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Enrich the student experience with personalization

How machine learning can help higher education institutions support student success

Provide better student experiences and improve institutional agility

Personalization leverages data to individually tailor interaction with students to improve their success and enhance their educational experience. It extends the services of colleges or universities so personalized student engagement at scale is possible in spite of staffing challenges. Institutions can now leverage multiple data sources to generate a comprehensive picture of a student's experience and proactively engage with individually relevant and timely actions. Connecting to the student's needs in this way fosters a sense of belonging, which is critical to student success.

With rising tuition costs and questions about return on investment, demand for modernized educational experiences is increasing across the globe. To address these concerns, many higher education leaders and administrators are focusing their attention on artificial intelligence (AI) for course recommendations, administrative process automation, and career path options for students. Pressure to deliver real-time, highly personalized experiences is increasing.

In the next section, we'll review some of the challenges experienced by higher education in the adoption of AI/ML services, and share how institutions are leveraging it to build institutional capacity and support student success.

"Educators across the world are rapidly learning the power AI has to give every learner an education tailored to their specific needs. It is empowering teachers and students to perform better than ever before and has the potential to revolutionize the way education is delivered"

Daniel Neeld,
director of partnerships
at CENTURY Tech

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Challenges to succeeding with personalization

There are three key challenges impeding institutions' ability to personalize student experiences with machine learning.

1
Data visibility gaps

Student and institutional data is siloed, incomplete, and complex. The process to extract and activate information is labor-intensive, manual, and error-prone.

One thing is clear. We all want our students to succeed, and institutions have made significant investments in systems such as student information systems, learning management systems, and student success and advisory systems. However, the lack of integration between these systems creates disparate pockets of data—resulting in only siloed insights being generated from each data set. From an analytics perspective, that means analyzing data and implementing strategies that span across this digital sprawl is cumbersome. For example, an institution may have all the information about the courses they offer but they lack the ability to correlate this data with relevant student information to make the appropriate recommendation for a student. Many institutions are not in a position to completely overhaul their current infrastructure and instead seek solutions that are compatible with their current setup.

2
Generating insights from student data

Most institutions have a growing wealth of student data that could be used to support personalization for their students. This includes student information such as skills and interests, struggles or barriers to learning, how they prefer to learn, past courses with grades, and demographic data. However, taking advantage of this information is still a challenge for many institutions. In many cases, off-the-shelf analytics solutions don't provide the transparency that decision makers need. Gaps in data management skills can also lead to limited adoption of analytics tools. To deliver a better experience for students, institutions must have a centralized repository to be able to visualize data, run real-time analytics, and utilize ML.

3
Low student satisfaction from legacy recommendation systems

Most existing systems for personalization provide recommendations based on simplistic, predefined rules. For instance, "If a student takes an introductory course on computer science, recommend an intermediate computer science course next." These systems are static, require significant manual maintenance, and lack effective analytics to assure bias mitigation. Additionally, it is challenging to define rules that are specific to each student and offer meaningful personalization. An institution may have all the information about the courses they offer, but lack the ability to utilize previous assessment records to identify areas where students have excelled and provide personalized recommendations to ensure subject comprehension.

Overcoming personalization challenges through machine learning

ML is powering a new class of personalization solutions that are no longer held back by legacy challenges. Through greater scalability, automation, and intelligence, these solutions can incorporate behavioral student data and inferred preferences to deliver highly relevant, enticing experiences that are tailored to individual students—rather than one solution for the entire student body. ML can do this by processing vast amounts of student data and then selecting the suitable algorithms to dynamically present the most relevant learning experience, support, or educational content to each and every student at the right time.

ML solutions built for higher education are now available to integrate into your existing workflow, allowing you to address real-time student and faculty needs and achieve specific outcomes that are most important to the institution. These solutions can improve each student's journey by offering real-time personalized course recommendations, promoting appropriate activities on campus, and issuing just-in-time interventions to help students who need support.

Leveraging cloud technology for ML to build a more scalable and agile data environment that centers around data lake technology provides the flexibility to take advantage of data in many ways.

In the next section, we'll show you how you can leverage AWS ML to deliver on the promise of personalization through the use of specific AWS services.

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Machine learning services for personalization

Implementing ML is a continuous learning journey that can be easily integrated with your data stores and information systems to expand personalization across all channels and devices. AWS offers institutions worldwide two approaches that can be used to implement an ML-based solution to personalize student experiences, depending on the stage of your personalization journey, institutional landscape, and desired mission outcomes.

