligence” is a system with comprehensive knowledge and cognitive computing capabilities akin to human intelligence. As manufacturers of robots, at present, we aren’t aware of any true AGI systems, or any on the immediate horizon, but fear of AGI drives many dystopian science-fiction narratives. And in particular, robots that have an animal or humanoid form factor and demonstrate surprisingly sophisticated motion are wrongly assumed to be empowered with AGI, as depicted in many robot “doomsday scenario” movies and television shows.

It is important to recognize the different kinds of AI and to avoid the fallacy of extrapolating from advances in one realm of AI to all branches of AI. These distinctions among different types of AI are important because, as AI and robotics converge, it will be important not to regulate AI as one monolithic thing. Policymakers should keep in mind the impact of AI regulation on the robotics industry, which has received limited policy attention.

While AI is Already Empowering Robots to be Smarter, Robot “Doomsday” Remains Implausible

Robots, as an implementation of Narrow AI, embody different AI technologies. Progress in robotic capabilities tends to focus on incremental improvements, via the convergence of multiple forms of Narrow AI. While it may appear the progress has been sudden because real walking robots are now broadly visible, many of us in the industry have spent multi-decade careers to get the technology to a place that it warrants public attention. The rate of adoption of new AI technologies is often noted as a key risk that could limit society's ability to adapt. Robots are complex electro-mechanical systems powered with software that still must be reliably and affordably produced. Unlike pure software systems, there is a fundamental rate limit to progress with such systems that probably buys us many years before these machines are widely adopted.

Nevertheless, the recent advances in AI are exciting and promise to accelerate the development of a new generation of mobile robots. Computer vision enables robots to perceive their environment, recognize objects and offer contextually relevant services. Vision as well as natural language processing will enable us to more easily communicate with robots using language and gestures. Machine learning is increasingly used to create the motion control software that drives the robots, enabling an acceleration in their development. In the not too distant future, robots will use AI technologies to learn the tasks they should perform simply by observing other people or other robots doing that task.

Additionally, AI will improve robot safety. Robots that better understand the world around them will be safer when they interact with people. Consider the following example of how regulation of AI intended to address one challenge could have an unanticipated negative impact elsewhere: While privacy interests may compel computer vision training sets comprised of pictures of people in public to have blurred faces to protect privacy and identity, robots may learn better how to detect and safely move near people with an unblurred training set, because robots will encounter non-blurred faces in the world. The right approach to AI regulation will investigate these downstream effects. Similarly, the ability of AI to detect people accurately without bias resulting from gender, racial or other differences, would make an

AI-enabled robot safety feature safer. Like others, we share an interest in effective AI regulation so that these technologies can be free from bias or inaccurate information, not only as a provider of embodied AI in the world, but also as an end-user and beneficiary of AI innovations.

This is why it is important not to let fearful narratives overshadow the many beneficial uses. We can readily contrast doomsday scenarios of Terminator and Black Mirror with the more positive stories of C-3PO and Wall-E. We must recognize that in the real world, robots are overwhelmingly positive, and beneficially automate dull, dirty and dangerous tasks, and those that humans simply cannot perform.

Policy Ideas and Recommendations

With a view towards appreciating the benefits of AI-powered robots, while also acknowledging and working on specific emergent risks, I respectfully offer a series of ideas and recommendations at the intersection of AI and robotics, for your consideration.

1. Prohibit Weaponization of General-Purpose Robots

Our vision for robots that are broadly accepted by the public and become a major new industry in the United States is placed at risk when such robots are weaponized or used to harm people. As advanced robots have become increasingly accessible, we have seen examples of people mounting dangerous weapons to them, often with the goal of creating a sensational, viral social media video reminiscent of fictionalized movie characters. These videos have generated widespread fear and condemnation in the press, government, academia, and among online communities. Mounting weapons to robots that are remotely or autonomously operated, widely available to the public, and capable of navigating within locations where people live and work, raises new risks of harm and serious ethical issues.

Last year, we and other leading robot industry organizations published an [open letter](#) pledging not to weaponize our advanced-mobility general-purpose robots, and to not support others doing so. These principles have been included in our legal terms and conditions of sale since we started selling our robots. As AI makes robots smarter and more autonomous, this should be a priority policy initiative: prohibit the weaponization of robots in civilian society. We have been working with state lawmakers in Massachusetts and in other states, to develop legislation to prohibit the manufacture, sale, use or operation of a robot that is mounted with a weapon. Appropriately, these policies leave unaffected military systems and contractors, whose development and manufacturing activities are not at issue, and do not prohibit the important work of bomb squad officials who use robots to safely disable suspected explosives.

We welcome technological solutions to this challenge as well. Indeed, our open letter from last year specifically welcomed research on technology solutions. As with other aspects of AI, technology-based solutions can often more effectively address a concern than policy. Two potential technology solutions come to mind: misuse detection and emergency stop devices.

We have experimented with methods to detect the weaponization of robots and have learned that this is a complex, substantial undertaking. Broader government leadership will be required to bring the rest of the robotics industry on board with investing in technology solutions. The US government could

lead the way by launching a “grand challenge” type prize, or by funding research to determine how robots could detect that they have been weaponized or misused, and then take action to prevent further misuse.

