Oct. 2025

GEORGIA PATHWAYS

MAGAZINE

Air Traffic Control
A vital Georgia STEM shortage

Veterinary Challenges Across Georgia

Bridging Georgia Digital Skills Gap
Dr. Loretta Daniels

VR In Aviation

The Technology Association of Georgia Education Collaborative (TAG-Ed) strengthens the future workforce by providing students with relevant, hands-on STEM learning opportunities and connecting them to Technology Association of Georgia (TAG) resources.

Formerly the TAG Foundation, TAG-Ed is a 501(C)(3) non-profit organization formed by TAG in 2002. Later, the organization's name was re-branded to TAG Education Collaborative to facilitate our role as the leaders for K-12 STEM education in Georgia.

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Welcome to the October 2025 edition of Georgia Pathways Magazine, your monthly look into the people, ideas, and technologies shaping Georgia's innovation economy. As industries evolve and new opportunities emerge, one constant remains clear: the need for forward-thinking talent ready to lead in science, technology, engineering, and beyond.

This month's issue explores how Georgia continues to strengthen that foundation through technological innovations in critical fields. In Air Traffic Controllers Shortage, we'll read about the growing career field where STEM training meets real-world demand, highlighting the need for systems that keep our skies safe and our workforce strong.

Similarly, Virtual Reality in Aviation showcases the immersive technologies transforming pilot training and aviation safety. Beyond the Buzz Words examines the role of impartiality as a critical value for sustainable innovation in the landscape of modern industry. Then, Veterinary Challenges in Rural Georgia highlights how technology is bridging healthcare gaps for Georgia communities and their animals. Finally, in Transcendental Learning in STEM Education, we'll read how addressing the needs of the whole student creates stronger, more resilient learners and future leaders.

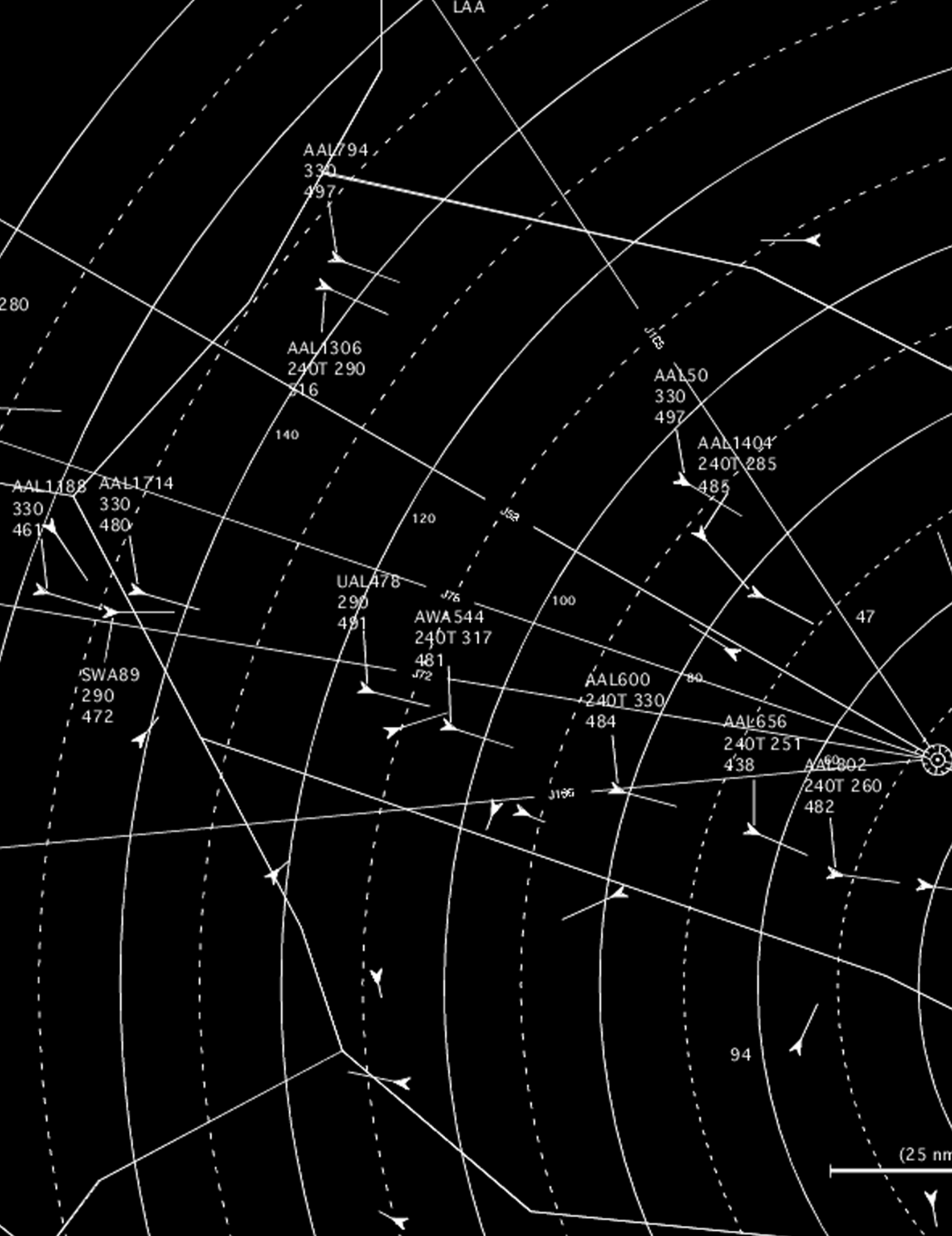
As Georgia's technology ecosystem continues to expand, so do the opportunities to connect, collaborate, and invest in its future. That's why TAG Education Collaborative is proud to partner with IBM SkillsBuild, a global initiative designed to equip

both educators and students with the digital and professional skills needed to thrive in today's workforce. Through this partnership, TAG-Ed is helping Georgians access free, high-quality training in areas like cybersecurity, data analytics, cloud computing, and more, ensuring that learners of all ages are prepared to meet the demands of a rapidly evolving tech landscape.

Together, TAG-Ed and IBM SkillsBuild are building a more inclusive and resilient talent pipeline, one that empowers communities, strengthens schools, and fuels innovation across the state. These efforts ensure Georgia's place as a global hub of innovation, where talent and technology intersect to shape the future. Learn more about TAG's workforce development initiatives at tagedonline.org.