Amazon Personalize is the fastest and easiest way to start leveraging the power of personalization today. It's a service that allows you to create real-time personalized user experiences at scale, making it possible for any developer to implement a sophisticated recommendation system in days, not months. Amazon Personalize enables you to maximize the value of your data to create authentic connections with your faculty and students—with no prior ML expertise required.

If you want to create your own ML models for personalization, Amazon SageMaker provides out-of-the-box feature with all the tools you'll need in one place. Typically, taking ML models from conceptualization to production is complex and time consuming but Amazon SageMaker reduces this complexity by making it much easier to build and deploy ML models. It is a fully managed service that helps your analysts, data scientists, and ML developers prepare data and build ML models quickly. For recommendation engines, SageMaker offers built-in algorithms such as factorization machines, hundreds of pretrained models, and algorithms available through Amazon SageMaker JumpStart that can help you tune models prior to deployment and get started with ML, as well as the option to develop your own algorithms.

In the next section, we'll show how these and other AWS ML services can power and generate dynamic solutions to accelerate performance; outline the primary use cases for personalization; and finally, take a look at how AWS ML can deliver results leveraging these tools across institutions worldwide.

Personalization use cases

1. What if institutions could more effectively focus recruitment efforts?

Higher education institutions are aiming to recruit students from diverse populations, geographies and backgrounds, but attracting and retaining more diverse learners remains a challenge for many institutions. ML can help to address these challenges especially in times of enrollment declines.

Student segmentation can help you run more effective marketing campaigns to recruit students, increase diversity, and maximize the level of engagement by identifying which students are a good fit and most likely to enroll. With traditional personalization services, segmentation is rudimentary, solely relying on demographic information and manually curated institutional rules to make assumptions about student intentions, assigning them to pre-defined student segments. Intelligent student segmentation with AWS leverages advanced ML techniques to segment students based on their preferences for courses, departments, and career goals. This can help drive higher engagement, increase targeted messaging, and improve enrollment.

2. What if institutions could recommend the best course for each student?

Personalization can help students discover content that will improve their overall experience. This includes courses, student programs, or school information that a student can find as "recommended for you" typically found on the college website or app to help guide students. Although many existing solutions offer this feature, these systems are often only informed by data initially provided when a student enrolls in an institution, most commonly with static rule-based techniques. AWS ML can extend far beyond this, enabling dynamic recommendations that are informed by student behavior and real-time changes in learning path or interests.

Content can be curated to match unique student behavior across these channels, improving the relevance of recommendations being generated. With contextualized recommendations, Amazon Personalize considers things like device type, location, time of day/seasonality, and course history. For instance, if a student tends to focus on his/her research at school on their computer and takes care of their elective studies at home on their mobile devices, an ML-powered solution can automatically recognize and adjust the recommendations generated within each channel based on that information.

Udemy, a leading destination for learning and teaching online, leverages Amazon SageMaker to help supply its 57 million learners with a highly personalized list of recommended courses to improve discoverability amongst the company's 213,000 course offerings, making learning as easy as possible. "At Udemy, we believe continuous learning is a societal imperative," says Sam Cohan, head of machine learning at Udemy. "It's incredibly important to us that we deliver an innately personal experience that keeps our learners and instructors engaged. With the help of Amazon SageMaker, we're able to super charge our AI and ML solutions to provide a highly personalized, best-in-class experience to millions of Udemy customers across the globe."

3. What if students could choose their own learning method?

Personalized learning method refers to the technique of how each student prefers to engage– including conversational AI, transcribed lecture information, and the provision of voice prompts for vision-impaired students.

Afya, a leading medical education group in Brazil, developed an app (Medcel Station) that allows students to build their own study schedule. With over 4,200 pieces of learning content, 1,200 topics, and 8,700 quizzes, students get to choose the content format (video, audio, text), subject of interest, and enter the study time available for the platform to build a study schedule or a recommended playlist based on each student's scenario.

Conversational AI can also help educational institutions provide better support and respond faster when someone needs help or guidance. Through conversational AI, students can reach the helpdesk in the middle of the night, departments can provide a virtual tutor to complement human instructors, and institutions can offer interactive support 24 hours a day, 7 days a week through and on-line learning platform.

Lancaster University, one of the highest ranked universities in the United Kingdom (UK), uses voice technology powered by AWS ML technology to enrich its students' campus experience. Using Amazon Alexa and multiple AWS services, including Amazon Cognito, Amazon Lex, and Amazon Lambda, the voice-powered campus companion answers common academic and social questions.

