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Advancing Radiological Automation for TCA Measurements following Adolescent Idiopathic Scoliosis Using Whole-Spine Standing Radiographs Through Keypoint Region-Based Convolutional Neural Network

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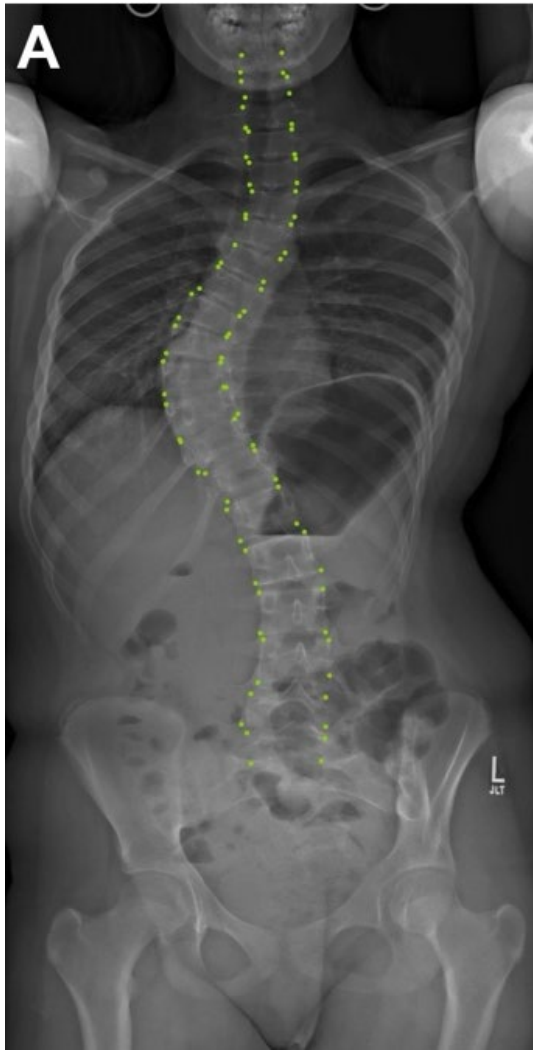
- Presenter:
- No financial disclosures

- Can AI tools measure spinopelvic parameters in an automated fashion?

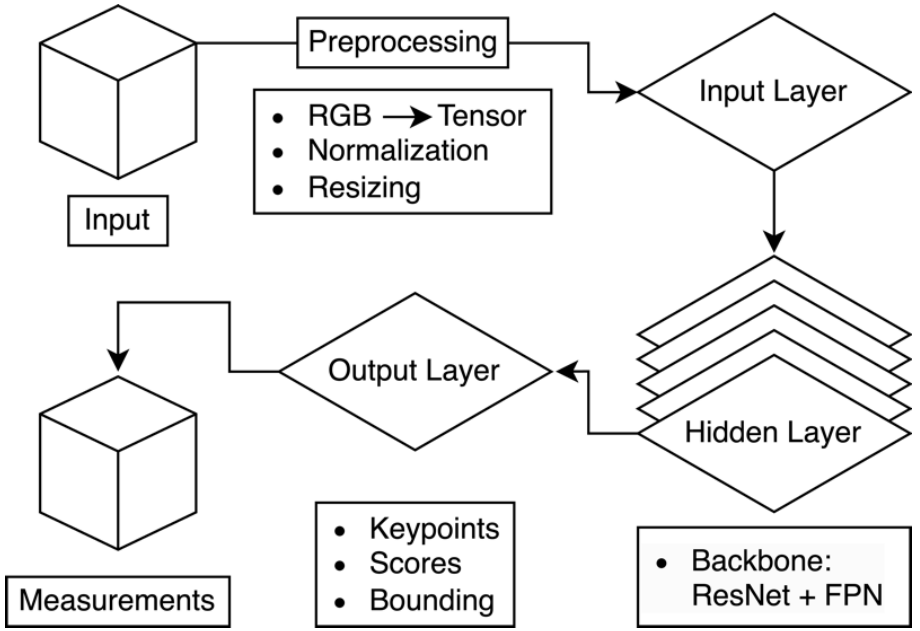
- Fast, Accurate and Reliable?

