Artificial Intelligence, Authentic Results

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Artificial Intelligence (AI) is one of the most rapidly advancing innovations in our history — giving us unprecedented potential for efficiency and growth. While it continues to play a more prominent role in our daily lives through computers and cell phones, it has also permanently transformed how dentistry operates, both chairside and at the lab. Thanks to recent developments in both design software and intraoral scanning, the possibility of creating same-day restorations has become a reality.

Meanwhile, the process of producing restorations has become even more accurate and predictable for dental labs. With the goal of making digital dentistry more accessible to dentists everywhere, Glidewell has found creative solutions to ensure that clinicians can take advantage of a digital lab without significantly altering their workflows. By developing and implementing a sophisticated AI algorithm that designs crowns, Glidewell can now assign the complicated tasks associated with advanced computer-aided design (CAD) and computer-aided manufacturing (CAM) directly to the AI algorithm, ultimately presenting clinicians with a simplified workflow.

But the benefits of AI extend beyond the manufacturing stage. By weaving AI technology into its glidewell.io™ In-Office Solution line of products such as the fastdesign.io™ Software and Design Station and the fastmill.io™ In-Office Mill, Glidewell successfully puts the lab chairside — allowing clinicians to benefit from a digital lab right from their office.

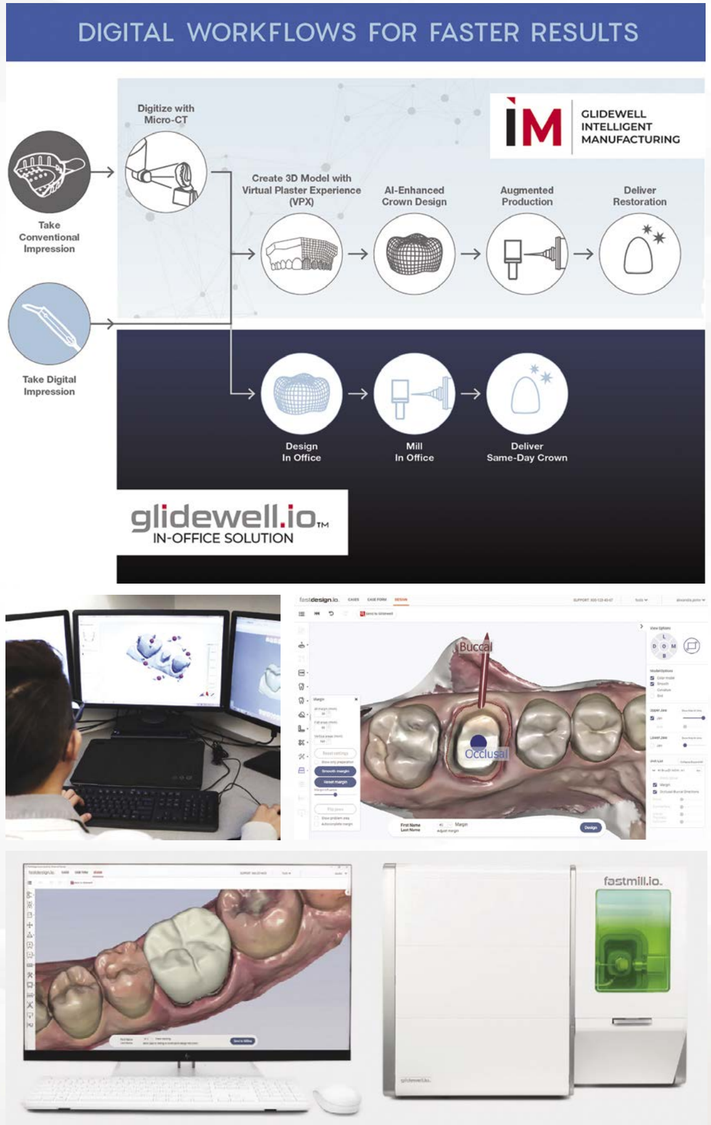
Using AI in the Lab

Historically, the process of designing crowns has run parallel to the limits of available technology. From using die-and-punch sets to create crown shells, all the way to the ubiquitous use of skilled technicians to mimic natural teeth, creating restorations has largely been an analog process. It wasn't until computer visioning and machine learning achieved near-human outcomes that the potential benefits of AI in dentistry were considered.

