



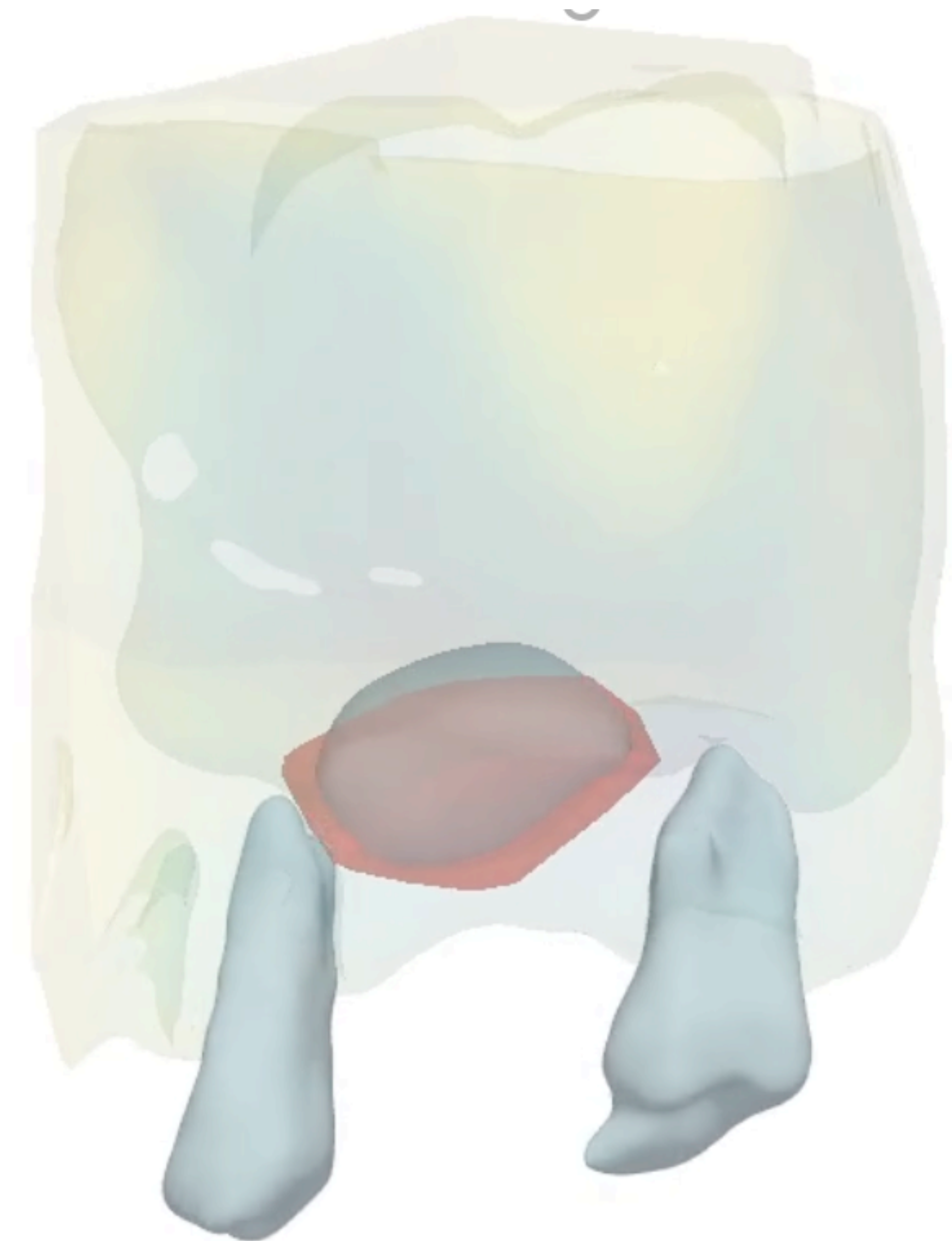
Predicting Future Sinus Augmentation Procedure and Bone Grafting Volume Using Deep Learning from CBCT Scans

Ham S. Kibuuka DMD, Ekaterina Zernitckaia DDS, PhD, Jaime Lozada DDS, Joseph Kan DDS, MS, Aladdin Al-Ardah DDS, MS, Periklis Proussaefs DDS, MS



