



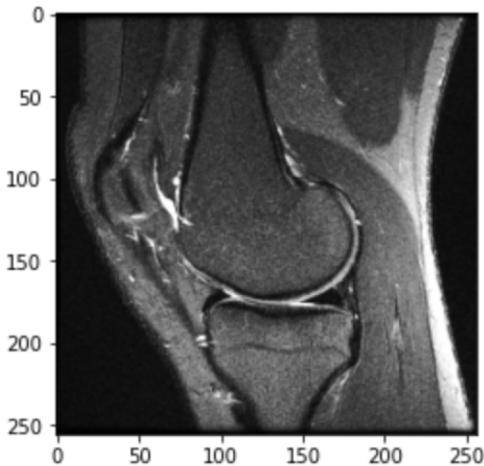
Evaluating the impact of reduced feature space on deep-learning-assisted diagnosis for knee MRIs

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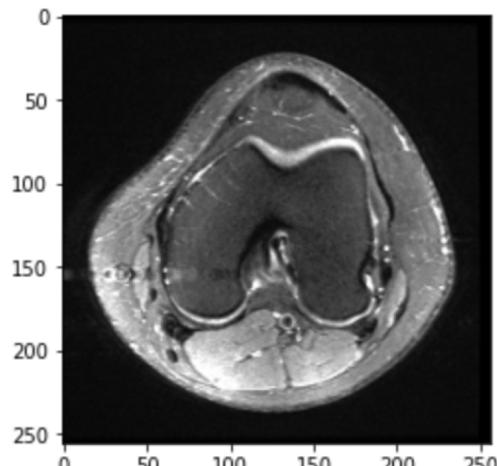
Agenda

- I. Background and Motivation
- II. Objective
- III. Methods
- IV. Results
- V. Conclusion

