

# Improving Dental Bracket Application through Artificial Intelligence and Deep Learning

4th-IR collaborated with an orthodontic bracket technology company (OBT) to explore how Artificial Intelligence could be used to apply dental braces.

“A whole new market is being opened up to us. But, it’s not just allowing us to expand our business. We are now able to bring high-quality care through braces at an affordable price.”

– Dentist

## Company Info:

Name: Orthodontic bracket technology company (OBT)

Location: USA

Industry: Health

## Challenge

Resolving malpositioned teeth through the application of dental braces, a relatively straightforward process, can be expensive and requires long-term coordination with an orthodontic specialist. The complexity and challenge comes from the experience and precision needed to analyze a patient’s mouth, correctly position the brackets and accurately track changes in teeth movement during the straightening process. While this complexity currently requires an orthodontist, a dentist could feasibly apply the brackets with proper training.

## Solution

4th-IR collaborated with an orthodontic bracket technology company (OBT) to modify bracket design. Computer recognition and measurement technology can now assist in bracket application, opening the door for dentists to apply braces at a significantly lower cost to patients.

Through the use of augmented reality (AR), Artificial Intelligence (AI) and Deep Learning, 4th-IR simulated an orthodontist’s decisions to guide in bracket placement and provide a second set of highly-trained eyes. Through several stacked Deep Learning algorithms, AI can recognize a patient’s mouth structure, segment the teeth from the background, and suggest the correct bracket placement.

By applying this digital application, 4th-IR and the OBT were able to train dentists in bracket placement and transform the orthodontic market.

### Key Product and Services Features

- Visualization of optimal bracket placement on teeth
- Quality control of actual bracket placement against suggested placement
- Ongoing progress monitoring against treatment plan
- Unique bracket design that facilitates high-quality placement
- Initial process and application training
- Multi-channel customer support

### Results

#### Changing the Game in Bracket Placement

Collaborating with 4th-IR, the OBT has modified the braces design to be compatible with AI technology. 4th-IR developed an AI-backed, digitally enhanced placement and service capability, known as the placement ecosystem that makes it possible for dentists to apply braces.

#### Capturing Experience Through Trained Algorithms

Experience makes a big difference, but even the best trained orthodontists are not always able to do a perfect job. However, experience can be replicated and augmented by a trained algorithm that can approximate and exceed human knowledge and visual acuity to guide dental professionals in making correct decisions.

Once brackets are in-place, teeth begin moving. By observing the movement at a micro level, undetectable by the human eye, early deviations from the treatment plan can be seen and understood. This will guide the dental professional on the proper adjustments to the patient's teeth. The collective observations from thousands of patients will result in a clearer understanding of the dynamics of teeth movement and bone growth. This benefits future applications.

#### An Easy-to-Follow, Step-by-Step Treatment Plan

At an appointment, a dentist takes a prescribed set of pictures of the patient's mouth and feeds them into the Digital Ortho Analysis System for recommendations. The system applies its trained algorithms and proposes next steps for treatment. The dentist interacts with the system to determine a final diagnosis and treatment plan.

This initial consult is fast and based on extensive AI analysis. The technology allows for infinitely complex reasoning and can draw differentiated inferences from the data and pictures provided.

#### Accurate bracket placement through image processing

After a dental assistant places the brackets on a patient's teeth, and before curing the epoxy, a final inspection is needed by the dentist. There is a finite set of measurements that needs to be conducted.

*"The efficiency and accuracy of this new approach to dental braces is amazing. It feels almost magical in the way treatment is applied today."* – Dentist

Though an experienced orthodontist can assess the application, an augmented reality app can assist dental professionals when applying them. Brackets are now placed with even higher accuracy through image processing. With the app, the dentist points a smart phone or tablet camera at the patient's mouth, submits the image and then receives recommendations on ideal bracket placement.

Thanks to the AI technology implemented by 4th-IR, dentists with limited orthodontic experience have the opportunity to learn how to correctly place brackets on teeth with a higher degree of accuracy than a seasoned orthodontist. Even if there is a point where a dentist is unsure, or needs extra guidance, the 4th-IR AI team can develop customized service and provide assistance.