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KNOWLEDGE ABOVE ALL

THE FEUD THAT CREATED AMERICA'S GREATEST RACE CAR

BY SHREEYESH S.

It all started with a business deal gone bad. In 1963, Henry Ford II, "the Deuce," decided he wanted Ford Motor Company to go racing. The only problem: Ford didn't have a sports car in its portfolio. The quickest way to acquire a sports car, the Deuce thought, was to buy Ferrari, then a race car company that only sold street-legal machines to fund its track exploits. Ford sent an envoy to Modena, Italy, to hash out a deal with Enzo Ferrari. The Americans offered $10 million, but as the negotiations neared their conclusion, Ferrari baulked at a clause in the contract that said Ford would control the budget (and thus, the decisions) for his race team. Ferrari, known otherwise as “Il Commendatore,” couldn’t stomach the surrender of autonomy, so he bailed, sending Henry Ford II a message the Deuce didn’t often hear: There was something his money couldn’t buy. In lieu of the sale, Ford decided to direct his company’s cash and engineering toward petty revenge. He decreed Ford would start its own race team, with the singular goal of beating Ferrari in the world’s most prestigious race, the 24 Hours of Le Mans.

“They spent a lot of money, but that was no guarantee you’d win a race,” says Preston Lerner, author of *Ford GT: How Ford Silenced the Critics, Humbled Ferrari and Conquered Le Mans*. “[Ford] also had to bring in the right people to win. They had to have the mechanics, the race organization people, the drivers.It could’ve been a glorious failure.”

And in 1964 and 1965, it was. Ford’s new race car was fast, but they couldn’t figure out how to make it last for 24 hours. Gearboxes broke. Head gaskets blew. The aerodynamics were a mess, too, with cars developing so much lift they’d see wheelspin at 200 mph. After two aerodynamically unstable GT40s crashed during testing in 1964, one test driver, Roy Salvadori, quit. “I opted out of that program to save my life,” he said.

This car, a Superformance GT40 Mark II, is a “continuation car,” a street-legal re-creation of the winning 1966 Le Mans car. In fact, this particular GT40 Mk II was used in the new film Ford v. Ferrari, based on the legendary story. It’s magnificent. And like both the 2005-2006 Ford GT and the current GT model released in 2017, the Superformance owes its existence to that long-ago battle of egos between two stubborn industrialists. The 1966 GT40 Mk II feels like such a fully realized race machine, it’s hard to believe it started out as a half-baked effort that was not only uncompetitive but dangerous.

INTRODUCING JAPAN'S LITHIUM ION BATTERY-POWERED SUBMARINE

ANURAG PULIKOTIL
STUDENT

Japan’s submarine fleet is getting a major upgrade, and it’s likely the same tech found in the device you’re using to read this article. The new submarine Toryu, or “Fighting Dragon,” is equipped with lithium-ion batteries, which power most of the consumer technology available worldwide. The result is submarines capable of cruising silently underwater longer than ever. All diesel-powered submarines use batteries to travel silently underwater. The batteries are charged by the diesel engine, which needs oxygen to run. This in turn requires the submarine to surface, or at the very least snorkel, which exposes the periscope, an air intake, and an exhaust port above the surface of the water. Although small, these bits of equipment can be detected by radars, bringing unwanted attention from enemy anti-submarine ships and planes. Some modern submarines use an air-independent propulsion system instead of regular diesel engines to travel underwater and recharge their batteries. This increases the amount of time a submarine can travel underwater, but it's noisier than battery propulsion. The better the batteries, the longer a submarine can travel—and fight—underwater. Since World War II, submarines have used lead-acid batteries.

Lead-acid batteries are heavy, but they’re also a proven technology. They’re also obsolete in the consumer world, replaced in the 1990s by nickel-metal hydride batteries. Today’s devices are powered by even better technology, lithium-ion batteries. Toryu, built by Kawasaki Heavy Industries and launched on November 6th, is equipped with lithium-ion batteries. Lithium-ion batteries are lighter and have a higher energy density, meaning a pound of lithium-ion batteries will store more electricity than a pound of lead acid. Lithium-ion batteries also hold their charge longer and are faster to recharge. Toryu will be able to sit quietly on the bottom of the ocean, waiting in ambush for the enemy fleet, then sneak away on battery power after it unleashes a salvo of torpedoes. Lithium-ion batteries aren’t a risk-free technology. Lithium catches fire when exposed to water, a precarious situation for a submarine. In the event of a leak, the batteries must be shielded from water at all costs. Lithium fires are hot, burning at up to 3,600 degrees Fahrenheit, and release hydrogen gas. Hydrogen gas buildup on submarines is very bad because a submarine is a small, enclosed space and hydrogen gas is flammable. A hydrogen gas buildup is one theory behind the sinking of the U.S. Navy submarine Scorpion.

