

ihmc



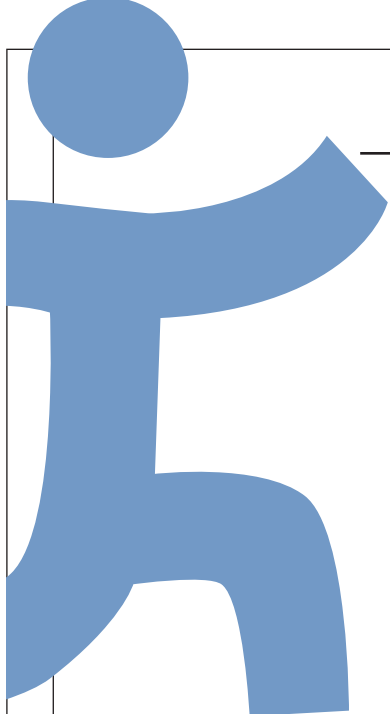
FLORIDA INSTITUTE FOR HUMAN & MACHINE COGNITION

VOLUME 19 ISSUE 2

Featured Research Using cognitive science and novel language understanding to harness AI's power. 3	Featured Research Intelligent cognitive assistant could offer support for those with dementia. 5	Featured Research IHMC robotics team hosts international Dynamic Walking Conference. 6	Featured Research Triumph Gulf Coast grant supports expansion of IHMC's work. 7
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- 8 | IHMC welcomes new colleagues**
- 10 | Robotics Open House draws hundreds to Pensacola campus.**
- 11 | Summer Robotics Camp preparation begins**
- 12 | Evening lectures**
- 14 | STEM-Talk recaps**



Soon we will move into our new Healthspan, Resilience, and Performance research complex, a \$40 million project that has been changing the Pensacola skyline since construction began in early 2023. A future edition of the newsletter will be fully devoted to showcasing the transformative science that this new complex will enable us to conduct.

As we wait for move-in day to come, we wanted to share more about work that we have under way that is no less exciting than the prospects presented by our new facility.

Dr. Ian Perera's research focuses on whether computers could become more helpful teammates with their human counterparts. Based in our Ocala facility, Ian has focused on using cognitive science and novel language understanding methods to harness the power of artificial intelligence to improve communication in multiple settings. While much of his work has been focused on questions of human-machine teaming for military research projects, he has successfully applied his methods in other domains.



Dr. Archna Bhatia, who also works primarily in our Ocala campus, leads an intriguing project that is exploring whether an intelligent cognitive assistant leveraging natural language processing could support people with dementia in their daily lives.

In this edition, I'm also pleased to share that IHMC was awarded a grant from Triumph Gulf Coast that will help further expand and support our ability to handle sensitive federal research in support of Department of Defense and other research sponsors.

Our robotics research group has had a full early spring, first hosting an Open House as part of National Robotics Week. IHMC is also hosting in Pensacola, the International Dynamic Walking Conference, a gathering of robotics experts IHMC last hosted in 2018.

We are looking forward to summer Robotics Camp, coming soon in both Pensacola and Ocala. And as always, we're pleased to see our Evening Lectures, Science Saturdays, and STEM-Talk podcasts episodes continue to earn rave reviews.

Big things are happening – and more are in store. Thank you all for being part of a community that generously supports our mission and vision.

Best,

Ken Ford

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Dr. Ian Perera's research focused on using cognitive science, novel language understanding methods to harness AI's power

Dr. Ian Perera started his research career by exploring the question of whether computers could become more intelligent and helpful assistants by learning the way children do.

If the IHMC Research Scientist can make it work, the implications could be wide-ranging and substantial.

Since joining the Florida Institute for Human and Machine Cognition in 2013, Perera has worked on numerous military and government projects applying novel language understanding methods and cognitive science to problems



Dr. Ian Perera

from de-escalating heated social media conversations to improving trust between human and AI team members and more.

The popular culture's focus on headlines claiming AI can perform complicated tasks and will soon replace our workforce misses something critical, Perera says.

"This technology is uncritically learning associations between words and concepts,

and mimicking behaviors of people online that isn't always grounded in reality," Perera says.

While there is some similarity to the powerful associative learning connections that children use when they encounter something new, imbuing AI with a more critical and exploratory approach could lead to a powerful capability with a transformative influence on human decision-making.

It could benefit warfighters in the heat of battle, cool the overheated world of social media commentary, and even improve the long-term health and well-being of military personnel.

While artificial intelligence has a fever-grip on the public imagination, Perera has delved into the true possibilities and limitations of this discipline. And here's a hint: it's not about supplanting human intellect.

"The goal is to take our knowledge about how we learn things and use it to inform our models so that they get a better understanding more quickly," Perera said. "We are looking at strategies to augment associative learning that could be translated to artificial intelligence."

Typical AI training involves a massive data dump into the system to "teach it," but that creates an AI that is only as trustworthy as the data it has been fed. Perera has worked to find ways to use language to teach machine learning systems and minimize flaws such as implicit bias.

Having trust in an AI-teammate's decision is critical to the successful integration of the technology into human decision-making, especially for military operators and others who could rely upon such data to make life-or-death decisions.

"What we were looking at is, can we make sure that an explanation is encoded into the system so that when it makes a decision, you can see if it seems like a logical consequence of what the system is deciding," Perera says.

Perera's current work includes a project for the U.S. Office of Naval Research where AI is responsible not only for finding irregularities or unexpected events, but also for providing the user with multiple possible explanations given the context. For example: multiple ships may be stationary nearby because they are waiting out a storm, or aspects of their behavior may point to illicit activity.

The applications are wider ranging than warfighting, however.

