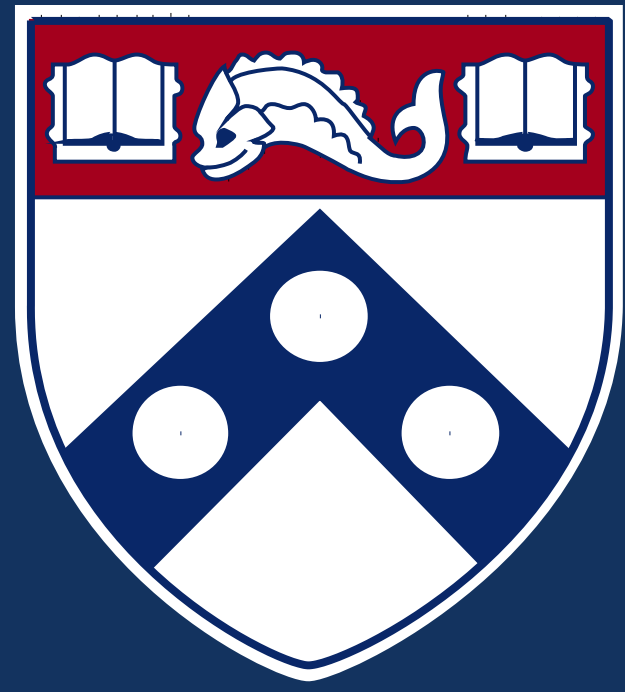




Advancing Artificial Intelligence in Digital Impressions: Enhancing Accuracy and Workflow in Edentulous Maxillary Arch Scanning

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Introduction

Capturing accurate digital impressions of edentulous maxilla is challenging due to limited landmarks for stitching. New AI features (e.g., Smart Stitching, enhanced filtering) aim to ease/accelerate scanning, but their effect on accuracy (trueness/precision) and workflow remains unclear.

Aim: To compare AI-enabled vs AI-disabled intraoral scanning of a fully edentulous maxillary model with respect to accuracy (CloudCompare RMS) and workflow (scan time, rescans) against a laboratory control.

