“6 Things You Might Not Know About OSU and AI”

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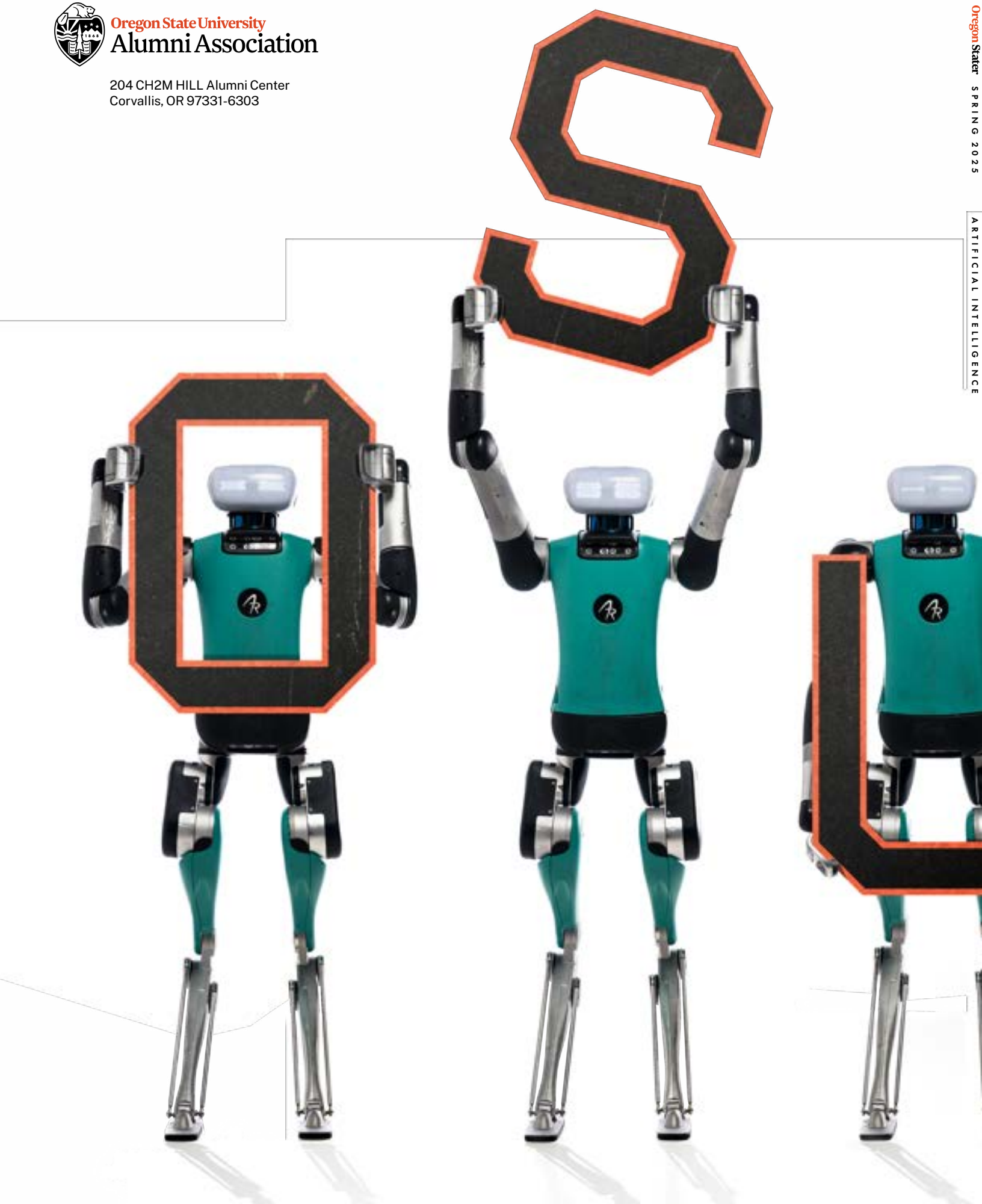

Oregon Stater

SPRING 2025

EXPLORING OSU'S TUNNELS

CUTE DOG SNIFFS OUT SCIENCE CLUES

GO BEAVS!

Six brag-worthy ways we're making an impact with artificial intelligence.