One such project, Civil Sanctuary, had the goal of engaging in social media communities with automated dialogue agents to help with content moderation.

And if there is any place where there is room for improvement, it is the world of online discourse.

Civil Sanctuary aimed to spot language that would indicate when people in an online forum are crossing the line from disagreeing to becoming toxic.

"We wanted to see if we could say something about the emotions being conveyed or the moral foundation" of the comments, Perera said.

Keeping a human in the loop of content moderation is ideal, but the volume of content to moderate makes it nearly impossible for humans to keep up. AI could be helpful in this, especially if it can sense the tone and emotional meaning beneath the words.

Perera's modeling took several things into account to try to gauge when a moderator gets involved in the interplay

among commentators. He also worked on modeling how the community responds to certain emotions.

“We can pick up on it before the human would and before it can do more damage, and say to the human in the loop, ‘Hey, this may be something you want to look at,’” he said.

Countering implicit bias

In AI research, human judgement is sometimes seen as the “ground truth” or the “correct” answer. However, we know that everyone has implicit biases that affect how they take in and respond to information. Even if a belief is grounded in fact or good intentions, the nature of the expression of that belief can shut down constructive discourse.

Yet there may be a way forward, aided by artificial intelligence.

“Sometimes, if you’re aware of the bias, then you can start to see what you might want to change about that,” Perera said.

Towards this end, Perera and his team developed an “echo-chamber burster” — a method to analyze language and suggest refinements that would make a user’s comment on social media more constructive, even de-escalating potentially toxic or insulting discourse.

“We wanted to see if we could change how a comment is phrased to come to some common ground and reduce the toxicity,” Perera said. “Can we make the sentiment less angry and generate language that people can just engage with that’s not highly emotionally charged.”

The work coming out of this project presents a new vision of the potential for generative AI – one that creates new opportunities for bridging ideological differences by reframing communication in terms of the beliefs and ideals of the person or group across that divide.

Studying trust calibration

Another of Perera’s efforts looked at a co-training methodology to calibrate trust



Research Scientist Dr. Ian Perera’s work at IHMC’s Ocala campus includes artificial intelligence, cognitive science and more.

building in human-machine teams. At its core, this method sees the human and the AI agent train together, each learning as they go along.

That has included building a user interface that allows the human and machine partners in a team to navigate tasks and avoid obstacles together.

This co-training model gives the human and the AI team members each more feedback about their performance than a traditional model.


“We see (it) as being open with your strengths and weaknesses,” Perera says.

The findings so far suggest that team performance improves with the approach.

“It makes the AI aware of its limitations and then encourages the human user to consider where AI can be applied most effectively,” he said. “In fact, we found that in this task, having an AI that was open about its capabilities and suggested delegations created a more effectively performing team than simply improving the AI’s accuracy by 20 percent.

“When we talk about improving systems that are used by people in decision making, this result shows us we should be focusing more on the human element, rather than chasing percentage points of accuracy.”

Ongoing work that Perera is part of includes looking at virtual reality tools that may help identify the impacts of mild and subconcussive traumatic brain injury before the condition might be clinically diagnosed. These are instances in which symptoms are challenging for even humans to identify but if they are left untreated, these injuries can have long-term consequences.

“When I think about the potential of AI, I’m not as focused on how we can do tasks as well as humans. I instead look at opportunities for AI to tell us something about ourselves or the world that we might miss as humans,” Perera says. “To do that, we need to turn a critical eye to ourselves and teach AI to do the same for its judgement.” 

Intelligent cognitive assistant leveraging NLP to support daily living for those with dementia

Dr. Archna Bhatia, leading the project team, is focused on harnessing Natural Language Processing to help seniors with Alzheimer's Disease and related dementias retrieve words in the course of daily life. The effort is being supported by funding from the Massachusetts AI and Technology Center, a member of the a2Collective, which represents the Artificial Intelligence and Technology Collaboratories for Aging Research (AITC). The AITC program is funded by the National Institute on Aging (NIA), part of the National Institutes of Health.

The project's goal is to develop an assistant that learns from the user and builds a personalized database utilizing natural language processing that can help users in real time by retrieving difficult words, and ultimately could identify the areas of memory where a person is having more difficulty.

The IHMC team working on the system development includes Dr. Bhatia, Dr. Peter Pirolli, Roger Carff and William de Beaumont, and includes colleagues from around the nation including Dr. George Sperling from the University of California Irvine, and Dr. Misha Pavel from Northeastern University.

The system will identify users' associative networks, the intricate web of connections woven between the words in each person's memory, based on the way that person uses them. It then will tailor the feedback it offers "because each individual connects words differently based on their own knowledge and past experiences," Bhatia said.

By way of example, Bhatia notes that in the brain, the names of all of a person's neighbors are built in one associative network. The list of all of your medications, instructions from your

healthcare providers are built in another. There could be, and there would be connections in between these different sub regions as well, but all of those connections are highly individualized.

Even in the typical pattern of aging, "these connections become weaker and that's when we start to forget," Bhatia said. Fatigue and distraction also play a role in weakening these connections and negatively impact the processing capabilities of these systems.

spot patterns in the queries from the user. For example: if a person is increasingly asking questions about medications, or about the names of people, the assistant could send that user games, puzzles or other stimulations to strengthen the connections that are weakening.

A longer-term goal Bhatia said, is that the database built across all of the app's users could provide insights into what regions of the associative networks are impacted more often as Alzheimer's



Dr. Archna Bhatia

However, when neurodegenerative disorders and dementias are present, these disorders add yet another layer of disruption to the capacity of these systems to recall the words and phrases we may need to communicate.