ROBOTS NEED TO KNOW THEY CAN DIE AT ANY MINUTE, JUST LIKE THE REST OF US

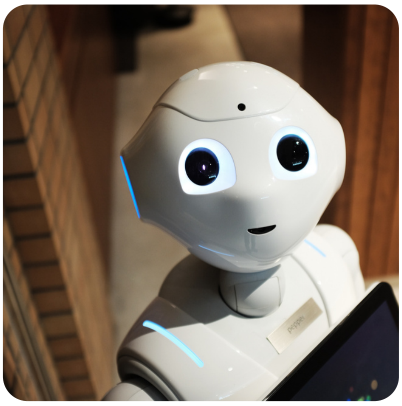
MANDAR PITALE
STUDENT

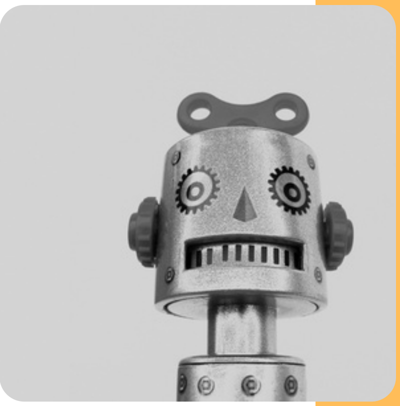
Cognitive scientists suggest in a new paper that machines could model human vulnerability in order to make better decisions.
Humans in survival mode must make complex decisions with dire consequences, and scientists suggest modelling this mode could add depth and "emotion" to machines.
A machine that understands risk and threat could, in turn, make better decisions in applications to care, industry, and more.
How do you get machines to perform better? Tell them they could croak at any minute. In a new paper from the University of Southern California, scientists say that "in a dynamic and unpredictable world, an intelligent agent should hold its own meta-goal of self-preservation."

Lead researcher Antonio Damasio is a luminary in the field of intelligence and the brain. In his profile at the Edge Foundation, they say Damasio "has made seminal contributions to the understanding of brain processes underlying emotions, feelings, decision-making and consciousness." At USC, he's co-director of the Brain and Creativity Institute (BCI) with his equally luminous wife, Hanna Damasio.

Damasio's paper, coauthored with BCI researcher Kingson Man, is a model based on philosophy and science of mind paired with accumulating research into robotics technology. They published the paper in Nature Machine Intelligence, a title usually meant as "Nature's [Journal of] Machine Intelligence" but in this case, strangely prescient.

Damasio and Man suggest the way to make resilient robots isn't to make them impenetrably strong, but rather, to make them vulnerable in order to introduce ideas like restraint and self-preserving strategy. "If an AI can use inputs like touch and pressure, then it can also identify danger and risk-to-self," ScienceAlert summarized.
the way more and more complex materials and computing are bringing machines steps toward our level, not the other way around.





IS TRASH A FORM OF RENEWABLE ENERGY?

ROHAN THAKUR
STUDENT

OUR ENTIRE SOCIETY runs on garbage, at least in a manner of speaking. Aeons-old junk—coal and oil that began as ancient plants and dinosaur remains, among other dreck—has powered our electric grid since the beginning of the industrial age. Of the 3.8 trillion kilowatt-hours of electricity the United States used in 2020, most came from fossil fuels. The problem is that this trash isn't meant to keep lights on or charge up EVs; it's supposed to stay deep beneath the surface, locking away the gases that now flood our atmosphere and cause disastrous warming. The good news—and bad news—is that we're making new batches of carbon-rich refuse all the time. In 2018, the average American generated an unsavory 4.9 pounds of waste every day. Could these fresh trash heaps help replace our dependence on dead dinos?

We already know, of course, that we can burn carbon-based products for energy. But simply setting trash aflame has its own nasty side effects. Incineration plants, which have been running in the US since 1885, emit nitrogen oxides, sulfur dioxides, particulate matter, lead, mercury, and dioxins, among other toxins. They also belch greenhouse gases out the wazoo: more than half of what coal spews. The process isn't even very efficient, extracting just a fraction of the refuse's potential power. "A lot of energy escapes in the process," says Johan Enslin, executive director of the Energy Systems Program at Clemson University.

Luckily, firing up trash, be it new or millions of years old, isn't the only way to turn it into fuel. Take natural gas: Deep beneath the earth, organic matter breaks down and compresses to form methane (chemically, CH_4). We call that byproduct natural gas, which has run a chunk of the grid since the 1960s, and which today contributes more power than coal and oil combined.

So could we ever run the entire electrical grid using nothing but garbage? Probably not. And wind, solar, and hydro arguably have the potential to power the whole thing on their own. But tapping the planet's junk could help us make the most of methane that would otherwise keep filling our atmosphere. We just need to make sure we learn from the mistakes we made powering all our cars and factories on dinosaurs.