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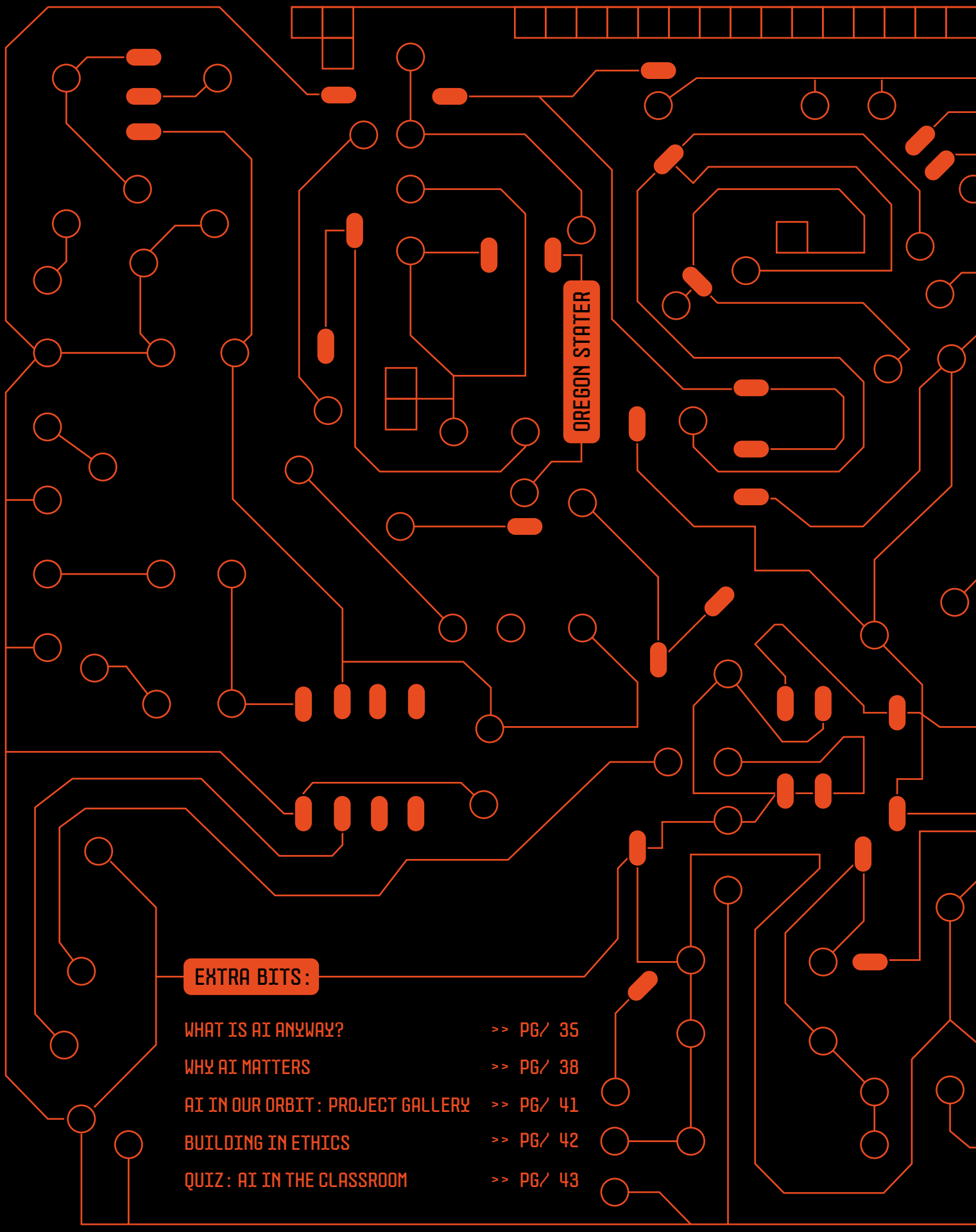

EXTRA BITS:

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6 Things You Might Not Know About OSU and AI

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SYNOPSIS:

HOW BEAVERS ARE MAKING AN IMPACT WITH THE TECHNOLOGY CHANGING OUR WORLD

WHETHER you see artificial intelligence as a game-changer, a cause for concern or just another tech buzzword, one thing is certain: AI is reshaping our world. And Beavers are playing a major role in that transformation — developing fundamental technology behind it, creating the chips that power it and pushing the boundaries of AI-driven robotics. To bring you up to speed (and supply you with bragging rights) we've rounded up six things you might not know about Oregon State and AI. But that's not all. Keep reading for a crash course on what AI is, why it matters and how it's changing education for today's students.

1. OREGON STATE WAS THE FIRST UNIVERSITY IN THE NATION TO OFFER BOTH MASTER'S AND DOCTORAL DEGREES IN AI.

IN THE FALL OF 2021, Oregon State University launched the nation's first graduate program offering both master's and doctoral degrees in artificial intelligence. This program not only prepares graduates for the fast-growing AI job market but also positions the university at the forefront of AI education and research.

This is thanks in part to a strategic decision made about 20 years earlier when the Department of Electrical and Computer Engineering, led by Terri Fiez, Ph.D. '91, made building the AI faculty one of its top priorities. Not only did that help the department retain strong faculty like Thomas Dietterich and Prasad Tadepalli, Fiez said, but it attracted "red hot" new talent.

"That was well before AI was a hot topic," said Professor Alan Fern, who was one of those early hires, "and it is because of that decision that we have such a core strength in AI today."

Before the new graduate program was established, Oregon State students interested in artificial intelligence pursued degrees in computer science or electrical and computer engineering with an AI specialty. But this traditional structure posed challenges for top candidates with unconventional backgrounds — such as an undergraduate physics major largely self-taught in programming or AI — who faced hurdles in admissions, as well as remedial coursework requirements.

Creating a new program meant being able to offer flexibility. Students can count relevant coursework from other disciplines toward a degree, making it easier for them go deeper into their research interests and to foster interdisciplinary partnerships. For example, researchers in microbiology and artificial intelligence are working on a project that uses a deep language model to better understand links between disease and human gut microbiomes.

The result is graduates prepared to tackle complex real-world challenges that transcend the boundaries of traditional computer science.

(See "AI in Our Orbit" on p. 40 for a sampling of Oregon State projects.)