As a user asks the assistant about something, behind the scenes, the assistant is learning about the associative networks that user relies upon. Volunteers alpha-tested the usability of the cognitive assistant for six months to provide design feedback. Ultimately, the assistant could

disease progresses. Such an insight could help support targeted therapies and further research into these areas.

The Centers for Disease Control and Prevention notes that in 2020, nearly 5.8 million people are living with Alzheimer's and related dementia. That figure is estimated to grow to 14 million people by 2060. The prevalence of Alzheimer's disease and related dementias are a growing challenge for those diagnosed with it and their friends and family members who care for them. ✧

Experts in Dynamic Walking gather in Pensacola for 20th annual conference

In late May, IHMC will host the 20th annual Dynamic Walking Conference, a premier gathering of engineers and roboticists working in robotics.

The conference, set for May 27-30 at Pensacola Beach, includes experts and researchers in biomechanics, human and animal locomotion, prosthetics and orthotics, robot design and control, wearable robotics, and exoskeletons.



Dr. Robert Griffin

It has been six years since IHMC hosted the conference, which rotates between the United States and Europe. The 2023 conference was hosted in Munich by DLR, the German Space Agency.

Dr. Robert Griffin, the IHMC research scientist who leads the robotics team, looks forward to the opportunity to showcase his team and their work. The conference typically attracts some 200 researchers from around the world, Griffin said.

Work that Griffin's team has completed recently on the humanoid robot Nadia is likely to be a topic of discussion, as well as IHMC's work on exoskeletons.

Throughout late 2023 and early 2024, the team has been testing new designs for Nadia's arms, as well as changes in the mixed-reality teleoperation assistance environment that controllers use to direct the robot.

"The opportunity to present and exchange ideas at conferences like Dynamic Walking is a highlight every year for our robotics team and provides a unique opportunity for collaboration," Griffin said.

During the conference, IHMC's team will present highlights from its work on locomotion in humanoid robots, a burgeoning research area on reinforcement learning on quadrupeds, as well as work with both assistive and augmentative exoskeletons.

The conference will include plenaries, keynotes, small-group discussions, and social and after-hours networking opportunities. Its audience will include startup founders and workers, academic and research institute principal investigators, graduate and undergraduate researchers, and industry research and development teams.

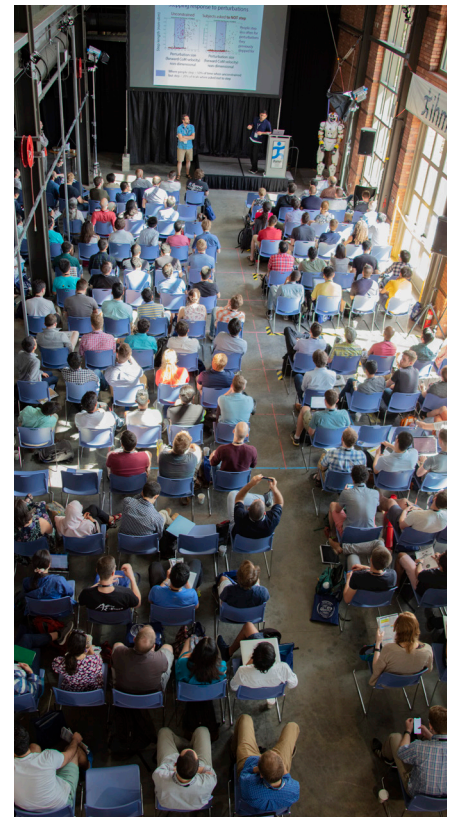
Conference and program assistance is coming from the Georgia Institute of Technology Physiology of Wearable Robotics (PoWer) lab under Dr. Greg Sawicki, who is also an IHMC Senior Research Scientist. Assistance also is coming from Florida State University's Optimal Robotics lab, Robotics and Technology for Human Health and Mobility (RTHM) lab and the Center for Intelligent Systems, Control and Robotics (CISCOR) lab.

While the intellectual exchanges are clearly a highlight of the conference, there are other benefits. Griffin notes past conferences were enlivened by hiking and rock climbing in Madison, Wisc., and

country tours in Munich that included visits to castles.

In 2018, the last time IHMC hosted, extracurriculars included sailing, playing kickball in Pensacola Blue Wahoos stadium, and Evening Lecture at the historic Saenger Theatre. This time around, the IHMC team once again looks forward to having the chance to share what Pensacola has to offer visitors.

"We are thrilled to host our colleagues, collaborators, contributors, and like-minded experts in their fields and look forward to showing them all that our community has to offer," Griffin said. "We think a good time will be had by all of the participants." 🤖



IHMC last hosted the Dynamic Walking Conference in 2018, drawing experts in the field to Pensacola for several days of collaboration.

Triumph Gulf Coast funding will help bolster research capabilities at Pensacola campus

An investment of \$7.8 million from Triumph Gulf Coast will allow IHMC to bolster its research capabilities with a facility designed to handle sensitive federal research in support of U.S. Department of Defense and intelligence community customers.

The grant to the Florida Institute for

key research sponsors in order to better address their needs and strategic goals.”

Absent the facility, Stone said, travel is required for discussions with some defense-related research sponsors. “Having those discussions locally, and by having the sponsor interact with our researchers and see our facilities, that

and diversifying our economy.”

The grant will provide a much-needed secure environment for sensitive federal activities related to requirements stemming from national defense, intelligence, and security sponsors. It also will facilitate collaboration with government agencies, defense contractors, and other organizations involved in research projects which demand the greatest protections.

“The incorporation of secure facilities and secure processing capabilities within our new facility will fortify our research capabilities, increase research opportunities, and establish IHMC as a regional leader in research advancements for Government sponsors requiring these highly specialized assets.” said Ryan Tilley, IHMC’s director of strategic program execution and innovation.

