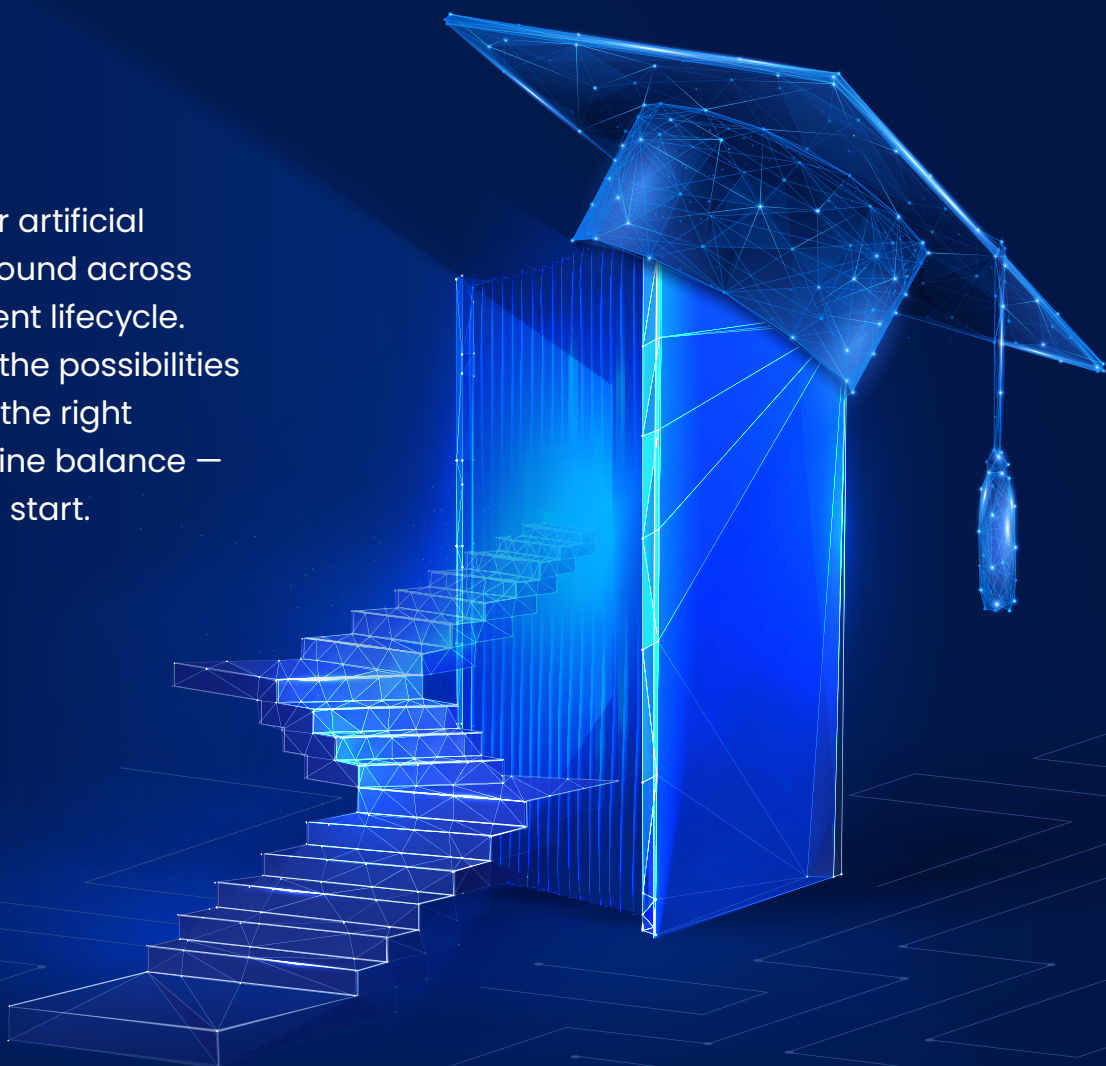# The Time For AI In
HIGHER EDUCATION
Is Now

Applications for artificial intelligence abound across the entire student lifecycle. But evaluating the possibilities means finding the right human- machine balance — here's where to start.

Many assume AI in education is nascent or experimental, or not necessarily mainstream," but market data suggests otherwise, Keller said. A **2022 Global Market Insights report** found the AI education market reached $1 billion in 2021 and is expected to grow 40 percent between 2021 and 2027.

Supporting student outcomes as is a top priority, alongside the common challenges institutions face around enrollment and applicant attraction, the complete student to alumni lifecycle, and the learning experience, Keller sees AI and ML applications across the entire student spectrum.

"The opportunities are really boundless," he said.

What's Possible?