KARL MAASDAM, '93

2. A FACULTY MEMBER HELPED PIONEER THE TECHNOLOGY THAT UNDERPINS TODAY'S AI.

ARTIFICIAL INTELLIGENCE wasn't always so, well, intelligent. First, it had to learn how to learn. Distinguished Professor Emeritus Thomas Dietterich (shown here) is one of the pioneers of machine learning, which makes it possible for AI systems to analyze large datasets, extract insights and then make decisions using that data. The results are as close as the smartphone in your pocket: Machine learning powers apps that can identify birds and plants when you're out on a hike, as well as the video recommendations Netflix and YouTube offer you.

National and international accolades have followed. Dietterich has been recognized with both the Advancement of Artificial Intelligence's Feigenbaum Prize, awarded to recognize outstanding advances in AI research, and the Award for Research Excellence from the International Joint Conference on Artificial Intelligence, the highest honor for a career in the field. Since 1985, only 23 other people have received the Award for Research Excellence. The first, John McCarthy, is known as the father of AI.

One of Dietterich's significant contributions was a novel approach for hierarchical reinforcement learning that breaks down big problems into smaller ones. Because machine learning is a general approach to solving complex problems, the real-world applications of Dietterich's research have been diverse and wide-reaching. They include drug design, intelligent user interfaces for smart desktops, computer security, management of wildfires and invasive species, and even understanding the distribution and migration of birds.

Currently, he's researching ways to improve AI systems, such as self-driving cars, that make high-risk decisions. "Now that machine learning is having huge impacts across society, it is more important than ever to work on methods for ensuring robustness, safety and effectiveness," Dietterich said.