The December grant also includes funding for additional equipment related to the Healthspan, Resilience, and Performance research that will be housed at the new complex being built at the corner of Garden and Alcaniz streets.

“Over the course of our work on this project, and as research technology advances, we have identified the need for additional specialized equipment that will significantly contribute to the quality and depth of our research efforts. We are proud that Triumph sees IHMC as a leader in this effort and we are grateful for their support,” Tilley said.

The Healthspan, Resilience, and Performance complex will be a one-of-a-kind research facility that also bolsters the regional economy through new funding in federal and industry-sponsored research. It will become a hub for collaboration with regional institutions and organizations that share an interest in healthspan and performance. ✦



Dr. Morley Stone



Ryan Tilley

Human and Machine Cognition was approved by Triumph’s board of directors in December 2023. Previous Triumph funding helped equip the \$40 million Healthspan, Resilience, and Performance research complex, which was completed in 2024.

The award includes funding to construct a highly flexible, multilevel secure facility. The addition of secure capabilities will bolster the institute’s ability to meet federal grant and contract security requirements.

Dr. Morley Stone, IHMC’s Chief Strategic Partnership Officer, says such a facility allows the Institute “to work with

often leads to more sponsored work.”

David Bear, chairman of the Triumph Board of Directors, says the secure facility is the type of project the board likes to support. Triumph is the nonprofit corporation funded by a legal settlement with BP following the 2010 Deepwater Horizon oil spill.

“IHMC continues to build on the success of its Human Healthspan, Resilience, and Performance program,” Bear says. The addition of secure facility capabilities expands IHMC’s ability to bring economically impactful research opportunities to the region far beyond the term of this grant, continually improving

Welcoming our new research scientists, associates



CHRIS BATES, RESEARCH SCIENTIST

Chris joined IHMC in January 2024 as a research scientist working with Dr. Ian Perera and his team in Ocala. His research has included studying efficient data compression in perception. Chris' research interests have included looking at how deep neural networks compress memory to glean clues about how our brains might use similar strategies to manage memory storage. Chris earned his bachelor's degree in mechanical engineering at Purdue University. He earned his Ph.D. in cognitive science at the University of Rochester and is a postdoctoral fellow at Harvard University.



EDWARD "DREW" CRANFORD, RESEARCH SCIENTIST

Drew joined IHMC as a Research Scientist in January 2024 working with Dr. Kevin Gluck, among others. He will bring his expertise in computational modeling to several human performance research subjects. His research interests include decision-making, learning, and expertise in human-machine interactions, with a focus on developing methods for integrating computational cognitive models with machines to personalize human-machine interactions. Drew earned his Ph.D. in cognitive science from Mississippi State University. He most recently was a faculty researcher at Carnegie Mellon University with the Functional Modeling Systems group, directed by Dr. Christian Lebiere. His focus of research was primarily in developing instance-based learning cognitive models of end-user decision making to improve cybersecurity defense and training. In his spare time, he enjoys outdoor activities such as fishing, kayaking, golf, and tennis.



LOUIS RICHARDSON, SENIOR RESEARCH ASSOCIATE

Louis joined IHMC as a Senior Research Associate working with the robotics lab in December 2023. He brings more than a decade of commercial experience in mechanical engineering, industrial design, conceptual design, and manufacturing in the creation of innovative and immersive animatronic characters and experiences. He earned his bachelor's degree from the Savannah College of Art and Design, where he began to blend his artistic creativity with mechanical design. He applied his cross-discipline engineering and artistic skills to challenges of world-leading theme parks and exhibitions. Louis enjoys collaborating with talented and diverse teams of engineers, designers, artists, and fabricators where he's able to contribute to the development of novel ideas, technologies, and concepts. He sees IHMC as an ideal place for such collaboration on meaningful and creative research. In his free time, he enjoys video game development, cooking for friends and family, and making replicas.



KIAN AGRAWALA, RESEARCH ASSOCIATE

Kian joined IHMC full-time in May 2024 as a Research Associate. He spent time as an intern working with Dr. Matt Johnson and his team on the DARPA Artificial Social Intelligence for Successful Teams project. He graduated from Rutgers University Honors College with a double major in mechanical engineering and computer science. Outside of academia, Kian's interests include competitive table tennis, mountain biking, Legos, PC gaming, cooking, baking, and woodworking.



SEAN BRIDGES, RESEARCH ASSOCIATE

Sean joined IHMC in May 2024 as a research associate working with Dr. Gwen Bryan and her team on exoskeletons and related projects. He earned a bachelor's degree in mechanical engineering at the University of West Florida and previously spent time as an IHMC intern. As an intern he worked with the exoskeleton team. As a student, he held leadership positions in the American Society of Mechanical Engineers, University of West Florida Division and participated in the annual NASA Human Exploration Rover Challenge in Huntsville, Ala.



GARRETT LUNDEGARD, RESEARCH ASSOCIATE

Garrett joined IHMC in April 2024 as a Research Associate working with Jared Li and his team on exoskeleton projects. He earned a bachelor's degree in electrical engineering from the University of Maryland, and a master's degree in biomedical engineering from Hamburg University of Applied Science. He spent five years as an electrical and embedded systems engineer before pursuing his master's degree. IHMC's interdisciplinary workflow appealed to him given his research interests. During his master's degree, he led a team to design a system for controlling a robotic hand using electromyography signals from the forearm of a person during flexion and extension movements.