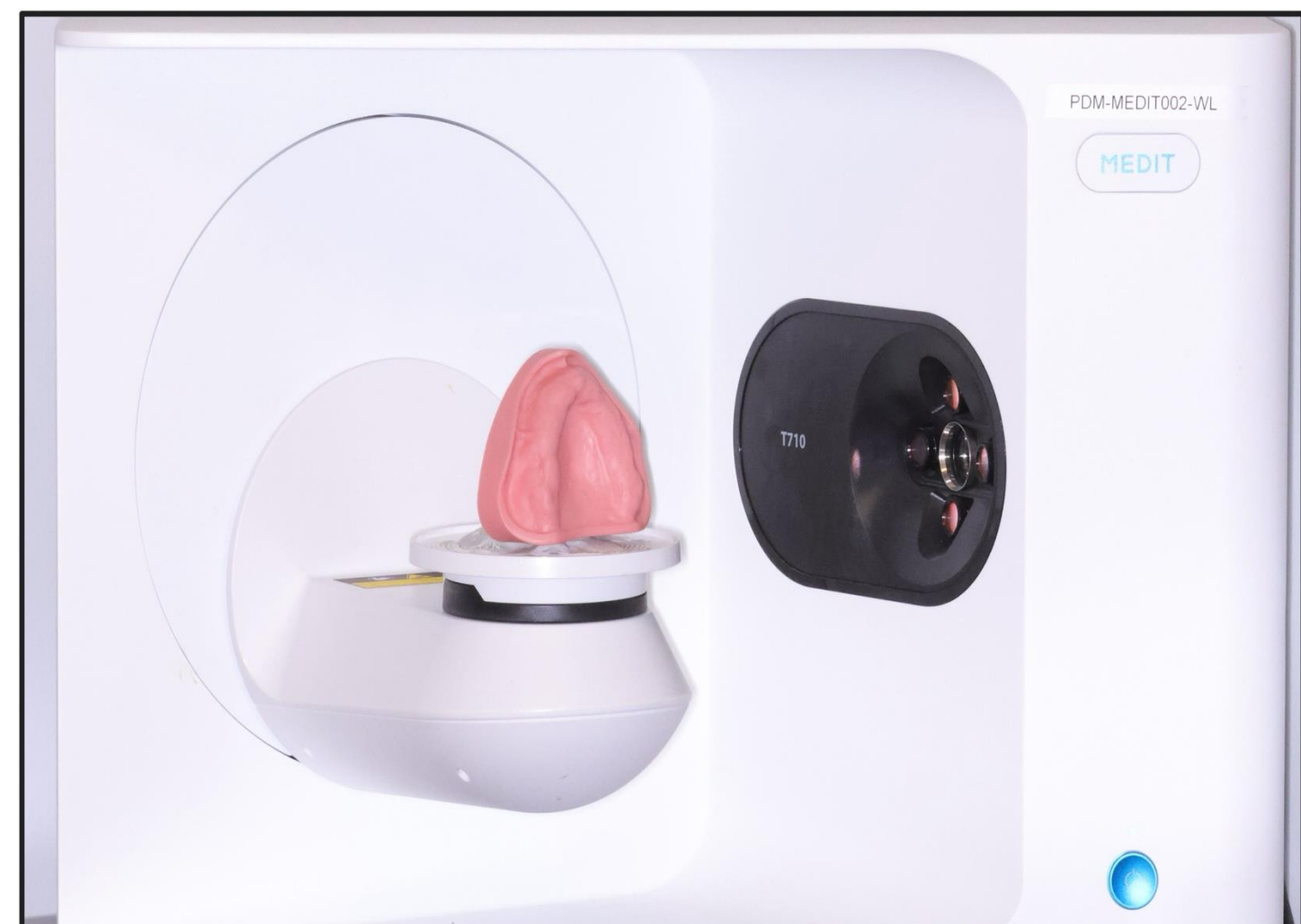
Materials



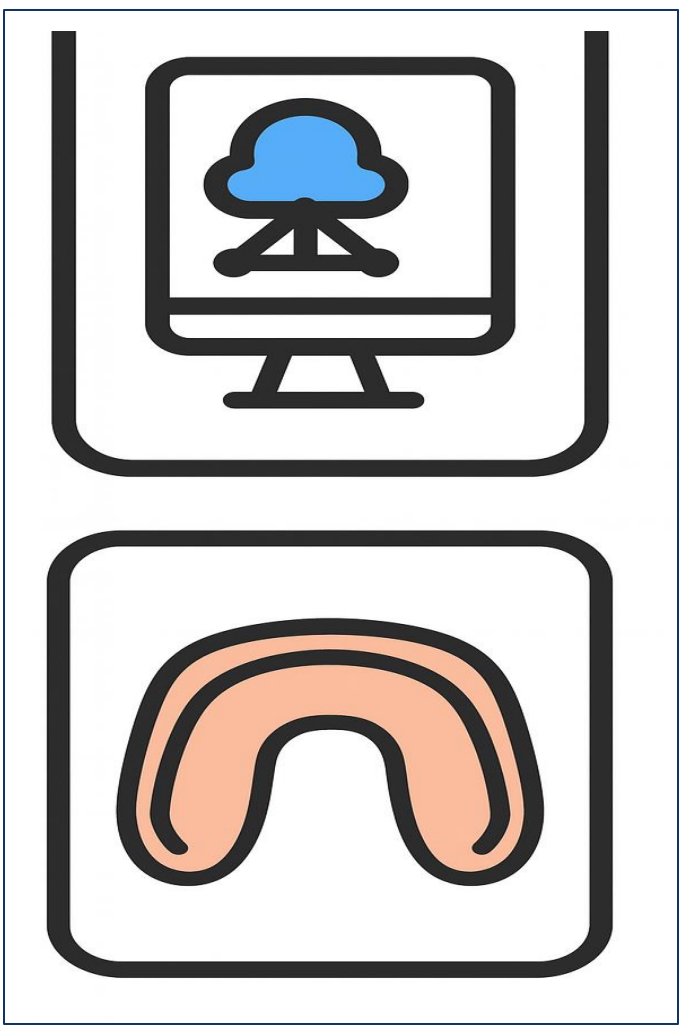
1. Standard Edentulous Maxillary Model



2. Scanning with Medit i700



3. Control: Medit T710 lab scanner



4. CloudCompare Analysis & Workflow Metrics

Methods

- Model:** Standardized edentulous maxillary cast.
- Scanner groups (total n=20 intraoral scans):** AI-enabled (Smart Stitching ON) - Medit i700 with AI stitching and enhanced filtering **ON** (manufacturer: filters soft tissues to streamline capture). **n=10** scans; AI-disabled (Smart Stitching OFF) - Same scanner and protocol with AI stitching/filtering **OFF**. **n=10** scans.
- Control:** Medit T710 laboratory scan (reference).
- Accuracy:** RMS deviations in CloudCompare (trueness & precision).
- Workflow:** Total scan time; number of rescans.
- Spatial assessment:** Color-coded deviation maps (fixed 0–2 mm) and histograms.