Larry K. Williams
President
TAG / TAG-Ed

Larry K. Williams serves as the President and CEO of the TAG and the TAG Education Collaborative. TAG-Ed's mission is to strengthen Georgia's future workforce by providing students with relevant, hands-on STEM learning opportunities by connecting Technology Association of Georgia (TAG) resources with leading STEM education initiatives.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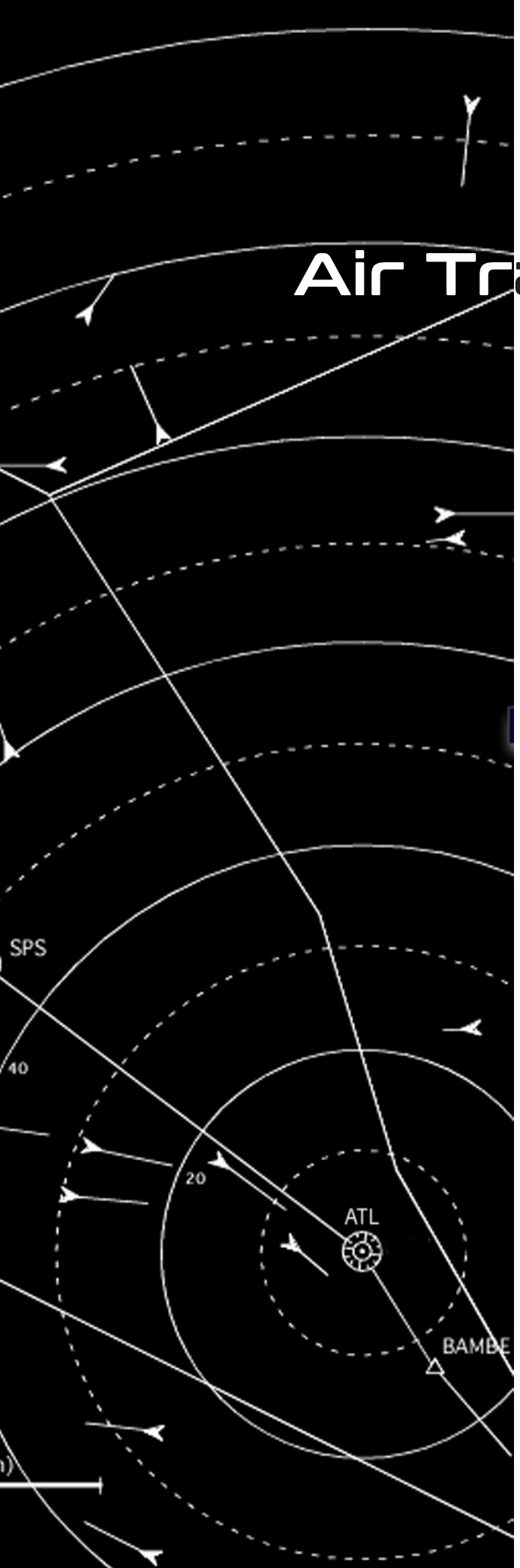


Air Traffic Controllers

A STEM Career Shortage

Every minute, every hour, every day, there are men and women working to ensure the safety and efficiency of our national airspace system.

This elite group of more than 14,000 FAA air traffic control specialists provide a vital public service to guide pilots, their planes and 2.2 million daily passengers from taxi to takeoff, through the air and back safely on the ground.

Because of the serious nature of this work and zero margin for error, the training regimen and proficiencies needed to become an air traffic control specialist, are demanding. Initial selection does not guarantee placement into federal civilian service. Entry-level applicants must complete required training courses at the FAA Academy in Oklahoma City* and gain on-the-job experience before becoming certified professional controllers.

Georgia aviation needs you now.

Air traffic controllers' primary concern is safety, but they also must direct aircraft efficiently to minimize delays. They manage the flow of aircraft into and out of the airport airspace, guide pilots during takeoff and landing, and monitor aircraft as they travel through the skies. Air traffic controllers use radar, computers, or visual references to monitor and direct the movement of the aircraft in the skies and ground traffic at airports.

Controllers usually manage multiple aircraft at the same time and must make quick decisions to ensure the safety of aircraft. For example, a controller might direct one aircraft on its landing approach while providing another aircraft with weather information.

The following are examples of types of air traffic controllers:

Tower controllers direct the movement of vehicles, including aircraft, on runways and taxiways. They check flight plans, give pilots clearance for takeoff or landing, and direct the movement of aircraft and other traffic on the runways and in other parts of the airport. Most work from control towers, observing the traffic they control. Tower controllers manage traffic from the airport to a radius of 3 to 30 miles out.

Approach and departure controllers ensure that aircraft traveling within an airport's airspace maintain minimum separation for safety. They give clearances to enter controlled airspace and hand off control of aircraft to en route controllers. Approach and departure controllers use radar equipment to monitor flight paths and work in buildings known as Terminal Radar Approach Control Centers (TRACONs).

They also inform pilots about weather conditions and other critical notices. Terminal approach controllers assist the aircraft until it reaches the edge of the facility's airspace, usually about 20 to 50 miles from the airport and up to about 17,000 feet in the air.

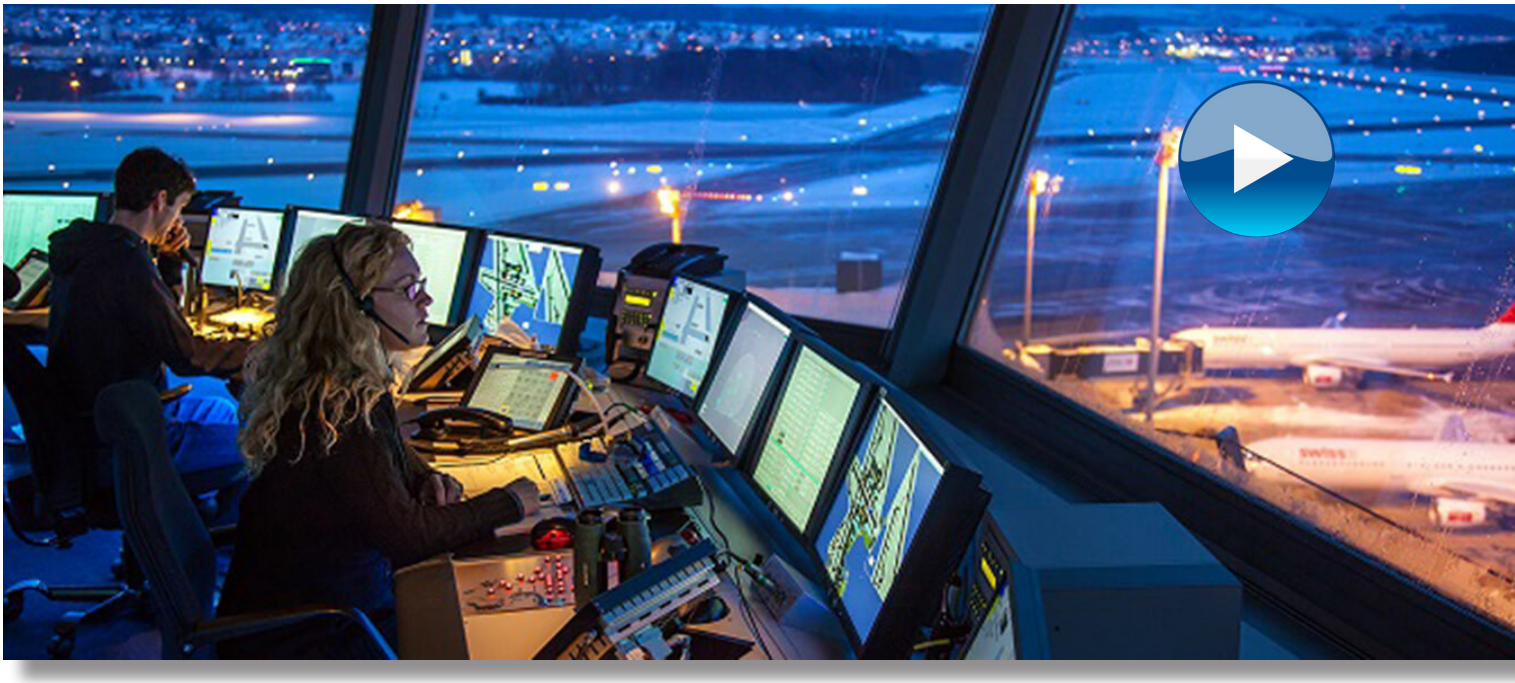
En route controllers monitor aircraft once they leave an airport's airspace. They work at air route traffic control centers located throughout the country, which typically are not located at airports. Each center is assigned an airspace based on the geography and air traffic in the area in which it is located. As an airplane approaches and flies through a center's airspace, en route controllers guide the airplane along its route. They may adjust the flight path of aircraft to avoid collisions and for safety in general. Route controllers direct the aircraft for the bulk of the flight before handing to terminal approach controllers.