As the data available around students grows exponentially, the many toolkits and technologies coming online to make sense of all that data also continue to grow. Applying AI and ML tools and technology allows higher education to enhance and improve operations or outcomes in three mission-critical areas: operational/administrative efficiency, student success, and research. For instance, a variety of processes at every stage of the student lifecycle are streamlined with AI and ML including profiling and segmenting applicants, extracting data from admission forms, targeting marketing campaigns, processing transcripts and evaluating performance, generating predictions and insights for students, and modeling student retention. The appropriate mix of enabling technology, platforms, or tools will change depending on the data sources or desired outcomes. Partners like Quantiphi help institutions build or engineer customized solutions based on their particular needs and requirements. Such mix-and-match applications mean solutions can be stood up to meet nearly any challenge.
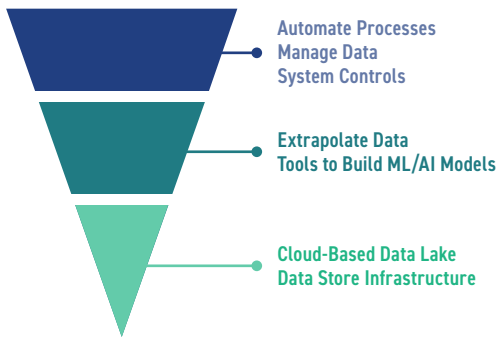
> Applying AI and ML tools and technology allows higher education to enhance and improve operations or outcomes in three mission-critical areas: operational/administrative efficiency, student success, and research.

From an admissions standpoint, when a potential student first interacts with an institution's website, AI can assist the admissions office with developing personalized marketing campaigns thanks to cookies and data that form the backbone of multi-layered candidate experiences. Teams can leverage candidates' and students' data-rich profiles to better focus recruitment efforts and messaging to "most likely"

Automate Processes
Manage Data
System Controls

Extrapolate Data
Tools to Build ML/AI Models

Cloud-Based Data Lake
Data Store Infrastructure

Out-of-the-Box AI/ML

The cloud allows colleges and universities to deploy and scale AI and ML capabilities rapidly, bypassing otherwise time-consuming stages of building on-premises data centers and provisioning, procuring, implementing, and installing hardware.

While institutions remain responsible for system management and controls, cloud providers like AWS handle data security and the enabling infrastructure according to the attributes or requirements their customers select. The total cost of ownership and ROI models "are incredibly more compelling than they have been on-premises," Quantiphi's Jim Keller said. "Now, it's really about what data store we need on AWS, what pipelines we need to create to take the data feeds, and what tooling we can provide to build the ML and AI models to do that. And that's all utility pricing-based, so it's based on the amount of storage. In machine learning terminology, it might be the number of iterations on a model, but we're talking pennies."

Some vendors, like Quantiphi, also provide cloud management services, which frees IT staff to focus on other value-added activities beyond system management.

candidates, determine financial aid eligibility, and build predictability models that help fine-tune individual messaging based on those predictions. Similarly, AI can help marketers develop and deliver brand campaigns and more deftly manage brand reputation through the meaningful, real-time site or event interactions.

AI and ML tools unlock the value and promise of so-called Big Data through their ability to pull data from disparate sources, quickly make sense of it, and use it to inform automated processes or deliverables. It is difficult to think of a more data-rich example than a higher education student.

"How does one understand what students are going through experientially, whether that's online, on campus, or more and more in sort of a hybrid mode? How do you maintain and drive and understand what students are experiencing from a learning standpoint? From a student-life standpoint? From an at-home standpoint? All of this is driven by data," Keller said. "This concept that we're advocating — student 360 — what that means in practical terms is, how do you grab all of the data a student may have in a disparate set of sources, from the registrar, the LMS, student life, athletics, and create a centralized data store, whether that be a data lake or data warehouse, and then utilize that data to support the best academic and personal outcomes for the student?"

The COVID pandemic brought the need to bolster retention and deliver robust student experiences sharply into focus as institutions struggled to handle student outcomes that traditionally relied upon on-campus interactions. Forced to pivot engagement through remote or hybrid offerings, the need to model or predict outcomes using available data meant institutions required more compelling solutions.

COVID "really pushed institutions to think quite intimately about the learning experience for students and understand where a student may be in a course, a bundle of courses, a course of study, and recommend interventions," Keller said.

Fraud prevention, proctoring, and verifying test-takers' identities also lent themselves to smarter solutions, becoming "a massive challenge for institutions, and something we had to move pretty quickly around, to verify and validate and ensure students earn the grades and degrees that they say they should have," he noted.

