Using deep learning to diagnose knee injuries on magnetic resonance images: current potential and limitations

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Background

RESEARCH ARTICLE

Deep-learning-assisted diagnosis for knee magnetic resonance imaging: Development and retrospective validation of MRNet

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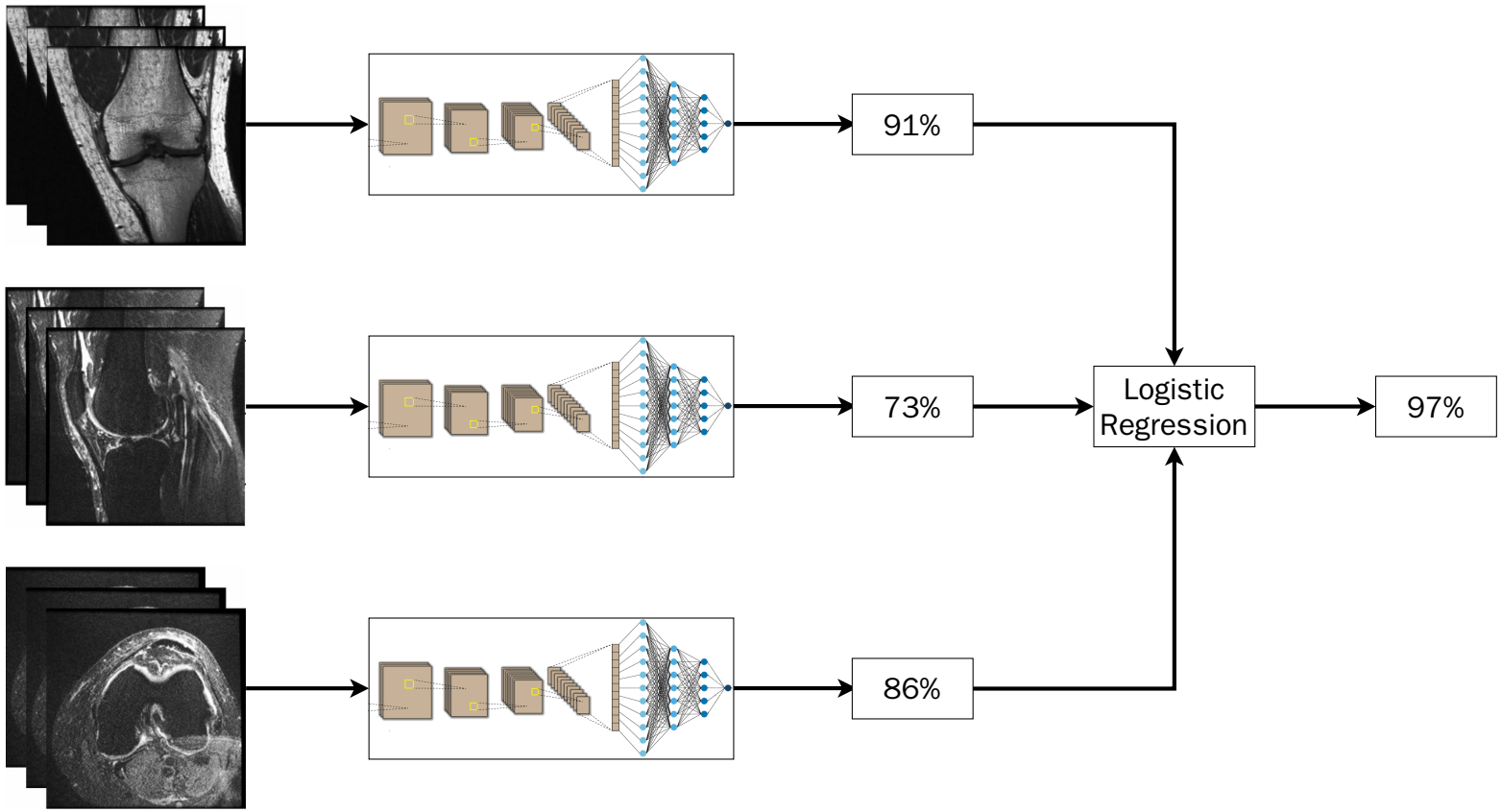
Methods: Data