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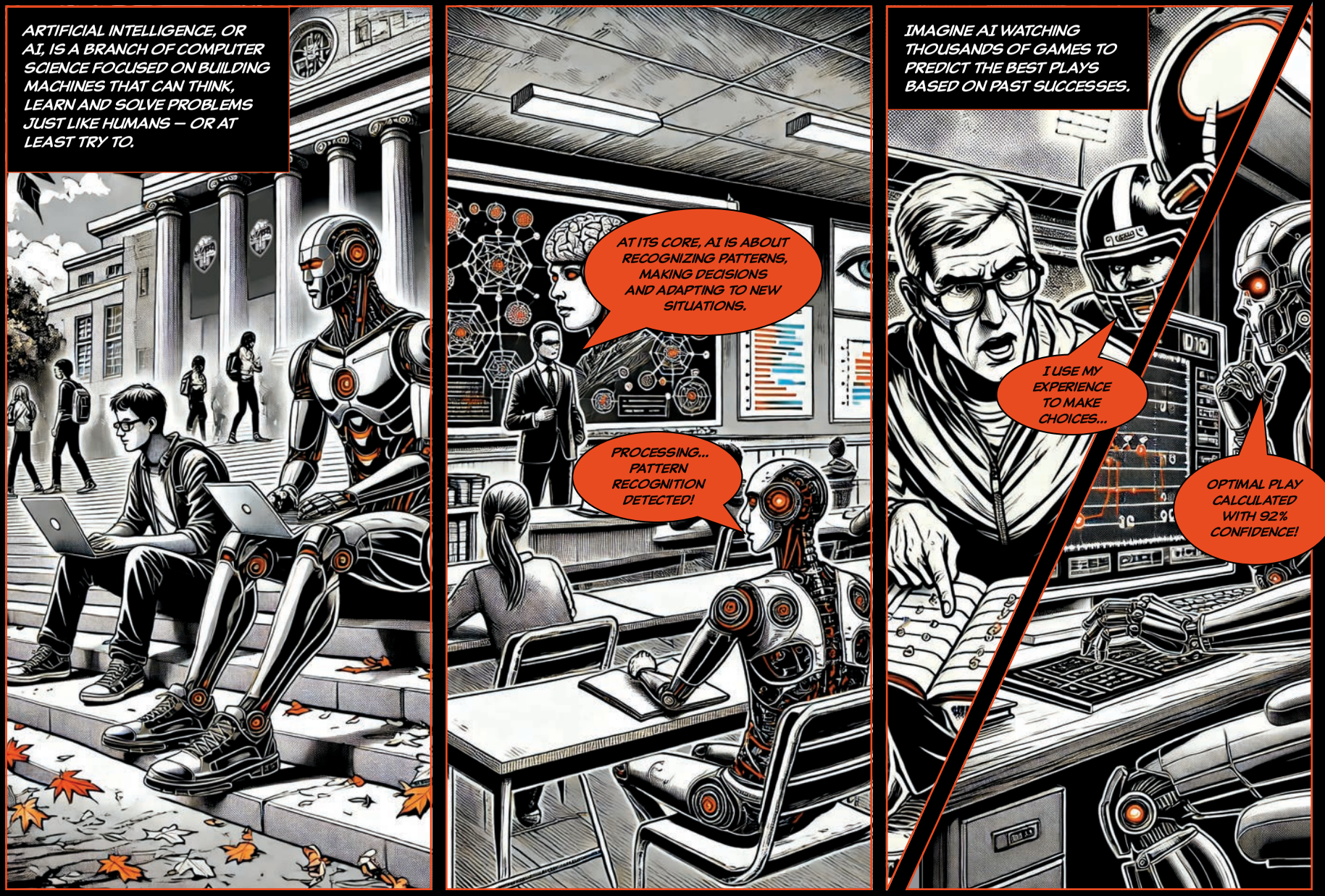
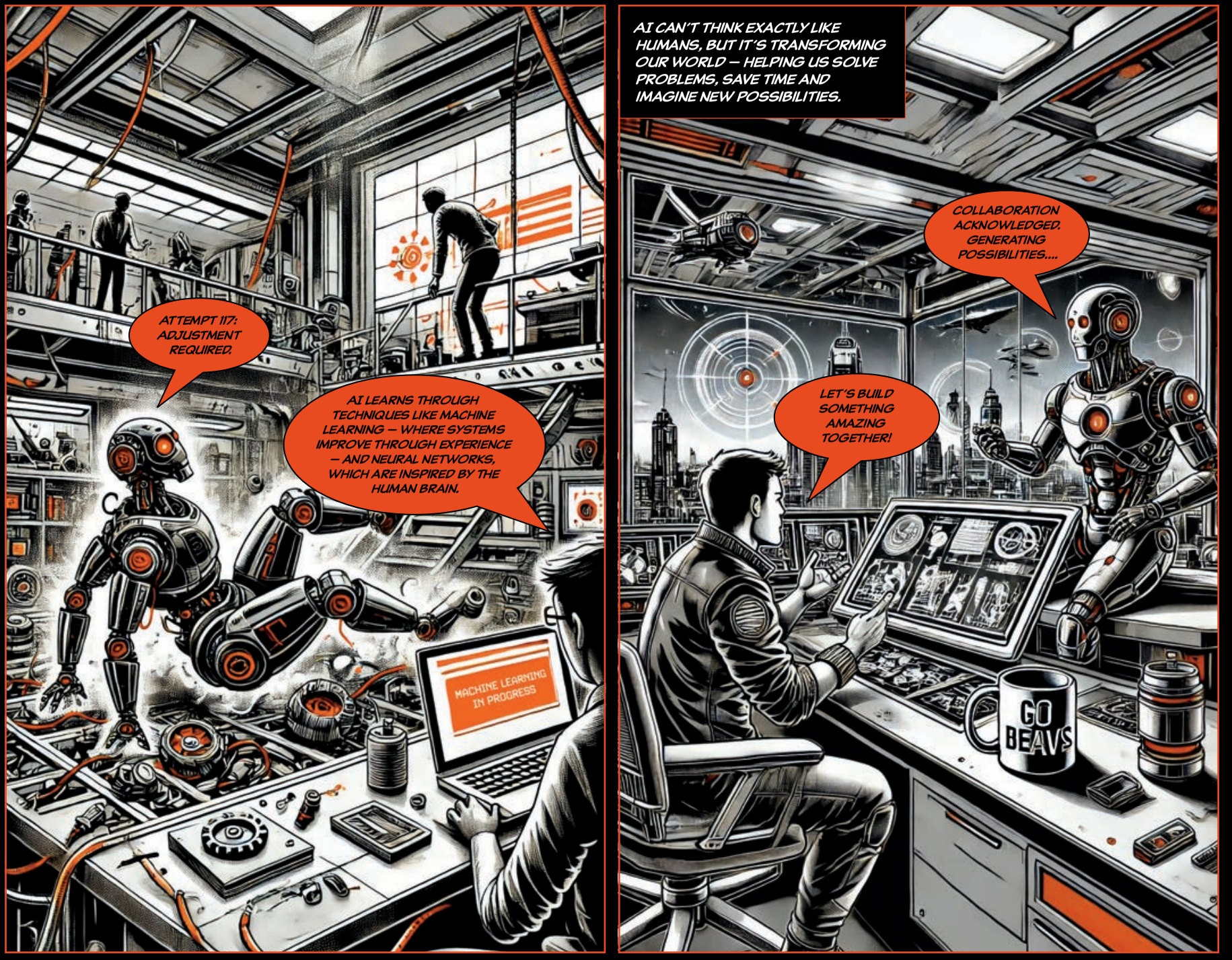
What is AI anyway?

HERE'S WHAT THE AI CHATBOT CHATGPT (WITH LOTS OF HUMAN GUIDANCE) THINKS YOU NEED TO KNOW TO UNDERSTAND THE BASICS OF ARTIFICIAL INTELLIGENCE.





Just what can artificial intelligence do? This comic-book-style explanation of how AI works offers a demonstration. The editor and designer guided ChatGPT and DALL-E (OpenAI's image generation tool) through many iterations of the script and graphics to create these pages. (Look for telltale signs of AI-made art in the background faces and fingers.)

3. ONE OF THE BIGGEST NAMES IN AI IS AN OREGON STATE ALUMNUS.

JENSEN HUANG, '84, has played a pivotal role in the development of AI as the founder and CEO of NVIDIA. The Santa Clara, California-based company, launched in 1993, was valued this March at roughly $2.93 trillion, placing it in the running with companies like Apple and Microsoft for the world's largest market capitalization.