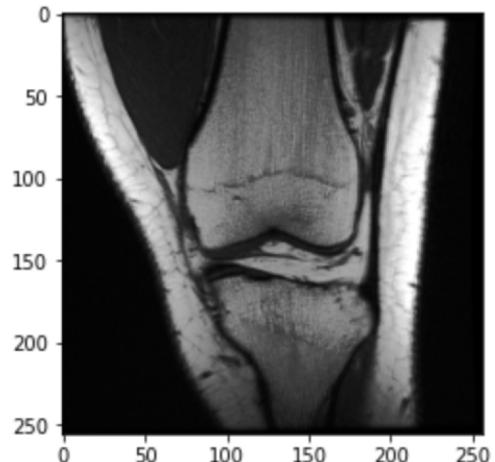
Background and Motivation



Sagittal



Axial



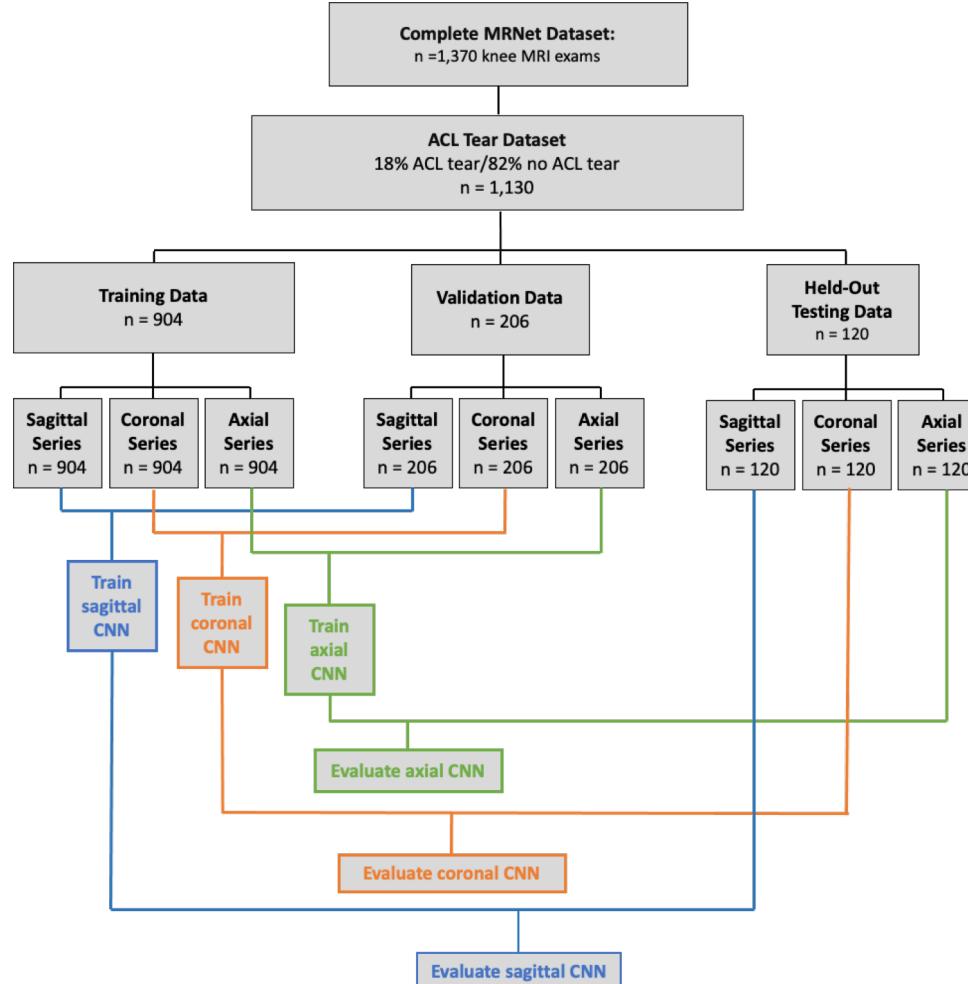
Coronal

Objective

Evaluate performance of a variation of MRNet on ACL tear classification using a reduced feature space to decrease computational complexity, cost, and time.

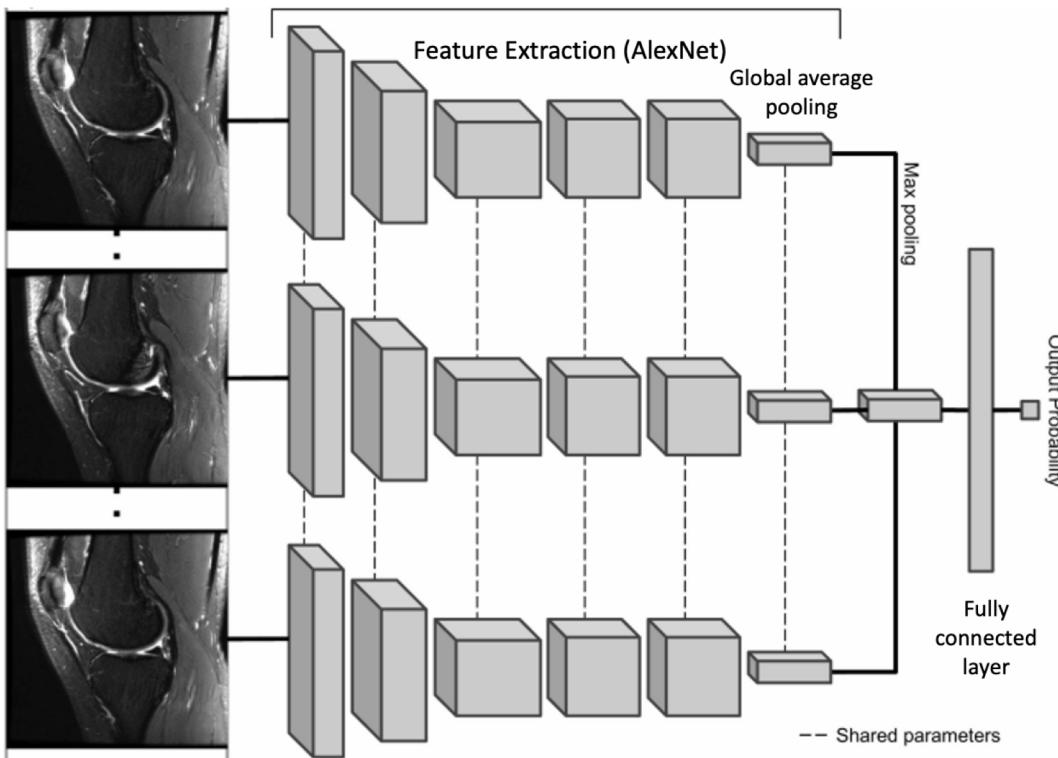
1. Establish comparable or superior performance using MRNet structure with fewer input series
2. Utilize class activation mappings (CAM) to elucidate image regions contributing to predictions