Introduction

- The accurate prediction of future bone augmentation procedures and bone grafting volume is crucial for preoperative planning in oral and maxillofacial surgery.
- Current manual methods are time-consuming and subjective. We aim to address this problem by leveraging deep learning techniques to automate and improve the accuracy of these predictions.
- The accurate prediction of future bone augmentation procedures and bone grafting volume is crucial for preoperative planning in oral and maxillofacial surgery.
- Current manual methods are time-consuming and subjective. We aim to address this problem by leveraging deep learning techniques to automate and improve the accuracy of these predictions.





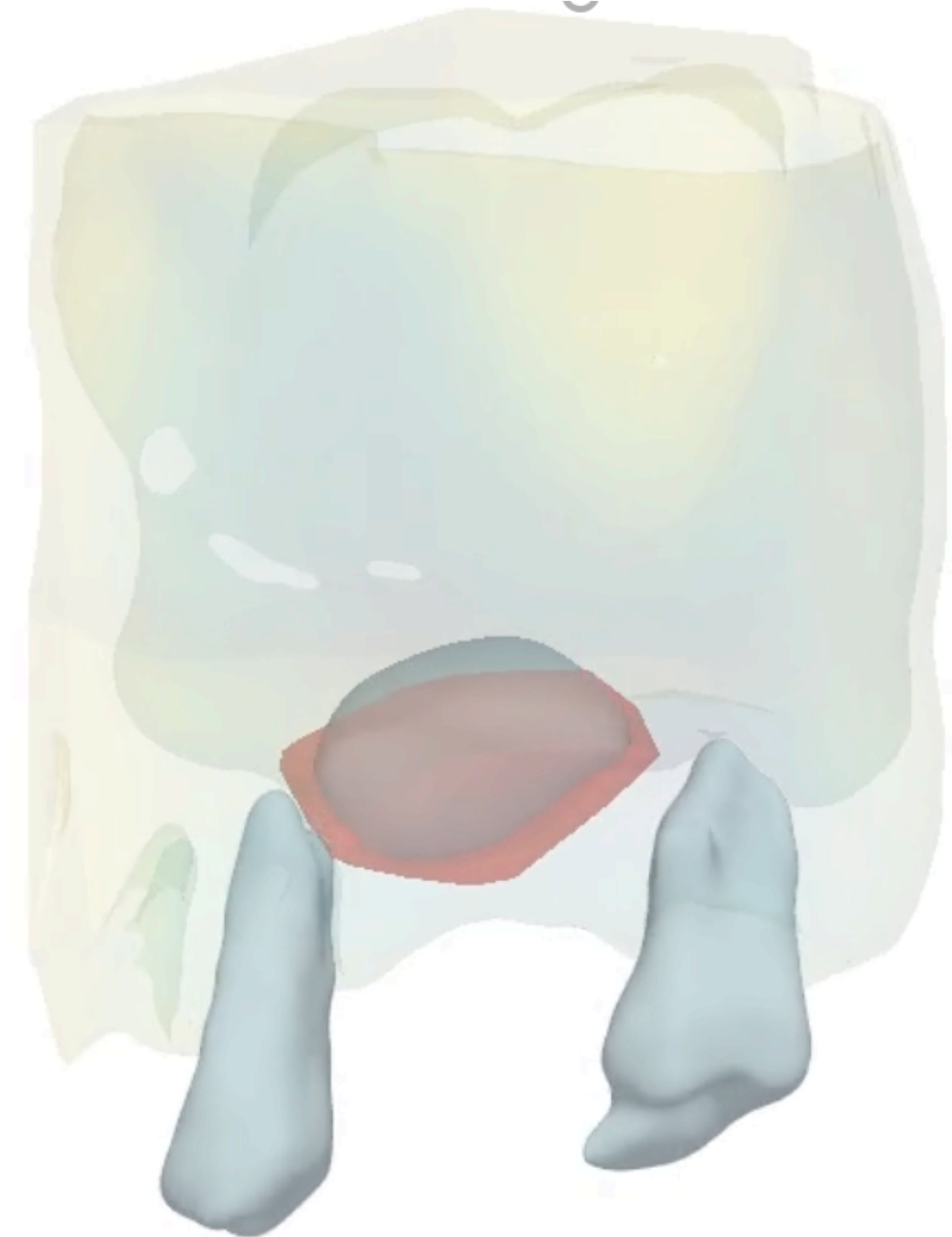
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Null hypothesis and Aim

