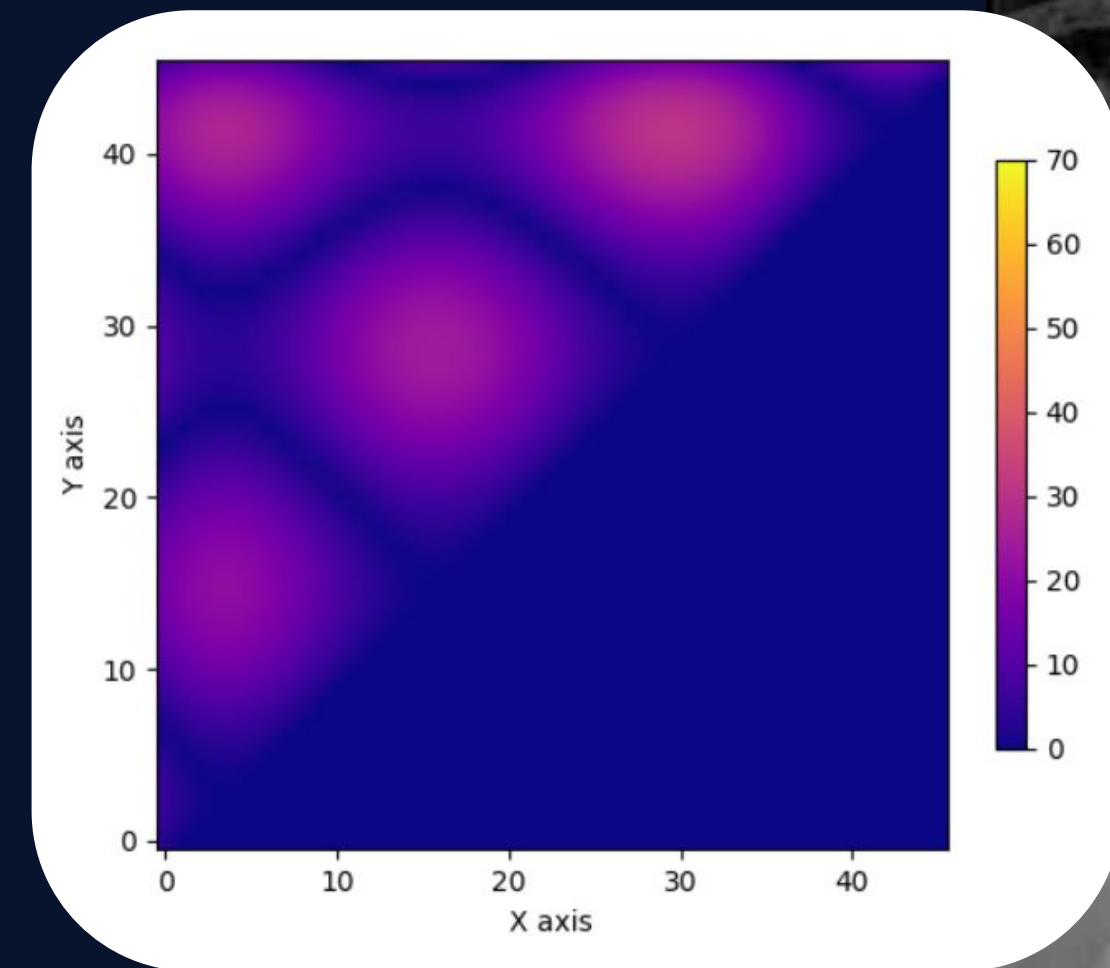


Automated Scoliosis Classification: AI-enabled Spine Contouring and Cobb Angle Matrix Estimation

*How spine functions can be used to create nuanced
representation of spinal pathology and automate detection.*

*Yash Lahoti, MSE; Jennifer Yu, BS
Samuel K. Cho, MD; Jun S. Kim, MD*

Yash Lahoti MSE, BAS | AI/Machine Learning Engineer
Icahn School of Medicine at Mt. Sinai | MS3



