

Killer robots: World's top AI and robotics companies urge United Nations to ban lethal autonomous weapons

Open letter by leaders of leading robotics & AI companies is launched at the world's biggest artificial intelligence conference as UN delays meeting till later this year to discuss the robot arms race

An open letter signed by 116 founders of robotics and artificial intelligence companies from 26 countries urges the United Nations to urgently address the challenge of lethal autonomous weapons (often called 'killer robots') and ban their use internationally.

In December, 123 member nations of the UN's Review Conference of the Convention on Conventional Weapons unanimously agreed to begin formal discussions on autonomous weapons. Of these, 19 have already called for an outright ban.

Released at the opening of the International Joint Conference on Artificial Intelligence in Melbourne, the world's pre-eminent gathering of top experts in artificial intelligence (AI) and robotics, the open letter is the first time that AI and robotics companies have taken a joint stance on the issue. Previously, only a single company, Canada's Clearpath Robotics, had formally called for a ban on lethal autonomous weapons.

"Lethal autonomous weapons threaten to become the third revolution in warfare," the letter states. "Once developed, they will permit armed conflict to be fought at a scale greater than ever, and at timescales faster than humans can comprehend.

"These can be weapons of terror, weapons that despots and terrorists use against innocent populations, and weapons hacked to behave in undesirable ways. We do not have long to act. Once this Pandora's box is opened, it will be hard to close," it states, concluding with an urgent plea for the UN "to find a way to protect us all from these dangers."

Signatories of the new letter include:

- **Elon Musk**, founder of Tesla, SpaceX and OpenAI (USA)
- **Mustafa Suleyman**, founder and Head of Applied AI at Google's DeepMind (UK)
- **Esben Østergaard**, founder & CTO of Universal Robotics (Denmark)
- **Jerome Monceaux**, founder of Aldebaran Robotics, makers of Nao and Pepper robots (France)
- **Jürgen Schmidhuber**, leading deep learning expert and founder of Nnaisense (Switzerland)
- **Yoshua Bengio**, leading deep learning expert and founder of Element AI (Canada)

Their companies employ tens of thousands of researchers, roboticists and engineers, are worth billions of dollars and cover the globe from North to South, East to West: Australia, Canada, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Iceland, India, Ireland, Italy, Japan, Mexico, Netherlands, Norway, Poland, Russia, Singapore, South Africa, Spain, Switzerland, UK, United Arab Emirates and USA.

Toby Walsh, Scientia Professor of Artificial Intelligence at the University of New South Wales in Sydney, is one of the organisers of the open letter, as well as a letter released in 2015 warning of the dangers of autonomous weapons, which was signed by thousands of researchers in AI and robotics working in universities and research labs around the world

"Nearly every technology can be used for good and bad, and artificial intelligence is no different," said Walsh. "It can help tackle many of the pressing problems facing society today: inequality and poverty, the challenges posed by climate change and the ongoing global financial crisis. However, the same technology can also be used in autonomous weapons to industrialise war.

"We need to make decisions today choosing which of these futures we want. I strongly support the call by many humanitarian and other organisations for an UN ban on such weapons, similar to bans on chemical and other weapons," he added.

"Two years ago at this same conference, we released an open letter signed by thousands of researchers working in AI and robotics calling for such a ban. This helped push this issue up the agenda at the United Nations and begin formal talks. I am hopeful that this new letter, adding the support of the AI and robotics industry, will add urgency to the discussions at the UN that should have started today."

"The number of prominent companies and individuals who have signed this letter reinforces our warning that this is not a hypothetical scenario, but a very real, very pressing concern which needs immediate action. Ryan Garipey, founder & CTO of Clearpath Robotics was the first to sign the letter. He noted, "We should not lose sight of the fact that, unlike other potential manifestations of AI which still remain in the realm of science fiction, autonomous weapons systems are on the cusp of development right now and have a very real potential to cause significant harm to innocent people along with global instability." He added, "The development of lethal autonomous weapons systems is unwise, unethical, and should be banned on an international scale. "

Yoshua Bengio, founder of Element AI and a leading Deep Learning expert, said "I signed the open letter because the use of AI in autonomous weapons hurts my sense of ethics, would be likely to lead to a very dangerous escalation, because it would hurt the further development of AI's good applications, and because it is a matter that needs to be handled by the international community, similarly to what has been done in the past for some other morally wrong weapons (biological, chemical, nuclear)."

Stuart Russell, founder & VP of Bayesian Logic Inc and author of the leading text in AI, said "Unless people want to see new weapons of mass destruction - in the form of vast swarms of lethal microdrones - spreading around the world, it's imperative to step up and support the United Nations's efforts to create a treaty banning lethal autonomous weapons. This is vital for national and international security."

The open letter follows:

This open letter will be released at the start of the world's leading conference on artificial intelligence, [IJCAI 2017](#) in Melbourne, Australia. A special focus of this conference are the technical, legal, social and other challenges posed by autonomy especially in areas like the battlefield.

As companies building the technologies in Artificial Intelligence and Robotics that may be repurposed to develop autonomous weapons, we feel especially responsible in raising this alarm.

