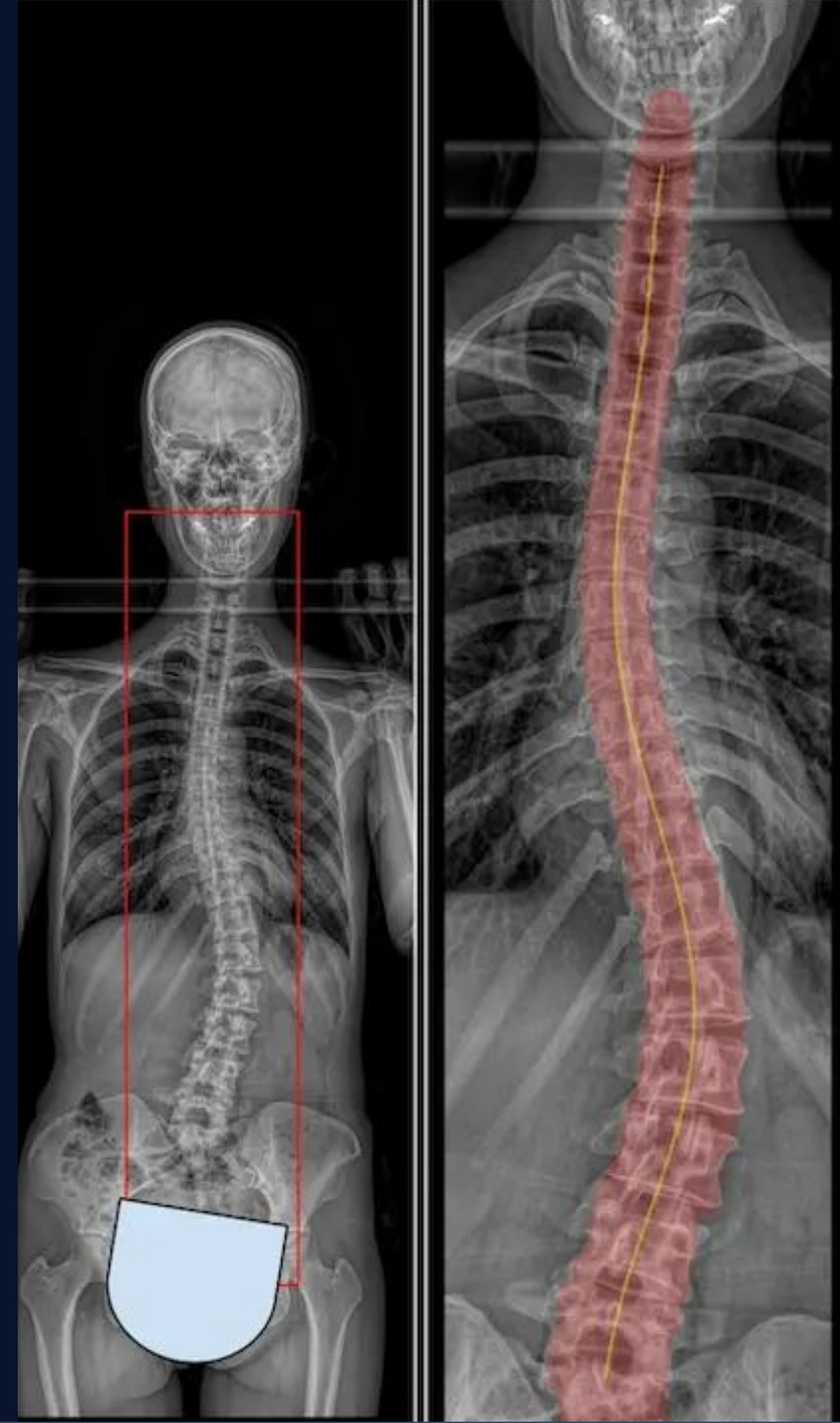


Using Dynamic Time Warping to Find Patterns in Coronal Spinal Alignment

How can we search a database of spine patients to identify relevant past cases and inform preoperative planning?