KATHERINE MORTIMORE, RESEARCH ASSOCIATE

Katherine joined IHMC in January 2024 as a research associate working with Dr. Toshi Miyatsu and his team. Her research interests lie in applying neuroscience and data science to critical challenges in healthcare and medicine. She came to IHMC eager to build upon her successful experience in a human neuroscience lab at the University of Washington, where she was research coordinator for the Cognition and Cortical Dynamics Lab. She earned her bachelor's degree in neuroscience at Washington. She also served a student internship for the U.S. Navy at the Strategic Weapons Facility Pacific in Silverdale, Wash., where she worked to develop new information sharing portals for the facility.



BEN SHINNICK, RESEARCH ASSOCIATE

Ben joined IHMC in January 2024 as a Research Associate with the human machine teaming group. He earned a bachelor's degree in computer science from the University of West Florida. Ben began as an IHMC intern on the DARPA Artificial Social Intelligence for Successful Teams. His work as an intern involved data analysis and developing software tools, simulations, and visualizations that implemented effective automated teammates and supported the understanding of teamwork and team performance. His research interests include human-machine teamwork and machine learning, software engineering technologies, web development, and user interface design. In his free time, he enjoys reading, running, hiking, traveling, and cooking.



ELIZABETH CHRISTENSEN, ACCOUNTING COORDINATOR

Elizabeth joined IHMC as accounting coordinator in February 2024. Her background in bookkeeping, accounting, and office management in the private sector adds depth and additional support to the administrative team overall and especially to the finance team led by Chief Financial Officer Ronnie Armstrong. She earned an associate's degree at Pensacola State College and is a Florida Notary Public. Outside of work, Elizabeth enjoys traveling, baking, and almost any outdoor activities.

Peek behind the curtain as IHMC hosts Open House for National Robotics Week

As a middle school teacher, Jen Reichwage believes that when it comes to the possibility of a career in science, for her students, seeing is believing.

first-hand their work in drones, robotics, virtual reality experiences, human performance research projects, data visualization, and more.

the chance to interact with researchers and learn more about what they do.

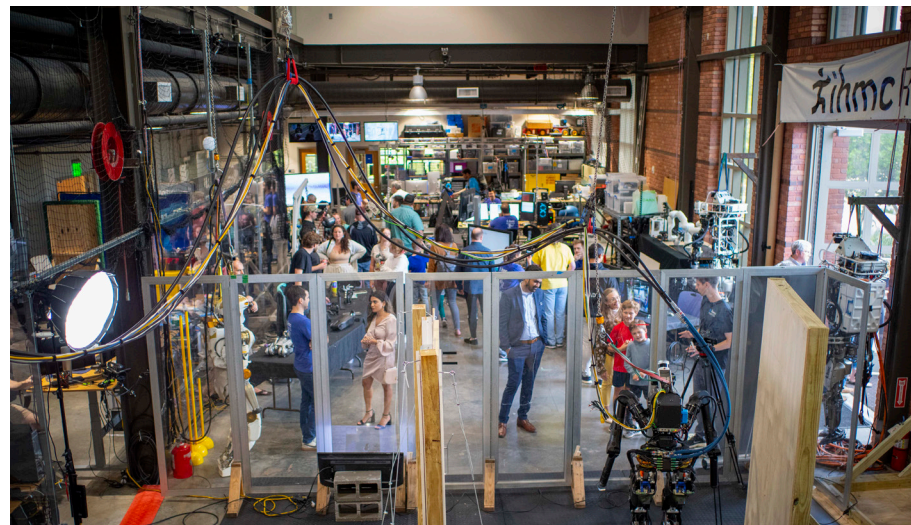
“Students were able to see different aspects of research that utilize technology in creative and innovative ways. They were able to test some of them and interact with others,” Reichwage said.

The Levin Center for IHMC Research — which houses the robotics lab — was one of the main draws of the event, but all of IHMC’s research disciplines were represented at Open House.

Dozens of researchers in robotics, engineering, cognitive science, and human performance, shared their work — and their love of their careers in science-related fields.

“IHMC is a shining star for the community and students were captivated by speaking to researchers and interacting with the exhibits,” Reichwage said.

National Robotics Week was established by Congress in 2010 and aims to bring together students, educators, and influencers who share a passion for robots and technology. ✨



Visitors to the robotics lab at IHMC’s 2024 Open House were able to meet many researchers and learn about the science and technology conducted at IHMC.

“Students must be exposed to STEM-related professions,” she said. “If students cannot see what it means to be in (Science Technology Engineering and Math), they will likely not see themselves in a STEM field and not pursue one.”

That is why Reichwage led a field of her students to the April Open House at the Florida Institute for Human and Machine Cognition (IHMC). The event drew hundreds of people, including Reichwage’s students from Creative Learning Academy, as staff welcomed families, students, and the public for tours, walk-throughs, and inspiration on the Pensacola campus.

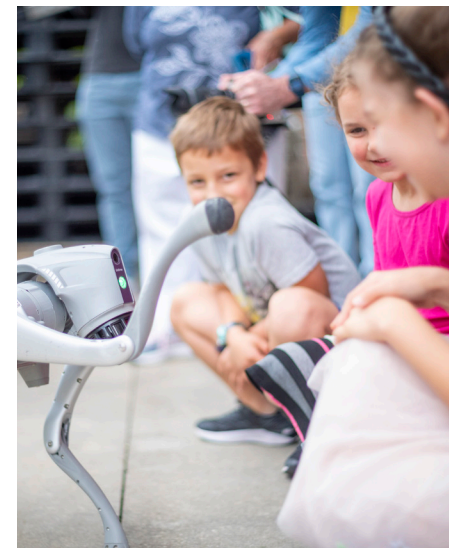
The family-friendly event encourages scientific discovery through hands-on activities, challenges, and demonstrations while providing the opportunity to learn. Visitors met IHMC researchers and saw

Debbie Garland was another teacher who led a field trip to Open House, which coincides with National Robotics Week. Garland’s students are fourth-graders at Sacred Heart Cathedral School.