"Two vectors stand out above the others. The first is just from stickiness and a relationship perspective: The more unique and personalized that experience can be for a particular student, the likelihood of that student sticking with the institution increases proportionately. The second is optimizing their learning experience so it's as relevant as it can be in terms of what they seek to have as an outcome for themselves. Those two things have become intertwined, as opposed to a broader aperture, which is, 'Well, we have a cohort and trust we'll get a preponderance of the cohort to have that relationship.'"
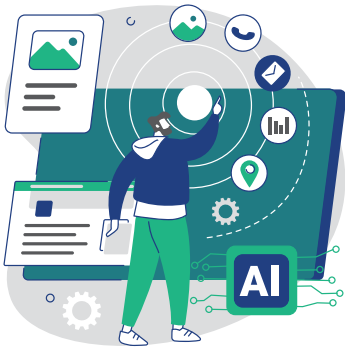
Use Case: Personalized Student Support

Customer
A global provider of comprehensive **learning solutions** for more than **50 million students** in 150 countries from pre-K through 12th grade

Challenge
The institution's goal was to create a personalized content recommendation engine for students based on their goals, knowledge levels, and learning abilities. Its existing in-house third-party recommendation engine was a black box that provided little visibility and control, limiting the options for customization.

Results
Quantiphi developed a deep learning-based solution to implement a hyper-personalized recommendation engine that could suggest the next best learning exercise for the student.

The solution considers factors such as a student's learning ability, the difficulty level of the exercise, and student interaction with different learning materials over time.

This customizable and reusable solution provided the institution with complete control and visibility into the recommendation engine's functioning.

He added that without the benefit of daily, on-campus interaction, such tools can also aid the work of faculty or counselors in assessing students' academic performance or financial or personal challenges and recommending remediation strategies.

"The machine can start to help inform that, so you no longer need to guess what that should be, and as the student goes through that journey, create intervention opportunities," Keller said. "If you and I are in the same major and the same courses, and your level of engagement is materially different than mine, then you want to treat those situations differently and support mechanisms as required. All those things are within the art of what's possible, and all those things are being done."

Responsible AI

AI's true potential cannot be considered without giving due weight to the growing ethical questions surrounding the use, maintenance, and protection of data in the educational setting, alongside privacy, bias, and safety considerations. Keller said Quantiphi's leadership continues to tackle questions around the more salient aspects of ethical use of AI and ML and developed a framework around responsible use, which they encourage their customers to adopt and follow.

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"There's the nature of who the engineer is who built the models, and the perspective of their belief system, so we've created a responsible AI framework that talks about a core set of pillars under this umbrella, which includes security and privacy, governance, and fairness, and this notion of being human-centric, transparency, and explainability," Keller said. "My favorite way of putting this is, pretend you are going in front of a responsible AI board, and you have to explain the output of this model. Can you explain it? Is it rational? Does it follow a charter that one can explain? Does it have a sense of scientific rigor? Is it disciplined? Is it hardened? Has it been exercised properly? Is it socially beneficial?"

The governance framework Quantiphi developed guides institutions as they determine the answers to those and other questions "because these are not things that organizations traditionally have had as top of mind," Keller said. Yet as adopters determine their institution's AI and

ML roadmap, these are questions that must be resolved before any building can begin.

"Using these technologies becomes a first-blush lens through which organizations can determine whether they have a problem and, if they do, how do they address it?" he said. "It is a big topic, it is an important topic, and, from a societal standpoint, we believe it will become as core as most mainstream topics are today, whether it be around gender or religious affiliation or skin color or whatever the case may be. These are really, really important things, and we also want to make sure that things are not being done improperly with unintended consequences that have a detrimental impact on a person or groups of people or an institution."

An Informed Approach

Beyond questions guiding responsible use, institutions must also ask questions of their potential partners to ensure the right vendor or product fit and alignment on institutional objectives.

"We welcome the scrutiny, we think it's a good thing, and institutions that come at it from that perspective are better prepared actually to take advantage of it in the right way," Keller advised.

Questions to ask a prospective partner include:

- Have you built out AI/ML capabilities before? In what context?
- Are you taking advantage of core, mainstream capabilities such as AWS or relying on proven technologies to deliver on your customer's behalf?
- Do you have a perspective on the balance of technology and human interaction?
- Does the vendor have a spirit or sense of partnership and joint accountability?
- Perform background research. Challenge the prospective vendor partner to prove that they can do what they say they can do.

"These are hard discussions," Keller admitted, "especially when you talk about responsible AI." Assessing the appropriate human-machine balance often proves a tricky prospect as well.

"If we come at it from, how do we automate as much as we can but not those that impact human interaction, it can become clearer," Keller said. "Forms and transcripts are not things that people want to do manually. What might impede student or faculty satisfaction? Or, from a cost standpoint, what might save time for more valuable things? Every institution is different, but those are generally the levers we look at so that we can start to prioritize where an institution should focus initially. From there, you can start to come up with a roadmap."

Quantiphi at a Glance

About
Quantiphi is an award-winning AI-first digital engineering company driven by the desire to reimagine and realize transformational opportunities at the heart of the business. As an AWS Premier tier partner, Quantiphi's services include advanced ML/AI, data analytics, application development, data migration & modernization, and contact center transformation. For more on Quantiphi's capabilities, visit **www.quantiphi.com**.

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