Huang's vision and leadership transformed NVIDIA from a graphics card company into an AI powerhouse that provides the essential tools and technologies that drive the current AI revolution. The company's graphics processing units (GPUs) — initially designed for gaming — have proven exceptionally well suited for the parallel processing demands of deep learning algorithms, and make it possible to quickly train large language models and analyze enormous datasets related to genomics, healthcare and climate science, among other fields. Huang recognized this potential early on. Soon, the company became a leader in AI, helping transform industries.

Huang and his wife, Lori Mills Huang, '85, first met as engineering lab partners at Oregon State. Married in 1985, the couple have been faithful supporters of the university and its mission ever since. In 2022, they contributed $25 million toward construction of the Jen-Hsun Huang and Lori Mills Huang Collaborative Innovation Complex, opening in 2026, and $25 millon toward the supercomputer it will house. This facility is set to become, as OSU President Jayathi Murthy has put it, "the symbolic heart of AI at the university."

WHY AI MATTERS

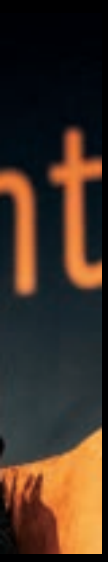
IN CONVERSATION WITH JENSEN HUANG AND PRESIDENT JAYATHI MURTHY.

In the spring of 2024, Oregon State's first Global Futures Forum on artificial intelligence explored the technology's potential economic, scientific and creative impacts on the university and the world. Here's an excerpt from a panel discussion with OSU President Jayathi Murthy and alumnus and NVIDIA CEO Jensen Huang, moderated by Provost Ed Feser.

FESER: My first question to Jensen and then President Murthy is "so what" about AI?

HUANG: Let me take a step back first and explain why NVIDIA is at the center of the AI revolution. ¶ We started the company 31 years ago to pioneer a new way of doing computing. Our observation was that in many important applications — it could be scientific, it could be computer graphics, it could be artificial intelligence or robotics — 5% of the code consumes 99.9% of the time to run. And if that's the case, why would we compute using a general-purpose computer that does everything the same way? It's not really sensible. ¶ So we invented a programming model called CUDA that has effectively driven down the cost of computing over the past decade or so by a million times. Just do that thought experiment: If the cost of doing something — weather simulations, molecular dynamics simulations — goes down by a million times, how would that change what you do? And it turns out because computers are such a foundational part of almost everything we do, and the computer is such an important instrument in nearly every field of science, this changed everything. ¶ For example, look at a few sample data points. Make an observation and apply the scientific method. Write some software to process that data and try to

KARL MAASDAM, '93



make that prediction that you've observed and then test your hypothesis against more experimentation. Go through that loop over and over again. That's called the software development method. ¶ Instead of doing it that way, why not just give the computer as many examples as you could and let it go figure out what the program is by itself? Let it write the program. Let the computer observe all of this mountain of data and find the patterns of relationships within the data, to extract, if you will, the defining features by itself, the predictive features by itself, and then write the program. ¶ That is the gigantic breakthrough. And what I just described is the foundational technology called machine learning, which led to deep learning, which led to the breakthroughs that we know of today called artificial intelligence. That's the "so what." ¶ When something of great value, something that's hard to do, becomes a million times or a billion times or a trillion times faster or cheaper, how would that change behavior? We observed that it was going to change the industry completely, that software programing would be revolutionized, that the type of software we could write, unimaginable in the past, we would do on a routine basis now and a whole bunch of new applications would be created. ¶ An example is applying artificial intelligence to one of the largest multi-physics problems: climate science. Or an incredibly tough problem for computers — easy for us, but a tough problem for computers — the articulation and manipulation of things, which is called robotics. ¶ These types of problems are now within the practical imagination of developers around the world. That's the "so what."

FESER: President Murthy, how would you respond from a higher education and Oregon State University standpoint?

MURTHY: If you look at the problems facing the universe or the world — the climate crisis is such a big part of it — our ability to handle big datasets give us tools that we've never had before. And this is particularly relevant for OSU: big on oceanography, on forests, on agriculture. AI gives us tools to address these problems, to create new models, to predict the future, to control the future. That's a huge, big deal. ¶ Enabling our graduates to be able to use these tools to address climate science, to address biotech, to address human health, to address robotics — that's the big "so what" for me. Just expanding the possibilities of the problems that we can solve and enabling our students to address these big problems.

ODDS ARE, THE NEXT wave of Oregon State research breakthroughs is likely to happen at the corner of Southwest Memorial Place and Monroe Avenue in Corvallis. That's where the Jen-Hsun Huang and Lori Mills Huang Collaborative Innovation Complex is now taking shape. The 143,000-square-foot research and teaching facility will house a cutting-edge AI supercomputer, predicted to be among the most powerful university supercomputers in the nation.

This advanced system will significantly boost the university's research capabilities, said Dirk Petersen, director of Oregon State's new Supercomputing Center.

"This increase in power will drive advancements in AI, as well as several critical research areas that increasingly depend on AI — including climate science, clean energy, water resources, quantum computing simulations and biological system modeling," he said. "It will provide researchers with the immense processing power needed for large-scale simulations, data analysis and machine learning tasks. Its advanced architecture will enable faster processing speeds and greater data handling capacity than previous systems."

In other words, research that once might have taken an OSU scientist a lifetime will now take place in record time.

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4. STARTING IN 2026, OREGON STATE WILL HOST ONE OF THE MOST POWERFUL UNIVERSITY SUPERCOMPUTERS IN THE NATION.