Methods



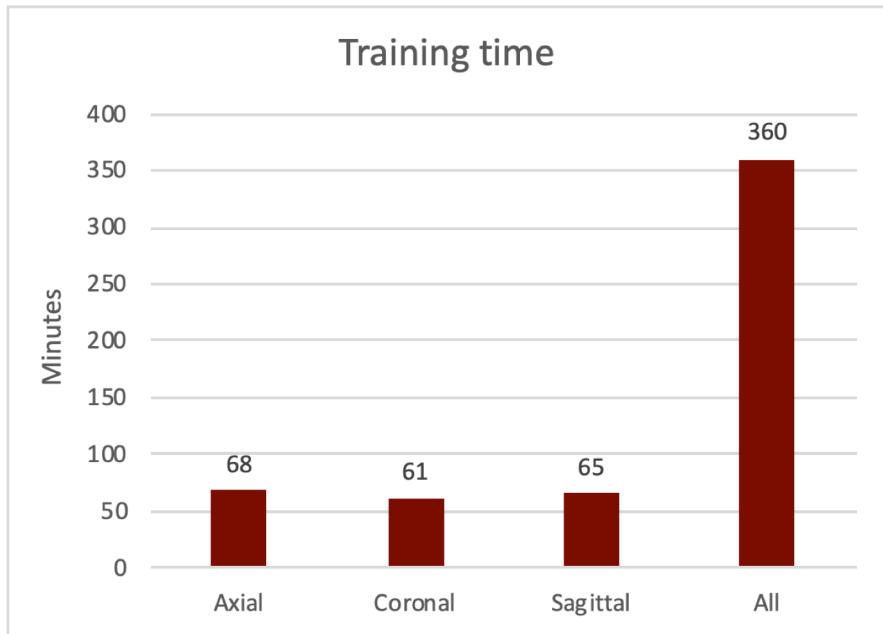
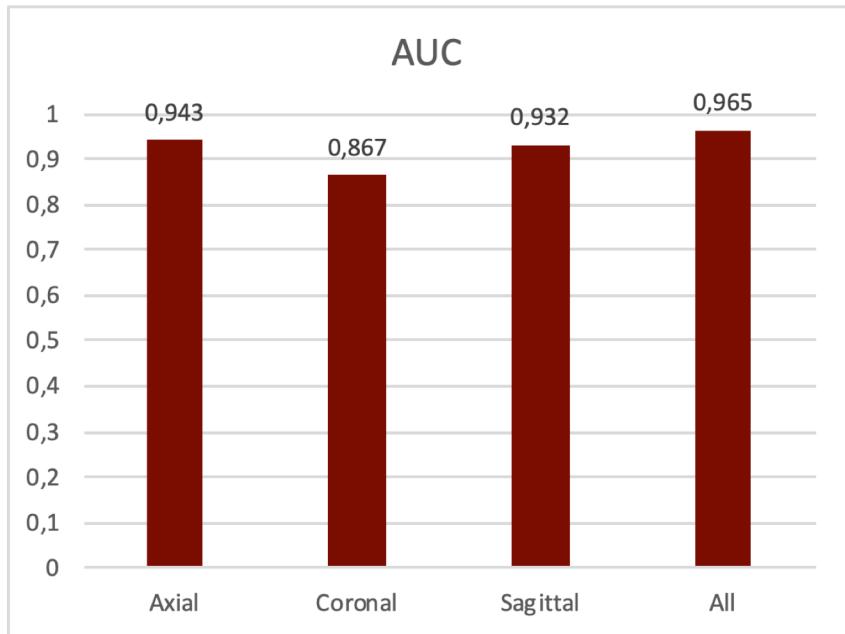
Methods

