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Week 6

Applications of Foundation Models and Efficient Diffusion Models to Dental Radiography to Assist Dental Treatment Planning
Melody Halbert, MS and Laura Brattain, PhD

Project Overview

- Teeth charting is a manual process at the office
- It is a two person job and is error prone
- We aim to use AI to automate teeth charting
- Since dental datasets are limited, we are using foundation models
- To assist in pre-surgical planning and patient education we aim to apply diffusion models to generate synthetic teeth for fitting

Proposed AI Tasks

Automated Segmentation of Teeth

- Zero-Shot ✓
- Fine tuning ✓
- YOLO Segmentation
- YOLO prompt for fine tuning

Diffusion Model for Synthetic Teeth Generation

What Has Been Finished

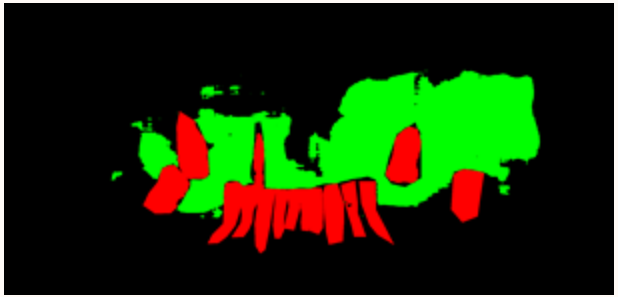
Zero-shot with MedSAM

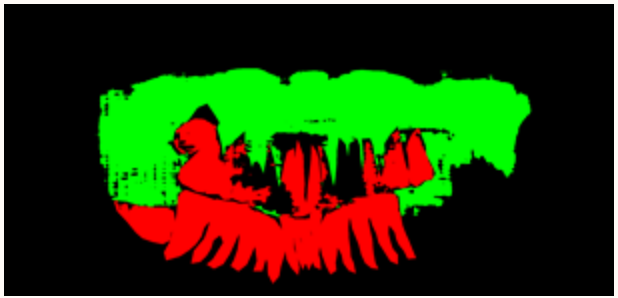
Zero-shot





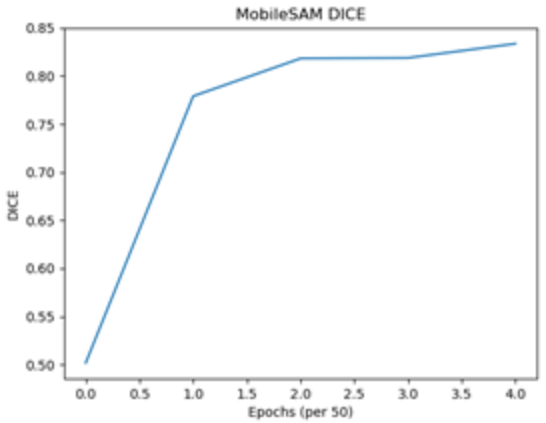
Zero-shot compared with Ground Truth





What Has Been Finished

Fine tuning with MobileSAM



Ground Truth Mask gt_mask_20.png



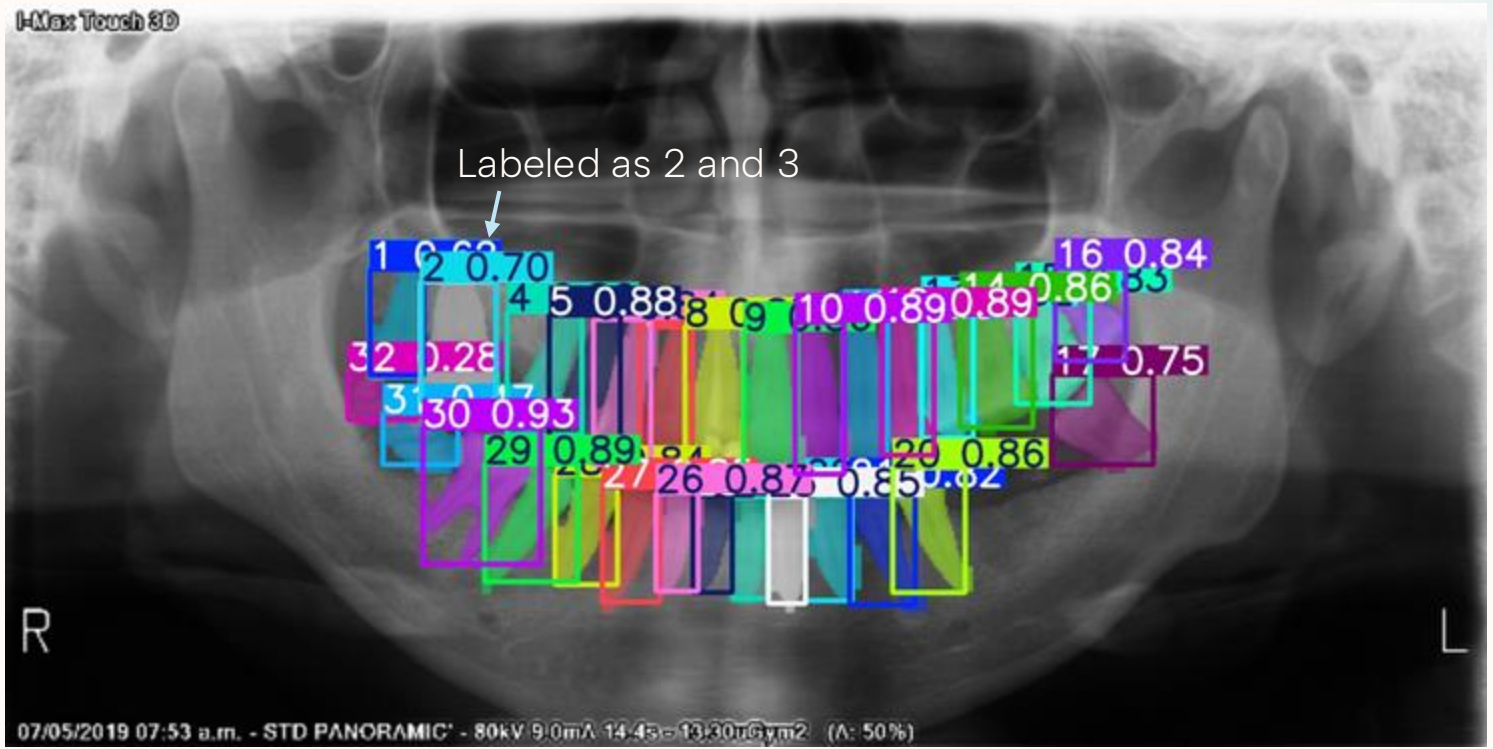
Predicted MobileSAM Mask



What Was Done This Week

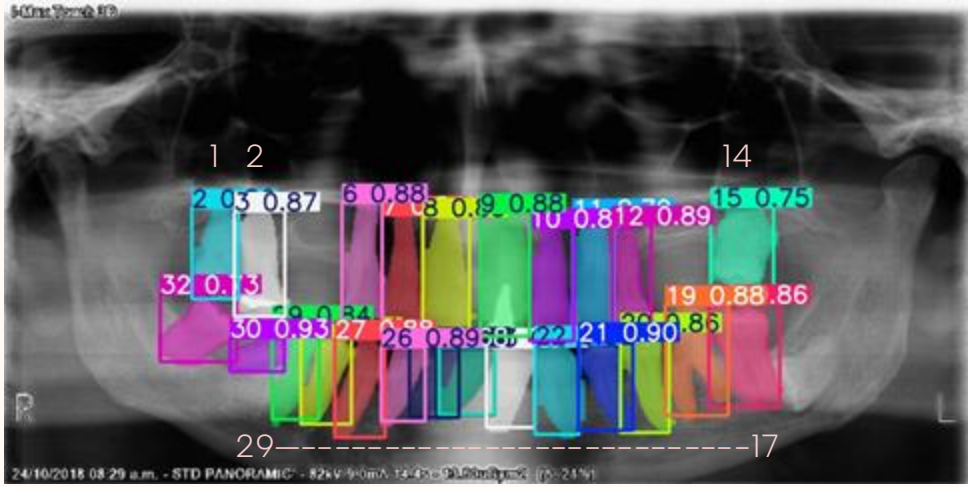
- Increase the dataset size
  - Existing dataset is kaggle (598 images)
  - Added tufts dataset (1001 images)
- Fine tuning YOLOv8 for bounding box detection and segmentation on the dental dataset
  - Most community support
  - Best performance for medical datasets

