

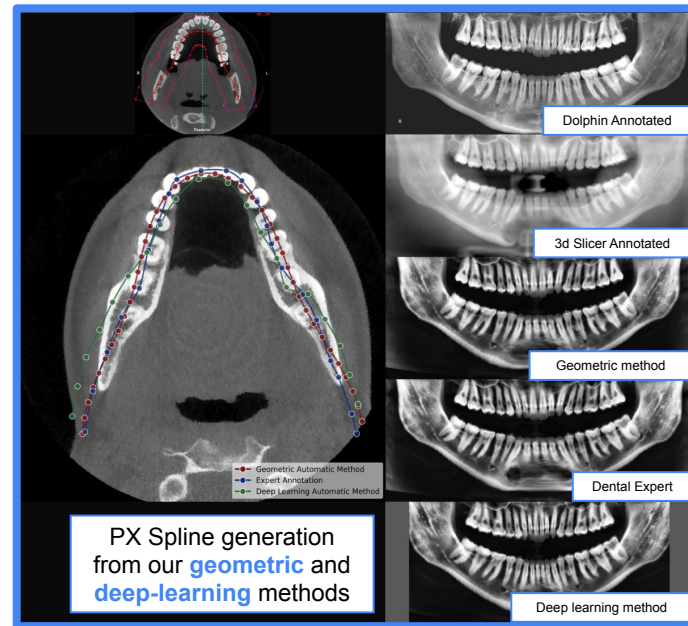
AutoSpline: Automated Dental Arch Curve Detection from CBCT as A Geometric and Learning-Based Platform

Paper #30

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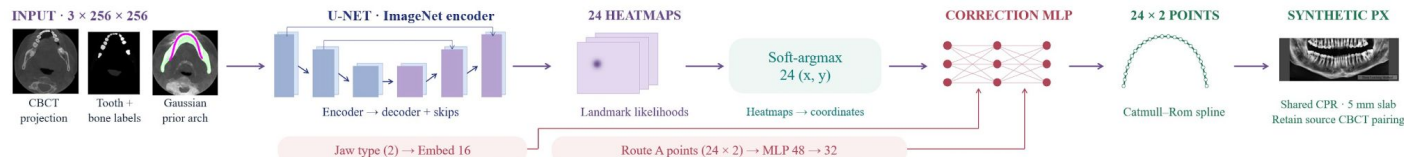
- **Context:** Paired CBCT and panoramic radiographs (PX) from the same patient are scarce within public databases. CPR needs a patient-specific arch spline, yet **manual tracing limits scale**. Previous **centroid-based geometric methods** fit splines through tooth-label centers.
- **Objective:** Propose a **pipeline** to generate automatically splines on 3D CBCT shapes to create panoramic scans. We compare geometric and AI-method such as HeatmapNet.
- **Results:** Our **open-source GUI AutoSpline** automates this step to enable **mass creation of paired CBCT–PX datasets with deep-learning and geometric panoramic spline generation**.
 - **163 open-source** expert annotated splines on the Tooth Fairy 2 3D CBCT volumes by dental expert on our github.



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HEATMAPNET • Illustrated learning pipeline



Prior: automatic Route A centroid arch before editing. Loss: curve distance at 100 arc-length samples + 0.01 × smoothness. Training: five-fold stratified CV, AdamW (10⁻⁴), cosine, 60 epochs, batch 8. All routes share the CPR renderer.



Try Autospline here!



RESULTS • GEOMETRY & IMAGE QUALITY

Route	MCD ↓	SSIM ↑	PSNR ↑	Time
A Geometric	5.79	0.418	10.44	Interactive
B Thresholding	3.24	0.453	10.86	~6 s
C HeatmapNet	5.06	0.542	12.81	~10 s

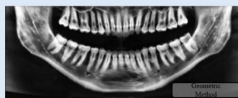
Full-set comparison. MCD: distance between 100 matched curve samples (mm); PSNR: dB. CPU time includes detection + CPR per jaw.

HELD-OUT CV · MCD (mm)

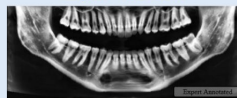
Residual regr.	17.2
PolyLaneNet	8.2
BézierLaneNet	8.1
HeatmapNet	4.3

4.3 mm · 47% below BézierLaneNet

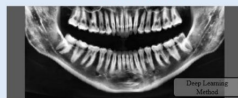
A · Geometric



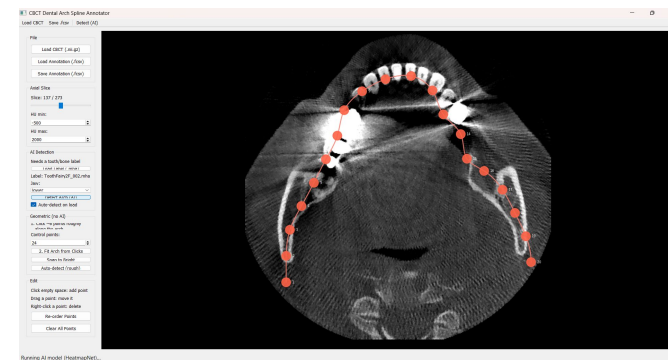
Expert · Reference



C · HeatmapNet



Case F_018. SSIM / PSNR compare synthetic PX with the expert-spline reference.



CBCT with **heavy implants**: our method performs to detect spline

See our paper at Poster #14 !



<https://intellidentai.com/>