Approach

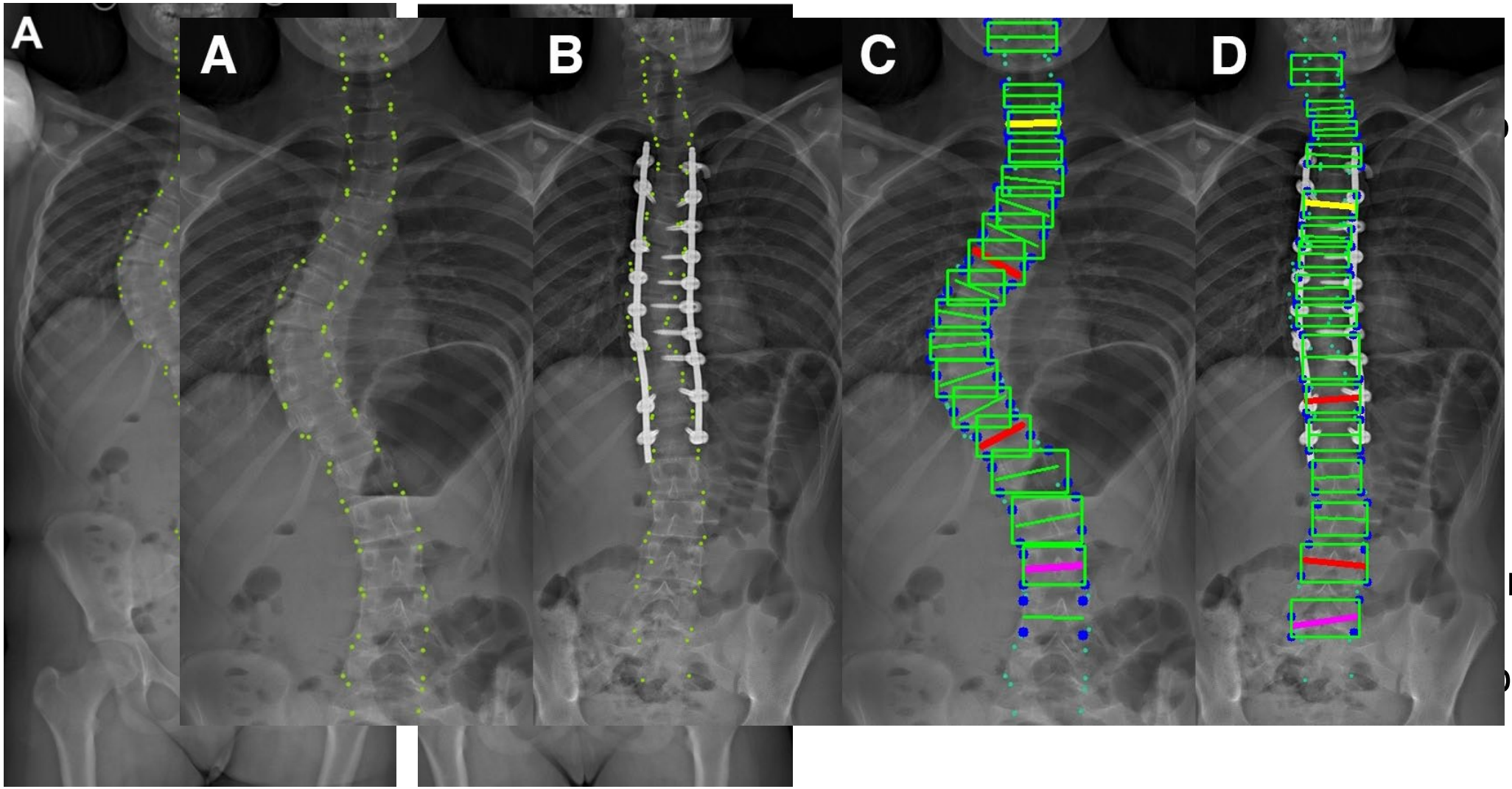
- Development of Artificial Intelligence tool utilizing a Keypoint Region-Based Convolutional Neural Network (R-CNN)
- Automated thoracic Cobb angle measurement on standing whole-spine radiographs
- Posterior long-segment fusion for correction of AIS
- External Training Cohort (n=609)
- Institutional Validation Cohort (n=83)
- Automated measurements compared to manual



Development



Keypoint Region-Based Convolutional Neural Network (R-CNN)



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Angle

Validation Cohort (CHOP)

Variables	Overall (n=83)
Age	13 (11-14)
Female	61 (73.5%)
BMI (kg/m2)	21.6 (19.4-25.8)
Radiographic measurements	
Thoracic Cobb Angle (°)	56.0 (52.0-64.0)
Lumbar Cobb Angle	42.0 (32.0-52.0)
Levels of Fusion	11 (10-12)

Median (Inter-Quartile Range)

Performance Metrics

Compared to “Ground Truth” Board Certified Radiologist

Mean Absolute Error ± SD (95% CI)

- 2.22 ± 2.04 (1.06 to 3.39)

Median Absolute Error (IQR; 95% CI)

- 1.47 (0.73-2.97; 0.89 to 3.15)

Symmetric Mean Absolute Percentage Error (SMAPE)

- 4.29

Intraclass Correlation Coefficient (ICC)

- 0.98

Take Aways

- Methodological feasibility study
- AI models may be capable of fast, accurate and reliable measurement of thoracic Cobb angle
- Reduce subjectivity of manual measurements
- Expand to additional spinopelvic parameters
- Potential for improvement in AIS screening, clinical decision making, surgical planning and post-operative follow up
- Thorough validation needed prior to clinical application

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Patients and Families