What Was Done This Week

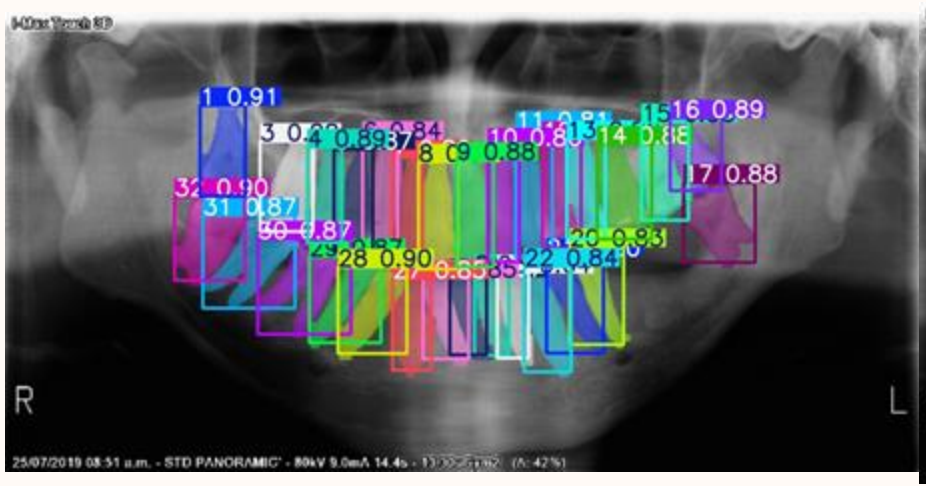


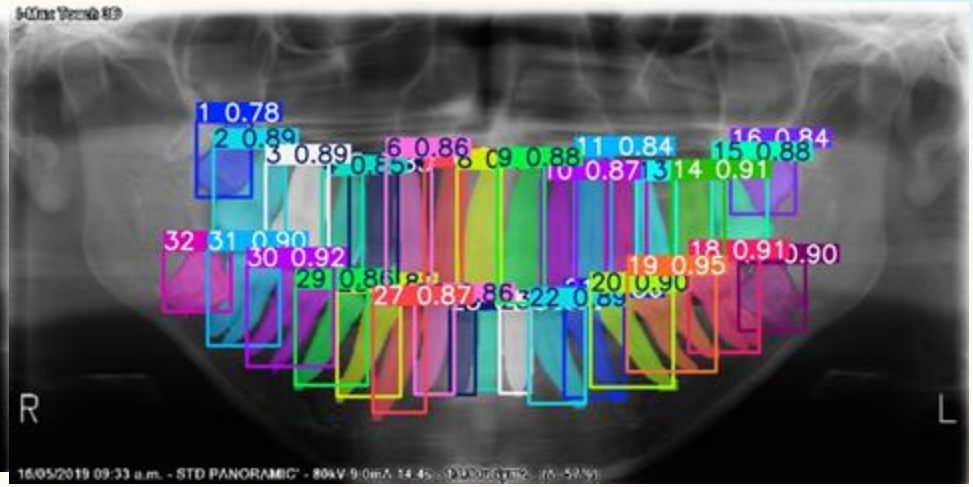
What Was Done This Week



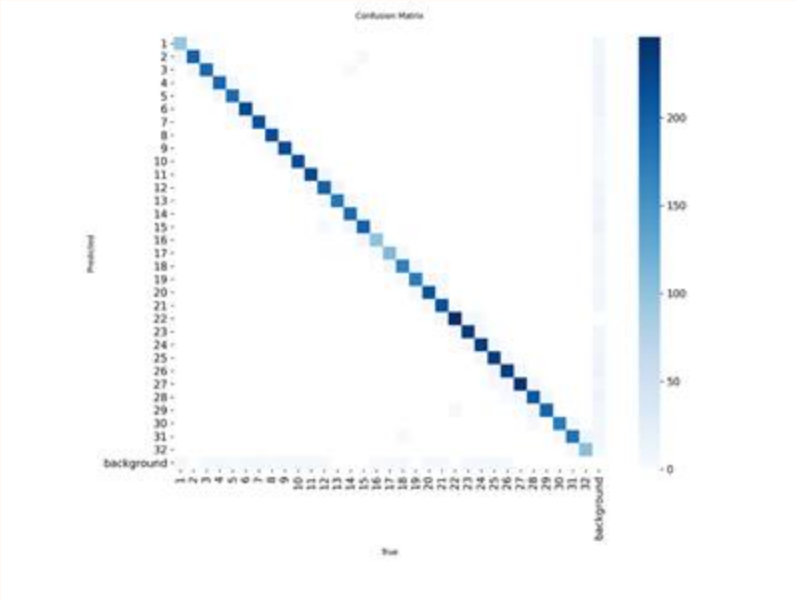


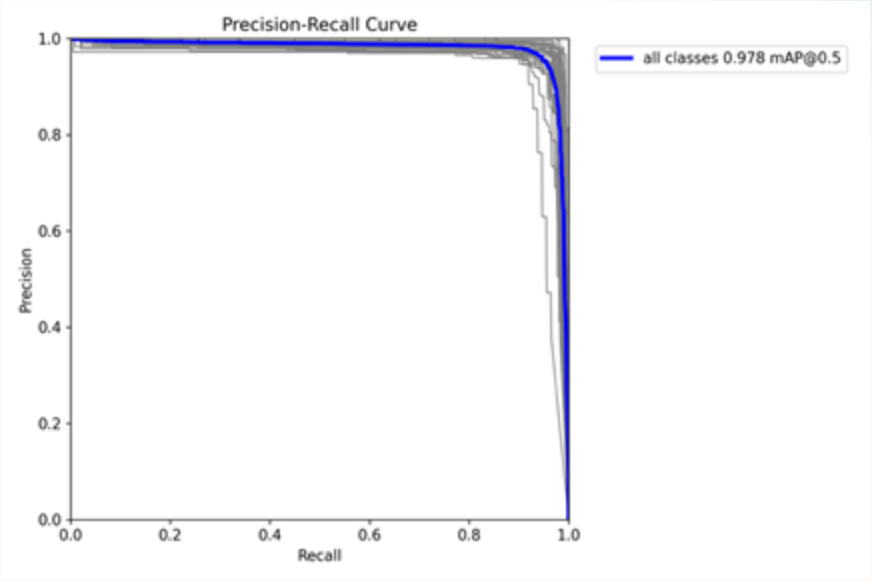
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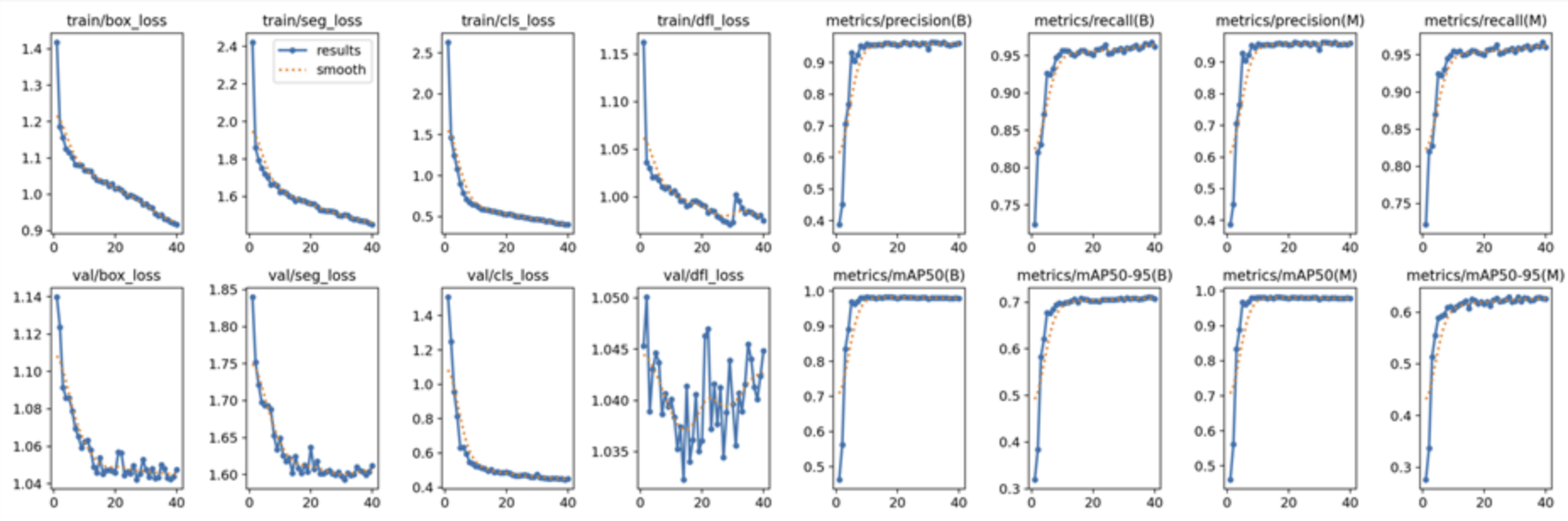


What Was Done This Week





What Was Done This Week



Proposed AI Tasks

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Diffusion Model for Synthetic Teeth Generation

Next Week

- Tests with YOLO bounding boxes vs. MobileSAM fine tuning
- Research into diffusion models and demos

References

SuperMedIntel. (n.d.). *GitHub - SuperMedIntel/Medical-SAM-Adapter: Adapting Segment Anything Model for Medical Image Segmentation*. GitHub. https://github.com/SuperMedIntel/Medical-SAM-Adapter/tree/main

https://zaradental.com/teeth-numbers-and-names/

https://www.kaggle.com/datasets/humansintheloop/teeth-segmentation-on-dental-x-ray-images/data

https://github.com/bowang-lab/MedSAM

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Thanks!