Some air traffic controllers work at the Air Traffic Control Systems Command Center, where they monitor traffic within the entire national airspace.

When they identify a bottleneck, they provide instructions to other controllers, helping to prevent traffic jams. Their objective is to keep traffic levels manageable for the airports and for en route controllers.

Air traffic controllers typically do the following:

- *Monitor and direct the movement of aircraft on the ground and in the air*
- *Control all ground traffic at airport runways and taxiways*
- *Issue landing and takeoff instructions to pilots*
- *Transfer control of departing flights to other traffic control centers and accept control of arriving flights*
- *Inform pilots about weather, runway closures, / other critical information*
- *Alert airport response staff in the event of an aircraft emergency*



"People become air traffic controllers for the challenging, global, and dynamic work environment, along with significant benefits like high pay, early retirement options, federal benefits, paid parental leave, and predictable schedules. This rewarding career also offers the opportunity to be a vital part of the air travel system, ensuring safety and efficiency for everyone in the skies."

Education for Air Traffic Controllers

Candidates who want to become air traffic controllers typically need an Associate's or a Bachelor's degree from an AT-CTI program. Other candidates must have 3 years of progressively responsible work experience, have completed 4 years of college, or have a combination of both.

The FAA sets guidelines for schools that offer the AT-CTI program. AT-CTI schools offer 2- or 4-year degrees that are designed to prepare students for a career in air traffic control. The curriculum is not standardized, but courses focus on subjects that are fundamental to aviation. Topics include aviation weather, airspace, clearances, reading charts, federal regulations, and related topics.

The STEM of ATC

Vital Qualities for Air Traffic Controllers

Communication skills. Air traffic controllers must be able to give clear, concise instructions, listen carefully to pilots' requests, and respond by speaking clearly in English.

This skill set falls under language arts or STEAM, and is critical to nearly every career field.

Concentration skills. Controllers must be able to concentrate in a room where multiple conversations occur at once. For example, in a large airport tower, several controllers may be speaking with several pilots at the same time.

Decision making skills (Engineering Method). Controllers must make quick decisions. For example, when a pilot requests a change of altitude to avoid poor weather, the controller must respond quickly so that the plane can operate safely.

Problem-solving skills (Engineering Method). Controllers must be able to understand complex situations, such as the impact of changing weather patterns on a plane's flight path. Controllers must be able to review important information and provide pilots with appropriate solutions.

Math skills. Controllers must be able to do arithmetic accurately and quickly. They often need to compute speeds, times, and distances, and they recommend heading and altitude changes.

Organizational skills. Controllers must be able to coordinate the actions of multiple flights. Controllers need to be able to prioritize tasks, because they may be required to guide several pilots at the same time.

Salaries -

The median annual wage for air traffic controllers is $122,410. The median wage is the wage at which half the workers in an occupation earned more than that amount and half earned less. The lowest 10 percent earned less than $66,390, and the highest 10 percent earned more than $172,680.

Georgia ATC Programs

Atlanta -
https://www.aviationschoolsonline.com/g/Air-Traffic-Controller-Training/North-Atlanta-Georgia-GA/

Macon -
Middle Georgia State
https://www.mga.edu/aviation

Valdosta -
Wiregrass Ga. Technical College
Advanced ATC
https://advancedatc.com

VR In Aviation

Using Augmented and Virtual Reality In The AIR

Research, operation and future considerations for augmented reality technologies have been expanding throughout the global aviation industry over the past decade, though published exploration of A/R can be traced back as far as the 1990s. Let's highlight some of the ways in which different areas of the aviation industry are using and evaluating future use cases for augmented and virtual reality technologies.

According to Intel, the official definition for augmented reality is computer-superimposed enhancements to a user's real-world environment, such as an oil pressure reading on a cockpit panel display. Virtual reality is defined as the creation of an environment by a computer that a person fully sees — usually accomplished with goggles or a head-mounted display system. For example, using virtual reality, the user can experience stepping into an airplane avionics bay or cabin.

Pratt & Whitney

Pratt & Whitney is no stranger to pushing new technologies forward. As far back as 2002, for example, Pratt &

Whitney Canada announced an agreement with IBM and Dassault Systems to become the first company in the aerospace industry to develop engines using digital technology throughout the entire design and manufacturing process.

The United Technologies Research Center unveiled a collaboration with Pratt & Whitney's customer training division to invest in virtual reality engine maintenance training for airline mechanics. According to Bruce Hall, general manager of Pratt's customer training division, the company is currently beta testing in classroom environments the use of headsets and hand sensor controls that would allow mechanics to virtually walk inside a GTF engine to examine parts and view a running engine in motion.

Aero Glass

Aero Glass introduced a headset that pilots can wear and view cockpit control information like altimeter readings, fuel pressure, heading and oil temperature within a display that sits in the glass portion of the headset. Aero Glass made headlines when Airbus BizLab selected their technology as one to help become transformed into a business proposition.

The head-worn display concept has also received funding from the European Union's Horizon 2020 research and innovation program. Check out its 2014 YouTube video below detailing the concept.

Air France

Air France began testing Aug. 1 what it calls an "immersive entertainment system" with the use of virtual reality headsets that passengers can wear to view 3D and 2D films or television series.

The virtual reality headset is a result of the French carrier's partnership with SkyLights, an American-French startup company that was awarded 'Les As De L'Innovation' at the Paris Air Forum

last July. Under the award, SkyLights will receive funding from Air France to expand development of its headsets.

Air France is testing the use of the headsets onboard its Airbus A340 flights between Paris-Charles de Gaulle and St. Martin. At the end of this test period, this new system could be rolled out on other flights in the months ahead, according to Air France.

Air New Zealand

Microsoft describes its Hololens headset as a "fully self-contained holographic computer" with an optical system that works with advanced sensors and a holographic processing unit (HPU).

The HPU is a TSMC-fabricated 28 nm coprocessor that has 24 Tensilica DSP cores. It has around 65 million logic gates, 8 MB of SRAM, and an additional layer of 1 GB of low-power DDR3 RAM. That RAM is separate to the 1 GB that's available for the Intel Atom Cherry Trail processor, and the HPU itself can handle around a trillion calculations per second.

Air New Zealand, in collaboration with IT service-provider Dimension Data, is beta-testing the use of HoloLens for its cabin crew. The airline envisions a future where flight attendants wearing a HoloLens headset can display passenger information on the headset such as flight details, time since last served

and even the emotional state of the passenger. The video above gives an overview of what Air New Zealand wants to do with the technology.

Bell Helicopter

Bell Helicopter publicly unveiled for the first time its futuristic FCX-001 concept helicopter, with an airframe crafted from sustainable materials, a hybrid power system, an artificial intelligence co-pilot and morphing rotor blades that change to suit different flight conditions.

Bell's description of the virtual cockpit feature notes that the company sees "pilots of the future controlling the aircraft with the aid of augmented reality and an artificial intelligence computer assistance system." This would place future helicopter pilots in the role of safety and mission officer, while the computer assistance system flies with them.

Bell sees the virtual cockpit concept as a stepping stone to "fully autonomous un-piloted vertical-takeoff-and-landing air vehicles in the future."

Boeing

Boeing announced the latest investment by its HorizonX venture arm, which was established earlier this year with the purpose of investing in start-ups for disruptive new aviation technologies. The latest investment positions Boeing within a group of investors funding Pittsburgh-based C360 Technologies' non-stitched immersive video in the world. Our live output for linear broadcast and OTT streaming platforms coupled with the industry's smallest pro-grade immersive camera is unique compared to others.