- There is no significant difference between the volumetric measurements derived from preoperative AI-based segmentations and those obtained through manual segmentation performed by experienced surgeons.
- The aim of this study is to contribute valuable insights to maxillary subantral augmentation and enhance preoperative planning precision in implant dentistry.





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Material and Methods

- **Sample Size** : 200 CBCT scans from patients who were to undergo sinus augmentation procedures.

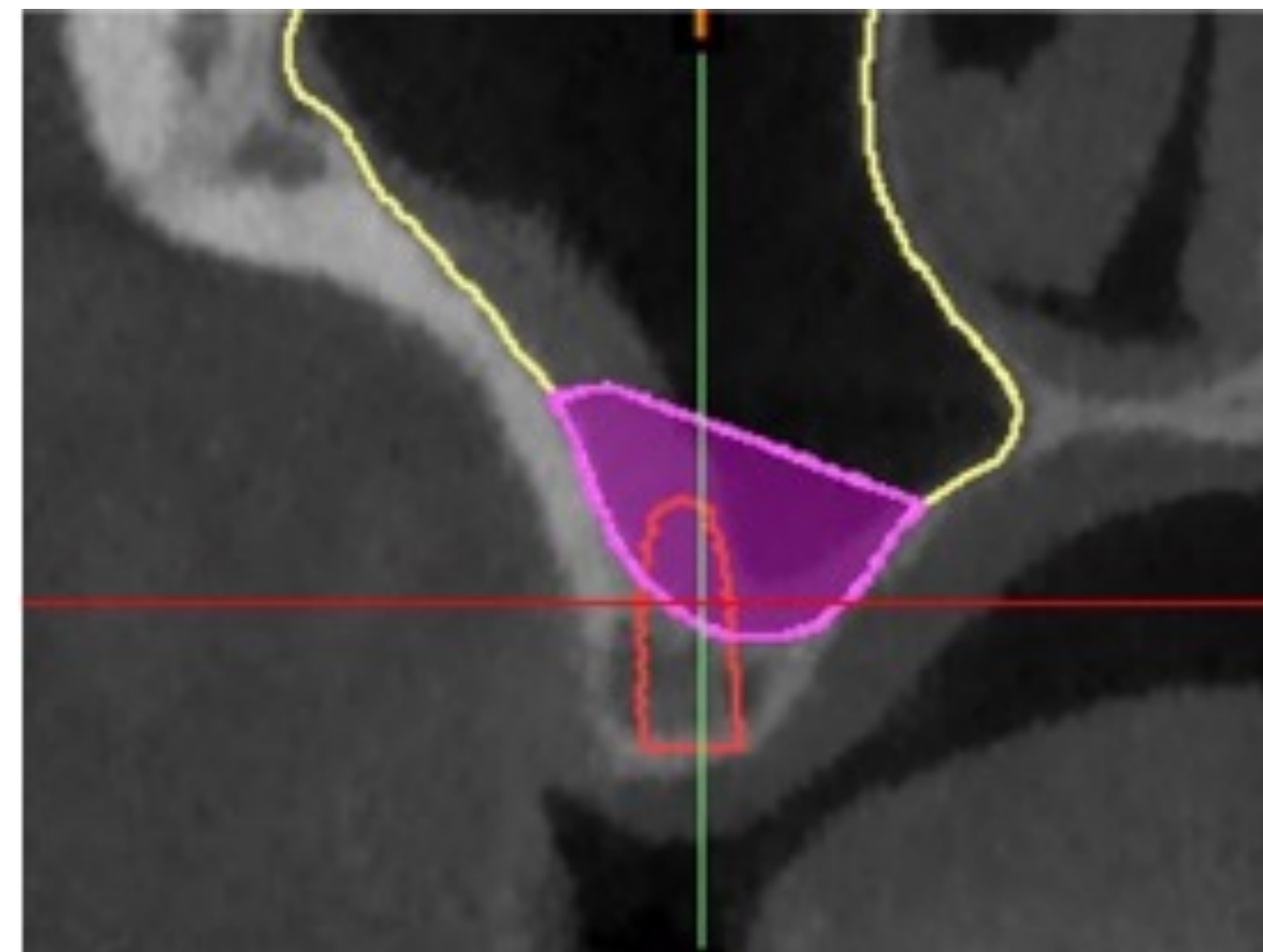


Fig1: Sagittal View of Sinus depicting area needed to graft.