Input: slices from
one series type



Stanford
MEDICINE

Results



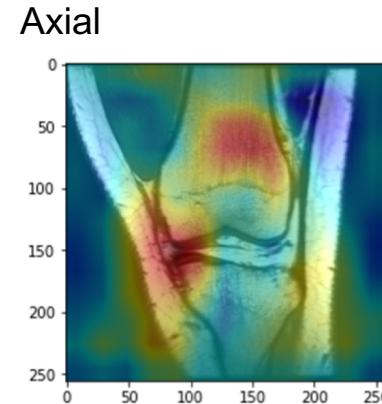
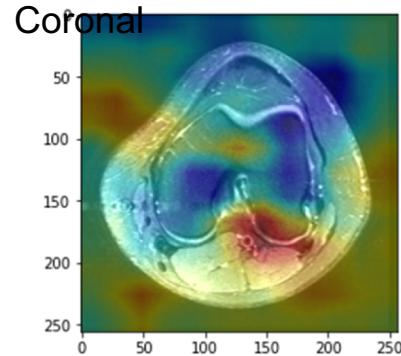
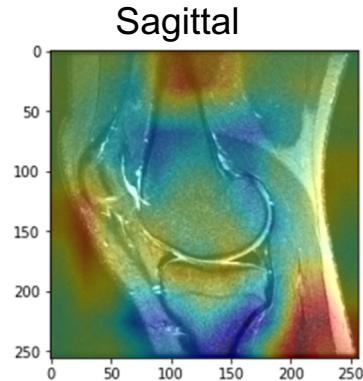
Class Activation Mapping (CAM)

- A Class Activation Map is a visual representation of the regions in an image that the CNN used to determine the output class
- Applying a heatmap to this CAM can help see this even more clearly.

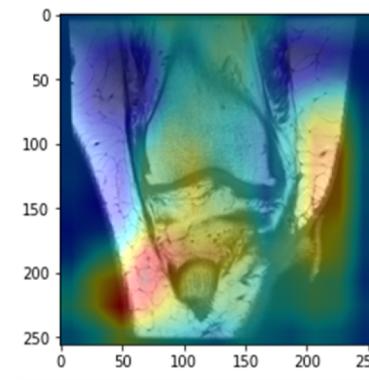
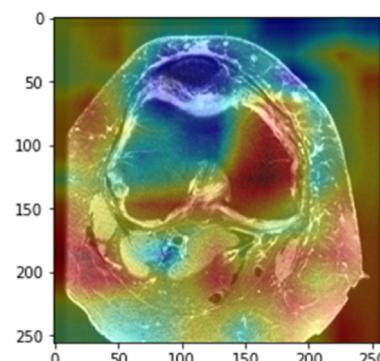
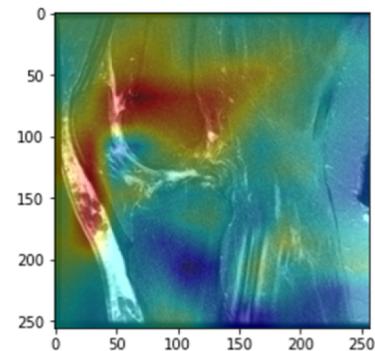


Class Activation Mapping (CAM)

Patient
without an
ACL tear
(Patient 0048)



Patient with
an ACL tear
(Patient 0049)