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5. OREGON STATE HAS HELPED BLAZE THE TRAIL IN AI PHYSICAL INTELLIGENCE.

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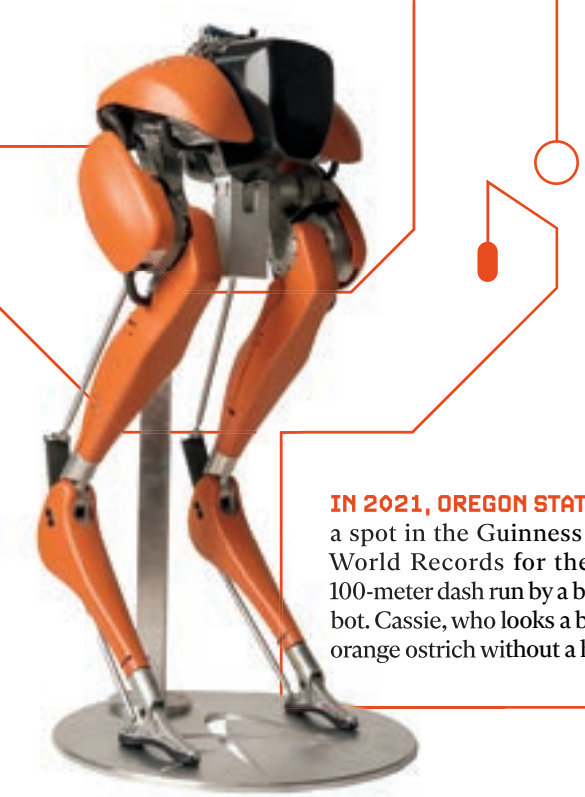


IN 2021, OREGON STATE earned a spot in the Guinness Book of World Records for the fastest 100-meter dash run by a bipedal robot. Cassie, who looks a bit like an orange ostrich without a head, ran the race in under 25 seconds — a far cry from Usain Bolt's record of 9.58, but a breathtaking achievement in the world of robotics, where, previously, two-legged robots were mostly known for their stumbles and falls.

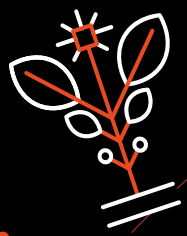
Cassie was developed under the direction of Oregon State robotics professor Jonathan Hurst — co-founder and chief robot officer of OSU spinoff company Agility Robotics — and trained in collaboration with artificial intelligence professor Alan Fern and OSU students using machine learning. To teach Cassie and later Digit (Agility Robotics' humanoid robot and our cover model) how to move in unpredictable environments required blazing a trail in a different realm of artificial intelligence — physical intelligence.

"A language model has an entire internet of right answers to look for patterns in — from sixth graders texting to Shakespeare," said Hurst, referring to the large language models that power conversational AI chatbots like ChatGPT and Microsoft Copilot. "But when you're trying to control a robot, there are zero examples."

Before Cassie, robot movements were typically created by engineers writing equations, which takes specialized expertise and a lot of time and iteration. It's also very limited, often resulting in cautious behaviors. Instead, Cassie learned more like a toddler — by falling and trying again — but all in simulation, so the learning took hours rather than years. This approach made it possible to generate new behaviors faster, and they were better than any engineer could imagine with equations.

"That behavior we did with Cassie is still the best in the world. We were the very first," Hurst said. "And that wasn't an Agility Robotics thing. That was an OSU thing."

Since Cassie's early success, Fern and his students have used AI to help Digit learn to use its legs and arms to not only walk but also lift and carry. In 2024, Digit became the first humanoid robot used in commercial operations. Digit is being tested in Amazon fulfillment warehouses alongside humans and has been deployed since June 2024 in a GXO Logistics facility in Atlanta, lifting the heaviest loads for women's clothing retailer SPANX.



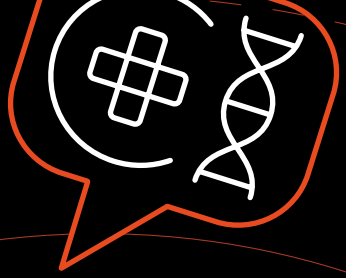
TENDING TOMORROW'S FIELDS

Water scarcity, severe weather events and labor shortages can all spell disaster for farmers. Oregon State is part of a coalition of universities and industry partners using AI to unlock solutions for these global agricultural challenges. The AgAID Institute's (agaid.org) wide-ranging projects include using neural networks to improve predictions of cold hardiness and help grape growers avoid frost damage; training robots to prune fruit trees in simulated, digital orchards with reinforcement learning; and a robotic fertilizer that uses smart sensors and artificial intelligence technology to apply precise amounts of liquid nitrogen to individual trees in an orchard. Researchers work closely with farmers. "We start by asking our partners, 'What would be useful to you?'" said Alan Fern, professor of artificial intelligence. "We don't start by coding up the AI."