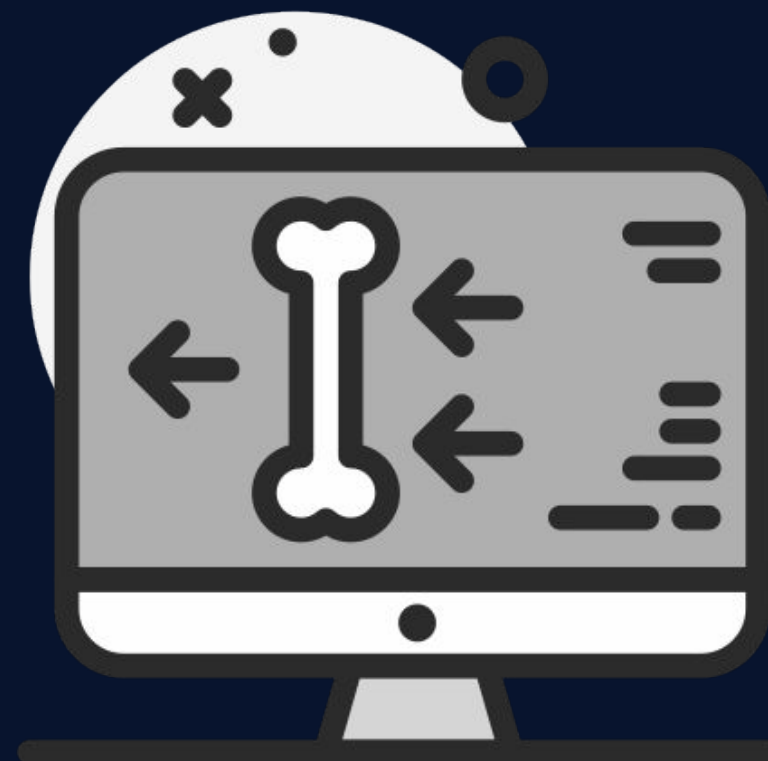
3 Required Components to Build a Classification System

1. 1.



Large Patient Database

1. 2.



Standardized, Automated Measurement System

1. 3.