We warmly welcome the decision of the UN's Conference of the Convention on Certain Conventional Weapons (CCW) to establish a Group of Governmental Experts (GGE) on Lethal Autonomous Weapon Systems. Many of our researchers and engineers are eager to offer technical advice to your deliberations.

We commend the appointment of Ambassador Amandeep Singh Gill of India as chair of the GGE. We entreat the High Contracting Parties participating in the GGE to work hard at finding means to prevent an arms race in these weapons, to protect civilians from their misuse, and to avoid the destabilizing effects of these technologies.

We regret that the GGE's first meeting, which was due to start today, has been cancelled due to a small number of states failing to pay their financial contributions to the UN. We urge the High Contracting Parties therefore to double their efforts at the first meeting of the GGE now planned for November.

Lethal autonomous weapons threaten to become the third revolution in warfare. Once developed, they will permit armed conflict to be fought at a scale greater than ever, and at timescales faster than humans can comprehend. These can be weapons of terror, weapons that despots and terrorists use against innocent populations, and weapons hacked to behave in undesirable ways. We do not have long to act. Once this Pandora's box is opened, it will be hard to close.

We therefore implore the High Contracting Parties to find a way to protect us all from these dangers.

BACKGROUND

The International Joint Conference on Artificial Intelligence (IJCAI) is the world's leading conference on artificial intelligence. It has been held every two years since 1969, and annually since 2015. It attracts around 2,000 of the best researchers working in AI from around the world. [IJCAI 2017](#) is currently being held in Melbourne, Australia.

There will be a news conference at 11am on Monday 21 August 2017 to open the IJCAI 2017 conference at the Melbourne Exhibition and Conference Centre, where we will answer questions on the technical, legal and social challenges posed by autonomy especially in areas like the battlefield, and on the open letter.

Two years ago, at IJCAI 2015, more than 1,000 AI researchers released an open letter calling for a ban on lethal autonomous weapons. Signatories to this letter have [now grown to over 17,000](#).

As part of Melbourne's [Festival of Artificial Intelligence](#), there will be a public panel on Wednesday 23 August, 5.30 to 7.00pm, entitled, 'Killer robots: The end of war?'. The panel features Stuart Russel, Ugo Pagallo and Toby Walsh. This is part of [AI Lounge](#), a conversation about artificial intelligence open to the public and media every night from 21 to 25 August 2017 (see <http://tinyurl.com/ailounge>)

Toby Walsh's new book, [It's Alive!: Artificial Intelligence from the Logic Piano to Killer Robots](#), just published by Black Inc, covers the arguments for and against lethal autonomous weapons in detail.

To obtain a press pass to attend the IJCAI 2017 conference in Melbourne, please contact Vesna Sabljakovic-Fritz, IJCAI executive secretary, on sablja@dbai.tuwien.ac.at

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FULL LIST OF SIGNATORIES TO THE OPEN LETTER

Tiberio Caetano, founder & Chief Scientist at Ambiata, Australia.
Mark Chatterton and Leo Gui, founders, MD & of Ingenious AI, Australia.
Charles Gretton, founder of Hivery, Australia.
Brad Lorge, founder & CEO of Premonition.io, Australia
Brenton O'Brien, founder & CEO of Microbic, Australia.
Samir Sinha, founder & CEO of Robonomics AI, Australia.
Ivan Storr, founder & CEO, Blue Ocean Robotics, Australia.
Peter Turner, founder & MD of Tribotix, Australia.
Yoshua Bengio, founder of Element AI & Montreal Institute for Learning Algorithms, Canada.
Ryan Gariepy, founder & CTO, Clearpath Robotics, Canada.
James Chow, founder & CEO of UBTECH Robotics, China.
Robert Li, founder & CEO of Sankobot, China.
Marek Rosa, founder & CEO of GoodAI, Czech Republic.
Søren Tranberg Hansen, founder & CEO of Brainbotics, Denmark.
Markus Järve, founder & CEO of Krakul, Estonia.
Harri Valpola, founder & CTO of ZenRobotics, founder & CEO of Curious AI Company, Finland.
Esben Østergaard, founder & CTO of Universal Robotics, Denmark.
Raul Bravo, founder & CEO of DIBOTICS, France.
Raphael Cherrier, founder & CEO of Qucit, France.
Jerome Monceaux, founder & CEO of Spoon.ai, founder & CCO of Aldebaran Robotics, France.
Charles Ollion, founder & Head of Research at Heuritech, France.
Anis Sahbani, founder & CEO of Enova Robotics, France.
Alexandre Vallette, founder of SNIPS & Ants Open Innovation Labs, France.