SUPERCHARGING SEED SELECTION

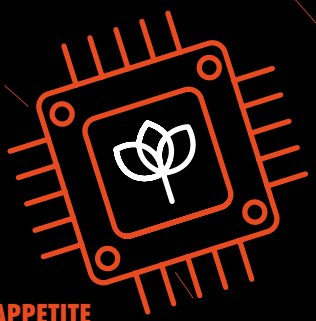
The Willamette Valley is known as the "grass seed capital of the world," but traditional methods of screening seeds for contaminants are time-consuming and prone to human error, posing risks to an industry worth $500 million annually. A multidisciplinary OSU team is training AI to recognize hundreds of seed types. The Deep Seed Project's goal is to create a convenient, reliable tool that farmers can use to assess seed quality faster and more accurately. Supported by grants from the Oregon Department of Agriculture, the Oregon Grass Seed Commissions and the OSU College of Agricultural Sciences, the project is developing a tabletop design for high-throughput analysis in lab settings and a portable light box version farmers can use in the field.

AGILITY ROBOTICS



DIAGNOSING RARE DISEASES

Though it may seem like an oxymoron, rare diseases aren't particularly rare. When you consider them together as a category, as many as 25-30 million people are impacted in the U.S. alone. To speed up diagnosis and access to treatment, a team of Oregon State students and faculty and a rare disease expert at the Institute for Systems Biology in Seattle have created a chatbot for medical professionals. Instead of spending hours poring over journal articles to find answers, doctors can ask the chatbot for diagnosis help backed by verified sources. The team has funding from Amazon Web Services and the Oregon State University Advantage Accelerator program to develop the software, called Radiant (radiant.rtx.ai), into a commercial product.



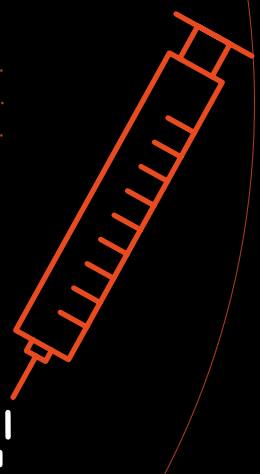
SHRINKING AI'S ENERGY APPETITE

Projections show that by 2027, AI data centers could use as much energy annually as the entire country of the Netherlands. Hoping to reduce AI's ravenous energy requirements, Associate Professor of Electrical and Computer Engineering Tejasvi Anand and his students designed a radical new chip that consumes half the energy of conventional architectures. High-speed communications chips need to minimize signal corruption as data zip around massive data centers that host chatbots and other AI agents. Reducing corruption requires signal processing, which typically involves using a power-hungry equalizer. Instead, Anand's team uses AI principles to train a classifier to undo the corruption.

AI IN OUR ORBIT

A SMALL SAMPLING OF OREGON STATE'S MANY AI PROJECTS

ILLUSTRATIONS BY
DAVIAN-LYNN HOPKINS



OUTWITTING JOB APPLICATION ERRORS

Once, you could expect that when you sent out a cover letter and resume, a person would be reading them at the other end. But today, applicant-tracking systems streamline most companies' recruitment processes, scanning resumes for keywords that match the job description and potentially rejecting even highly qualified candidates who don't prepare with a machine in mind. Alumni Akash Kannegulla, Ph.D. '18, and Bo Wu, Ph.D. '22, originally created the AI-powered Wisedoc (wisedoc.net) as doctoral students after becoming frustrated with the demands of formatting documents for submission to scientific journals. But when the COVID-19 pandemic triggered massive unemployment, they adapted it to the problem at hand. Now Wisedoc can check and correct for the most common applicant-tracking system issues, create cover letters tailored to specific job descriptions and improve resumes in ways designed to impress hiring managers. Oregon State University Alumni Association members get free access to this Beaver-made AI tool. (See ForOregonState.org/Benefits.)

SPEEDING VACCINE CREATION

COVID-19 sent the world into crisis as the virus spread rapidly across the globe with no vaccine to stop it. Now, researchers have developed an AI tool that can quickly find an optimal mRNA design that significantly enhances vaccine effectiveness and stability. The software tool, called LinearDesign, uses a series of advanced AI algorithms rooted in computational linguistics. The algorithm took just 11 minutes to find an optimal mRNA design for the SARS-CoV-2 spike protein. This novel approach, developed by a team led by Liang Huang, professor of computer science, has resulted in vaccines that generate antibody responses up to 128 times greater than traditional methods. And it doesn't stop there: LinearDesign also shows promise for the development of monoclonal antibodies and anti-cancer drugs.

BUILDING IN ETHICS

Two researchers tackling tricky issues of safety and bias

Thorny problems of AI ethics have captured the attention of university community members in diverse fields, but in the College of Engineering, researchers are working to build ethical behavior into AI systems themselves. A professor and a student offer two good examples.

Houssam Abbas, Assistant Professor

We trust AI to navigate us to new locations and one day it could drive our cars. But should we let AI make ethical decisions for us? Houssam Abbas, assistant professor of electrical and computer engineering, often shares this thought problem: A self-driving car is faced with an unavoidable accident. In the seconds it has before impact, it can choose to either plow into the car in front of it, possibly harming the occupants, or drive off the road into a ditch. What guidelines does it use to make that choice? ¶ To make ethics accessible to machines, Abbas is working to boil down the delicate balance of human decision-making into mathematical equations. He uses deontic logics, a family of mathematical languages that model how we think about our obligations and permissions. ¶ Abbas and his students work on several collaborative projects that include academic and industry partners to develop formal methods for verification of engineered systems.

