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Intelligent measurement of adolescent idiopathic scoliosis x-ray coronal imaging parameters based on VB-Net neural network: a retrospective analysis of 2092 cases

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Abstract

Background: Adolescent idiopathic scoliosis (AIS) is a complex three-dimensional deformity, and up to now, there has been no literature reporting the analysis of a large sample of X-ray imaging parameters based on artificial intelligence (AI) for it. This study is based on the accurate and rapid measurement of x-ray coronal imaging parameters in AIS patients by AI, to explore the differences and correlations, and to further investigate the risk factors in different groups, so as to provide a theoretical basis for the diagnosis and surgical treatment of AIS. **Methods:** Retrospective analysis of 3192 patients aged 8–18 years who had a full-length orthopantomogram of the spine and were diagnosed with AIS at the First Affiliated Hospital of Zhengzhou University from January 2019 to March 2024. After screened 2092 cases were finally included. The uAI DR scoliosis analysis system with multi-resolution VB-Net convolution network architecture was used to measure CA, CBD, CV, RSH, T1 Tilt, PT, LLD, SS, AVT, and TS parameters. The results were organized and analyzed by using R Studio 4.2.3 software. **Results:** The differences in CA, CBD, CV, RSH, TI tilt, PT, LLD and SS were statistically significant between male and female genders ($p < 0.05$); Differences in CA, CBD, T1 Tilt, PT, SS, AVT and TS were statistically significant in patients with AIS of different severity ($p < 0.001$), and T1 Tilt, AVT, TS were risk factors; Differences in CA, CBD, CV, RSH, T1 Tilt, PT, LLD, SS, AVT and TS were statistically significant ($p < 0.05$) in patients with AIS of different curve types, and TS was a risk factor; Analyzing the correlation between parameters revealed a highly linear correlation between CV and RSH ($r = 0.826$, $p < 0.001$), and a significant linear correlation between CBD and TS, and PT and SS ($r = 0.561$, $p < 0.001$; $r = 0.637$, $p < 0.001$). **Conclusion:** Measurements based on VB-Net neural

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network found that x-ray coronal imaging parameters varied among AIS patients with different curve types and severities. In clinical practice, it is recommended to consider the discrepancy in parameters to enable a more accurate diagnosis and a personalized treatment plan. © The Author(s) 2025.

Author keywords

Adolescent idiopathic scoliosis; Artificial intelligence; Intelligent measurement; VB-Net; X-ray coronal plane

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References (52)

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- 1 Karam, M., Vergari, C., Skalli, W., Bizdikian, A.J., Mehanna, J., Kawkabani, G., Kharrat, K., (...), Assi, A.

[Assessment of the axial plane deformity in subjects with adolescent idiopathic scoliosis and its relationship to the frontal and sagittal planes](#)

(2022) *Spine Deformity*, 10 (3), pp. 509-514. Cited 8 times.

<https://link.springer.com/journal/43390>

doi: 10.1007/s43390-021-00443-y

[View at Publisher](#)

-
- 2 Marya, S., Tambe, A.D., Millner, P.A., Tsirikos, A.I.

[Adolescent idiopathic scoliosis A REVIEW OF AETIOLOGICAL THEORIES OF A MULTIFACTORIAL DISEASE](#)

(2022) *Bone and Joint Journal*, 104 B (8), pp. 915-921. Cited 50 times.

<https://online.boneandjoint.org.uk/doi/full/10.1302/0301-620X.104B8.BJJ-2021-1638.R1>

doi: 10.1302/0301-620X.104B8.BJJ-2021-1638.R1

[View at Publisher](#)

-
- 3 Weinstein, S.L., Dolan, L.A., Cheng, J.C., Danielsson, A., Morcuende, J.A.

[Adolescent idiopathic scoliosis](#)

(2008) *The Lancet*, 371 (9623), pp. 1527-1537. Cited 1097 times.

<http://www.journals.elsevier.com/the-lancet/>

doi: 10.1016/S0140-6736(08)60658-3

[View at Publisher](#)

-
- 4 Yang, J., Huang, S., Cheng, M., Tan, W., Yang, J.

[Postural habits and lifestyle factors associated with adolescent idiopathic scoliosis \(AIS\) in China: results from a big case-control study](#)

(2022) *Journal of Orthopaedic Surgery and Research*, 17 (1), art. no. 472. Cited 7 times.

<https://josr-online.biomedcentral.com>

doi: 10.1186/s13018-022-03366-0

[View at Publisher](#)

- 5 Xu, S., Su, Y.J., Wang, Z.B., Liu, C.J., Jin, L.Y., Liu, H.Y.
Prevalence characteristics of scoliosis among primary and secondary school students in mainland China: a meta-analysis of 72 studies
(2021) *China Spinal Cord J*, 31 (10), pp. 901-910. Cited 13 times.

