Artificial Intelligence, Authentic Results

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Digital Workflows for Faster Restorations

Using AI in the Lab

Historically, the process of designing crowns has been arduous to parallel the limits of available technology. From using die-and-putty sets to create crown shells, all the way to the sheer volume of skilled technicians to mimic natural teeth, creating restorations has been an arduous process. It wasn’t until computer visioning and digital fabrication were introduced that the process was streamlined. Using AI technology into its design engine, Glidewell is bringing AI to the design process.

Using an existing cloud storage platform called Intelligent Manufacturing (IM), 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 the likes of DeepMind’s AlphaGo, to dynamically update its predictive abilities. Two neural networks cooperate 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 the technology is found across a variety of industries to help with visual modeling, what makes Glidewell’s AI unique is that these generated 3D models are used to create physical objects — crowns.

With the goal of providing dentists with precise, 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 to the lab to create virtual models of dental 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-enabled 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 patient or practice that are on their digital dentistry journey.

In-Office Artificial Intelligence

In a state of products known as the glidewell.io In-Office Solution, clinicians can use the same AI technology as Glidewell IM to make same-day restorations a reality. By offering the ability to scan, design and mill a crown in a single appointment, clinicians can gain a competitive edge while improving patient satisfaction. The glidewell.io digital workflow starts with an intraoral scanner, such as the fast-scan™ Scanning Solution. The handheld device captures digital impressions using dental technology, ignoring the discretion 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 sent to 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 and money that would otherwise be spent on designing a crown. This algorithmically generated crown is used to create natural-looking restorations ready for their office or fulfillment by the lab. For the dentist, this means 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. The fastmilled™ Design Station™ In-Office Mill. Clinicians can mill crowns using Glidewell’s FastMilled™ Technology, which is a fully automated system 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 within their practice or send to Glidewell, the design of the restoration will always benefit the Glidewell Crown AI 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 stay out on the advantages that AI-enabled technology can provide. But with glidewell.io, the design and milling software of CrownAI makes the process of designing and milling restorations in-office as easy and user-friendly as possible.

The Future of AI

Glidewell 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 clinicians are accustomed to. For forward-thinking dentists who want to bring that technology into their offices, the glidewell.io in-office design system gives the ability to provide same-day crowns with higher patient satisfaction. Even just the option to predict that AI would be capable of delivering crowns with the same accuracy as a technician. As we continue to invest in AI, we’re challenged to keep taking these services into the realm of great treatment planning.