Conclusion and Future Work

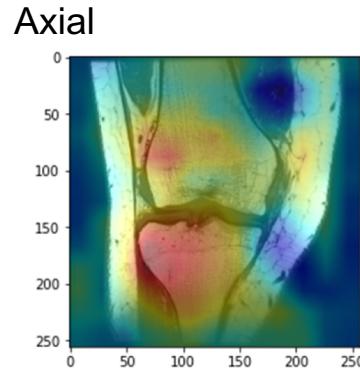
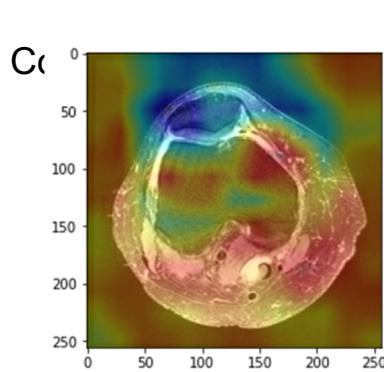
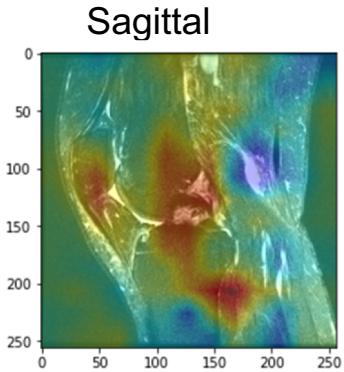
- We can get **comparable performance** in detecting ACL tears with **reduced feature space** (using only one set of views)
 - Using only **Axial or Sagittal views was effective** in determining presence of an ACL tear (94.3% and 93.2% accuracy respectively)
 - Using only images from the coronal view was less accurate (86.7% accuracy) but still reasonable
- Given the **time** taken to run each model (approximately $\frac{1}{6}$ the time used when using all three views to classify the images), it can be **very helpful to utilize this method to assist radiologists** in diagnosing ACL tears.
- Future directions:
 - Utilization of **different metrics** for classification, other than anatomical view
 - Present CAM and results to radiologists and compare accuracy when radiologists can **use the AI to augment** their diagnosis

Questions?

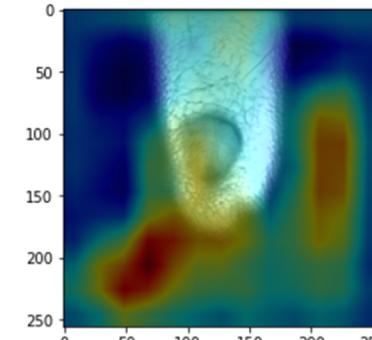
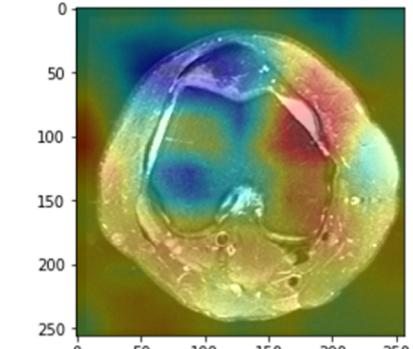
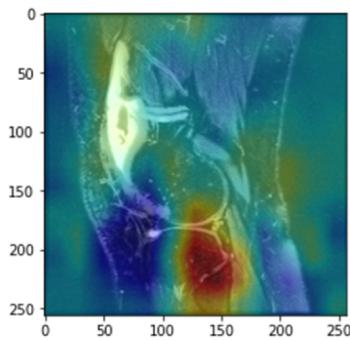
Appendix

Class Activation Mapping (CAM)

Patient
without an
ACL tear
(Patient 0000)



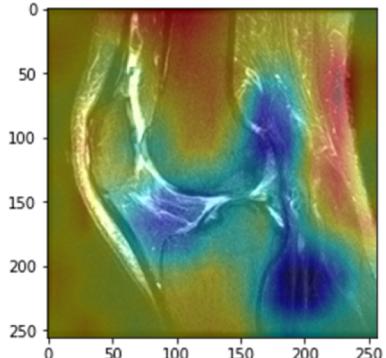
Patient with
an ACL tear
(Patient 0062)