Metric for Comparing similarity

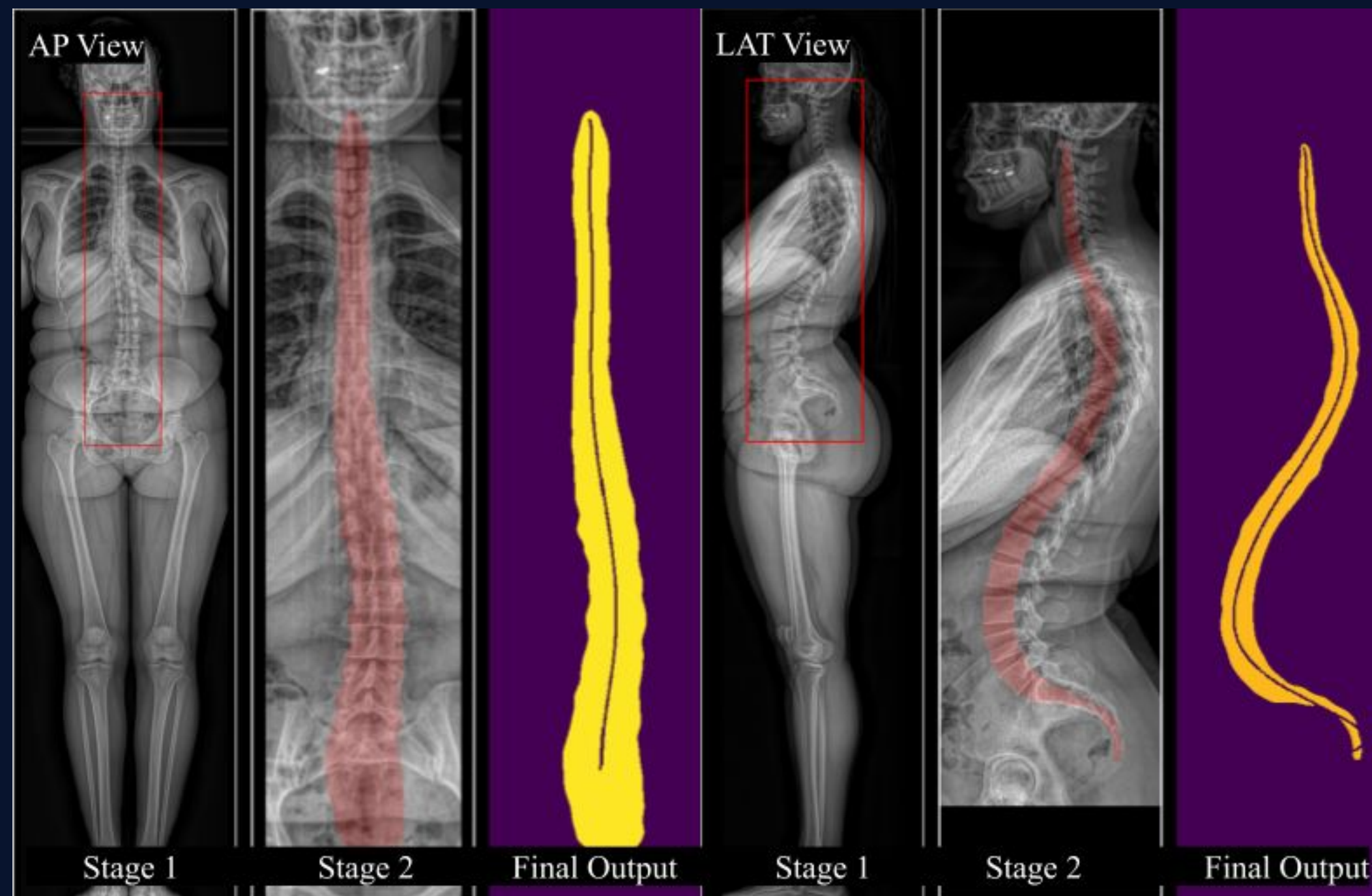
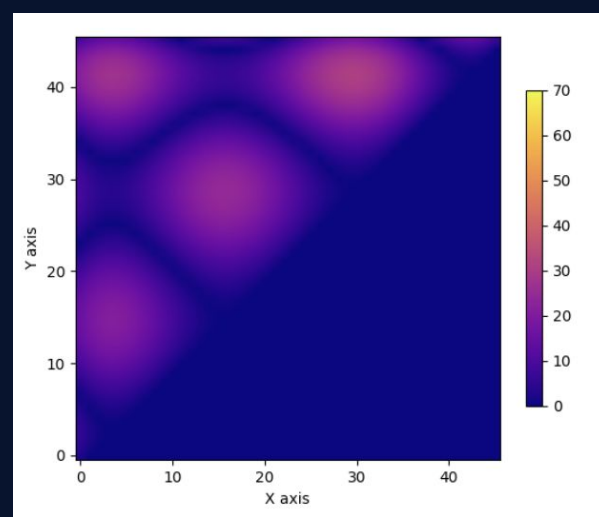
Purpose: Can AI-generated spine morphology and manual feature engineering can capture spine signature and appropriately classify clinically significant stages of scoliosis.

I (or my coauthors) have nothing to disclose

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
 - Divide function into 30 points
 - Compute the **tangent-intersection angle** for every combination of coordinates on the curve
- A) Train 2-layer ResNet CNN model to classify cobb matrix into no, mild, severe scoliosis

