

3D Dental Arch Curve Detection from CBCT Images and Its Applications to Tooth Segmentation

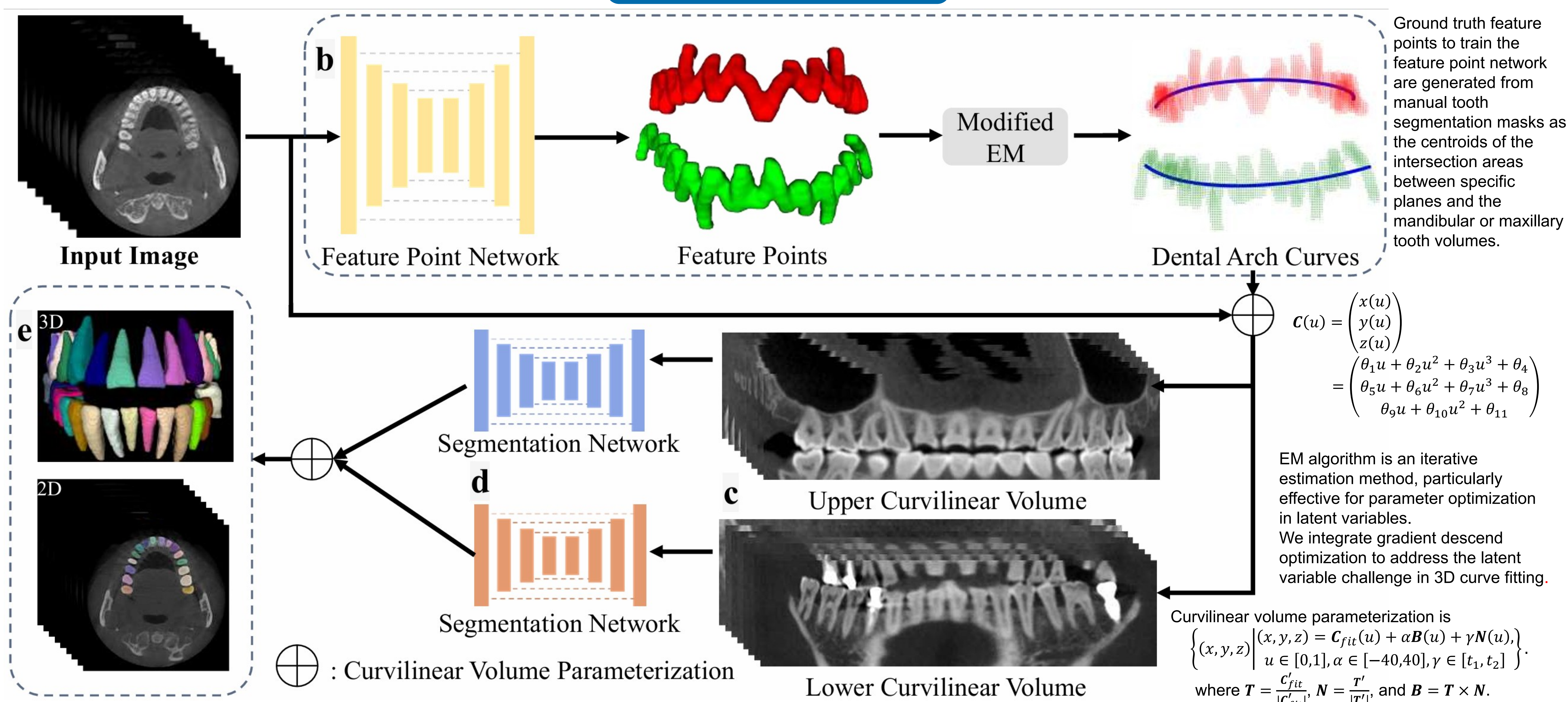
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Introduction