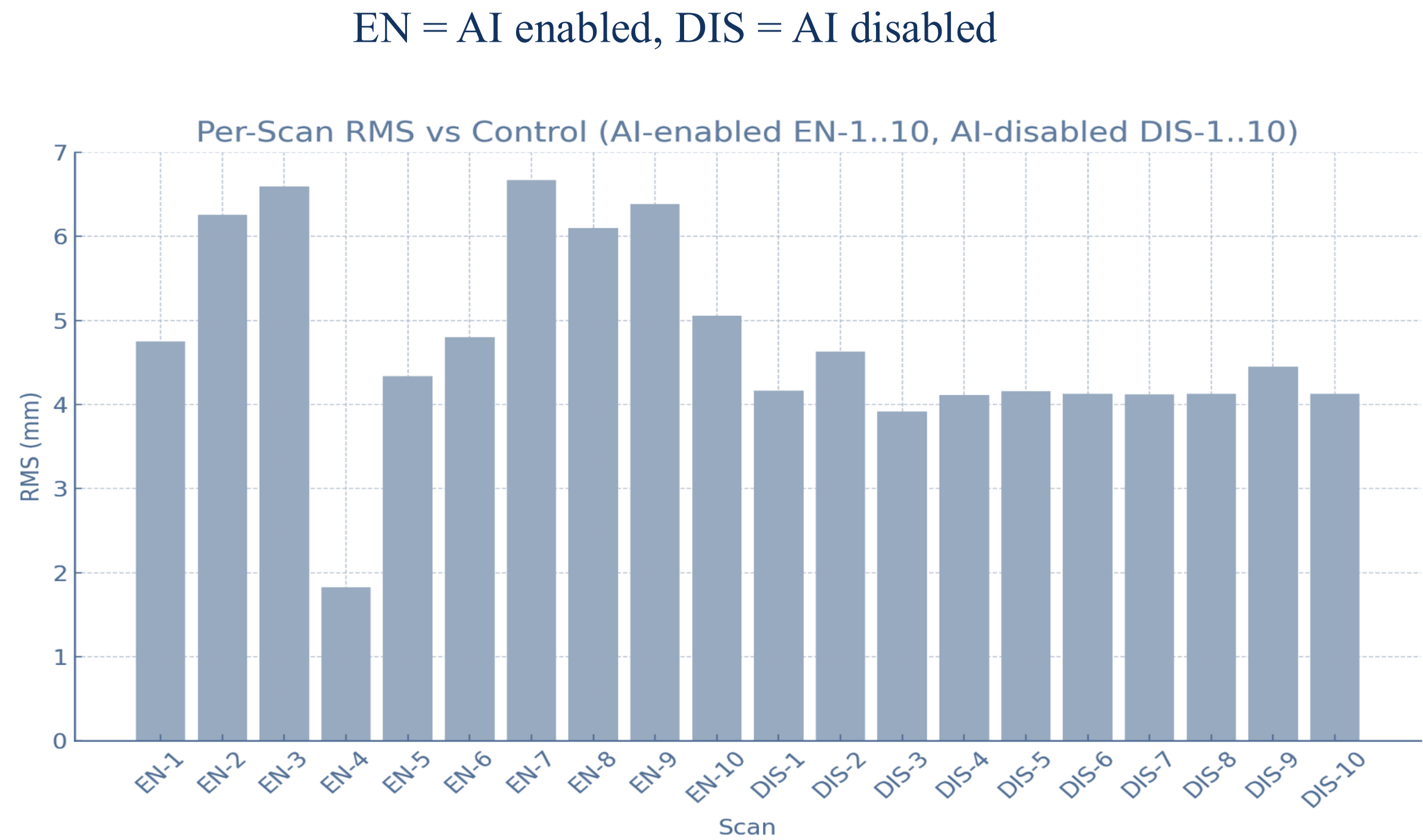
Results

Group	RMS Deviation	Mean ± SD	n	p-value
AI-enabled (n=10)	5.28 mm	±1.49	10	0.03
AI-disabled (n=10)	4.19 mm	±0.20	10	