In 2012, the research and development team at Glidewell set out to find a way to improve the process of designing crowns. Using an existing cloud storage system built for its internal manufacturing process, engineers were able to harness the information from a database of millions of crowns to create an algorithm that could accurately generate design proposals. Through rigorous testing and adjustments, the algorithm finally reached a point where the software could design crown proposals with a 98% acceptance rate. In other words, the same crown design that used to require the skill, time and expertise of a practiced technician could now be achieved with higher speed and accuracy thanks to AI programming.

It works by using generative adversarial networks, or GANs, the same technology behind lifelike AI-created art, to dynamically update its predictive abilities. Two neural networks compete with each other in a zero-sum game to learn from previous data sets and create increasingly accurate output through a constant state of learning. In other words, the more data that is fed into the algorithm, the more precise and predictable the algorithm will become. While this technology is found across a variety of industries to help with visual modeling, what makes Glidewell unique is that these generated 3D models are used to create physical objects — crowns.

With the goal of providing dentists with predictable, high-quality restorative solutions at a massive scale, Glidewell implemented this AI in the laboratory setting through a groundbreaking optimization called Glidewell Intelligent Manufacturing (IM). This method makes it possible for the lab to create virtual models based on the physical impressions sent by doctors, with no stone model needed. Physical impressions received can also go through a Micro-CT scanner to digitize the impression and create a virtual study model within an AI-enhanced design environment. The proprietary AI algorithm then stores the information from the study model to determine the best crown design and fit.



The algorithm, later named CrownAI™, successfully detects the unique morphology and variability of teeth — recognizing detailed measurements as small as a micron. When this information is used to create crown designs, the result is accurate and natural-looking restorations with minimal need for technician involvement. The result is crown restorations with better accuracy, higher likelihood of fit, and fewer remakes.

The main advantage of having Glidewell implement this AI is that it offers a way for clinicians to directly benefit from digital dentistry without having to change their workflow. With the option to submit impressions digitally or physically, this approach caters to any dentist no matter where they are on their digital dentistry journey.

In-Office Artificial Intelligence

In a suite of products known as the glidewell.io™ In-Office Solution, dentists can use the same AI technology as Glidewell IM to make same-visit restorations a reality. By offering the ability to scan, design and mill a crown in a single appointment, dentists can gain a competitive edge while improving patient satisfaction.

The glidewell.io digital workflow starts with an intraoral scanner, such as the fastscan.io™ Scanning Solution. The handheld device captures dental impressions using digital technology, forgoing the discomfort of a goop tray, while high-precision lasers on the tip of the device automatically register every detail of the patient's mouth. The 3D rendering of the impression is then stored on a computer and ready to move on to the design stage.

The fastdesign.io™ Software and Design Station then automatically marks margins and generates design proposals utilizing artificial intelligence, learning from Glidewell's extensive case database, and proposing the ideal morphological components for the crown. In seconds, a 3D restoration is ready for approval — eliminating the time that would otherwise be spent on designing a crown. This AI-enhanced design is then used to create natural-looking restorations ready for milling in the office or fulfillment by the lab. For the dentist, this means far fewer clicks per case. For the patient, it means faster treatment results.

Now that the design is ready, the final step is to mill the crown using the fastmill.io™ In-Office Mill. Clinicians can mill crowns using BruxZir® NOW Milling Blocks, a fully sintered zirconia ready to deliver right from the mill. With no oven time required, doctors can create crowns from the number one prescribed zirconia in less than 45 minutes without having to send an Rx to a lab. Regardless of whether the clinician chooses to mill the restoration in office or send to Glidewell, the design of the restoration will always benefit from Glidewell's CrownAI database — ensuring accurate, precise-fitting crowns every time.

When it comes to changing their workflow, many doctors are hesitant to change. Whether it's due to a perceived steep learning curve or high cost, many miss out on the advantages that AI-enabled technology can provide. But with glidewell.io, the machine learning software of CrownAI makes the process of designing and milling restorations in-office as easy and user-friendly as possible.

The Future of AI

AI is revolutionizing dentistry both at the dental lab and in the dental practice. As we increasingly value convenience and efficiency in dental care, AI-enabled labs like Glidewell offer the benefits of digital dentistry without changing the workflow of their customers. For forward-thinking dentists who want to bring that technology chairside — the glidewell.io In-Office Solution gives the ability to provide same-day crowns with higher patient satisfaction.

Even just a decade ago, it was difficult to predict that AI would be capable of designing crowns with the same accuracy as a technician. As we continue to invest more resources into developing machine learning, our next challenge is to keep moving the benefits of AI upstream and into the realm of guided treatment planning.

Optimize your services with the power of AI by visiting glidewell.com/digital-dentistry