Her students learn about simple machines and coding in fourth grade, so the open house offered a great hands-on learning opportunity for them to explore in a creative way. This was the fifth year that Garland brought her students to IHMC. She keeps bringing them back because it offers a unique hands-on learning experience that’s not found anywhere else.

“Students have a better idea about what sort of job opportunities might be available to those students that love science, robotics, and coding,” she said.

Reichwage and Garland both said the biggest takeaway for their students was



Students of all ages enjoyed the 2024 IHMC Open House.

Robotics camp offers middle and high school students an intensive STEM learning experience

For the student who loves robots and programming — and the student who is curious about it but has never gotten the chance to develop STEM skills in these fields — Robotics Camp is one of IHMC’s signature community outreach education efforts.

Camp is set for June in Pensacola and July at IHMC’s Ocala campus. Students don’t need prior experience in programming or prior knowledge about robots to enjoy this camp, said Dr. Ursula Schwuttke, director of educational outreach, who leads the camps.

“Students who are interested in STEM fields in general will enjoy themselves,” Schwuttke said. “There’s no better way to introduce these concepts to your child — while also providing them with a fun summer experience that will increase their self-confidence in STEM.”



Students at IHMC work in small groups to explore their interest in robotics and programming.

In 2023, 66 middle- and high-schoolers participated in these hands-on experiences, designing their own LEGO robots, learning the basics of coding, and increasing their problem-solving skills.

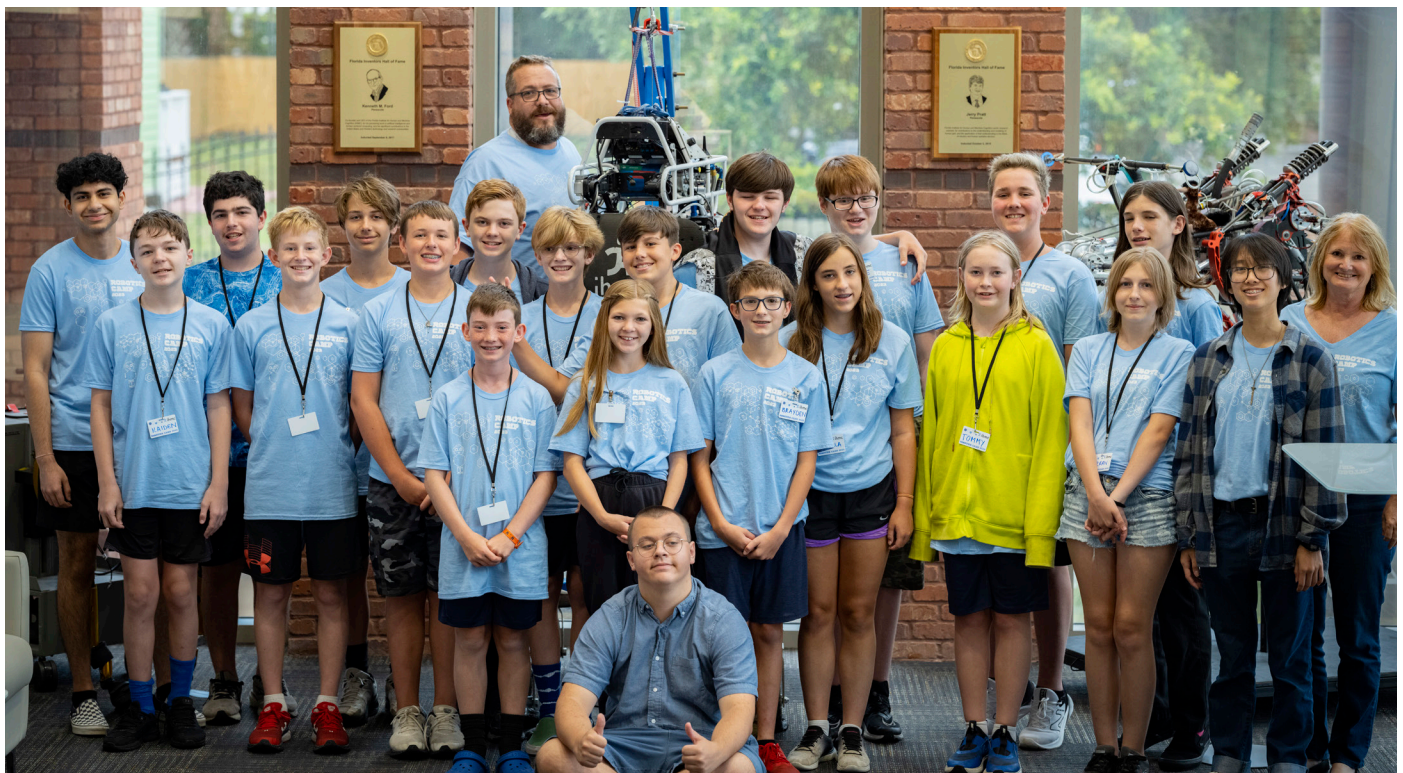
“Camp allows us to reach the next

generation of potential scientists and engineers, helping them to discover what their future might look like,” Schwuttke said.

“Opportunity is vitally important for kids,” said Schwuttke. “Without the opportunity to discover an interest coding or robotics, they wouldn’t know that it’s something they might

want to pursue.”

Robotics Camp is sponsored in Pensacola by Cox and in Ocala by Lockheed Martin, Cox, Career Source Citrus /Levy / Marion, and the Ocala Mac User’s Group.



Summer Robotics Camp ends with group portraits in the Levin Center for IHMC Research.

