

**Thesis Portfolio**

**Improving Dental X-Rays by Updating the Digital Sensor Positioning Device**  
(Technical Report)

**Misinformation and the Social Construction of Fact on Social Media**  
(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science  
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree  
Bachelor of Science, School of Engineering

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### **Sociotechnical Synthesis**

X-rays have been used in dentistry for more than a century, first being sparsely utilized in 1905, a mere decade after their discovery, before becoming widely used in the field after 1923, when the first dental X-ray machine was manufactured (Martinez, 2013). By 1950, X-ray machines became a standard in dental offices, using film to record radiographs. By the 1990s, though, the field had moved away from film and had instead adopted digital X-rays, which were cheaper, higher quality, instant, and more reproducible, using a digital sensor inserted in the mouth.

There are three main types of dental X-rays: periapical, bitewings, and panoramic. Periapical X-rays show the whole tooth from the crown to the root. Bitewings show half of the upper and lower teeth, and are especially helpful in showing cavities. Panoramic X-rays show a patient's whole set of teeth in one image. While all three types of X-rays could be improved, there is a glaring need to update the positioning device used in bitewing X-rays, as will be discussed later. In aiming to improve the positioning device, I hope to reduce the number of X-rays that must be taken by dentists, since many X-rays currently have to be retaken if the image is subpar.

Radiation is a serious cause for concern, and while dental X-ray machines are not particularly harmful as most of the beams scatter outside the body, each X-ray exposes a patient to roughly the equivalent amount of background radiation they would experience on any given day, but in a reduced area. Updating this technology will improve the safety of dental patients, as should be taken into consideration by any engineer, and will hopefully mitigate any fears that patients have of X-rays, and raise their trust in professionals.

For my STS prospectus, I've chosen to study a rather different topic, that being the spread of misinformation on social media and human's relation with understanding that we gain from interaction with this novel technology. As humans outsource increasingly more

interactions to social media, our collective perceptions and worldviews have been warped to the point where it is difficult to discern what is true and what isn't anymore. Social media companies are at an ethical crossroads in this respect: they have incentives to allow misinformation to spread so as to maximize their ad revenue, but in doing so they are complicit in the deterioration of discourse and greater distrust in traditional news. If they act to remove or qualify misinformation, though, they lose profit and are accused of favoritism. Therefore, I've decided to address the STS aspects of how humans' understanding of truth has been modified by social media use and how this phenomenon has led to the explosion of misinformation online. In addition, I will study what role social media companies play in the diminishment of misinformation spread on their platforms and what role governments have played in regulating these corporations so far, using COVID-19 and the spread of misinformation regarding the pandemic as a case study.

The technical subject of the STS prospectus and the technical topic for the Department of Biomedical Engineering are not related.