- **How Can We Calculate The Bone Grafting Volume?**

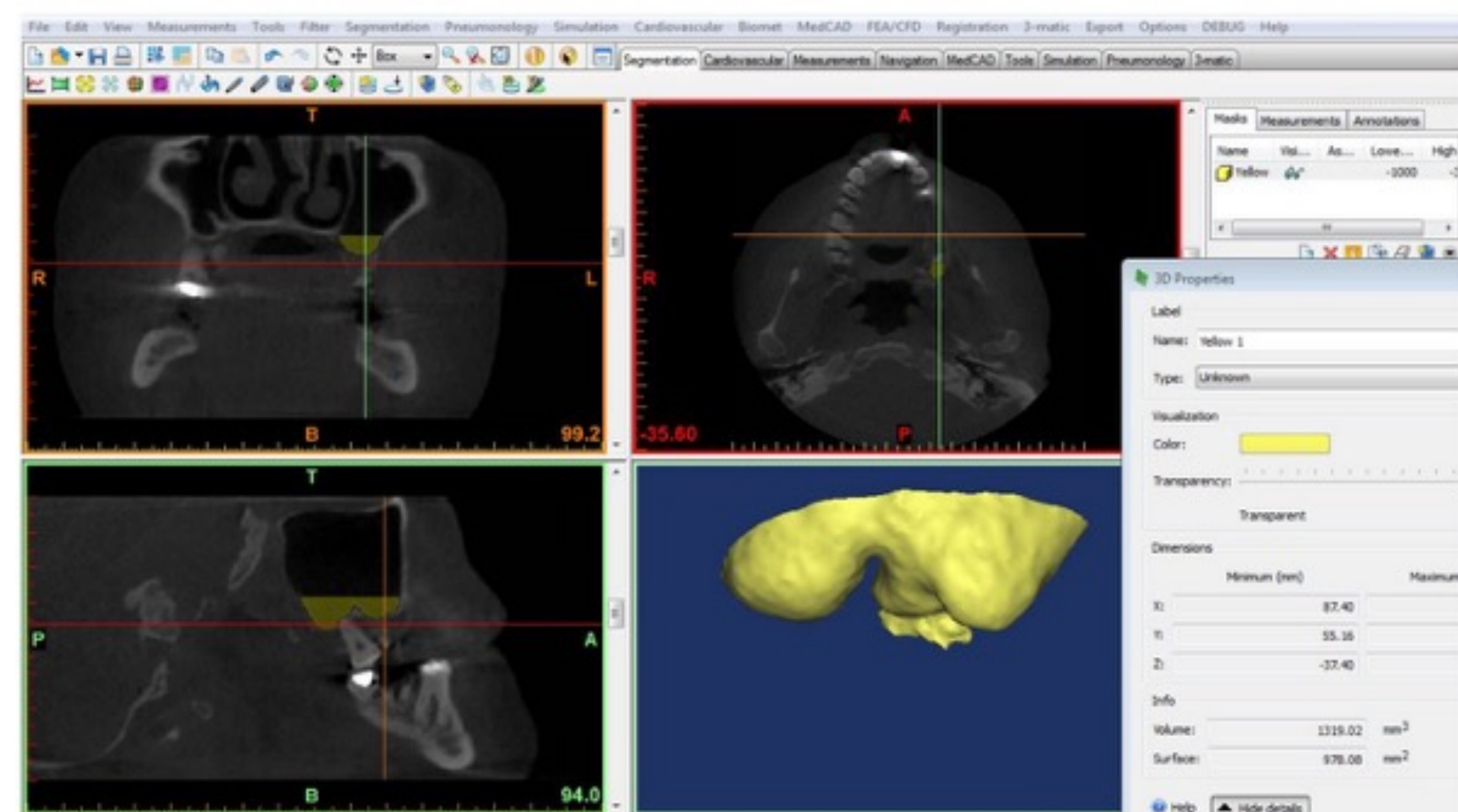


Fig 2 Manual Segmentation

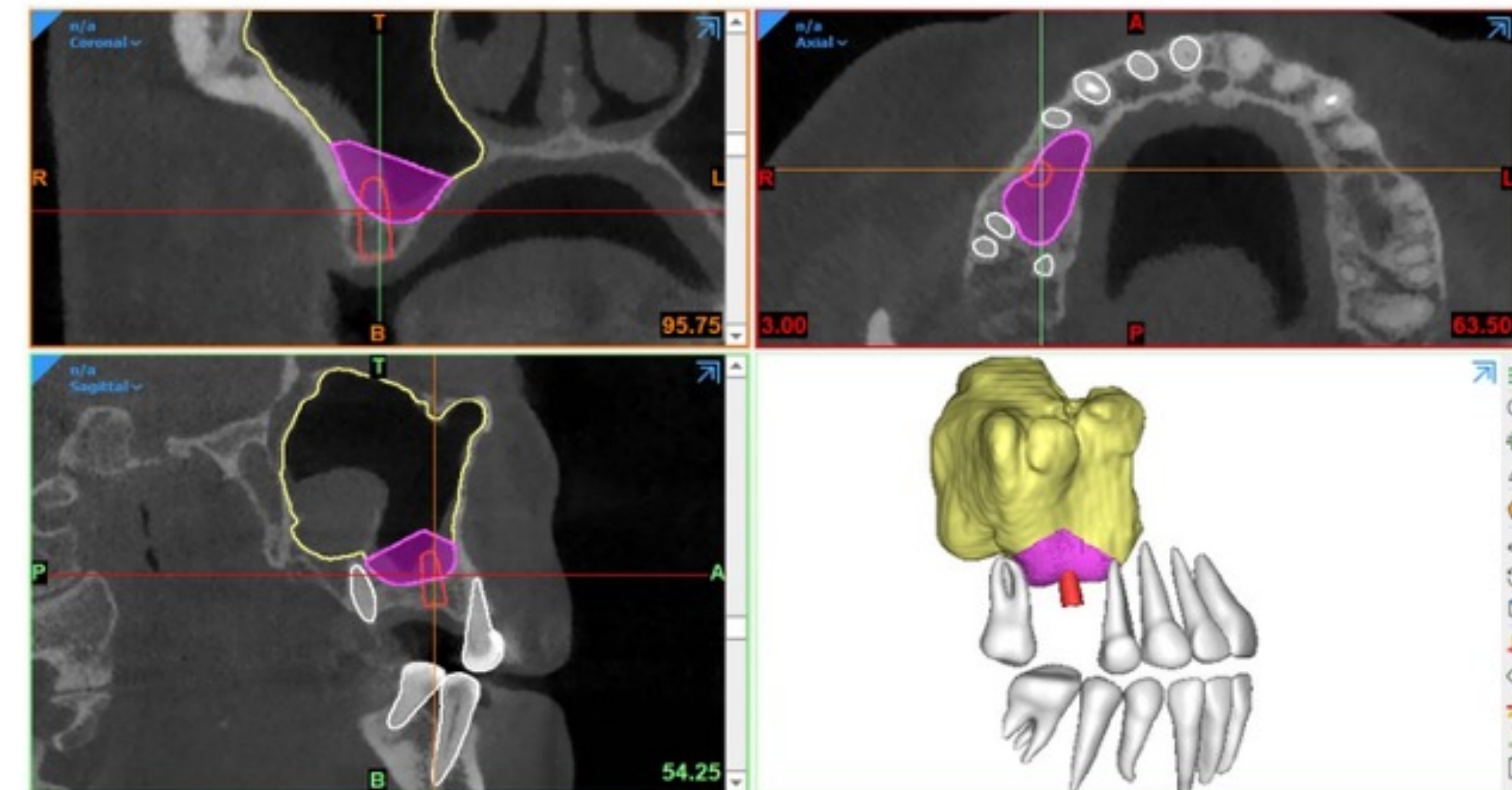