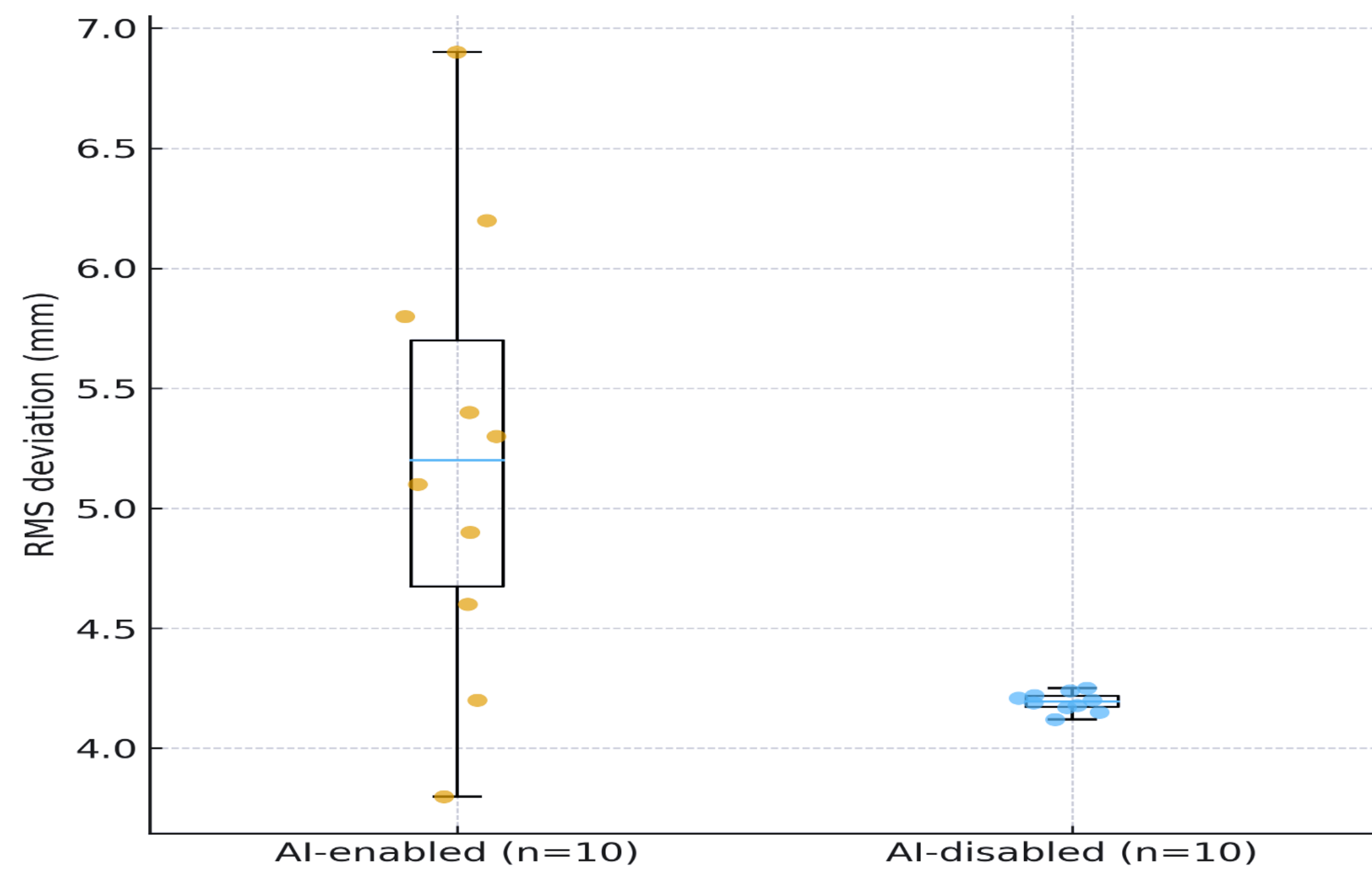
Table 1: Accuracy (vs. control) - AI-disabled scans show significantly lower RMS deviation than AI-enabled scans indicating higher trueness and tighter precision.