Eric Slyman, Ph.D. candidate in artificial intelligence; research engineer at Adobe

Many artificial intelligence models are trained with information from the internet, which is steeped in stereotypes. For example, an AI image generator, when asked to produce a picture of a doctor, might return an image of a white man by default. And this can get even worse when companies remove seemingly redundant photos — through a process called deduplication — to speed up AI training. ¶ Eric Slyman, Ph.D. candidate in artificial intelligence and now engineer at Adobe — creator of Adobe Photoshop, Acrobat and other industry-standard apps — helped create a cost-effective tool with researchers there that builds in awareness of social biases that may be in training data. Called FairDeDupe, it makes it possible to instruct an AI to preserve image variety by not pitching out photos of nondominant groups. "We let people define what is fair in their setting instead of the internet or other large-scale datasets deciding that," Slyman said.

JUST AS AFFORDABLE calculators changed the focus of math instruction in the 1970s and 1980s and the World Wide Web revolutionized student research in the 1990s, the advent of widely available artificial intelligence tools like ChatGPT is bringing a new wave of change to education. But generative AI doesn't have to mean the degeneration of teaching and learning.

While Oregon State doesn't have any university-wide policies regarding AI in teaching yet, leaders with Ecampus and the Center for Teaching and Learning are among those helping instructors explore the possibilities and limitations of these tools. The issues are complex, and the answers are rarely straightforward or easy. As Sanjai Tripathi, senior instructor in the College of Business, puts it: "To AI or not to AI — that is *not* the question. We have to teach it, or we'll become irrelevant. But we can't have students outsource their thinking to AI. The thinking is a necessary part of the learning process, like you have to exercise the brain muscle to improve it. We have that fundamental tension, and we just have to deal with it."

That means students are increasingly finding a vital new topic added to their Oregon State class syllabi: How to use generative AI effectively and appropriately. Conversations during the first week of class now include AI literacy topics such as the environmental impact of AI usage or data security protection and privacy. (OSU students and employees are encouraged to use a data-protected version of Microsoft Copilot rather than ChatGPT to ensure data is kept confidential and not used to train AI models outside the university.)

Instructors point out the limitations of these tools, including the fact that AI sometimes makes up information and is subject to embedded social biases. For example, an AI-generated image created to illustrate a PowerPoint presentation on international economics might portray ethnic or national stereotypes. Instructors are also training students to be transparent about their AI usage, citing the source like they would cite a book or journal. (Try the "AI in the Classroom" quiz on the next page to test your knowledge of appropriate AI use.)

In addition to prompting conversations about AI use, misuse and academic integrity, generative AI is also inspiring faculty to take a new look at the way they teach. In its guidelines, the College of Business recommends that teachers "focus on the value that humans provide that AI cannot: ethics, creative thinking, problem solving and human relationships rather than memorization. . . . Assuming that AI will be a part of their work life, consider what specialized knowledge or content students need to ask the right questions and supplement, challenge, correct or assess AI-generated answers." The task is to see how AI "can be used as an assistant to, rather than a replacement for, the human mind."

6. AI IS CHANGING EDUCATION ... AND THAT COULD BE A GOOD THING.

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Name: DIGIT Date: SPRING 2025

QUIZ: AI IN THE CLASSROOM

Just as instructors in the 1990s were faced with the new task of teaching students how to use information from the internet appropriately, artificial intelligence is challenging and reshaping today's classrooms. So what does that look like? Test your knowledge in this quiz.

1. Which of these ChatGPT prompts would not be considered appropriate use of AI in most OSU classrooms?

a. Help me understand this topic.

b. Draft an outline for an argument in support of this topic.

c. Write a 500-word essay on this topic.

d. Proofread the following paragraph for spelling and grammar.

e. Generate flashcards so I can study the following material.

2. True or false: OSU instructors are advised to rely on AI detectors to prove whether a student turned in an AI-written assignment.

a. True

b. False

3. What percentage of Ecampus students polled last winter either somewhat agreed or strongly agreed that knowing how to use generative AI tools would help them at work, help them get a job and help them advance their careers?

a. More than 50%

b. 0%

c. Less than 50%

d. 100%

4. How are some OSU instructors using generative AI to support their teaching and workflows?

a. To generate course outlines, learning objectives, lectures, quizzes, images and presentations.

b. To write emails.

c. To create custom chatbots for a specific purpose.

d. To build interactive role plays.

e. All of the above.

5. Take-home project: The best way to learn about generative AI tools is to take them for a spin. Here are some fun options to try:

Design an emoji (a beaver would do nicely) at **emojis.sh**.

Create AI-augmented study materials, like flashcards, with **quizlet.com**.

Write a song at **stableaudio.com**.

Listen to AI-created voices at **elevenlabs.io** (a similar AI program reads Stater articles aloud in multiple languages at **OregonStater.org**).

Answers: 1. C: One guideline is to treat AI like a friend. You wouldn't ask them to write your assignment for you, but they could be your study buddy. 2. False: Detection tools exist but they have been shown to be inaccurate and often biased. Instructors wary of AI misuse look for things like overly generic or hyperbolic language (cue the exclamation points), a lack of nuanced coverage in the course and the citation of fictitious sources. 3. A: More than half. 4. E: All of the above.