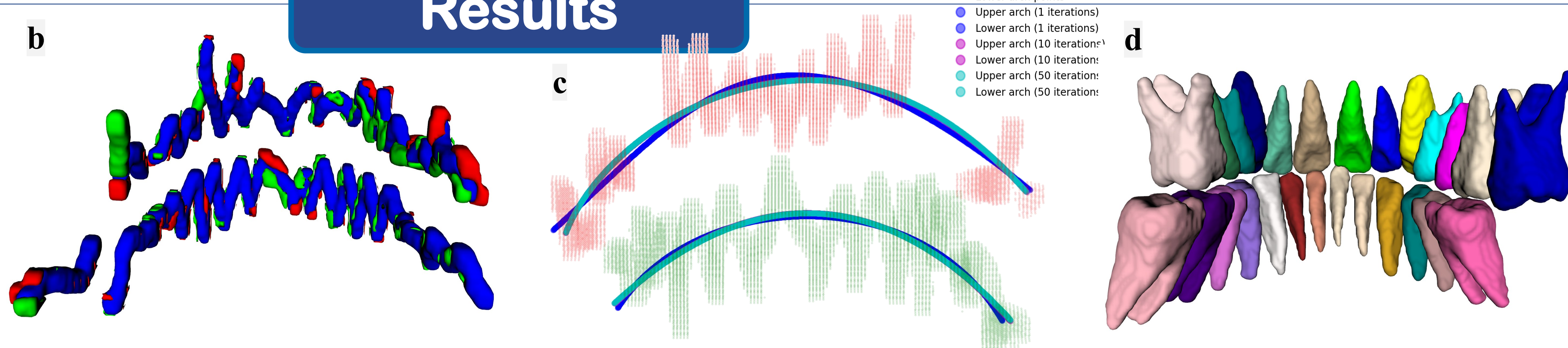
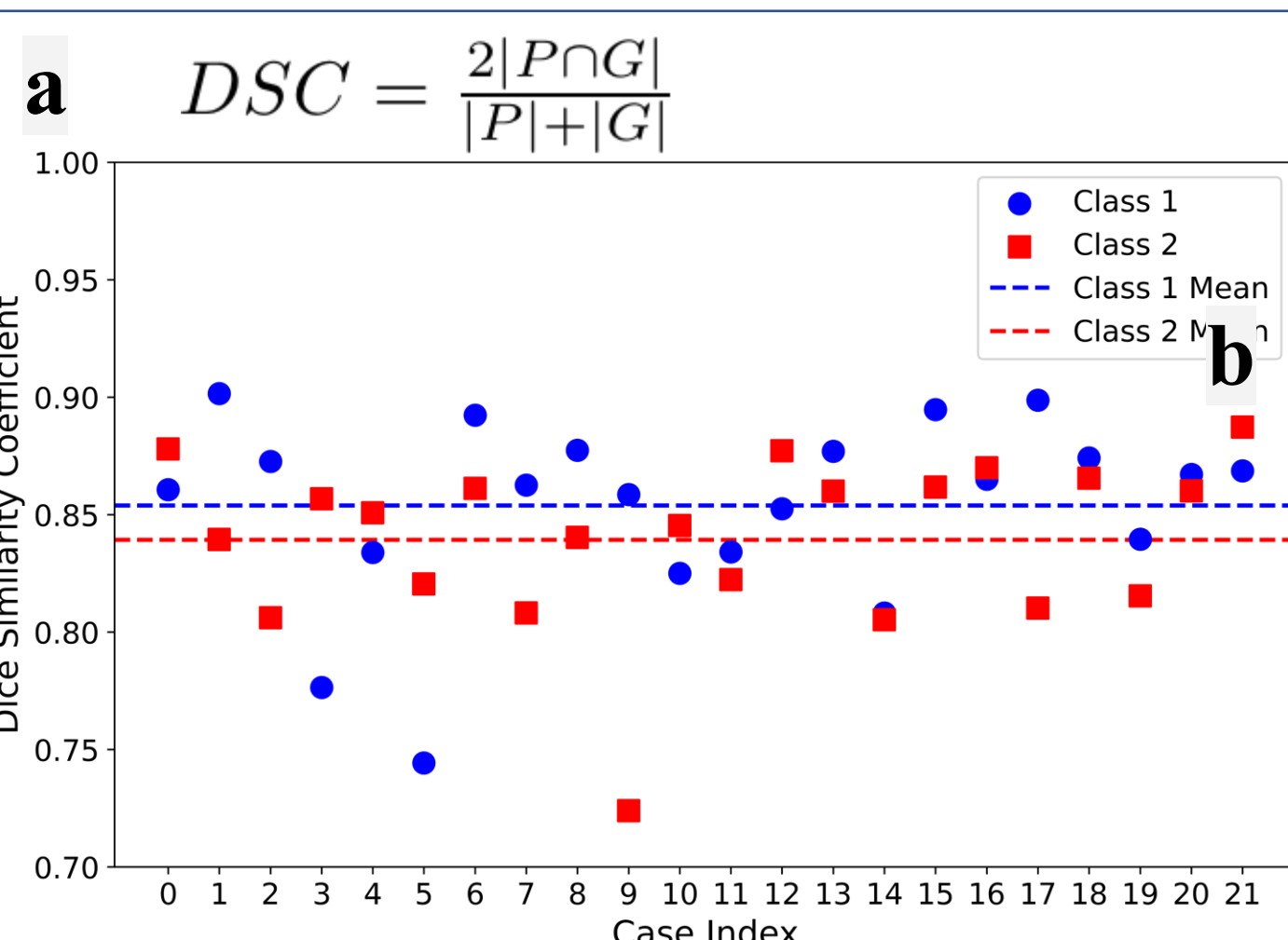
- The dental arch constitutes the curved arrangement of teeth within the maxilla or mandible.
- Along this critical anatomical feature, teeth exhibit precise spatial organization and are systematically and tightly aligned.
- The dental arch in the volumetric data set is three-dimensional (3D) that preserves authentic spatial inter-tooth relationships. However, existing algorithms have succeeded in detecting dental arch curves with two-dimensional (2D) cone beam computed tomography (CBCT) projections.
- This study proposes a three-stage fitting-based method for 3D dental arch curve detection in the 3D CBCT image.
- The application of the 3D dental arch—Multi-class tooth segmentation

Methods



Overview of the proposed method for fitting 3D dental arch curves, and serving as a plug-and-play tool for segmenting individual teeth from a 3D CBCT image:

Results



Conclusion

This study first proposes 3D dental arch curve detection from volumetric CBCT image and demonstrates that precise 3D dental arch curve detection serves as a plug-and-play tool for automated tooth segmentation. Experimental results show our 3D dental arch curve detection is accurate and robust. The dental arch curve guided tooth segmentation benchmarking methodologies are much more accurate than the corresponding benchmarking methodologies without dental arch curve guide.