Marcus Frei, founder & CEO of NEXT.robotics, Germany.
Kirstinn Thorisson, founder & Director of Icelandic Institute for Intelligence Machines, Iceland.
Fahad Azad, founder of Robosoft Systems, India.
Debashis Das, Ashish Tupate, Jerwin Prabu, founders (incl. CEO) of Bharati Robotics, India.
Pulkit Gaur, founder & CTO of Gridbots Technologies, India.
Pranay Kishore, founder & CEO of Phi Robotics Research, India.
Shahid Memom, founder & CTO of Vanora Robots, India.
Krishnan Nambiar & Shahid Memon, founders, CEO & CTO of Vanora Robotics, India.
Achu Wilson, founder & CTO of Sastra Robotics, India.
Neill Gernon, founder & MD of Atrovate, founder of Dublin.AI, Ireland.
Parsa Ghaffari, founder & CEO of Aylie, Ireland.
Alan Holland, founder & CEO of Keelvar Systems, Ireland.
Alessandro Prest, founder & CTO of LogoGrab, Ireland.
Alessio Bonfietti, founder & CEO of MindIT, Italy.
Angelo Sudano, founder & CTO of ICan Robotics, Italy.
Shigeo Hirose, Michele Guarnieri, Paulo Debenest, & Nah Kitano, founders, CEO & Directors of HiBot Corporation, Japan.
Luis Samahí García González, founder & CEO of QOLbotics, Mexico.
Koen Hindriks & Joachim de Greeff, founders, CEO & COO at Interactive Robotics, the Netherlands.
Maja Rudinac, founder and CEO of Robot Care Systems, the Netherlands.
Jaap van Leeuwen, founder and CEO Blue Ocean Robotics Benelux, the Netherlands.
Dyrkoren Erik, Martin Ludvigsen & Christine Spiten, founders, CEO, CTO & Head of Marketing at BlueEye Robotics, Norway.
Sergii Kornieiev, founder & CEO of BaltRobotics, Poland.
Igor Kuznetsov, founder & CEO of NaviRobot, Russian Federation.
Aleksey Yuzhakov & Oleg Kivokurtsev, founders, CEO & COO of Promobot, Russian Federation.
Junyang Woon, founder & CEO, Infinium Robotics, former Branch Head & Naval Warfare Operations Officer, Singapore.
Jasper Horrell, founder of DeepData, South Africa.
Toni Ferrate, founder & CEO of RO-BOTICS, Spain.
José Manuel del Río, founder & CEO of Aisoy Robotics, Spain.
Victor Martin, founder & CEO of Macco Robotics, Spain.
Timothy Llewellynn, founder & CEO of nViso, Switzerland.
Francesco Mondada, founder of K-Team, Switzerland.
Jurgen Schmidhuber, Faustino Gomez, Jan Koutník, Jonathan Masci & Bas Steunebrink, founders, President & CEO of Nnaisense, Switzerland.
Satish Ramachandran, founder of AROBOT, United Arab Emirates.
Silas Adekunle, founder & CEO of Reach Robotics, UK.
Steve Allpress, founder & CTO of FiveAI, UK.
Joel Gibbard and Samantha Payne, founders, CEO & COO of Open Bionics, UK.
Richard Greenhill & Rich Walker, founders & MD of Shadow Robot Company, UK.
Nic Greenway, founder of React AI Ltd (Aiseedo), UK.
Daniel Hulme, founder & CEO of Satalia, UK.
Charlie Muirhead & Tabitha Goldstaub, founders & CEO of CognitionX, UK.
Geoff Pegman, founder & MD of R U Robots, UK.
Mustafa Suleyman, founder & Head of Applied AI, DeepMind, UK.
Donald Szeto, Thomas Stone & Kenneth Chan, founders, CTO, COO & Head of Engineering of PredictionIO, UK.
Antoine Biondeau, founder & CEO of Sentient Technologies, USA.
Brian Gerkey, founder & CEO of Open Source Robotics, USA.
Ryan Hickman & Soohyun Bae, founders, CEO & CTO of TickTock.AI, USA.
Henry Hu, founder & CEO of Cafe X Technologies, USA.
Alfonso Íñiguez, founder & CEO of Swarm Technology, USA.

Gary Marcus, founder & CEO of Geometric Intelligence (acquired by Uber), USA.
Brian Mingus, founder & CTO of Latently, USA.
Mohammad Musa, founder & CEO at Deepen AI, USA.
Elon Musk, founder, CEO & CTO of SpaceX, co-founder & CEO of Tesla Motor, USA.
Rosanna Myers & Dan Corkum, founders, CEO & CTO of Carbon Robotics, USA.
Erik Nieves, founder & CEO of PlusOne Robotics, USA.
Steve Omohundro, founder & President of Possibility Research, USA.
Jeff Orkin, founder & CEO, Giant Otter Technologies, USA.
Dan Reuter, found & CEO of Electric Movement, USA.
Alberto Rizzoli & Simon Edwardsson, founders & CEO of AIPoly, USA.
Dan Rubins, founder & CEO of Legal Robot, USA.
Stuart Russell, founder & VP of Bayesian Logic Inc., USA.
Andrew Schroeder, founder of WeRobotics, USA.
Gabe Sibley & Alex Flint, founders, CEO & CPO of Zippy.ai, USA.
Martin Spencer, founder & CEO of GeckoSystems, USA.
Peter Stone, Mark Ring & Satinder Singh, founders, President/COO, CEO & CTO of Cogitai, USA.
Michael Stuart, founder & CEO of Lucid Holdings, USA.
Massimiliano Versace, founder, CEO & President, Neurala Inc, USA.