Tangent Intersection → Cobb Angle Matrix



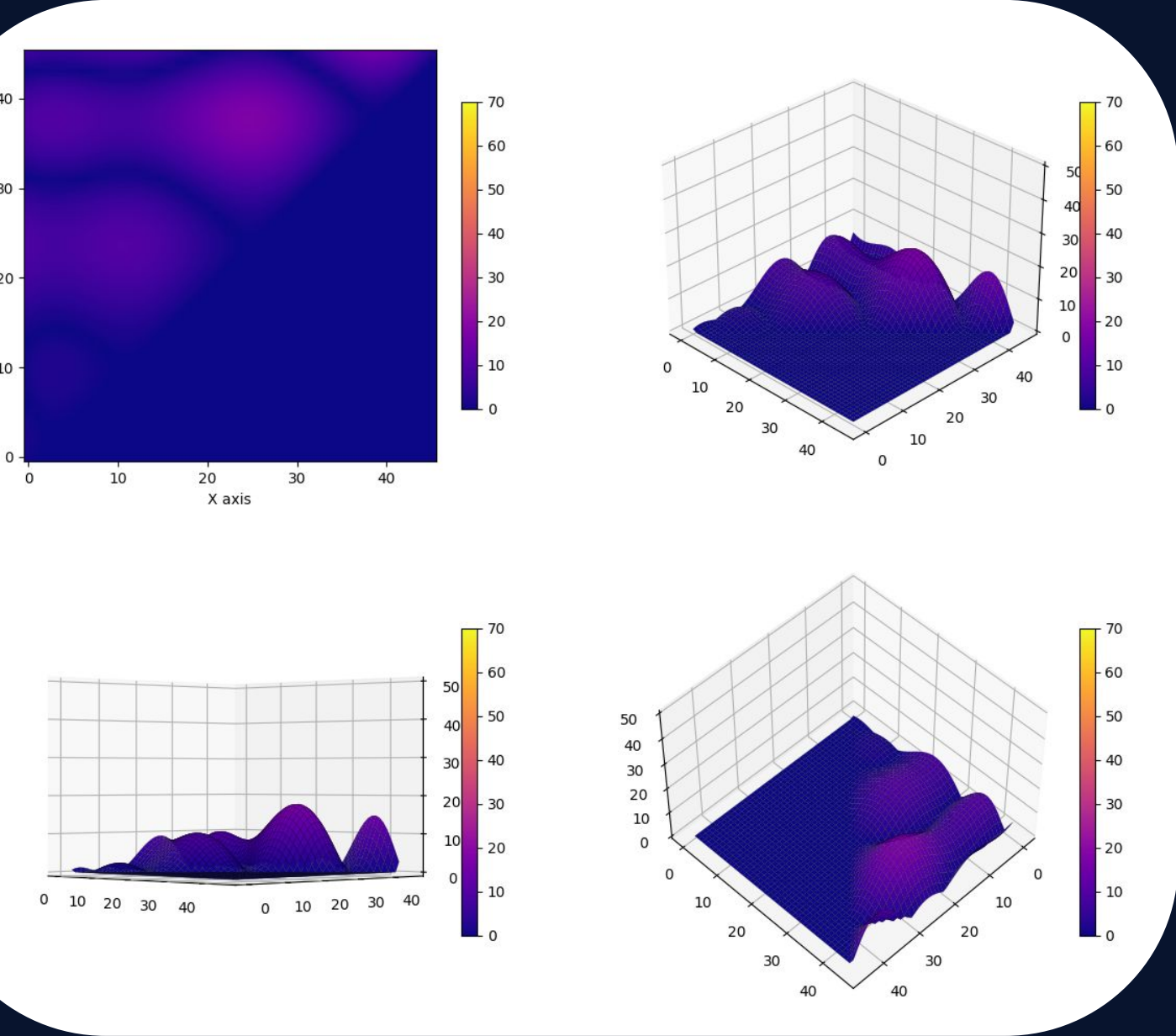
816 EOS Biplanar Films
- Stratify Split

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

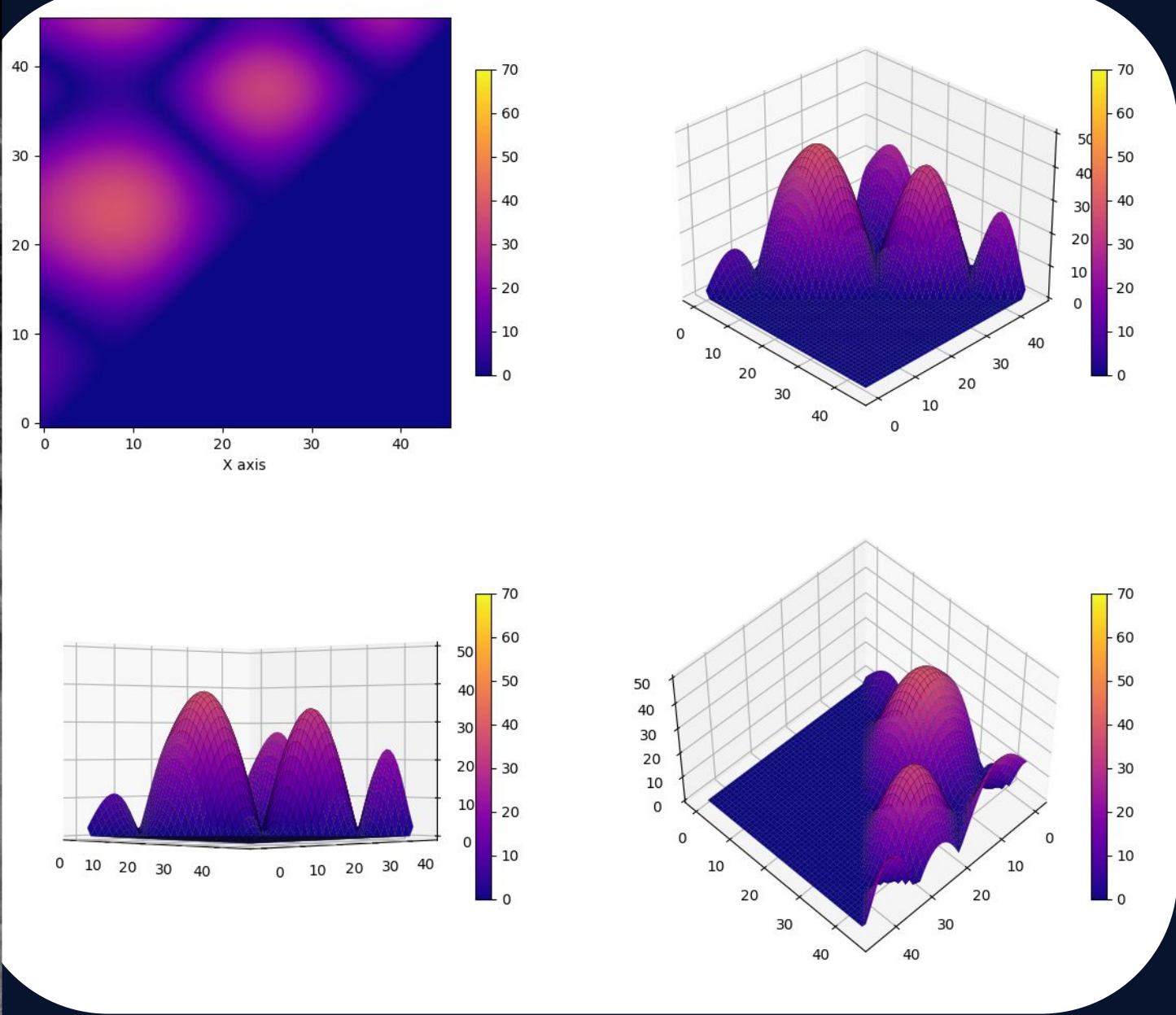
Hardware	Count
Yes	674
No	142

Cobb Angle Matrix Visualization