Fig 3 AI Segmentation

- **Dataset Creation**

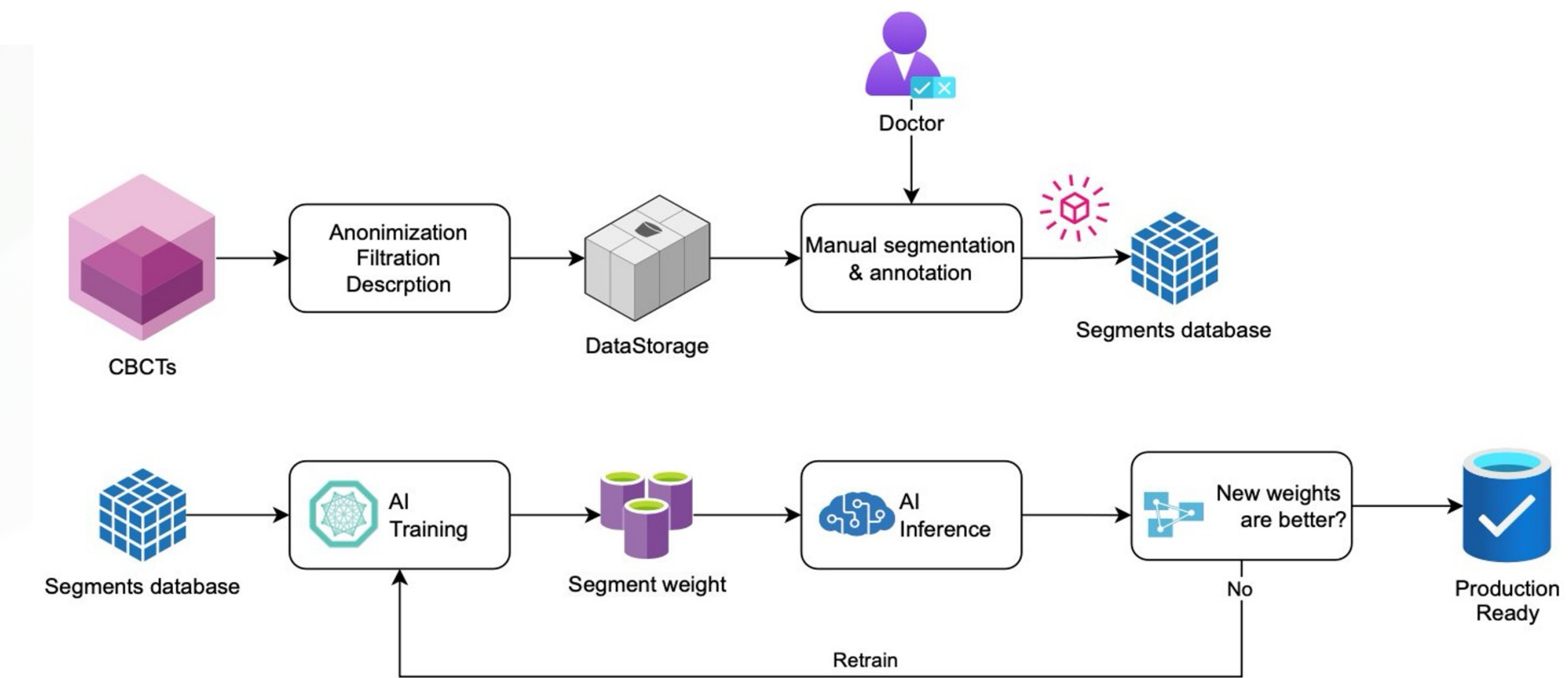


Fig 4: A detailed schematic of the training workflow

