Convolutional neural network-driven tool for automated segmentation of maxillary alveolar bone on cone-beam computed tomography images

Conventional segmentation of maxillary alveolar bone → Inherent **limitations**

- Laborious task
- High subjectivity Operator-dependent
- Sensitive to the inherent image quality limitations of CBCT

Potential solution

Development of **CNN-based tool** to perform an **automated segmentation**

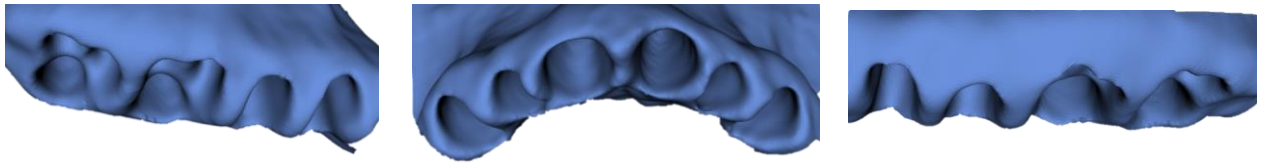
Development and validation of the CNN model

- Training 99 CBCT scans
- Validation 12 CBCT scans
- Testing 30 CBCT scans

AI vs Manual segmentation approaches

30% of the testing sample (n=9 CBCT scans) →
- Accuracy
- Time-consumed

Overall performance – AI segmentation



Segmentation highly accurate

- 95% Hausdorff distance (HD) **0.28 ± 0.02 mm**
- Dice similarity coefficient (DSC) **95.4 ± 0.6%**

AI vs Manual segmentation

1. Accuracy

Manual segmentation showed slightly better performance

2. Time-analysis

The AI method was 116 times faster than the manual method

Conclusion

Albeit the manual segmentation showed slightly better performance, the innovative CNN-driven tool provided a highly accurate and fast automated segmentation of the MAB and its crestal contour.