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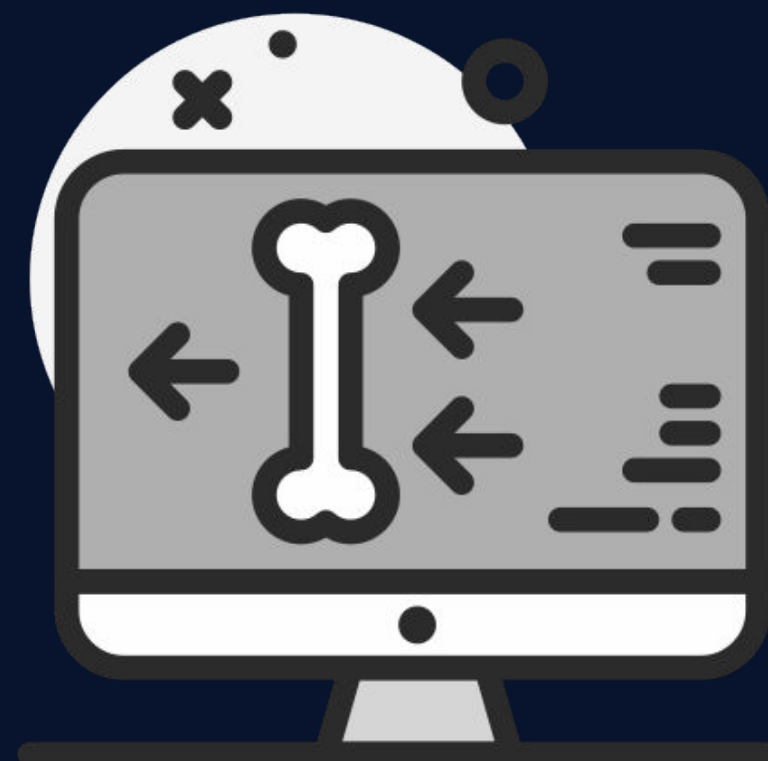
Methods: 3 Required Components to Build a Spine Search Tool

1. 1.



Large Patient Database

1. 2.



Standardized, Automated Measurement System

1. 3.



