**Final Project - Week 3 Submission**

Please answer the following questions:

**1. About Individual/Team Information**

1. Is this an individual or team project?

Individual

1. If it's a team project:
   * Who are your teammates? (List all names and student IDs)
2. Briefly describe how you will distribute the work among team members. (Skip this if you're doing an individual project)

**2. About Project Topic**

1. What is your project topic?
   * Briefly explain what your topic is and why you chose it

>In my project at an orthodontics startup as part of the CPT, I aim to build a model and conduct a deep-dive analysis to classify oral scanned images into four treatment categories. This study is directly valuable for an ongoing project and has an already existing dataset.

1. Brief Literature Review
   * Write a brief paragraph summarizing 1-2 related papers/articles that provided insights for your project.
   * (*You're welcome to conduct a more comprehensive literature review if interested*)

[Consistency of patient classification in orthodontic diagnosis and treatment planning](https://meridian.allenpress.com/angle-orthodontist/article/68/6/513/57307/Consistency-of-patient-classification-in) is devoted to the imaging techniques in orthodontics performed for the analysis of dental structure and recognition of diagnoses. In this, a number of classification methods have been discussed that helps an orthodontist in evaluating images for treatment planning. Insights on utilizing imaging to support precise categorization of dental images (which in turn allow for automated classification systems to be developed) were provided by this paper. The context from which the project presents itself comes from the description of the methods and challenges of classification in orthodontics based on images​.

[**Research on multi-class orthodontic image recognition system based on deep learning network model**](https://pubmed.ncbi.nlm.nih.gov/37272001/)This PubMed article by Wang et al. (2023) presents a CNN-based model designed to classify dental radiographs specifically for orthodontic treatment planning. The performance and reliability of the model are studied in a clinical setting, and the strengths and challenges of applying deep learning to orthodontics are discussed. This paper differs from my project in that they use radiographs, rather than the oral scans I use, which allow for different diagnostic features like visibility of bone structure. Nonetheless, it provides a glimpse into the structure of CNNs, training strategy and coping with image quality variations, and anatomical differences. This comparison helps my project because it indicates what adaptations to a CNN would be necessary to adapt it to the peculiarities of oral scans, and thus provides support for an approach to orthodontic classification that is specific to the problem.

1. **Optional**: Preliminary Research Questions
   * List 2-5 initial research questions you plan to explore.
   * Note: These questions can be refined after exploring your dataset.
   * You may also submit your research questions next week after finalizing your dataset.

Research question candidates:

* What key features in oral scans differentiate the four orthodontic treatment categories?
* How accurately can a CNN-based model classify oral scans into specific orthodontic treatment categories?
* What preprocessing techniques can enhance classification accuracy for oral scans in orthodontics?

*Note: I recommend that you start searching for relevant datasets while deciding on your topic because identifying available data early can help refine your research question and ensure the feasibility of your project. Next week, we will submit detailed descriptions of the selected dataset.*