Boeing gave little details about future use of C360's capabilities, but did state that the "potential aerospace applications" include "more capable autonomous systems and other advanced platforms."

The future is here, with a shared focus on safety and accuracy. As amazing as VR is in its aviation applications, it's not a game, and there are no do-overs. As this interactive application expands in its technical abilities, we will see continued innovation for a more effective cockpit and a higher level of safety.

Editorial: Reskilling and Upskilling to Bridge Digital Skills Gaps for Georgia's Students

By Dr. Loretta Daniels

As generative artificial intelligence slowly reaches a growing adoption rate in U.S. companies, entry-level hiring has slowed, according to data from the Bureau of Labor Statistics. This hiring slowdown foreshadows changes in the labor market in coming years, though these changes are hard to predict.

During the uncertainty, one thing is clear: for a worker to remain competitive, they must have a skillset that includes digital and generative AI skills. Goldman Sachs reports that some of the jobs currently at risk due to the growing adoption of AI include graphic design, marketing consulting, office administrative roles, and call centers, to name a few. The same report projects a growing possibility that roles like accountants, legal assistant-level roles, copy editors and more could face displacement in the near future.

The growing necessity of a digital and AI-literate competitive workforce, however, does not mean that jobs like those outlined in the above risk assessments will disappear overnight. According to surveys reported by Goldman Sachs, about 9.3% of U.S. companies reported that they had used generative AI in production during the last two weeks. Instead of bracing for a sudden impact, workers interested in remaining competitive during the future implementation of generative AI should strategize by upskilling and reskilling, and get involved in relevant education programs. As an educator and leader, I believe strongly that the education programs which allow reskilling and upskilling should be available to all career levels at little to no cost, to ensure equitable access to future opportunities.

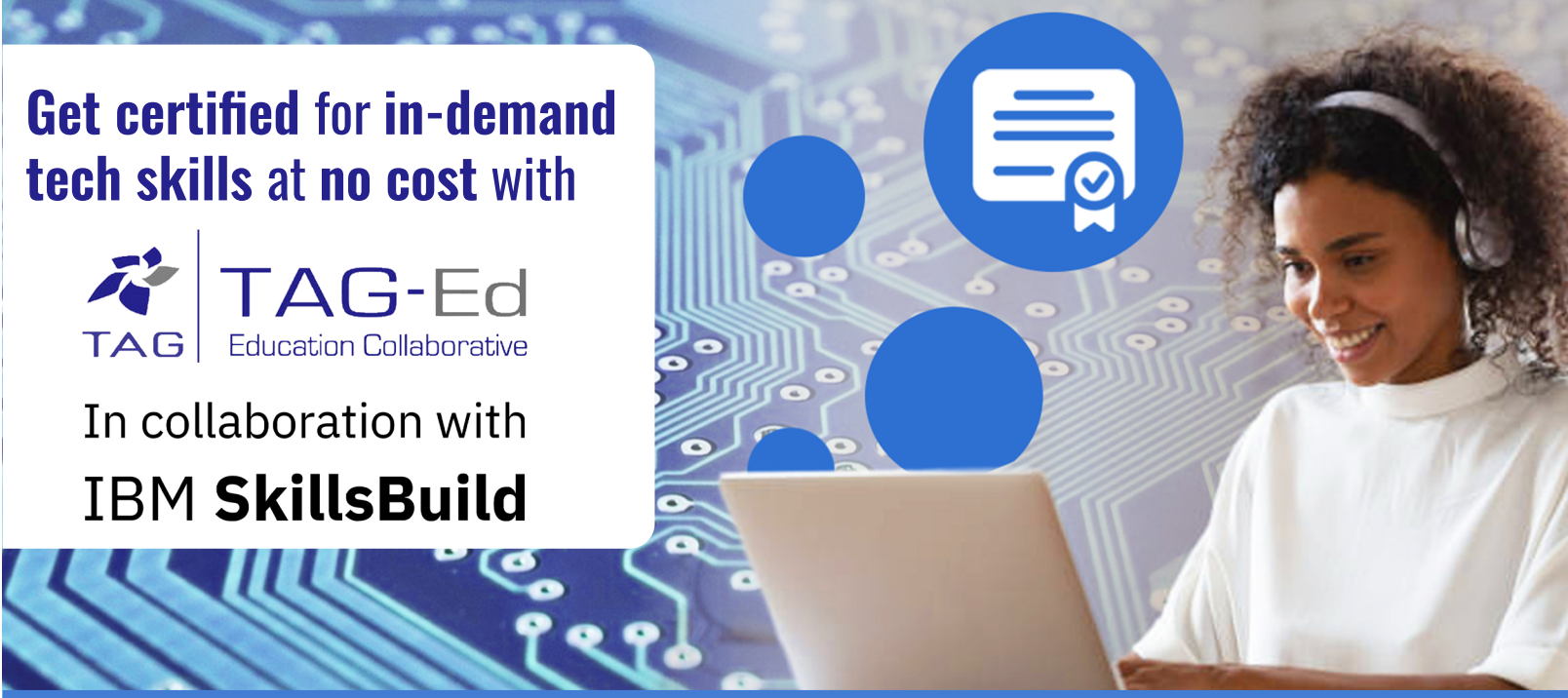
To meet the digital skills gap and prepare professionals and students for the continuing effects of AI, TAG Education Collaborative has partnered with IBM SkillsBuild to offer 7,500 certification opportunities at no cost for in-demand tech skills. The certifications offered by this program include fields like cybersecurity, data analytics, and generative AI fundamentals, among many others. Learners can apply for one of these courses by visiting https://tagedonline.org/ibm-skillshare-certificates

Learners at any career level, professionals and students alike, gain a strategic edge over future changes to the labor market by embracing education, reskilling, and upskilling. This crucial investment into one's own education doesn't need to fetch a hefty price tag, or one at all. Possible job displacement due to AI can be addressed with future-focused education initiatives like TAG-Ed's certification opportunities with IBM SkillsBuild.

Get certified for in-demand tech skills at no cost with

TAG | TAG-Ed Education Collaborative

In collaboration with IBM **SkillsBuild**



TAG-Ed and IBM SkillsBuild are offering a no-cost, cohort-based certificate program that empowers participants to earn an IBM SkillsBuild Certificate of their choice.

Who Should Enroll?

- High school students (18+)
- College students
- Professionals seeking upskilling and reskilling
- Veterans seeking upskilling and reskilling

Available courses include cybersecurity, cloud computing, generative AI fundamentals, data analytics, and more.

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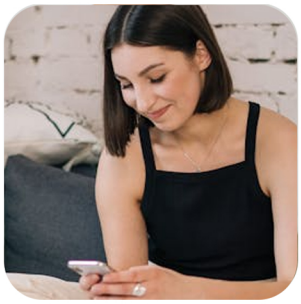


Apply for IBM SkillsBuild course through TAG-Ed

2

Begin cohort-based virtual instruction

3

Receive certification or digital credential upon completion!

SPACE IS LIMITED

Apply today!

Registered Tech Apprenticeship Program

Georgia's first nationally registered tech apprenticeship program

For applicants:

A thriving career in technology awaits you! No prior technology experience or degree is required to start paid on-the-job training at major companies!

For employers:

TAG-Ed has adapted the Registered Apprenticeship model to create a simplified path to qualified and certified talent. Access an array of tech talent address digital skills shortages!

Apprentice Journey

Interview with Employer	Begin Related Technical Instruction	Join Team	Meet with Mentor Monthly	Retrained!
				