Pensacola lectures featured experts on artificial intelligence, space, metabolic health and more



DR. NIRANJANI SURI

The Internet of Things: Origins, Present, and Future

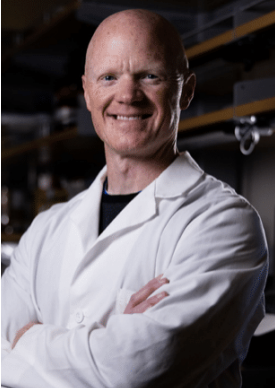
The Internet of Things (IoT) is the web of connected devices that are woven deeply into our everyday lives. From smart homes filled with smart appliances, smart switches, and smart light bulbs to personal devices such as Fitbits and smart watches, you interact with IoT devices every day. But what exactly is IoT? How did it become such a common element of our environment? What are some of the other applications of IoT? And what is to come in the near future? Dr. Niranjani Suri, IHMC's Associate Director, shared some of those answers in his lecture. He talked about the military applications of IoT, and he will talk about the challenges raised by IoT, such as privacy and data rights.



DR. TOM JONES

Space Shuttle Stories: Capturing the Human Element of America's Iconic Spaceship

It's been some 12 years since the Space Shuttles retired, but the lessons America learned from its signature space program still reverberate. What we know how to do well today in space, we learned on the shuttle. Those lessons are the foundation of work on the International Space Station and plans to return to the Moon. Nobody knows that better than Dr. Tom Jones. Jones spent 53 days living and working in space. A graduate of the U.S. Air Force Academy, he is an author, pilot, and speaker whose career includes 11 years at NASA. He flew on four Space Shuttle missions and led three spacewalks to install the centerpiece of the International Space Station. He shared with our audience, "Space Shuttle Stories," an IHMC Evening Lecture inspired by his book of the same title.



DR. BENJAMIN BIKMAN

Why We Get Sick: The Role of Metabolism in Health

According to Dr. Ben Bikman, the most common and lethal chronic diseases all have one thing in common — they're all caused or exacerbated by a metabolic condition known as insulin resistance. In his Evening Lecture, Bikman defined insulin resistance, provided an appreciation for its prevalence, and established a series of cause and consequence of the disorder. Bikman earned his Ph.D. in bioenergetics and was a postdoctoral fellow with the Duke-National University of Singapore in metabolic disorders. He works at Brigham Young University with the aim of better understanding the role of elevated insulin and nutrient metabolism in obesity, diabetes, and dementia. He also is the Chief Health Officer for RxSugar and the author of "Why We Get Sick."



DR. STEFAN M. PASIAKOS

Physiology of Stress in Strenuous Military Operations

Dr. Stefan Pasiakos joined the National Institutes of Health (NIH) in July 2023 as the Director of the Office of Dietary Supplements. He helps lead NIH efforts to expand the knowledge base on dietary supplements, enhance the research workforce, and translate dietary supplement research findings into useful information for the public. Previously, he was Chief of the Military Performance Division of the U.S. Army Research Institute of Environmental Medicine. There his team developed evidence-based solutions to limit musculoskeletal injuries and optimize physical and cognitive performance in military training and operational environments. His research interests include nutrition, muscle physiology, and human performance.

Ocala Lectures hosted experts on Parkinson's, sensory stimulation, human cognition, and more



DR. MICHAEL OKUN

Ending Parkinson's Disease: A Prescription for Action

In the past 25 years, the number of people with Parkinson's Disease has jumped from 3 million to more than 6 million. By 2040, it will likely double again. Dr. Michael Okun is a neurologist, neuroscientist, and author who is co-founder and director of the Norman Fixel Institute for Neurological Diseases at the University of Florida. He is best known for his work in translating physiological principles underpinning neurological diseases, including Parkinson's, into real-world therapies. In his lecture he noted the prevalence of environmental toxins that contribute to Parkinson's, while noting that our investment in new therapies have lagged behind the disease. He spoke about the Parkinson's PACT (Prevent, Advocate, Care, Develop Treatments) and increasing our investment in the next generation of research.



DR. KEVIN GLUCK

Mind Flight: A Sampling of Things We Now Know about the Human Mind

Today it seems imperative that there exists in the world an organization like IHMC focused on the study of cognition in humans and machines. A century ago, however, this would certainly not have been so. Back then, the prevailing opinion was that the internal workings of the mind were not even a valid topic of scientific study, because they were not directly observable. Now we live in an age in which we learn more nearly every day about how and why people learn, forget, and make decisions. This knowledge is fueled by decades of discoveries by a diverse set of disciplines dedicated to improving our understanding of the human mind. In this lecture Gluck provided a metaphorical "flight" or "sampler" of insights about our minds, all of which have some relevance and implications for our everyday lives.



DR. MICHAEL LARSON

Enhancing Wellness Through Sensory Stimulation: An Application to Better Sleep

In his lecture, Dr. Michael Larson shared the historical uses of sensory stimulation to alter various aspects of human physiology including heart rate, blood pressure, stress levels, and pain perception. Advancements in understanding of the brain and nervous system and technological advances have created new possibilities in this field. Larson introduced a framework for leveraging sensory stimulation to serve as complement to conventional treatments. Larson earned his Ph.D. from Massachusetts Institute of Technology and spent time in the U.S. Air Force before embarking on a career in academia for more than 30 years. Larson shared an example from his research into using structured sounds to enhance sleep. He has tackled a wide range of research projects.