Cobb Angle: 16.7



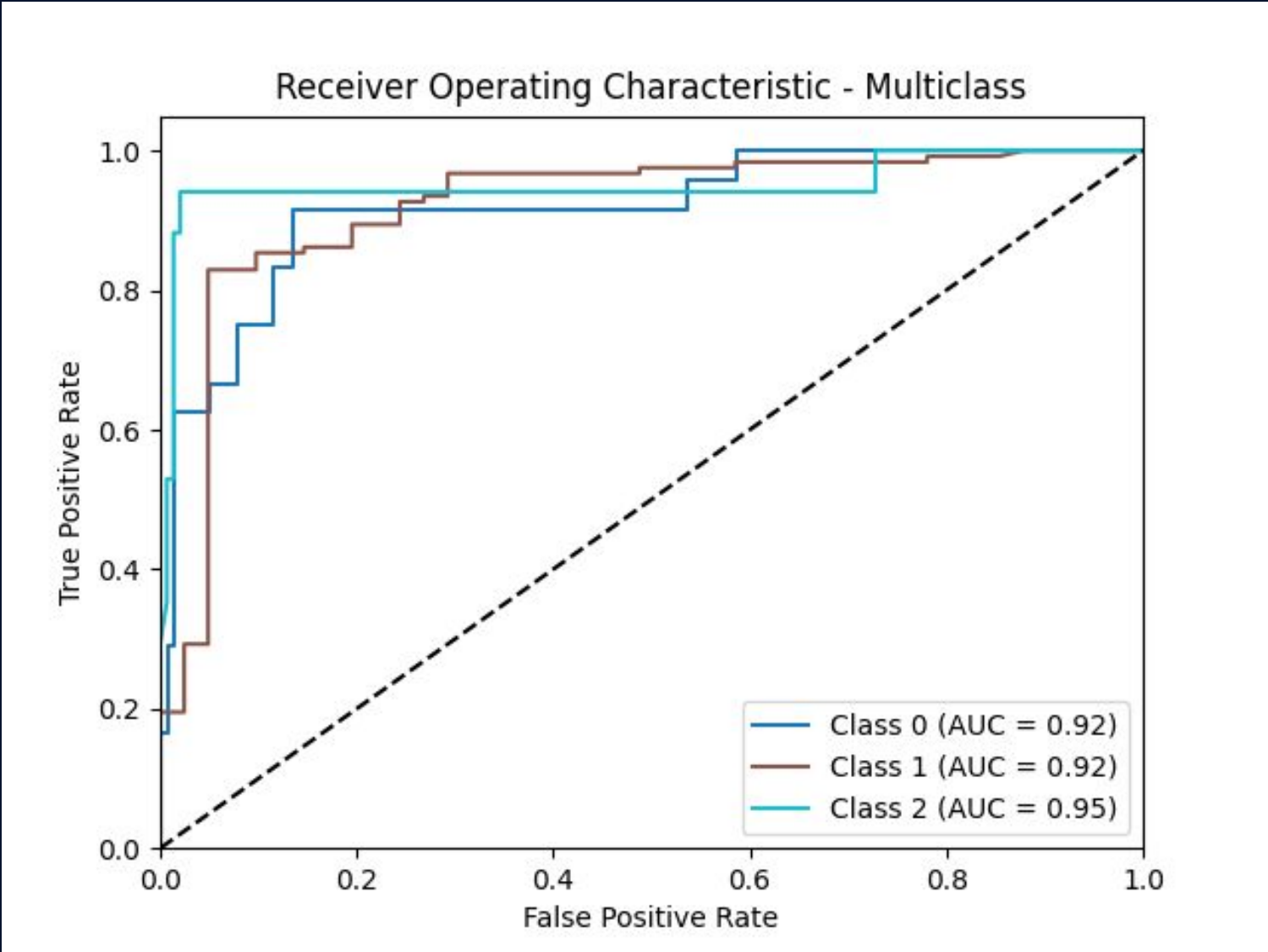
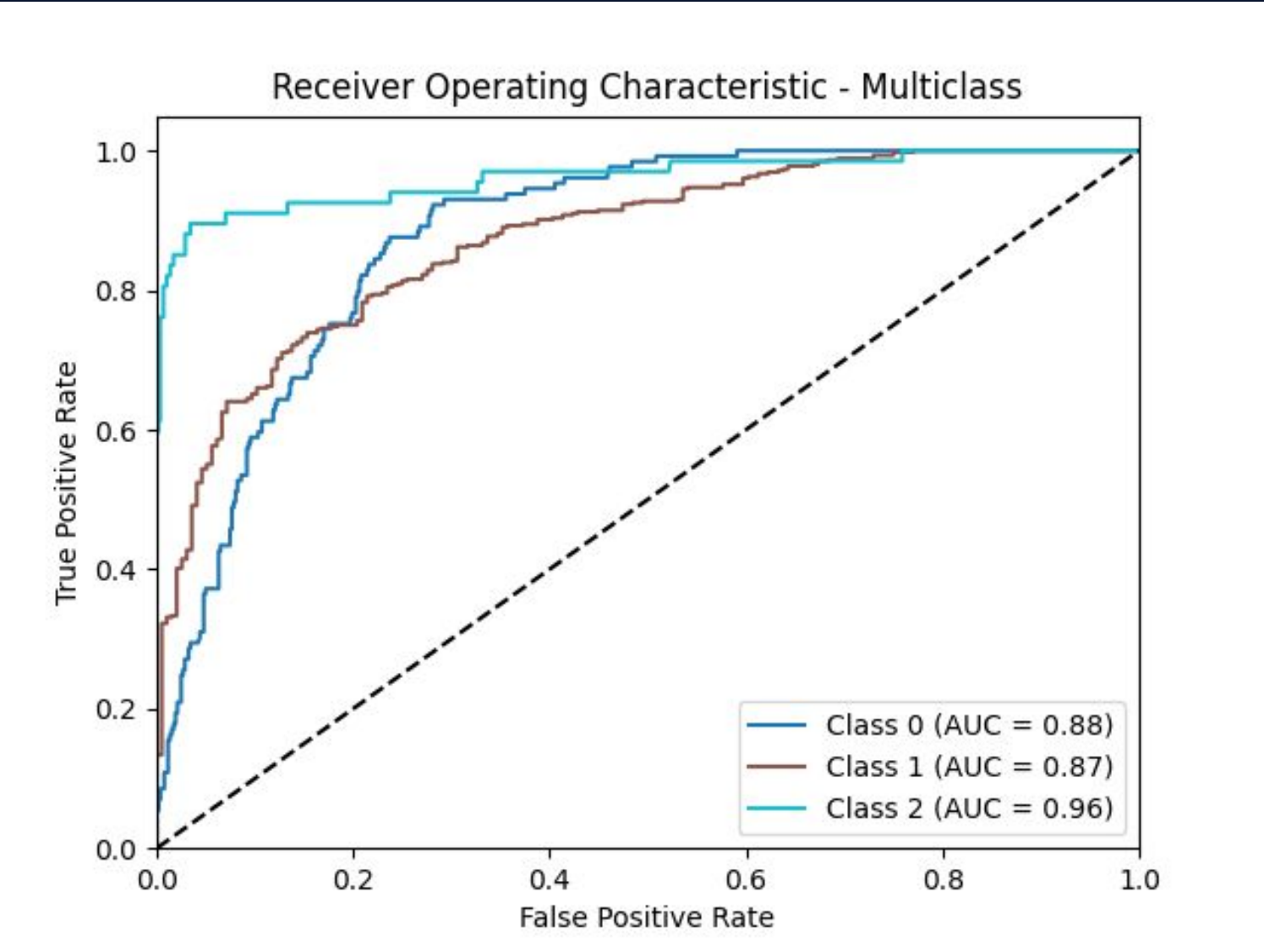
Cobb Angle: 29.8



Results: Training/Testing Performance

(n) TRAIN	Grade	Precision	Recall	F1-score
Class 0 (129)	0-10	0.609	0.434	0.507
Class 1 (456)	10-30	0.819	0.921	0.867
Class 3 (67)	30+	0.957	0.672	0.789
Accuracy		0.799	0.799	0.799

(n) TEST	(n) Grade	Precision	Recall	F1-score
Class 0 (24)	0-10	0.834	0.625	0.714
Class 1 (123)	10-30	0.907	0.960	0.933
Class 3 (17)	30+	0.875	0.823	0.848
Accuracy		0.896	0.896	0.896



Conclusions

Intermediate data points (segmentation, spine contour, cobb angle matrix) improve interoperability of AI-driven decision-systems

Automated screening of scoliosis with cobb angle matrix; spine “signature” serve as search template

Next steps involve...

- *Train AI model that will predict cobb angle from matrix*