Interview and Select Apprentice	Designate Mentors and Managers	Initiate Work Plan	Meet with TAG-Ed on the 1, 5, and 10 Month Marks	Extend Offer

Employer Journey

- Higher retention rates
- No college degree or prior technical experience required
- Save costs over traditionally sourced talent

To understand STEM...

...you must DEFINE STEM. You cannot define an acronym without defining each of the words the letters stand for.

Universities and organizations around the world continue to debate what a STEM career is, but there is no doubt that "every career" uses STEM skills and this observation remains the focus of STEM Magazine.

Science: "The systematic accumulation of knowledge" (all subjects and careers fields)

Technology: "The practical application of science" (all subjects and careers)

Engineering: "The engineering method: a step by step process of solving problems and making decisions" (every subject and career)

Math: "The science of numbers and their operations, interrelations, combinations, generalizations, and abstractions" (every career will use some form[s])

For a moment, set aside any preconceived notions of what you think a STEM career is and use the above dictionary definitions to determine the skills used in any career field you choose.

These definitions are the "real" meaning of STEM and STEM careers.

Beyond the Buzzwords:

How STEM and PBL Open Doors to **Fair** and **Impartial** Engagement

By Angela McDaniel, Ed.D.

When Impartiality Isn't an Add-On, But a Design Principle

In too many schools, equity (fair and impartial) is treated as a footnote, something to add after the lesson is written. But true equity in education isn't about catching students up; it's about designing learning that meets them where they are.

That's where PBL (project based learning) and STEM intersect beautifully. STEM gives us the content: real-world problems, data analysis, and engineering design. PBL gives us the method: authentic challenges, collaboration, student choice, and reflection. When we use both intentionally, we create space for all students, including those with neurodivergent thinking and students from underrepresented backgrounds, to find success.

STEM (Science, Technology, Engineering, and Mathematics) is more than just four subjects grouped together, it's an educational approach focused on applying interdisciplinary and transdisciplinary methods to solve authentic, often complex problems. STEM engages students in inquiry, experimentation, and design thinking. Done well, it reflects real-world challenges, preparing students for careers and civic life in a rapidly changing world. STEM also encourages critical thinking, data literacy, and persistence, skills that all students need.

However, STEM instruction alone can fall short of its promise if it becomes a set of isolated tasks or overly guided labs. Without opportunities for voice, choice, and deeper exploration, students, especially those from underrepresented or marginalized backgrounds, may struggle to see themselves as capable contributors in STEM spaces.

Project-Based Learning (PBL): A Structure for Inclusive Learning

Project-Based Learning is a teaching method where students actively explore meaningful questions or challenges over time. A strong PBL unit includes an authentic driving question, student voice and choice, sustained inquiry, critique and revision, and a public

product. It emphasizes collaboration, relevance, and the development of 21st-century skills.

PBL is naturally equity-focused when implemented well because it is grounded in student-centered learning. It affirms that all students, regardless of background, bring valuable perspectives and experiences to the learning process. PBL allows students to connect content to their lives and communities, which is especially empowering for those who have not traditionally felt represented in academic settings.

How They Mesh: PBL + STEM = Equity in Action

When PBL is used as the delivery method for integrated STEM content, it creates an educational environment where equity becomes a design principle rather than an afterthought. Here's how the intersection works:

- STEM gives the "what"—PBL gives the "how." STEM provides the content: real problems to solve using scientific and mathematical thinking. PBL provides the pedagogical structure that empowers students to engage with those problems meaningfully.

- STEM makes learning rigorous, PBL makes it accessible. Solving real-world problems demands depth of knowledge, but PBL breaks down barriers by scaffolding inquiry and encouraging collaboration, especially useful for English learners, neurodiverse students, and others who benefit from multiple ways of accessing content.

- Both are rooted in relevance. PBL-STEM units are naturally tied to authentic situations, like testing water quality, building safer communities, or designing renewable energy solutions. Relevance helps students feel that their learning matters and that they have a place in the problem-solving process.

- They create space for underrepresented students to lead. PBL often includes public presentation and iterative design, giving all students opportunities to take ownership, build confidence, and be seen as innovators and leaders, not just consumers of information.

In one STEAM TAC workshop, a group of eighth-grade students in rural West Virginia designed prototypes for water filtration systems based on local contamination data. What stood out wasn't just the science. It was the ownership.

Students weren't working on hypothetical case studies; they were solving their own community's problems. That's what equity (fairness and impartiality) looks like in action. They chose a local stream and, with the help of a Department of Natural Resources employee, collected and tested the water.

They found that it was contaminated by runoff from a nearby abandoned mining site. They then designed several methods to test whether they could make the water cleaner and, if so, how clean it would become.

Their "winning"
design was a wild-looking contraption that used layers of cotton, sand, charcoal, coffee filters, and small pebbles. It removed 70% of the additives from the water. As a wrap-up, they presented their findings to the local soil conservation office and DNR.

Engagement Is Not a Perk—It's the Path

Let's be honest: students are tired of worksheets. They want to matter. They want to solve real problems. When we trust them with meaningful work, they rise to the occasion.

In PBL, students lead investigations, collaborate in diverse teams, and iterate solutions. STEM offers natural content for these explorations: from designing earthquake-resistant structures in math to tracking migration patterns in science. Add in tools like coding, sensors, or digital modeling, and students start to see themselves not just as learners, but as scientists, engineers, and civic leaders.

In our STEAM TAC classrooms, we've had high schoolers code micro: bits to simulate seismographs, and middle schoolers build energy-efficient greenhouse models for Appalachian growers. Engagement isn't a side effect, it's the engine. And when engagement increases, so does learning, especially for students often left out of traditional methods.

A Model That Travels: What STEAM TAC Teaches Us

At STEAM TAC, we bring mobile PBL-STEM innovation to schools across West Virginia, including both urban and rural areas, as well as Title I and top-ranked schools. Everywhere we go, the results are the same: students lean in when the work is real. And teachers grow more confident when they see that PBL doesn't mean giving up control, it means amplifying student voice.

Our model is grounded in three principles:

- Hyperlocal authenticity: Projects draw on students' surroundings and lived experiences.

- Teacher partnership: We co-design units with teachers, not for them.

- Equity-first mindset: Every unit is planned with access, representation, and inclusion at its core.

We've served more than 60,000 students across 650 schools and worked with over 500 teachers in all 55 counties of West Virginia. That's not just outreach; it's proof of concept. In surveys, teachers report up to 95% engagement with these activities.

What Happens When We Trust Students with Complexity?

We get better outcomes. We see more profound questions. We witness higher-order thinking from kids who've never seen themselves as "honors" students. More importantly, we build classrooms where every learner feels seen, and where the future feels like something they have the power to shape.

I recommend we stop asking whether we should do STEM or PBL. Let's ask how we can do both better, and for every student, not just the ones already ahead.

Share this issue with your students, peers, parents and industry professionals you know across Georgia. Make this a new monthly connection for curiosity, interaction, college prep and career development.

Many parents really enjoy this content as they too pursue their personal life-long learning goals.

Local industry and government leaders need to know about this resource as their future employees decide and prepare how to spend their careers.

Engineering a STEM Solution to Veterinary

Challenges In Georgia

By Presha Kashyap

The Future of Veterinary Medicine

Veterinarians are essential pillars in our society and contribute to the well-being of the beloved companion animals which enrich human lives. Beyond their benefits to pets, they are also indispensable to the agricultural systems and animal husbandry which allow for abundant, safe, and nutritional resources. As with most professions, challenges persist for veterinarians both in mental health and the rigorous demands on time and energy.

