Supplementary

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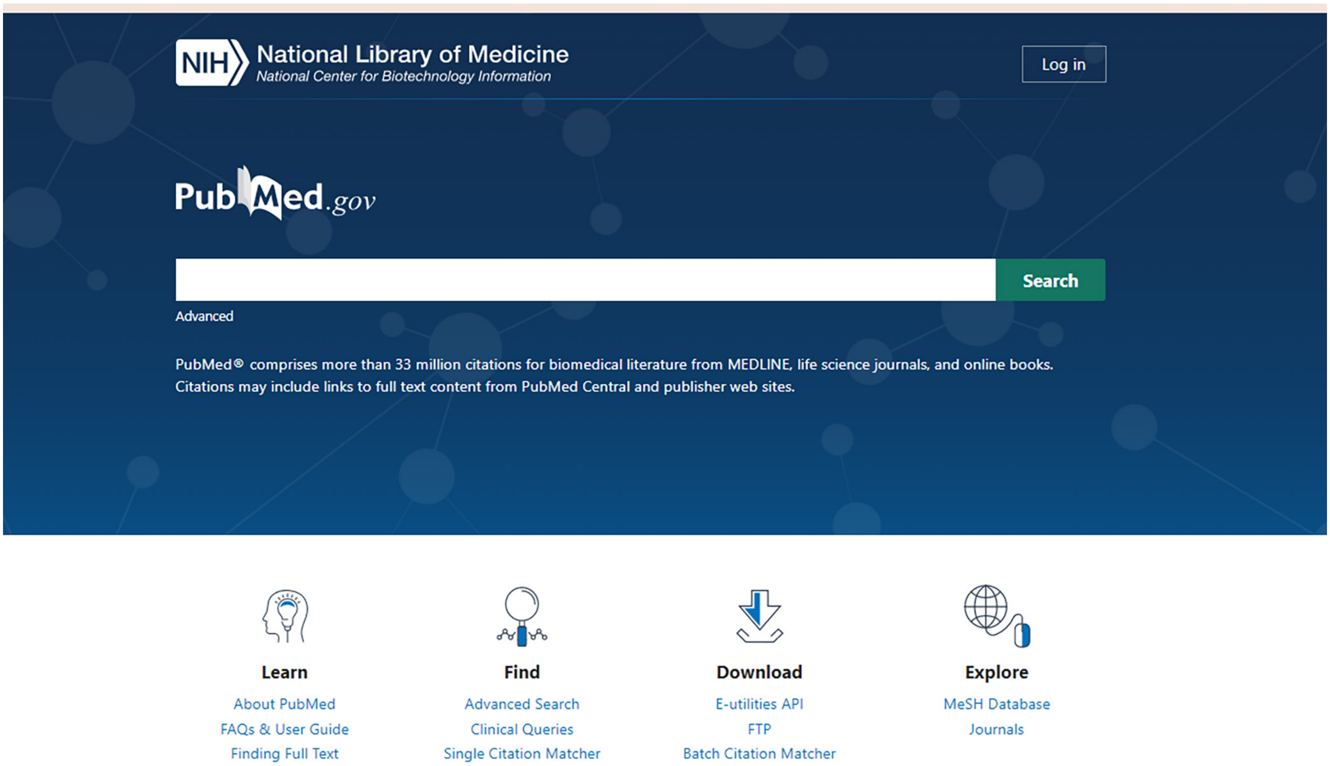

