OralVis AI Research Intern Task

Tooth Numbering Dataset – Instructions & Reference Guide

1. Dataset Overview

You will receive a dataset of ~500 dental panoramic images with corresponding YOLO-format annotations. Each image has a .txt file containing bounding boxes for teeth using the FDI numbering system.
YOLO Label Format: class_id center_x center_y width height (all normalized between 0 and 1).

2. FDI Tooth Numbering System

The FDI system is the international standard for dental numbering. It uses two digits:
- First digit = Quadrant (1=upper right, 2=upper left, 3=lower left, 4=lower right)
- Second digit = Tooth position within quadrant (1=central incisor → 8=third molar)

Examples:
• 11 = Upper Right Central Incisor
• 36 = Lower Left First Molar
• 48 = Lower Right Third Molar

3. Tooth ID ↔ FDI Reference Table

Class ID	Tooth (FDI)
0	Canine (13)
1	Canine (23)
2	Canine (33)
3	Canine (43)
4	Central Incisor (21)
5	Central Incisor (41)
6	Central Incisor (31)
7	Central Incisor (11)
8	First Molar (16)
9	First Molar (26)
10	First Molar (36)

11	First Molar (46)
12	First Premolar (14)
13	First Premolar (34)
14	First Premolar (44)
15	First Premolar (24)
16	Lateral Incisor (22)
17	Lateral Incisor (32)
18	Lateral Incisor (42)
19	Lateral Incisor (12)
20	Second Molar (17)
21	Second Molar (27)
22	Second Molar (37)
23	Second Molar (47)
24	Second Premolar (15)
25	Second Premolar (25)
26	Second Premolar (35)
27	Second Premolar (45)
28	Third Molar (18)
29	Third Molar (28)
30	Third Molar (38)
31	Third Molar (48)

*Class order must not be changed.

4. Dataset Preparation

You will receive ~500 dental panoramic images with YOLO-format labels (FDI tooth numbering).

Steps:

- Split the dataset into Train (80%), Validation (10%), and Test (10%).
- Ensure images and labels are paired correctly.

5. Data Configuration

Create a data.yaml file with paths to train/val/test and include the 32 FDI classes.

Example:

```
train: path/to/train/images
val: path/to/val/images
test: path/to/test/images
names:
  0: Canine (13)
  1: Canine (23)
  ...
  31: Third Molar (48)
```

6. Model Training

• Train any YOLO variant (YOLOv5/YOLOv8/YOLOv11).
• Recommended input size: 640x640.
• Use pretrained weights (e.g., yolov8s.pt).
• Save your training logs, weights, and metrics.

7. Model Evaluation

• Evaluate on the validation/test sets.
• Submit:
  - Confusion Matrix (per class).
  - Performance metrics: Precision, Recall, mAP@50, mAP@50-95.
  - Sample prediction images showing bounding boxes + FDI IDs.
  - include training curves (loss/accuracy plots)

8. Post-Processing (Optional but Recommended)

Apply logic to improve anatomical correctness:
• Separate upper vs lower arch (Y-axis clustering).
• Divide left vs right quadrants (X-midline).
• Sort teeth horizontally within quadrants and assign FDI sequentially.
• Handle missing teeth by skipping numbers where spacing is wide.

6. Submission Requirements

You must submit:
1. GitHub Repository containing:
  - Training code & config (data.yaml, scripts).
  - README with environment + training command.
2. Word Document (.docx) including:
  - Confusion Matrix + key metrics.
  - Short summary of your approach.
  - At least 3 sample result images.
  - GitHub repository link.

7. Deadline

You have **48 hours** from receiving this dataset & instruction document to complete the task.