The high demands on Veterinarians professionally often go unrecognized and certainly should be appreciated and considered for their contributions. Rural areas are especially susceptible to a variety of challenges, not the least of which include high service demand and usually poor medical supply availability.

The veterinary fields remain irreplaceable to our society, with the coming decades poised for expansive career importance. As the interconnectedness of societies globally increases the possibility of new zoonotic viruses, sustainable agriculture becomes more challenging to manage amidst the changing climate. Veterinarians will certainly play an increasingly important role in animal husbandry. To meet its evolving demands, the veterinary professionals must continue innovating and expanding with the help and partnerships of other STEM fields.

Georgia veterinary partnerships include collaborations between the University of Georgia (UGA) College of Veterinary Medicine and organizations like the Georgia Veterinary Medical Association (GVMA), Boehringer Ingelheim, and Atlanta Humane Society. These partnerships can ensure that not only one field is benefited but also related surrounding fields that are also essential to society, developing a mutualistic relationship that strengthens our communities.

Providing veterinarians with the necessary support and tech advancements will be a key contributor to providing a healthier future for everyone. Managing and monitoring animal health for the safety of public health remains a career priority. When considering veterinary medicine, people imagine cuddles with fluffy golden retrievers, regal cats purring on the examination table, or the fragrant winds of the pasture and

barn. Although this is often true, the expensive nature of veterinary care does not translate to inflated profits for veterinarians.

Veterinary medicine can be very complicated and demanding, physically, mentally and financially. A high level of emotional resilience is required of professionals in the veterinary fields to cope with financial stress and often limited technological access and infrastructure, specifically within rural communities.

The unseen struggle of veterinarians around the world presents a challenge for animal welfare and public health, but STEM innovations will enhance the field and make it more effective as well as provide a greater level of professional satisfaction for vets.

The Challenging Realities of the Veterinary Field

Veterinary medicine is academically rigorous and intellectually demanding, beginning long before actually setting foot into a veterinary clinic. Veterinary school admissions are extremely competitive, limited and expensive, possibly more than most medical schools, yet requiring a higher level of dedication in many academic areas. Once admitted, students complete several years of meaningful, though intense coursework, providing them with invaluable knowledge in topics ranging from the typical anatomy and physiology courses to surgery, diagnostics, and public health. Alongside the academic coursework that students undertake, clinical training is also required, providing advantageous experience in

preparation for the transition into the clinic environment. The stressors of the medical fields cannot be over-emphasized and must be seriously considered.

Upon entering the field after graduation, veterinarians can expect high pressure environments, long unpredictable hours and a heightened level of responsibility. Depending on the area of specialization, the possibility of handling aggressive animals that pose a physical danger is a stark reality.

From hostile pets to belligerent horses, the requirements of providing services to these animals requires tremendous mental and physical stamina, as well as lengthy hours and emotional challenges. Quality of care is always a priority, and the emotional impact of life and death decisions as well as the satisfaction of successful treatment cannot be taught, but only experienced. The saving of an animal's life is certainly worth the sacrifices of this career choice.

The financial aspects of the veterinary field underscores the value of its professionals. Approximately 82% of veterinarians graduated with student debt, which can take years to pay off.[1] Contrary to the belief that veterinarians are well-compensated, they earn significantly less than human doctors, despite having an equally heavy educational and emotional burden.[3]

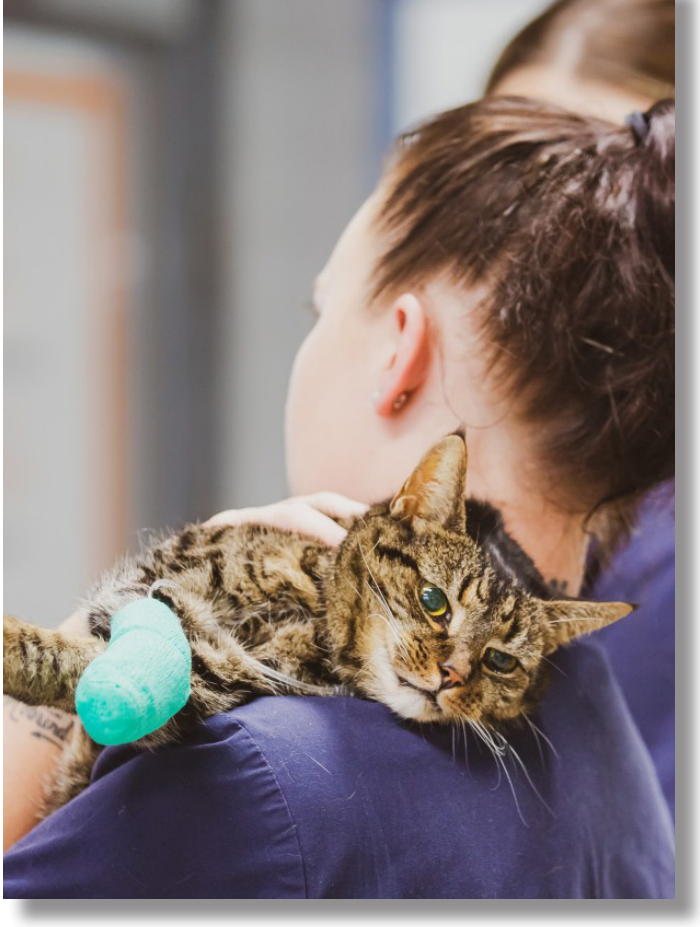
Additionally, in the face of large corporate practices, independent and rural veterinary practices are often unable to afford basic supplies due to rising supply costs, limited bargaining power, and outdated infrastructure. The finan-

cial limitations of independent veterinary practices make accessing quality veterinary care harder for the general public. Despite any negative impacts on access to quality care, these financial constraints can also have a positive effect on veterinary medicine by promoting the rise of new innovation. With the necessary attention, innovations, and solutions, veterinarians will be able to offer quality care to all communities while reducing their financial strain.

Such innovations contributing to successful care include telemedicine, enabling remote consultations and monitoring, portable imaging devices for remote care and diagnosis, Artificial Intelligence (AI) for faster diagnostics and image analysis, wearable devices for real-time animal health tracking; and 3D Printing for custom prosthetics and implants. Computer data access via the internet of genomics to understand breed-specific conditions, and improved Practice Management Systems to streamline operations and client communication are also cost saving, quality of care innovations.

The Effects of Rising Veterinary Costs

The financial strains that veterinarians face often have negative consequences on their clients, further emphasizing the need for thoughtful and creative innovations in the field. Gallup and



Pet Smart collaborated on a study to investigate Canadian veterinary care.4 The results of the study indicated that pet parents often skip visits to the veterinarian because of how expensive it is.

In fact, exactly half of the pet parent population studied in Canada had not taken their pets to their veterinarian within that year, or if they were able to visit a veterinarian, they were unable to accept recommended care. 67% of the people who reported that they had not visited the vet attributed the cause to their inability to afford veterinary medicine and only 28% of the pet parents unable to afford care were able to find a more affordable option.

The Gallup and Pet Smart study also observed the effects of limited veterinary visits on the pets themselves. While 42% of pets were unaffected by their lack of veterinary care, 12% had conditions that worsened or even led to their death. Twenty nine percent of pet parents reported that they have a friend or family member that has seen their pet suffer because they were unable to get affordable access to the proper medical care.

Rural Veterinary Care

The challenges faced by independent practitioners are amplified in rural settings, encouraging more critical thinking on the veterinarian's part. Dr. Bridget Heilsberg, owner of Crown 3 Equine offers her firsthand experience of owning an independent rural clinic. Her clinic serves a region that is deeply reliant on agriculture, a field under immense stress itself due to the growing issue of climate change and strained financial markets.