Metric for Comparing similarity

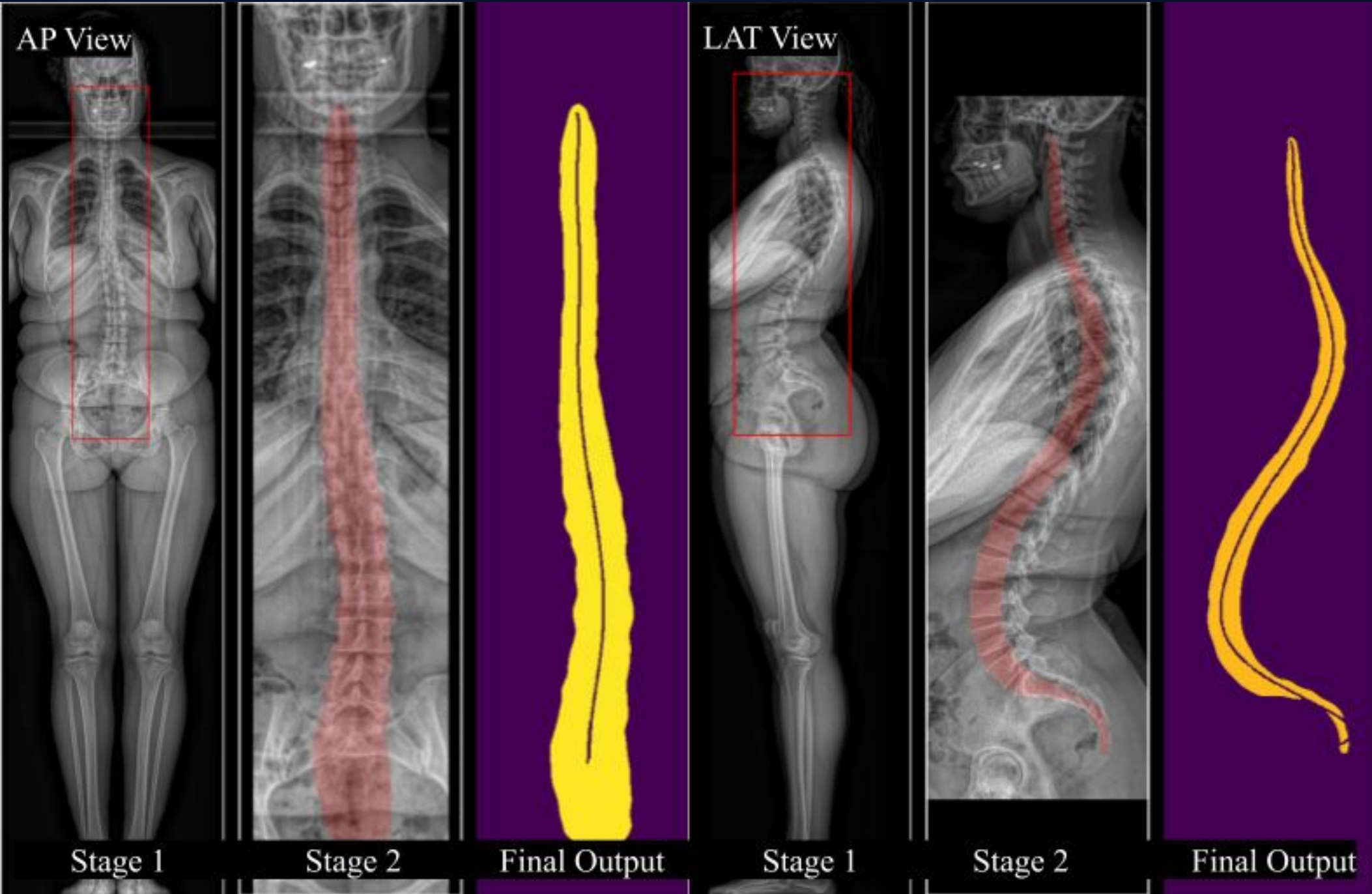
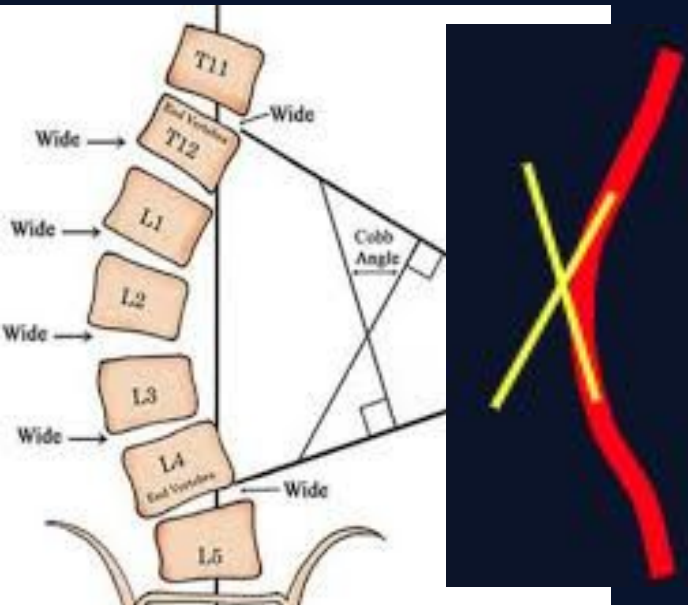
Purpose: Can AI-generated spine morphology approximation enable automated comparison of anterior-posterior (AP) spine contouring in patients with scoliosis using time series warping.