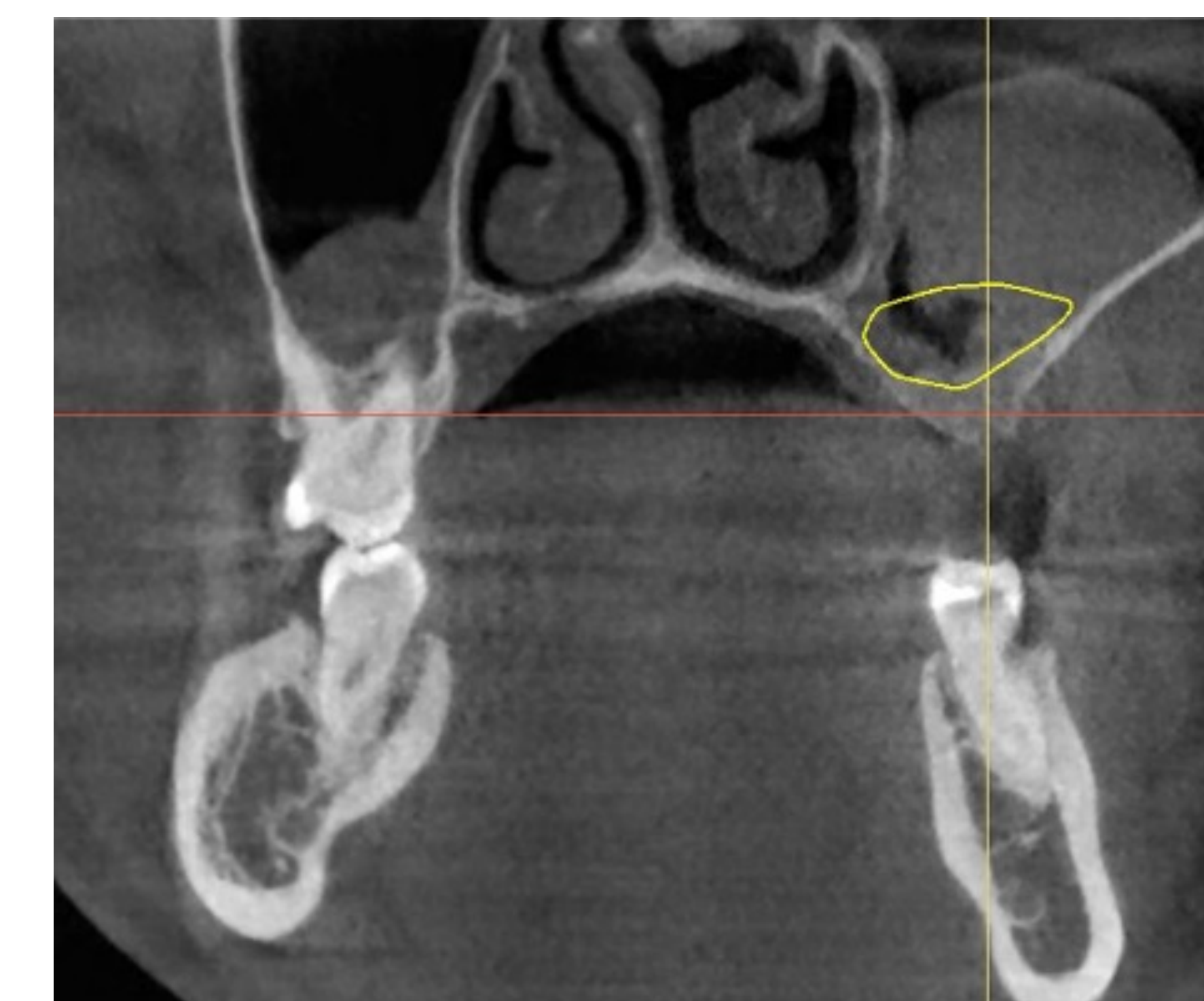


Fig 5: Volume Prediction



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Results

- The Red depicted in the figure below is the Doctor's volume detection of 735 mm³. The Grey superimposition is the AI volume detection of 737.2 mm³