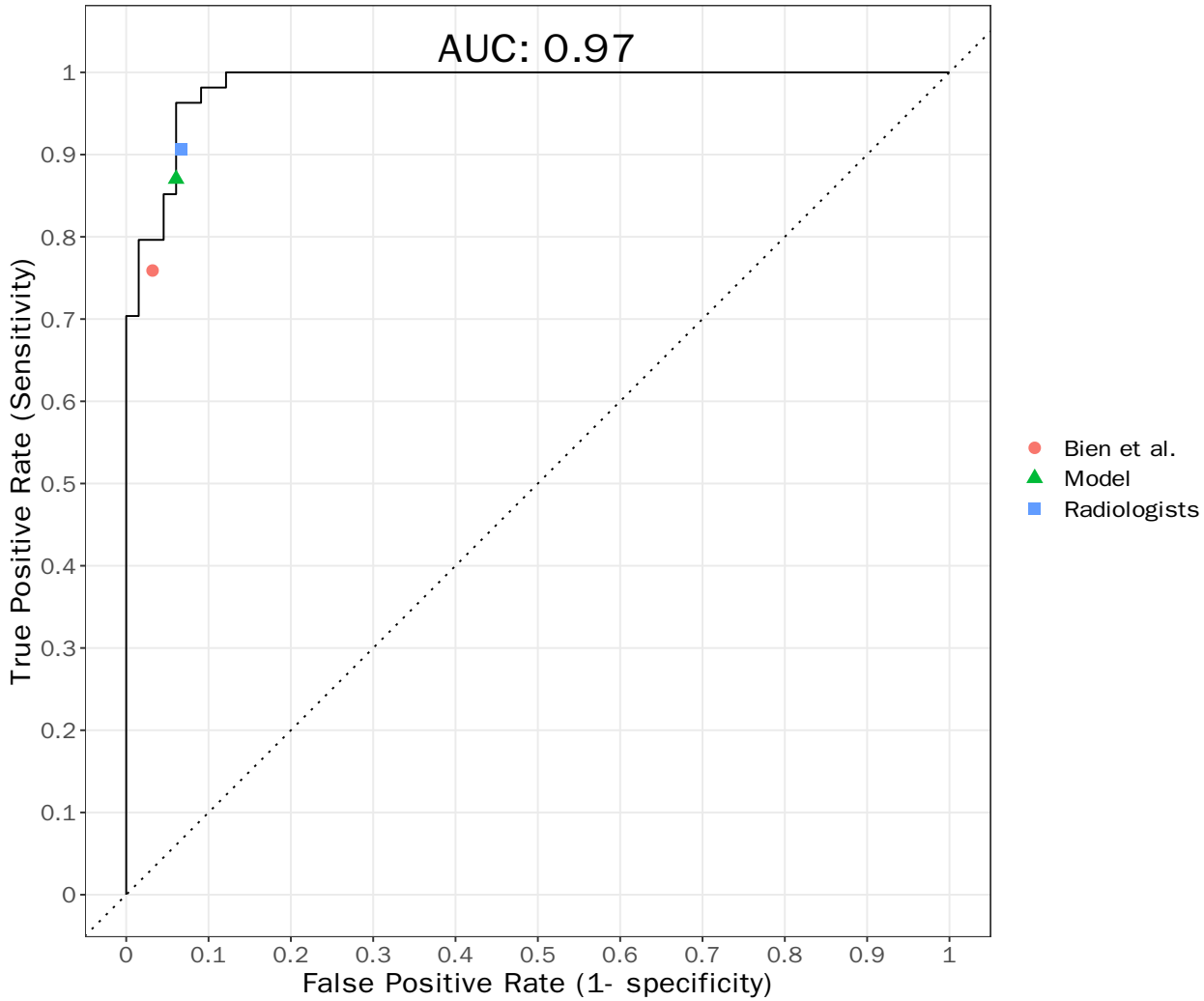
- 1250 cases
  - Training: 1130
  - Validation: 120
- Labels with diagnosis of meniscus and/or acl tear