DR. MARK LUPO

Thyroid Nodules, Cancer and Individualizing Care for the Best Outcomes

Dr. Mark Luopo is the founder and Medical Director of the Thyroid & Endocrine Center of Florida. He is board-certified in endocrinology and internal medicine. He attended Duke University and earned his medical degree and internal medicine training from the University of Florida. He completed endocrinology training through a combined program at the University of California, San Diego and Scripps Clinic. He is a Clinical Assistant Professor at the Florida State University College of Medicine, a member of the Board of Directors of the American Association of Clinical Endocrinologists (AACE), and the current Secretary of the Academy of Clinical Thyrologists. He lectures worldwide on thyroid nodules and teaches neck ultrasound in the evaluation of nodules and cancer to other endocrinologists and surgeons.

STEM-Talk experts share the power of precision medicine, blood-flow restriction training, the soleus push-up, and much more



ASK ME ANYTHING, EPISODE 159

Co-hosts Dr. Ken Ford and Dr. Dawn Kernagis tackle listener questions on several subjects, including AI, its capabilities and limitations. Ken, who is Fellow of the Association for the Advancement of Artificial Intelligence, answered questions about the future of AI, and also delved into questions about therapeutic ketosis, the pain-relieving potential of kratom, the likelihood of life elsewhere in the universe, and more. Ken closes the show recalling Arthur Kershaw, the high school wrestling coach whose influence and mentorship Ken still reflects upon.



DR. EUAN ASHLEY, EPISODE 160

Dr. Euan Ashley is a pioneer in the use of genomic sequencing to solve some of our most puzzling medical mysteries. Medical genomics, and the precision medicine it will enable, has the potential to predict, prevent, and diagnose many diseases. Euan is a professor of medicine and genetics at Stanford University and the author of *The Genome Odyssey: Medical Mysteries and the Incredible Quest to Solve Them*. The conversation covers how he has helped establish medical genomics, as well as the Undiagnosed Disease Network, which works with patients and families to solve medical mysteries.



DR. STEN STRAY-GUNDERSEN, EPISODE 161

The study of blood-flow restriction training is something of a family tradition for Sten Stray-Gundersen. His father, Jim Stray-Gundersen, was a guest on episode 34 of STEM-Talk in 2017 and helped pioneer blood-flow restriction training in the United States. In this episode, co-hosted by Dr. Marcas Bamman, IHMC Senior Research Scientist, Ken talks with Sten about how blood-flow restriction training increases muscle strength, improves endurance and reduces the risk of injury. It also delves into Sten's research into hypoxia and endothelial function. Sten is a post-doctoral research associate at the University of South Carolina and an adjunct instructor at the university's Arnold School of Public Health.



DR. MARC HAMILTON, EPISODE 162

Dr. Marc Hamilton has published pioneering work on the soleus push-up, a potent physiological method with the ability to elevate metabolism for hours, even while sitting. As a professor of Health and Human Performance at the University of Houston, Marc is well known for a string of papers beginning in early 2000's that found excessive sitting should be viewed as a serious health hazard. In this interview, we talk to the Texas native about the soleus push-up's ability to sustain elevated oxidative metabolism to improve the regulation of blood glucose more effectively than many popular methods touted as a solution.



DR. MARK MATTSON, EPISODE 163

Dr. Mark Mattson, an adjunct professor of neuroscience at Johns Hopkins School of Medicine, makes his third appearance on STEM-Talk. The interview focuses on his research into the neurotransmitter glutamate. Glutamate controls the structure and function of the brain's neuronal networks and mediates many of our human capabilities, such as learning, memory, creativity, and imagination. But there's also a dark side to it, as Mark describes how it can play a causal role in the development of disorders such as autism, schizophrenia, and epilepsy as well as diseases such as Alzheimer's, Parkinson's, and ALS.



DR. MICHAEL LEON, EPISODE 164

What if the path to delaying the onset of dementia symptoms begins at the nose? It is a doorway that the research of Dr. Michael Leon opened with a 2023 study on the power of olfaction enrichment to influence memory function and brain health. The findings drew wide interest when his results found that stimulation of our sense of smell with essential oils had a profound impact on memory, cognition, and language recall. That led us to invite him to STEM-Talk. Leon's long research career has focused on the influence of environmental enrichment on neurological function, disease, and disorders. He has studied the benefits of sensory-motor stimulation for children with autism spectrum disorder, for the treatment of anorexia and for those with dementia and neurological conditions.



DR. JOHNATHAN EDWARDS, EPISODE 165

Dr. Johnathan Edwards, an anesthesiologist, joined STEM-Talk for a frank conversation about the problem that suicide presents in American life, and the role ketamine could have in countering that. Ketamine was developed in 1960s in the search for an anesthetic that did not cause post-operative delirium. In the 1990s, researchers found that in low doses, it had a huge effect on eating-disorder patients. It was tried in treatment-resistant depression patients, then in the prevention of suicidal ideation. While ketamine has been found to be safe in therapeutic settings, a dark side of it is the way it has been used as a drug of abuse. Our conversation with Edwards also covers the benefits that psychedelics — including ketamine and MDMA — show in treatment of depression, suicidal ideation, post-traumatic stress disorder and more.



DR. VYVYANE LOH, EPISODE 166

Dr. Vyviane Loh returns for her second STEM-Talk appearance, this time to discuss atherosclerotic heart disease (ASCVD). The disease affects some 26 million people in the U.S., and annually leads 2 million hospitalizations and more than 400,000 deaths. Loh is a board-certified physician in obesity and internal medicine who specializes in weight management and the treatment of chronic metabolic diseases. In this episode, the conversation focuses on ASCVD and the gap between clinical treatment and the advances in biological science research about risk factors, including updates to the anatomical aspects of the disease model itself. "We're focused on cholesterol because that's what statins target," Loh says. "The idea has been... this is the main way to prevent atherosclerotic disease. We've seen that hasn't really been that effective."



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