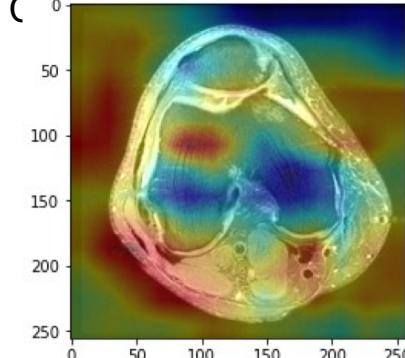
Class Activation Mapping (CAM)

Patient
without an
ACL tear
(Patient 0013)

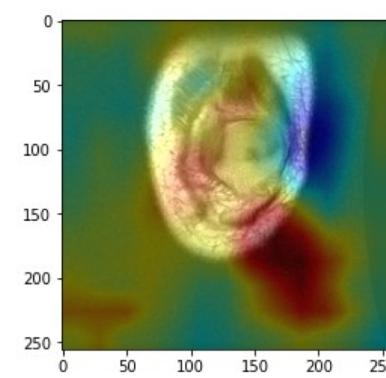
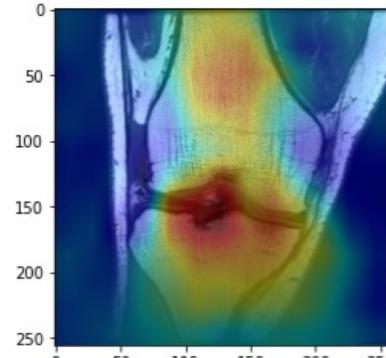
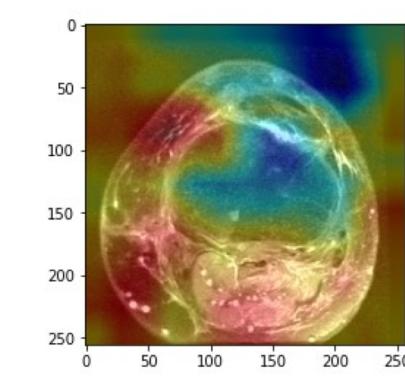
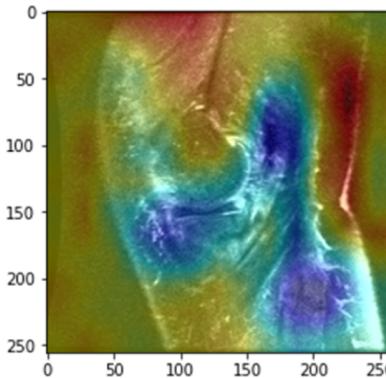
Sagittal



Axial



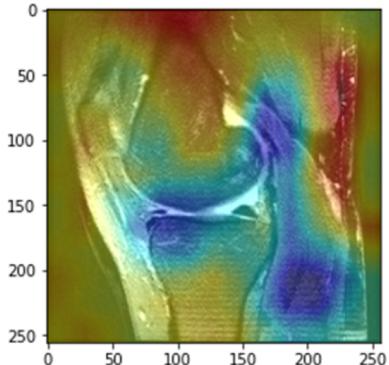
Patient with
an ACL tear
(Patient 0018)



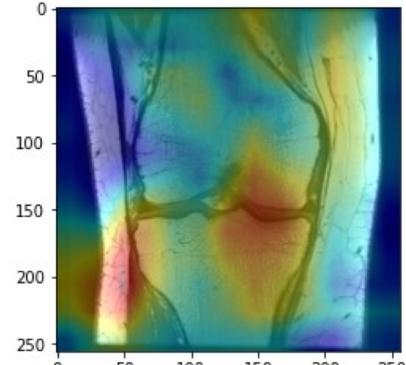
Class Activation Mapping (CAM)

Patient
without an
ACL tear
(Patient 0038)

Sagittal



Axial



Patient with
an ACL tear
(Patient 0037)