I (or my coauthors) have nothing to disclose

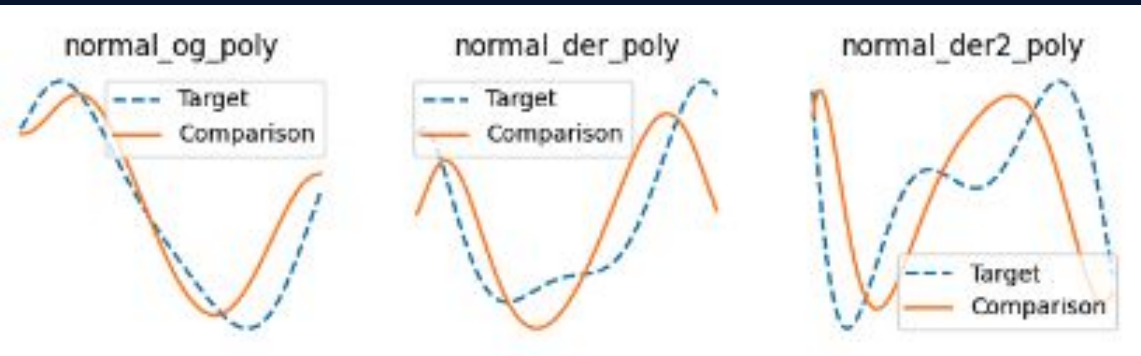
Methods: Automated Measurement Pipeline

- A) 2 Stage AI-Segmentation Pipeline
 - Stage 1: Spine ROI Detection
 - Stage 2: Semantic Segmentation
- A) Approximate 9-D Function From Mask
 - Ignore ends - asymptotic behavior
- A) Generate Features from Spine Function