4. What if institutions could personalize the learning progress?

Having a deep understanding of student data is fundamental to knowing whether you are offering the right courses at the right time, and which co-curricular learning supports have the greatest student impacts. Access to real-time student data gives you the opportunity to make just-in-time course recommendations based on the student's current progress they made on a particular subject or topic.

One thing that makes personalization so powerful for online learning scenarios is using this interaction data to deepen insights into how students are performing and how they are understanding a particular topic. This helps education leaders better understand what someone is trying to learn at a particular moment and recommend supplemental content or alternative supports content accordingly to increase student success.

5. What if institutions could increase student retention and graduation rates?

One of the biggest challenges for higher education institutions is reducing the time it takes for students to achieve their goals. AWS ML can extract student data such as assessment results, grades, extracurricular activity engagement level, attendance rate, and number of credits still required to graduate to identify students that may be at risk of attrition. By identifying this pattern, AWS ML can be used to provide more visibility into the academic performance for institutional leadership and the entire faculty. This helps faculty quickly identify at-risk students and provide the most effective pathways to graduation.

According to the National Center for Education Statistics, the overall 6-year graduation rate in 2020 was 64 percent in the United States. Portland State University was looking to change that for its students by using ML as part of their efforts to improve student success and retention. With Amazon Personalize, your institution can deliver personalized experiences based on the metrics that matter most to your administration and the unique preferences of the individual students.

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6. What if institutions could integrate new data sources to gain even more insight?

Unlocking information stored across multiple systems empowers you to unify your data, ultimately creating more meaningful student experiences. Useful data that can unveil insights is stored in learning management systems, student information systems, and student advisory or success systems but is often overlooked every day because it's not structured. This is critical data that could generate highly relevant personalized recommendations for students. For example, student information helps us to understand which upcoming seminars they may be interested in such as career advisory sessions. Institutions can leverage AWS ML to provide more guidance on recommendations for courses, seminars, programs, and on-campus activities.

Specifically, integration with Enterprise Resource Planning (ERP) systems that contain key data sources such as faculty information, admissions management, and student information, can help generate highly relevant and personalized recommendations. This information is crucial to providing actionable insights to students and the institution. For example, understanding which students need more financial or academic assistance or if an institution can effectively forecast net tuition revenue.

Ellucian, one of the leading higher education ERP system providers and an AWS Advanced Technology Partner, works with more than 2,500 institutions in nearly 50 countries to enhance operations and enrich the student experience for over 18 million students. They provide technology solutions and services that remove barriers, helping higher education institutions achieve student success.

Customer highlights

duolingo

DUOLINGO has successfully personalized its learning approach, which gamifies the learning experience through a points-based reward system to keep users engaged and progressing toward proficiency. The U.S. State Department estimates it takes 600 hours to learn a category-one language, like French or Italian. Duolingo hopes you can do this in just 15 minutes a day. Today, Duolingo manages over 100 micro-services on AWS, giving its teams the ability to deploy their own services with speed and ease. ([Learn more](#))

echo360

Echo360, a global leader in active and distance learning solutions, is leveraging Amazon's Automatic Speech Recognition technology to improve the learning experience for all students by developing capabilities for smarter search, deeper ways to engage with content, and a pathway for colleges and universities to offer effective and affordable closed captioning for all academic video. Using this service, transcripts from educational sessions can be created automatically and seamlessly integrated into the Echo360 platform. ([Learn more](#))

Knowt

Fast-growing educational technology startup Knowt developed an app to change the way students and teachers' study and create assessments. Using a powerful algorithm and artificial intelligence from AWS, the app quickly and automatically converts notes from students and teachers into quizzes and flash cards. "You can write down whatever information you'll need in your notes," says Abheek Pandoh, Chief executive officer at Knowt. "We've transformed our product from a self-study tool to a tool for learning from shared notes."([Learn more](#))

Start realizing the power of machine learning personalization for your institution today

There are several ways to get started with AWS ML for personalization. In addition to using Amazon Personalize or Amazon SageMaker, you can leverage AWS Professional Services, a global team of experts that can help you deploy personalization services to improve the experience.

You can also train your developers and data scientists to build custom personalization models and gain a stronger understanding of ML in general. Our training initiatives use the same curriculum we use at AWS, and many courses are available on demand and at no cost. We can help everyone in your institution—leaders across the institution, developers, and data scientists alike—become more proficient in ML.

Finally, you can contact us directly for more information about personalization or visit the AI Use Case Explorer to discover other use cases.

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