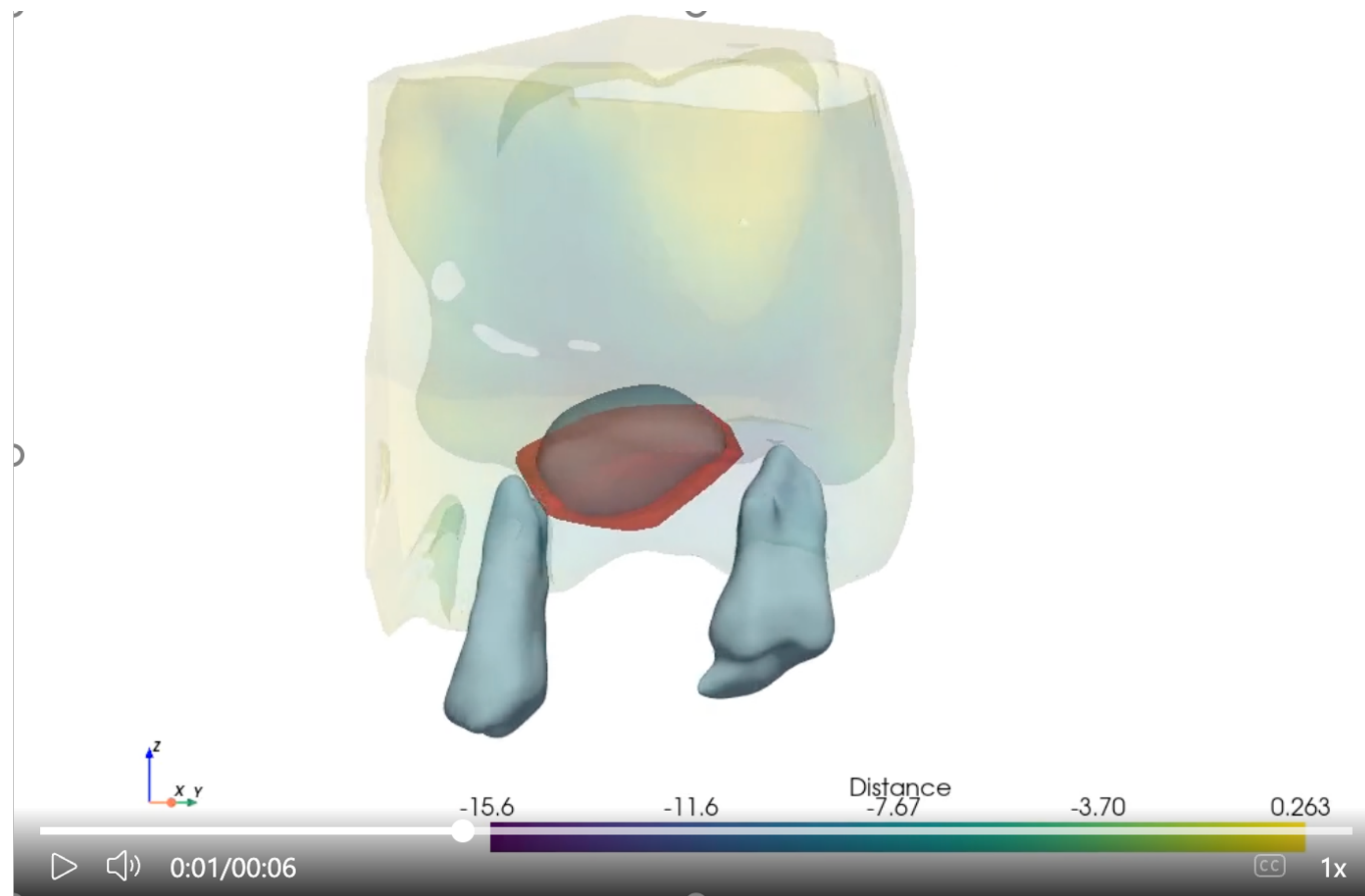


Fig 5: Volume Prediction

Discussion: This study has shown that AI/automated bone graft volume detection is comparable to that of an experienced surgeon thus making it an acceptable, faster and efficient alternative to the manual detection.

Conclusion: This study supports the feasibility of using AI-driven CBCT segmentation to estimate bone graft volumes for maxillary sinus augmentation. The data demonstrates reproducible learning and clinically meaningful volume approximation. This approach may enhance surgical planning accuracy, reduce material waste, and improve efficiency in implant dentistry and oral surgery.