$$\begin{pmatrix} 1 & 203 & 130 & 26 & 62 & 43 \\ 206 & 51 & 120 & 40 & 18 & 5 \\ 0 & 53 & 231 & 102 & 158 & 191 \\ 31 & 41 & 99 & 156 & 224 & 139 \\ 209 & 79 & 153 & 156 & 168 & 89 \\ 72 & 132 & 83 & 65 & 134 & 230 \end{pmatrix}$$

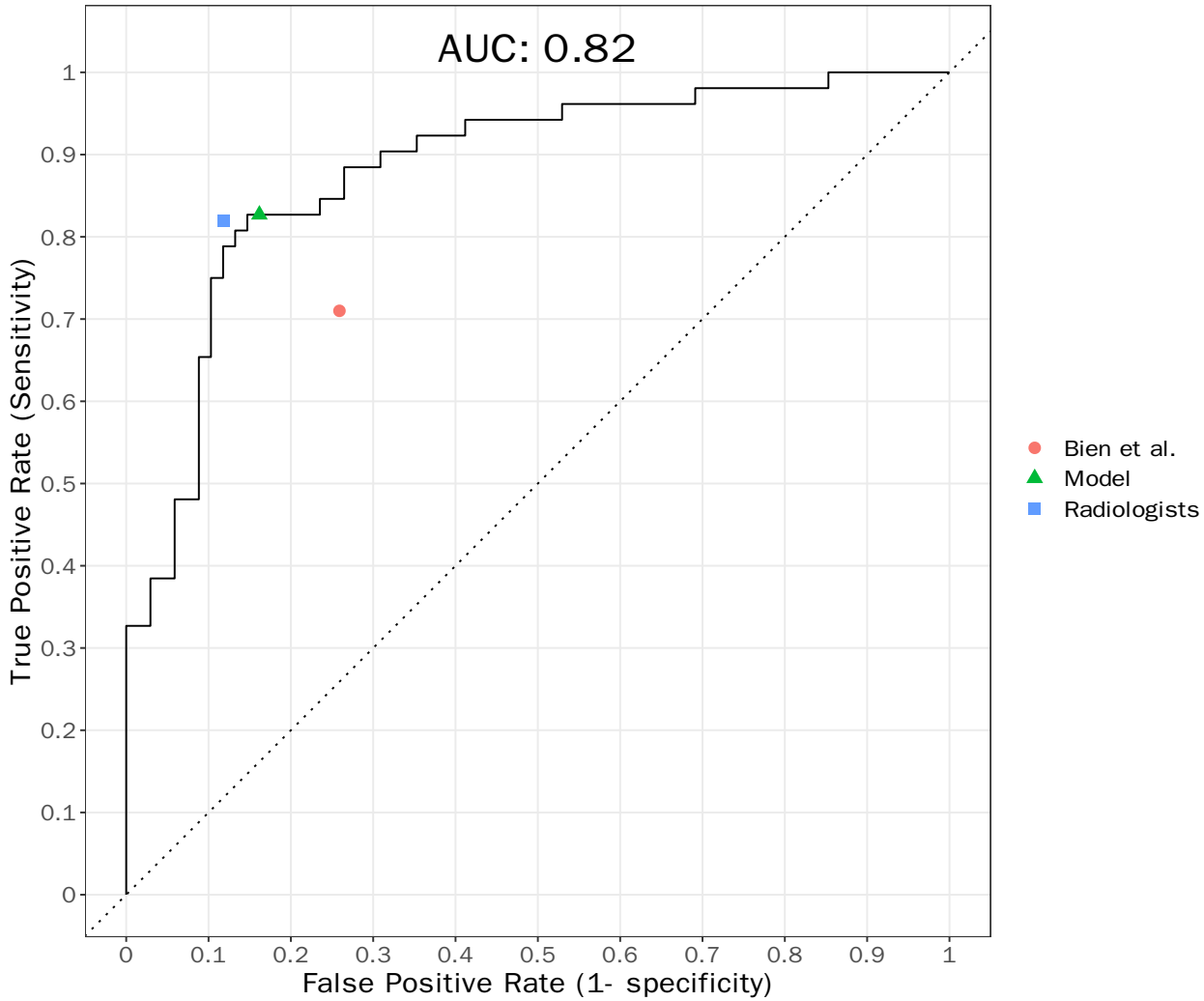
Methods: Deep learning model



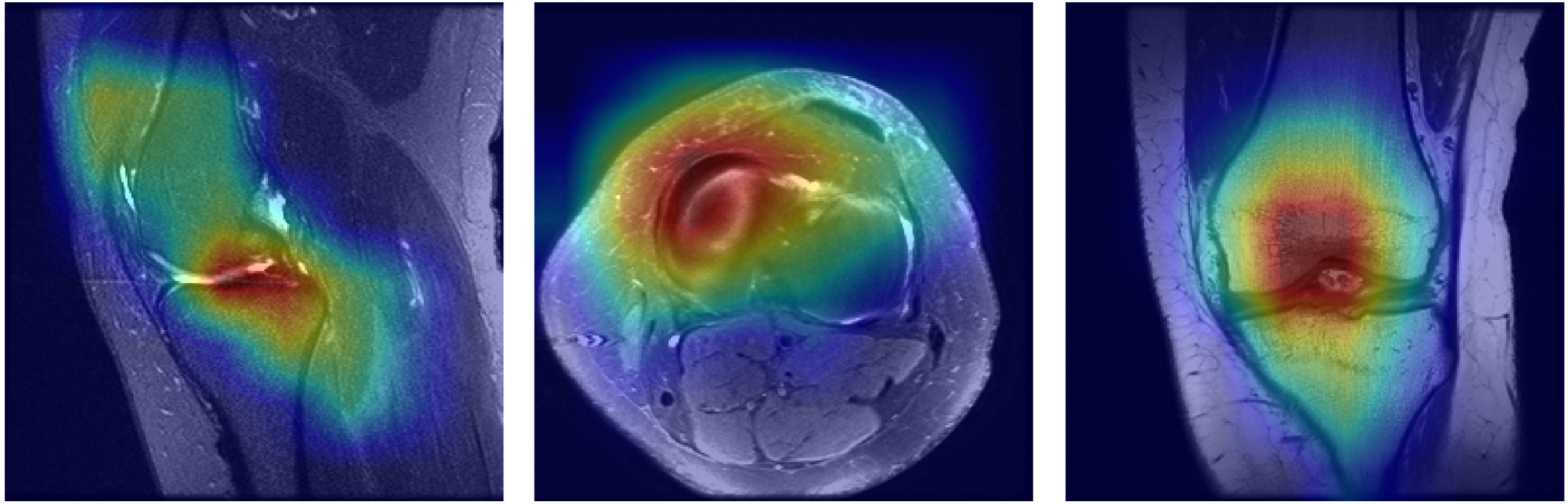
Results: ACL


AUC: 0.97
True Positive Rate (Sensitivity)
False Positive Rate (1- specificity)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Bien et al.
Model
Radiologists

Results: Meniscus



Results: GradCAM



Limitations

- Lack of generalizability
  - Patient population
  - Different scanners
  - Other pathologies
- Potential solution: More high quality data

Conclusions

- Deep learning methods has the potential to aid radiologists and orthopedic surgeons in the diagnosis of meniscus and ACL injuries on MRI.
- More high quality data is needed to improve generalizability.

Thank you!

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