Due to the rising amount of people abandoning rural life to get urban jobs, a paradox arises: veterinary medicine demand increases in these agricultural and animal-rich areas, but the financial support and infrastructure for it decreases. Rural communities are left with a growing deficit in animal healthcare essential to the backbone of their society: farming and agriculture.

Dr. Heilsberg, and other independent veterinarians, face unique and significant financial strains. For instance, supply chain programs are specifically designed for the large-volume purchases of large corporate entities. This structure provides a severe disadvantage to independent clinics, like Dr. Heilsberg's, who cannot afford such large purchases. Therefore, basic supplies required to run a veterinary clinic become extremely difficult to obtain due to their expensive nature, which

feeds into the already thin profit margins of rural and independent clinics.

Furthermore, funding renovations to rural clinics to provide the newest technology in veterinary medicine is very challenging without overpricing the already economically disadvantaged clients. Programs that are aimed toward debt relief for rural practices continue to be underfunded and cannot provide the volume of meaningful contributions needed.

It is difficult to utilize current technologies in rural locations similar to where Dr. Heilsberg is located. Most technology today requires a stable, high-speed internet connection – a requirement that is often unavailable or unreliable in remote locations. For instance, the X-Ray machine that Dr. Heilsberg borrows is often inoperable due to the lack of the needed internet connection.

Technological isolation leads rural veterinarians to rely on outdated and less effective practice methods. These methods usually result in slower and less precise evaluation and treatment, which further widens the gap in the quality of care between urban and rural settings. Emerging satellite internet services like Starlink and HughesNet, are showing promise in providing vital internet access to rural communities and service providers.

STEM-Driven Partnership for Progress

Recognizing these barriers, STEM organizations have stepped up to help their sister field. One such nonprofit organization is the Lift and Shift Foundation, founded by U.S. Veteran and biomedical engineer Tom Smoot.

A special feature of the Lift and Shift Foundation is that the team is entirely composed of volunteers, working to better the future of STEM without the expectation of monetary compensation. Initially focused on expanding STEM access to underserved students and veterans, the nonprofit has decided to partner with Dr. Heilsberg's practice to apply STEM innovations to veterinary care. The shared military backgrounds of Smoot and Dr. Heilsberg created an immediate bond and lengthy communications between the two.

Throughout this year, Smoot studied the various struggles that Dr. Heilsberg faces and brought this project to the Lift and Shift Foundation. When asked why he took on this difficult endeavor, Smoot stated, "U.S. health care is expensive enough for people. Adding stress over pet health care just feels wrong."

Smoot and his team of engineers, software developers, web designers, researchers, and ambassadors have

already created a general idea of the projects they are aiming to complete. The projects range from creating technology for improved horse hydration to setting up a treatment management app.

These projects are directed towards the goal of decreasing overhead costs. A notable project that is currently underway involves designing ultrasound accessories. Ultrasound is a painless imaging test that shows structures inside the body using high-intensity sound waves. Vet's can use this tech for exams and diagnosis to best determine procedures and treatment.

This project is currently in the market research phase, studying the preexisting accessories and the needs of veterinarians to ensure that the products are not only technologically superior but also practical and affordable. The Lift and Shift Foundation is also trying to improve vaccine transport by first doing market research and then designing a product that allows for more efficient transportation, which should also aid in the decrease of transportation costs. Many of their designs are aided by Computer-Aided Design (CAD), software designed for 3D modeling and virtual prototyping.

This design process ensures that the solutions they provide are realistic and usable. Smoot's goal is to have the first prototype done by the end of this year so that he can expand his project to aid other rural veterinary clinics in the near future.

Smoot's goal encompasses not only the need for better technology in rural areas, but also lower market costs for accessibility.

STEM innovations such as these require the interest, imagination and creativity of future professionals such as you. Your understanding of STEM skills and their implementation are vital to your success in any career field you choose.

About the author -

Presha Kashyap is a sophomore at BASIS Shavano Campus interested in pursuing a career in STEM. She was a summer intern at the Lift and Shift Foundation. She is the co-founder of the Biomedical Club and Rocket Club at her school and has many distinctions in writing, including being shortlisted for the John Locke essay competition in the psychology category.

She holds multiple leadership positions in the National Junior Honor Society and Health Occupations Students of America (HOSA), has presented original research at UT Austin, and is in the process of getting another research project published. In her free time, she enjoys reading and playing piano.

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Transcendental Learning
in STEM Education

By Shelly A. Muñoz

In an era where STEM education is often shaped by rigid standards, performance metrics, and an emphasis on digital skill acquisition, a quiet yet powerful shift is emerging. Across classrooms and communities, educators are yearning for more than test scores and technical proficiency. They are seeking meaning. They are asking: What if STEM could be a source of healing and connection? What if it could nurture not just knowledge, but wisdom?

- Rekindling Purpose, Wonder, and Wholeness in the Classroom -

Transcendental learning offers a hopeful and urgent vision for what STEM education could be. Rooted in the philosophies of thinkers like Henry David Thoreau and Ralph Waldo Emerson, transcendental learning invites us to reimagine education as a sacred, relational, and life-affirming journey.

It encourages educators to embrace the full humanity of their students and to cultivate classrooms where learning is a vehicle not only for solving problems but for discovering purpose, identity, and interconnectedness.

What Is Transcendental Learning?

Transcendental learning is not a method. It is a mindset. It acknowledges that students are not blank slates or future workers in training, but full human beings: thinkers, feelers, creators, and citizens of a shared world. It centers the idea that learning must address the heart, spirit, and conscience as much as it develops cognitive skills.

In this model, the classroom is not a place of compliance but a sanctuary for curiosity, reflection, and becoming. Students learn not only about the world but also about themselves. They explore their values, their communities, and their power to influence the world for good.

Core Principles of Transcendental Learning in STEM

Holistic Education

Learning must nourish the whole child. In STEM, this might mean embedding mindfulness into data analysis, using reflective journaling in engineering design, or discussing ethical implications of emerging technologies. When we humanize STEM, students don't just complete tasks. They grow as compassionate innovators.

Interconnectedness

Transcendental learning emphasizes systems thinking not just within disciplines, but between the learner and the world. A biology unit on ecosystems becomes a study in balance, justice, and sustainability. A coding project becomes a tool for amplifying unheard voices. STEM becomes a lens for understanding how all life is connected.

Intuition and Inner Wisdom

While logic is vital in STEM, so too is intuition, the inner voice that guides creativity and insight. Transcendental learning encourages students to trust their ideas, reflect deeply, and pursue questions that matter to them personally. It affirms that wisdom is not just found in data but in lived experience and quiet reflection.

Environmental Awareness

Nature is a teacher and a partner in learning. Whether students are designing pollinator gardens, studying the carbon cycle, or modeling renewable energy solutions, they learn to see themselves as stewards of the Earth, not separate from it. This nurtures a lasting sense of responsibility and reverence.

A Redemptive Vision of Education

Above all, transcendental learning reclaims education as a source of liberation, not limitation. It shifts the narrative from "How do we prepare students for tests?" to "How do we prepare students to live meaningful lives?" It calls educators to focus not just on what students know, but on who they are becoming.

Putting Transcendental Learning into Practice

You don't need a special program or expensive materials to bring this vision to life. What you need is a shift toward intentionality, relationship, and creativity. Here are a few powerful ways to start:

- Nature-Based STEM Learning

Use your schoolyard or local environ-

ment as a living lab. Let students collect field data, engineer with biomimicry, or build nature-inspired models. These experiences foster awe, resilience, and real-world problem-solving.