Many robots currently utilize an “emergency stop” button that can disable the robot in case of an emergency, similar to other industrial equipment. However, the operation of robots in public spaces, including on uneven terrain or stairs, makes this function a more complicated proposition. If a robot is fully disabled via e-stop while climbing stairs, does it become more dangerous by falling down onto someone below? If anyone can activate a robot’s e-stop, will public safety robot application suffer? If not everyone has access to a robot e-stop, how do we determine who does, and secure the function from bad actors? Some of the basic assumptions about technological safeguards that have long been borrowed from older industrial robots must be revisited in an era of highly mobile, AI-powered robots deployed across society. We would very much welcome collaborative federal leadership and standards on these questions.

2. Urge Federal Guidance on Law Enforcement Use

Although only a small percentage of our customer base, public safety applications have a very direct impact on keeping people safe. Spot protects bystanders, suspects and officers by maintaining distance from armed, barricaded suspects, investigating suspicious packages, delivering a communications link, food or water, and de-escalating conflicts during negotiations leading to surrender. In one example from Florida, a Spot robot [helped police rescue a three year old child](#) who had been taken hostage. Officers used the robot to see into the car where the child was trapped, enabling them to rescue the child unharmed. By being able to easily identify and open doors and climb up stairs in these incredibly dangerous situations, this type of quadruped robot is better able to keep communities safe than old-fashioned robots on wheels.

However, the use of robots by law enforcement has generated intense controversy, perhaps with a view to fictitious “RoboCop” doomsday scenarios. For example, we participated in two City Council [hearings](#) this year in Los Angeles concerning the approval of a donated robot to LAPD. The hearings were very contentious and lasted for hours, culminating in scant approval with no votes to spare. Unfortunately, those who wish to sensationalize controversy use robots to divert attention from core issues, such as the generalized relationship between police and their communities. This potential rejection of technology puts in jeopardy the enormous public safety benefits of using robots in these missions.

We have been proactive in encouraging community outreach by our public safety customers and now require our US law enforcement customers to develop policies regarding their use of our robot and to share those policies with their communities, as a way of educating and making clear that the robot’s use is of benefit to everyone. As a policy recommendation, we would urge that policy guidance and best practices be developed and published by federal agencies such as the Department of Justice and the Federal Bureau of Investigation on the integration of advanced robots into police departments.

3. Support Robotics STEM Education to Counter Workforce Displacement

One “doomsday” scenario long imagined is that robots will take everyone’s jobs. We do not believe this to be realistic, but we are concerned that robots will have the initial effect of disrupting jobs

people have today, especially in the field of warehouse automation. While this concern is not unique to robots, it is foreseeable that robots with legs and powered by AI will be perceived as more of a direct replacement for workers than other less anthropocentric technologies such as conveyor belts. Thus, the convergence of AI and robotics makes this issue more urgent and tangible. Our policy recommendation is for the government to do more to support STEM education and workforce training, specifically on robotics to ensure the workforce is trained to take advantage of robotic tools in the workplace. This is how someone in, say, a warehouse, goes from moving heavy boxes out of trucks (a literally back-breaking job) to becoming the “robot wrangler” of robots that do this work more productively. We are eager to learn how we might be able to contribute to a larger effort to train the automated workforce of the future. As an initial start in these efforts, we have partnered with select schools to develop a high school and community college STEM curriculum program for Spot that we will be more formally announcing soon.

4. Ensuring the United States Leads in Robotics

One “doomsday” scenario is that the thought-leadership in AI and robotics, including here at this Forum, will be irrelevant because the technology in question will be developed overseas and simply shipped to the United States as a finished product. Like many companies based in the US who develop high-tech products, we view our greatest long-term competition as likely being Chinese tech startups. As we have seen in the flying robot (i.e. commercial drone) industry, over the long run and with the advantages of scaled manufacturing and favorable government policies, Chinese tech producers who are fast-followers can become market leaders. So far, in the advanced robotics space, the Chinese have introduced products that are not nearly as good, but they are far less expensive than those developed and manufactured in the United States. In some cases, we have seen that the competition is making use of stolen intellectual property and trade secrets, with no feasible legal recourse to US-base innovators. While US-based robotics innovations currently lead the world, a clear threat is emerging.

Another reason for concern is that products developed overseas may not be as secure as ours, and therefore are a risk in the kinds of facilities where robots such as Spot are often operated, such as semiconductor fabrication plants, nuclear power plants, oil refineries, port facilities, and government buildings, or when used in agency operations. For example, we recently noticed with some surprise a video of U.S. Marines [testing a Chinese-made robot dog](#) armed with an M72 rocket launcher.

Other countries have national robotics strategies. For example, China’s Ministry of Industry and Information Technology [recently announced plans](#) to dominate the humanoid robotics industry by 2027. This follows from its [five-year plan](#) announced in 2021, along with 14 other Chinese government departments, laying out a plan to position China as a global robotics leader. We have not seen a recent national robotics strategy issued by the US government, nor has recent federal legislation encouraged the use of robots in key industries. Our recommendation for policy solutions to counter foreign competition includes standing up a cross-government national robotics task force, developing a national robotics strategy, re-committing the Congressional Robotics Caucus to engage in substantive work on the issues we have raised, and examining the security of foreign robotics products. We stand ready to advise and assist the US government in these and other collaborative efforts.