Metric	AI-enabled	AI-disabled	p-value
Scan time	211 ± 52 s	127 ± 17 s	0.07
Rescans	Max 3 (distortion risk)	Multiple allowed	-

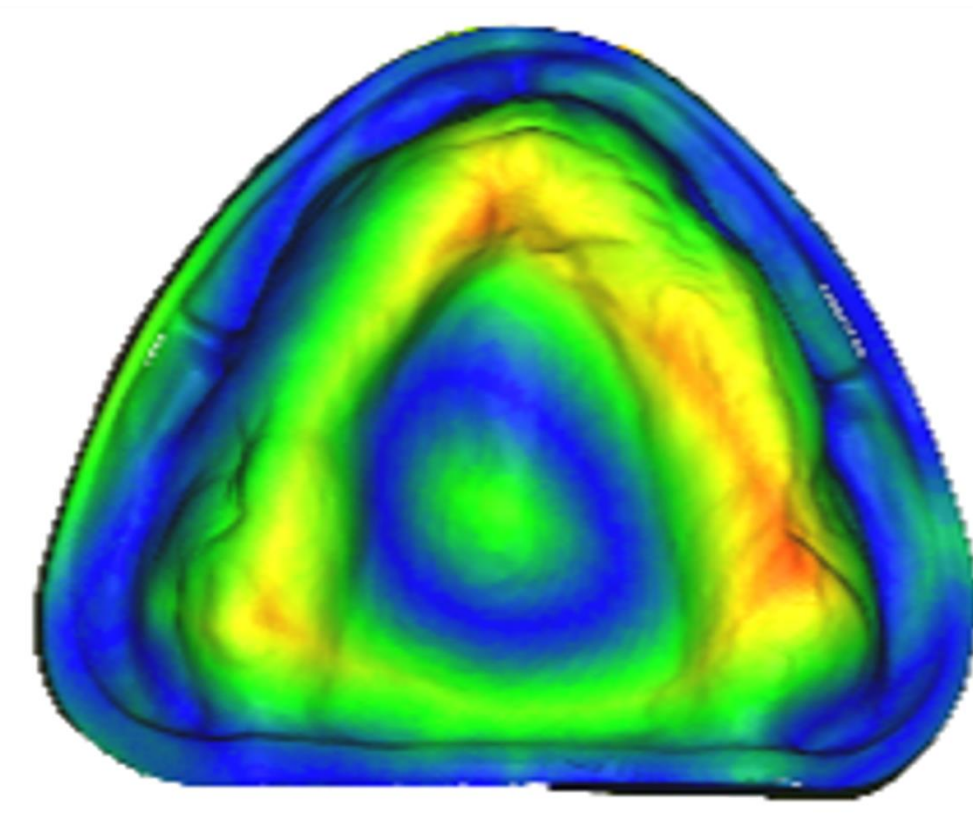
Table 2: Scan time (seconds) and rescan allowance. Workflow times were shorter on average with AI-disabled.