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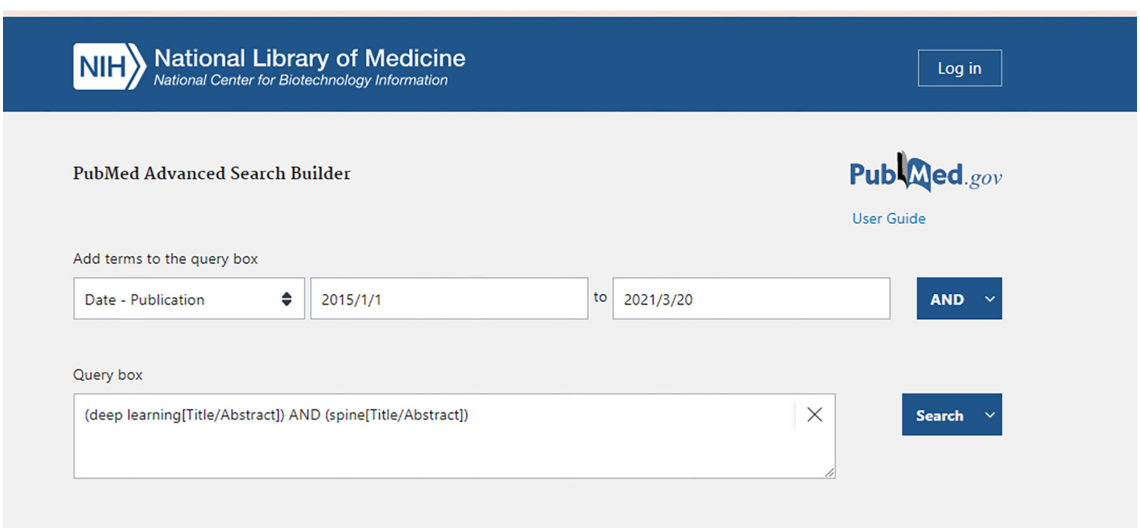

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Deep learning of lumbar **spine** X-ray for osteopenia and osteoporosis screening: A multicenter retrospective cohort study.

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Zhang B, Yu K, Ning Z, Wang K, Dong Y, Liu X, Liu S, Wang J, Zhu C, Yu Q, Duan Y, Lv S, Zhang X, Chen Y, Wang X, Shen J, Peng J, Chen Q, Zhang Y, Zhang X, Zhang S.

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As compared to dual-energy X-ray absorptiometry (DXA) measures, we aimed to develop a **deep** convolutional neural network (DCNN) model to classify osteopenia and osteoporosis with the use of lumbar **spine** X-ray images. Herein, we developed the DCNN models based on the ...

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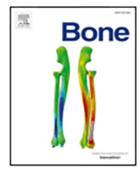

Deep learning of lumbar spine X-ray for osteopenia and osteoporosis screening: A multicenter retrospective cohort study

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A R T I C L E I N F O

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Lumbar spine X-rays

A B S T R A C T

Osteoporosis is a prevalent but underdiagnosed condition. As compared to dual-energy X-ray absorptiometry (DXA) measures, we aimed to develop a deep convolutional neural network (DCNN) model to classify osteopenia and osteoporosis with the use of lumbar spine X-ray images. Herein, we developed the DCNN models based on the training dataset, which comprising 1616 lumbar spine X-ray images from 808 postmenopausal women (aged 50 to 92 years). DXA-derived bone mineral density (BMD) measures were used as the reference standard. We categorized patients into three groups according to DXA BMD T-score: normal ($T \geq -1.0$), osteopenia ($-2.5 < T < -1.0$), and osteoporosis ($T \leq -2.5$). T-scores were calculated by using the BMD dataset of young Chinese female aged 20–40 years as a reference. A 3-class DCNN model was trained to classify normal BMD, osteoporosis, and osteopenia. Model performance was tested in a validation dataset (204 images from 102 patients) and two test datasets (396 images from 198 patients and 348 images from 147 patients respectively). Model performance was assessed by the receiver operating characteristic (ROC) curve analysis. The results showed that in the test dataset 1, the model diagnosing osteoporosis achieved an AUC of 0.767 (95% confidence interval [CI]: 0.701–0.824) with sensitivity of 73.7% (95% CI: 62.3–83.1), the model diagnosing osteopenia achieved an AUC of 0.787 (95% CI: 0.723–0.842) with sensitivity of 81.8% (95% CI: 67.3–91.8); In the test dataset 2, the model diagnosing osteoporosis yielded an AUC of 0.726 (95% CI: 0.646–0.796) with sensitivity of 68.4% (95% CI: 54.8–80.1), the model diagnosing osteopenia yielded an AUC of 0.810 (95% CI, 0.737–0.870) with sensitivity of 85.3% (95% CI, 68.9–95.0). Accordingly, a deep learning diagnostic network may have the potential in screening osteoporosis and osteopenia based on lumbar spine radiographs. However, further studies are necessary to verify and improve the diagnostic performance of DCNN models.