Tangent
Intersection



Manual Features



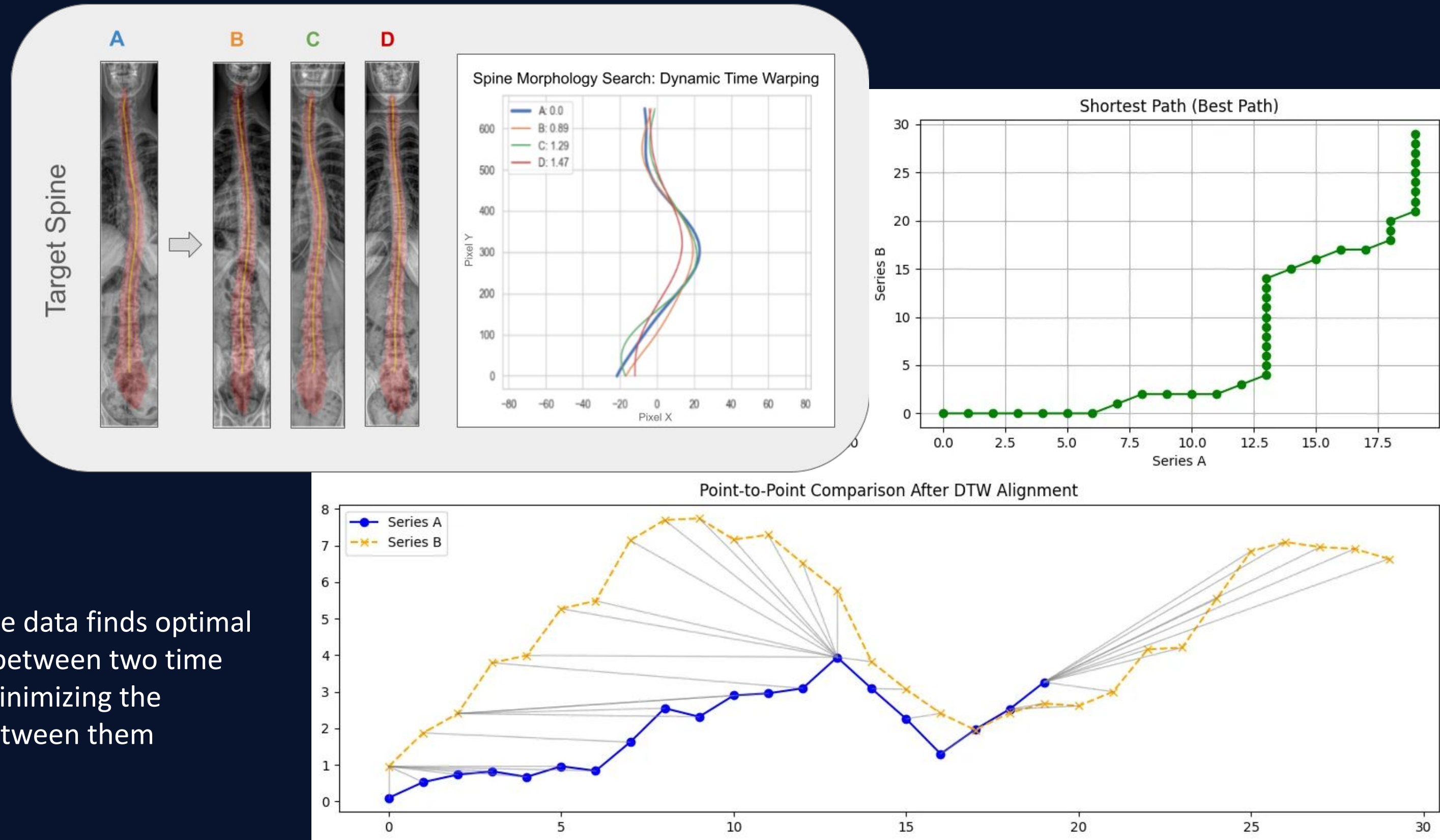
816 EOS Biplanar Films

Cobb:	Count
0-10	161
10-30	571
30+	84

Hardware	Count
Yes	674
No	142

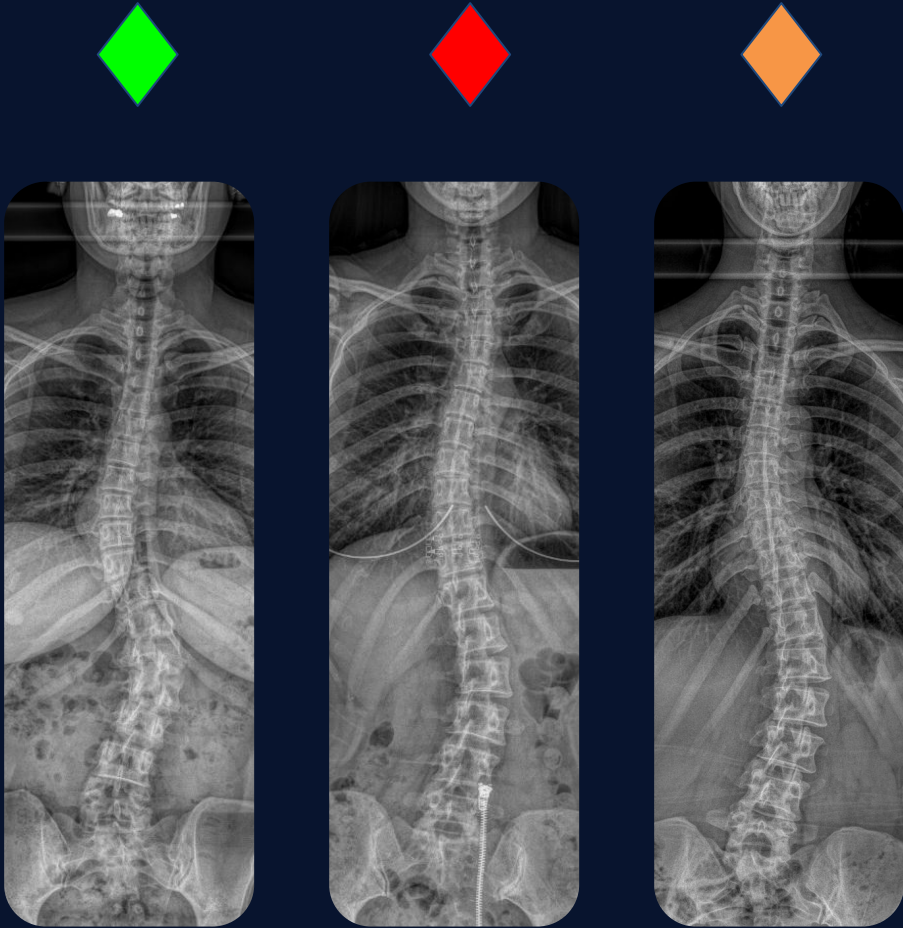
Methods: Dynamic Time Warping - Comparison Metric

- ◆ DTW designed to align and compare two time-series signals.
- ◆ Matching robust to signals out of phase or differ in length.