-
- 6 Asher, M.A., Burton, D.C.
Adolescent idiopathic scoliosis: Natural history and long term treatment effects

(2006) *Scoliosis*, 1 (1), art. no. 2. Cited 456 times.

doi: 10.1186/1748-7161-1-2

[View at Publisher](#)

- 7 Ramesh, A.N., Kambhampati, C., Monson, J.R.T., Drew, P.J.
Artificial intelligence in medicine (Open Access)

(2004) *Annals of the Royal College of Surgeons of England*, 86 (5), pp. 334-338. Cited 661 times.

doi: 10.1308/147870804290

[View at Publisher](#)

- 8 Joshi, R.S., Lau, D., Ames, C.P.
Artificial intelligence for adult spinal deformity: current state and future directions (Open Access)

(2021) *Spine Journal*, 21 (10), pp. 1626-1634. Cited 30 times.

<http://www.elsevier.com/locate/spinee>

doi: 10.1016/j.spinee.2021.04.019

[View at Publisher](#)

- 9 Lessmann, N., van Ginneken, B., de Jong, P.A., Işgum, I.
Iterative fully convolutional neural networks for automatic vertebra segmentation and identification

(2019) *Medical Image Analysis*, 53, pp. 142-155. Cited 197 times.

<http://www.elsevier.com/inca/publications/store/6/2/0/9/8/3/index.htm>

doi: 10.1016/j.media.2019.02.005

[View at Publisher](#)

- 10 Ha, A.Y., Do, B.H., Bartret, A.L., Fang, C.X., Hsiao, A., Lutz, A.M., Banerjee, I., (...), Hurt, B.
Automating Scoliosis Measurements in Radiographic Studies with Machine Learning: Comparing Artificial Intelligence and Clinical Reports (Open Access)

(2022) *Journal of Digital Imaging*, 35 (3), pp. 524-533. Cited 20 times.

www.springer.com/journal/10278

doi: 10.1007/s10278-022-00606-6

[View at Publisher](#)

-
- 11 Wong, J.C., Reformat, M.Z., Parent, E.C., Stampe, K.P., Sounthon Hryniuk, S.C., Lou, E.H.

Validation of an artificial intelligence-based method to automate Cobb angle measurement on spinal radiographs of children with adolescent idiopathic scoliosis

(2023) *European Journal of Physical and Rehabilitation Medicine*, 59 (4), pp. 535-542. Cited 11 times.

<https://www.minervamedica.it/en/getfreepdf/U0IvcjlXcEdkbWF0YlRGQnZLZEsdYTZkWTdSS2FENDR1VBnaWVQVGLvdksvQk4wVUlzxZXRYT1dQUkErdkjTg%253D%253D/R33Y2023N04A0535.pdf>

doi: 10.23736/S1973-9087.23.08091-7

[View at Publisher](#)

-
- 12 Wang, M.X., Kim, J.K., Choi, J.-W., Park, D., Chang, M.C.

Deep learning algorithm for automatically measuring Cobb angle in patients with idiopathic scoliosis

(2024) *European Spine Journal*, 33 (11), pp. 4155-4163. Cited 3 times.

<https://www.springer.com/journal/586>

doi: 10.1007/s00586-023-08024-5

[View at Publisher](#)

-
- 13 Zhang, L., Shi, L., Cheng, J.C.-Y., Chu, W.C.-W., Yu, S.C.-H.

LPAQR-Net: Efficient Vertebra Segmentation from Biplanar Whole-Spine Radiographs ([Open Access](#))

(2021) *IEEE Journal of Biomedical and Health Informatics*, 25 (7), art. no. 9350161, pp. 2710-2721. Cited 23 times.

<http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6221020>

doi: 10.1109/JBHI.2021.3057647

[View at Publisher](#)

-
- 14 Maaliw, R.R.

SCOLIONET: An Automated Scoliosis Cobb Angle Quantification Using Enhanced X-ray Images and Deep Learning Models

(2023) *Journal of Imaging*, 9 (12), art. no. 265. Cited 5 times.

www.mdpi.com/journal/jimaging/

doi: 10.3390/jimaging9120265

[View at Publisher](#)

-
- 15 Kim, Y.-T., Jeong, T.S., Kim, Y.J., Kim, W.S., Kim, K.G., Yee, G.T.

Automatic Spine Segmentation and Parameter Measurement for Radiological Analysis of Whole-Spine Lateral Radiographs Using Deep Learning and Computer Vision

(2023) *Journal of Digital Imaging*, 36 (4), pp. 1447-1459. Cited 10 times.

<https://www.springer.com/journal/10278>

doi: 10.1007/s10278-023-00830-z

[View at Publisher](#)

-
- 16 Wu, C., Meng, G., Lian, J., Xu, J., Gao, M., Huang, C., Zhang, S., (...), Li, Z.