

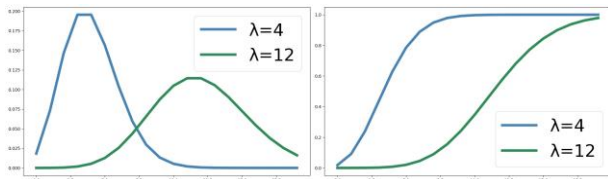


PURPOSE

- Use deep learning (DL) to improve 10-year fracture risk prediction
- Develop models for four clinical-relevant scenarios:
 1. Opportunistic Screening
 2. Advanced Screening
 3. Full Diagnostic Workup without DXA
 4. Full Workup with DXA

METHODS

- Limit inputs to fit clinical scenarios
 1. Demographic data
 2. Demographic data + low-energy DXA image
 3. Demographic data + 17 additional data fields (blood markers, disability status, fitness indicators)
 4. All of the above + low and high energy DXA images
- Use DL models to parameterize a Poisson distribution for hazard ratio prediction

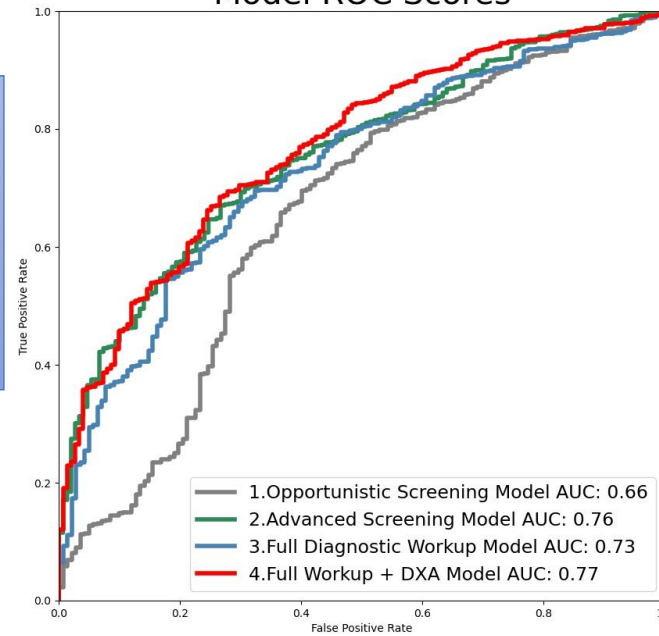


FINDINGS

By combining traditional predictors and DXA images our strongest model achieves a **0.77 AUROC** for predicting 10-year hip fracture risk.

- Performance is estimated on 20% of the original dataset reserved for model testing
- Model performance increases with more available data

Model ROC Scores



DATA

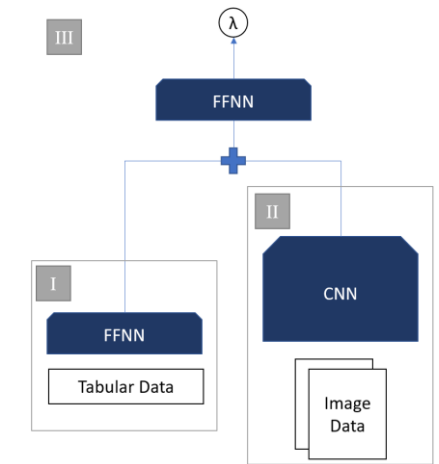
- Health, Aging, and Body Composition Study (HealthABC)
 - 3075 patients - 10920 proximal femur DXA scans
 - 70-79 years old, followed up for 15-year period

CONCLUSIONS

- Deep learning can improve hip fracture prediction models already containing demographics, bone density, and clinical risk factors
- Deep learning can be applied to DXA images without post acquisition analysis

NEURAL NETWORK (NN) MODELS

- 3 Networks that can be trained and used individually or combined
 - I. Feed-forward NN for scenarios 1& 3
 - II. Convolutional architecture (DenseNet) for DXA images (scenarios 2&4)
 - III. Full architecture for combining modalities (scenarios 2& 4)



ACKNOWLEDGEMENTS

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CONTACT INFORMATION

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