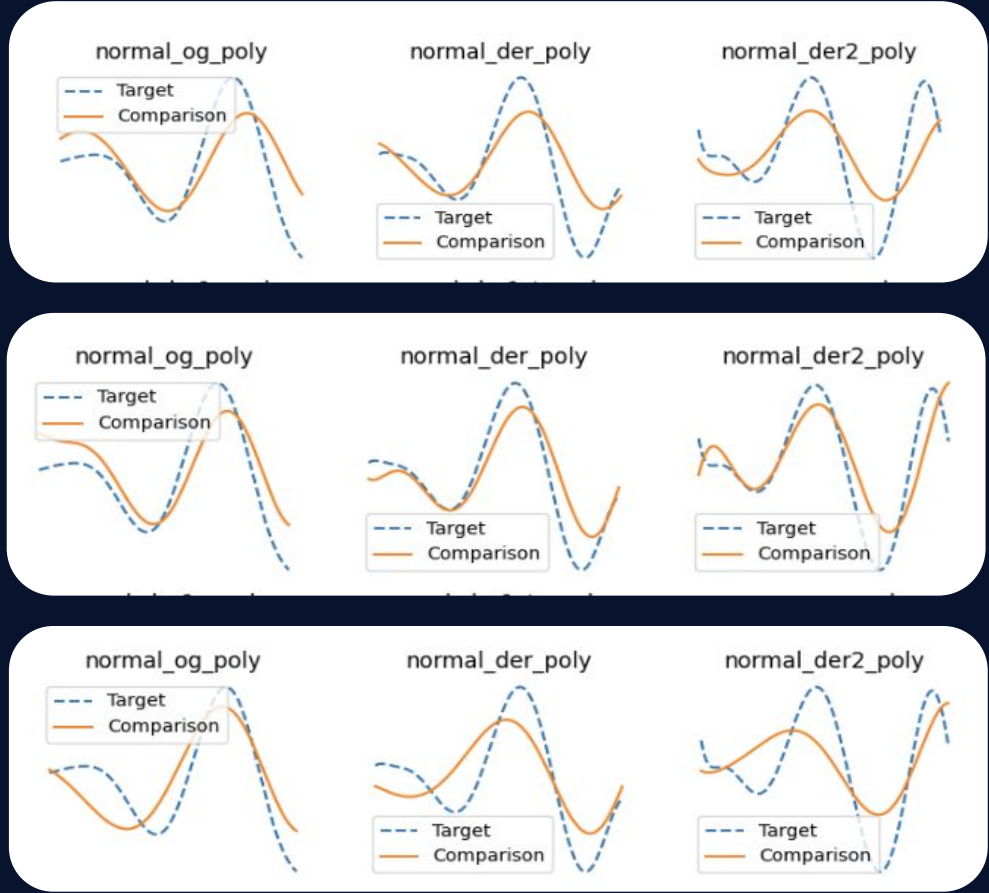


- ◆ Shape of the data finds optimal alignment between two time series by minimizing the distance between them