●Cultural and Linguistic Integration

Honor diverse ways of knowing by integrating Indigenous ecological knowledge, global STEM perspectives, and multilingual resources. Invite students' home languages and cultural experiences into their design thinking and research. This affirms identity and expands what counts as scientific.

●Project-Based Exploration

Create space for inquiry that is student-led and rooted in authentic, relevant problems. Let students design solutions to challenges in their own communities from accessibility to clean water to food justice. Purpose fuels engagement.

●Collaborative Learning Environments

Make learning social. Structure your classroom for dialogue, group work, peer critique, and reflection. STEM becomes a shared journey where students learn with and from each other, not just side by side.

●Purposeful Learning Connections

Link content to local and global contexts. A unit on data science could explore climate change, equity in healthcare, or misinformation. Students begin to see themselves not just as learners but as changemakers.

●Multi-Modal Expression

Give students multiple avenues to show understanding through videos, models, poetry, code, or visual storytelling. Honor the full range of talents in the room. This cultivates agency and authentic voice.

Why This Matters Now

We are educating a generation facing extraordinary complexity: rapid technological shifts, environmental crises, rising youth mental health concerns, and unprecedented social change. Standardized tests and performance metrics are not enough. Our students need tools not only to succeed but to stay grounded, hopeful, and whole.

Transcendental learning reminds us that education is not simply about preparing students for the future. It is about empowering them to shape it. It is about cultivating a generation of STEM thinkers who are deeply connected to the Earth, to each other, and to their own inner purpose.

When we teach STEM with heart and humanity, when we connect science to wonder, engineering to empathy, and technology to ethics, we open doors to transformation. For our students. For our schools. And for our world.

Final Reflection

Transcendental learning dares us to believe that the classroom can be a sacred space, a place where young people learn not just to code or calculate but to listen, reflect, and dream.

In our STEM classrooms, let us nurture students who are not only skilled but wise. Not only capable but compassionate. Let us teach with the belief that our students have the power not only to understand the world but to heal, shape, and uplift it.

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AI Skills: The New Currency in Today's Job Market

The AI revolution is here. Ever since ChatGPT arrived on the scene in late 2022, artificial intelligence has been reshaping the way we live and work. What does that mean for tech professionals looking to compete in a changing labor market?

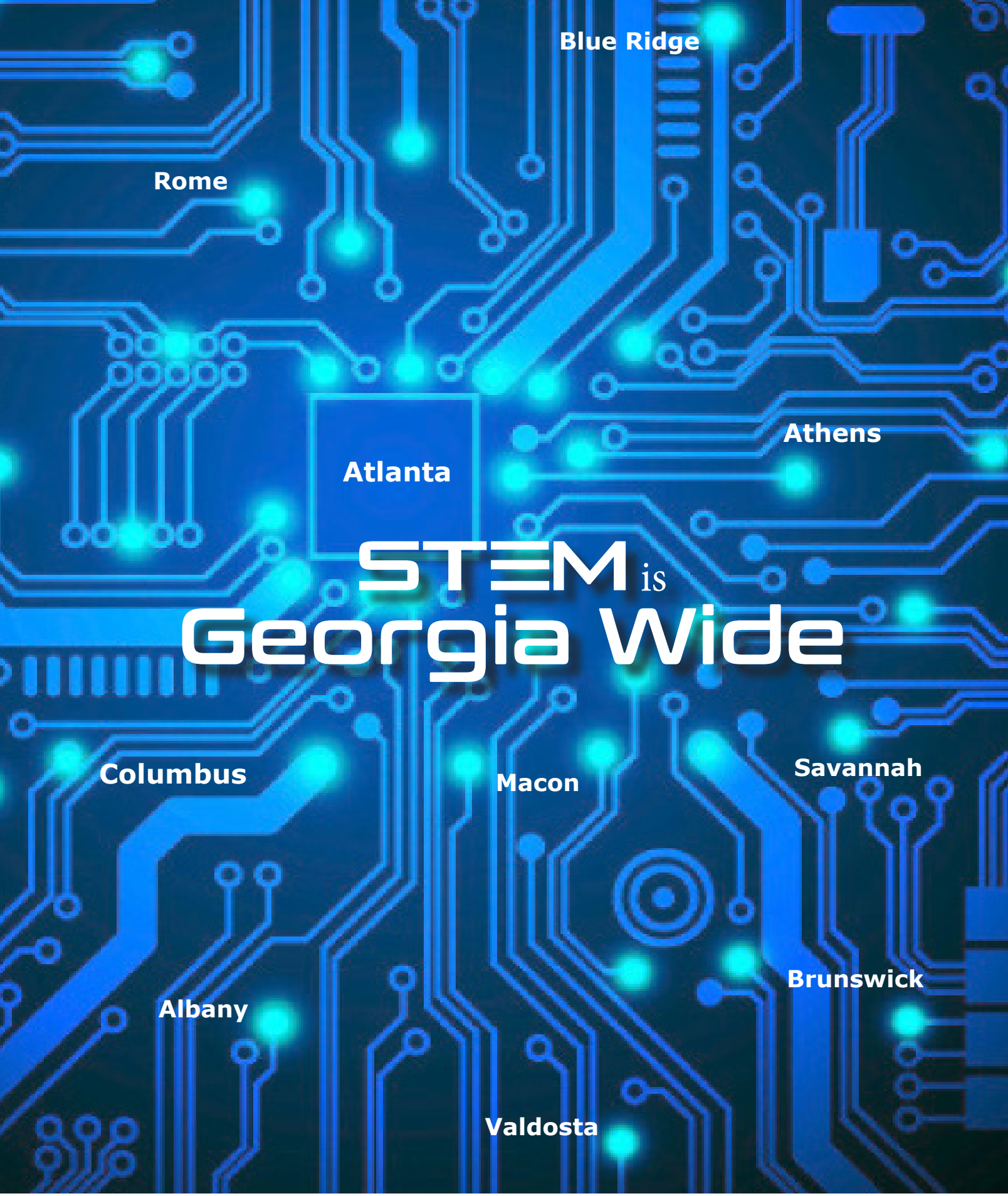
TV pundits and talking heads love to get riled up about whether robots are coming for our jobs — but the truth is that AI will probably create more jobs than it eliminates. And one thing's for sure: understanding how AI works, and mastering AI skills, will be the key to success in tomorrow's ever-changing world of work.

New research shows that a growing number of companies are asking for AI skills in job descriptions — including non-tech roles. And a survey of HR professionals released last month shows that job candidates with AI skills ask for more money during the interview process — and tend to get it once they're hired. Simply put, AI is going to be underpinning nearly every job out there. That's why staying ahead of the latest in AI development is so important.

Building AI skills doesn't just mean learning how to engineer prompts for ChatGPT. It's everything from programming to data modeling and analysis to mastering concepts like machine learning and natural language processing. And if there's anything certain in our fast-paced economy, it's that building AI fundamentals today will translate to career opportunities tomorrow and beyond.

That's where SkillStorm comes in. In partnership with TAG, we offer Microsoft Azure AI courses that are instructor-led, career-aligned tech certification courses and will help you build the AI skills that employers need. From the basics of AI and machine learning to a comprehensive understanding of how to design, deploy, and maintain AI solutions, you'll learn everything you need to accelerate a career in the economy's hottest fields.

It won't be long before all kinds of jobs, all across the economy, require AI skills. And starting now is the best way to accelerate your ascent up the career ladder. Build those skills today and you'll lay the foundation for opportunity for years to come — and set yourself up for success in an AI-driven future of work. Register today to get started with a career in tech.



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