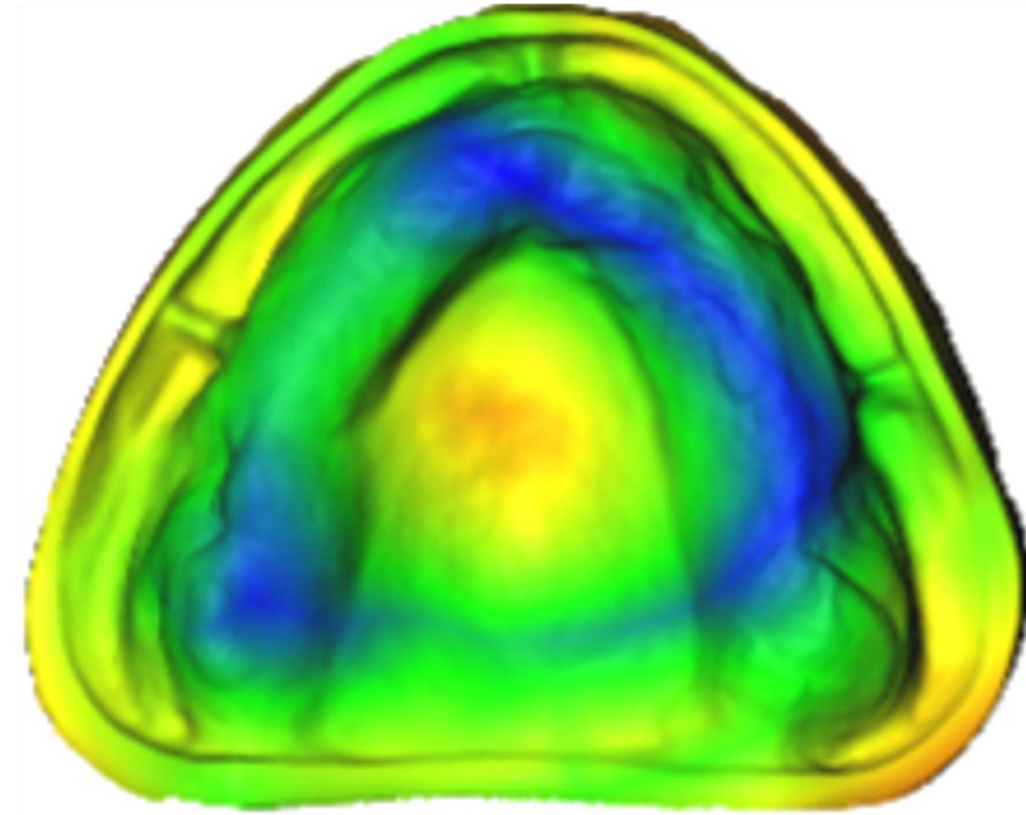
Per-scan RMS(mm): AI-disabled shows a narrower range, indicating higher precision



Boxplot of RMS deviation: AI-disabled exhibits a lower median and tighter spread than AI-enabled, indicating higher trueness and reproducibility



AI enabled vs Control



AI disabled vs Control

Color coded deviation maps (0–2 mm scale): AI-disabled shows fewer high-deviation regions.

Discussion

- AI-disabled scanning was more accurate and reliable than AI-enabled. In edentulous maxilla, the lack of landmarks likely destabilizes Smart Stitching and AI filtering, so turning AI on did not improve accuracy and increased variability.
- For workflow, any time savings with AI-enabled were not significant and were offset by rescan limits and distortion risk; AI-disabled allowed multiple rescans and safer recovery from mis-stitching.

Conclusion

AI-disabled scanning provided superior accuracy and workflow reliability. For fully edentulous maxillary arch, AI-disabled mode should be the preferred protocol in current complete denture workflows. Prioritizing accuracy and reproducibility outweighs modest speed gains from AI-enabled scanning.

Clinical Implication: Prioritize AI-disabled scanning for complete denture impressions of edentulous arches. Enhanced AI filtering (lips/cheeks/tongue) can inadvertently suppress subtle mucosal landmarks (papilla, rugae, tuberosity, ridge contours) that stitching/registration depends on, reducing trueness and consistency.