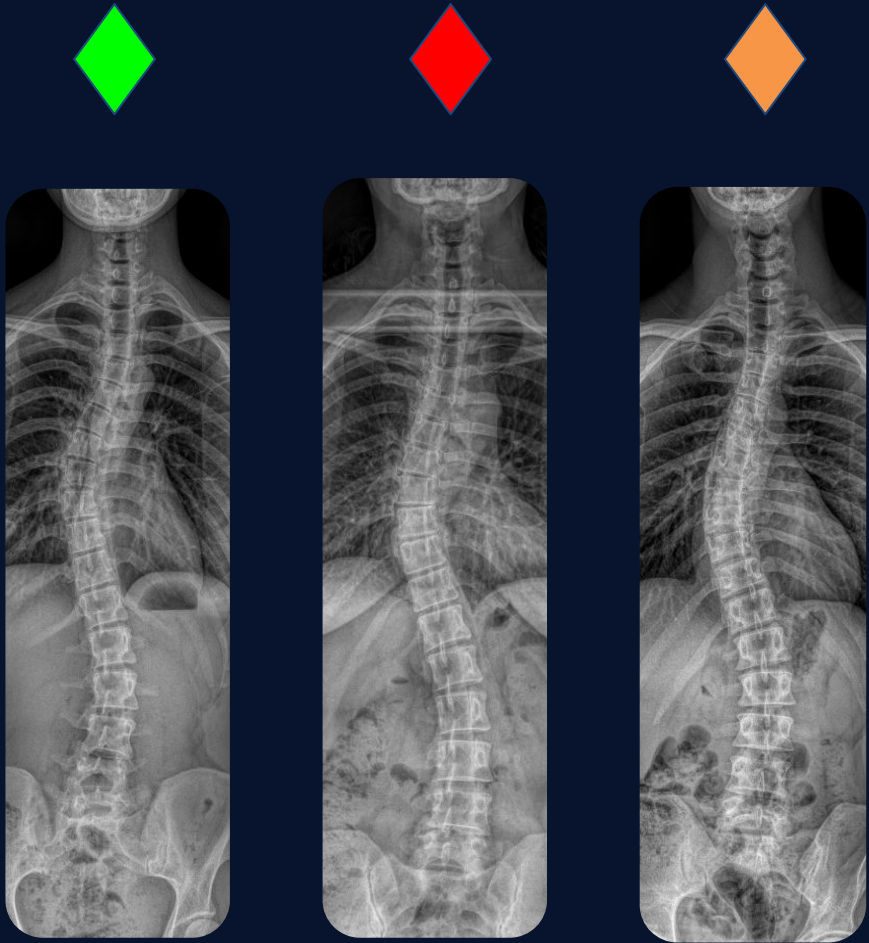
Results: Spine Search Case Studies



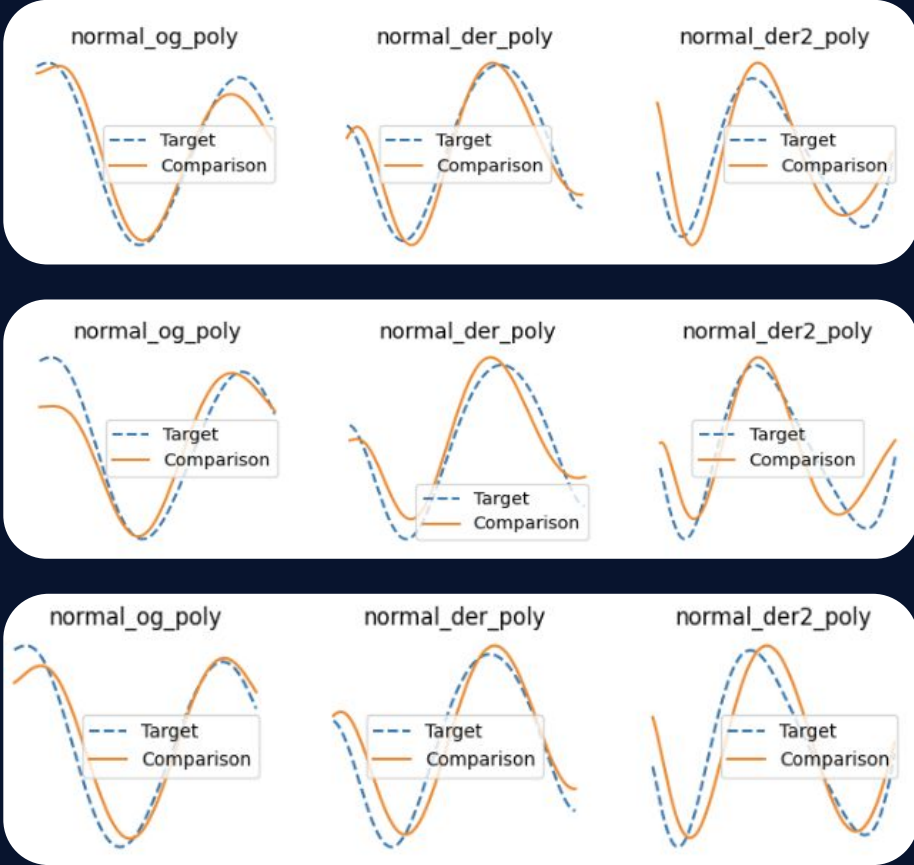
	Main Cobb Angle
REF	29.8
◆	32.4
◆	28.5
◆	28.1



Results: Spine Search Case Studies



	Main Cobb Angle
REF	37.2
◆	37.0
◆	37.3
◆	32.2



Conclusions

We show that spine contouring is an effective tool to identify patients with similar scoliosis presentation and spine morphology with similar Cobb Angles

This tool can be applied to help guide surgical planning and provide outcomes and surgical considerations for contour-specific cohort of scoliosis patients

Next steps involve...

- Multi-modal spine-search combining spine function + spinopelvic measurements*
- Curate a “Clinical Outlook” summary for each spine-search from clinical database*