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Detecting Anterior Cruciate Ligament Tears and Posterolateral Corner Injuries on Magnetic Resonance Imaging

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Detecting Anterior Cruciate Ligament Tears and Posterolateral Corner Injuries on Magnetic Resonance Imaging

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Introduction: Anterior Cruciate Ligament (ACL) tears are an extremely common orthopedic injury, with an incidence ranging from 39-52 per 100,000. Knee Magnetic Resonance Imaging (MRI) scans are the gold standard for diagnosing ACL tears and their comorbidities, such as posterolateral corner injuries; the results of these scans determine the appropriate treatment needed for patients. There is evidence that machine learning can be used to automate the detection of pathology on MRI, and we hypothesize that we can train a neural network machine learning model to accurately interpret ACL injuries and posterolateral corner injuries.

Methods: We will be analyzing over 1000 knee MRIs including those that are normal, those with ACL tears, and those with ACL tears with posterolateral corner injuries. First, we will manually annotate the knee MRIs to classify them appropriately. We will then train a convoluted neural network machine learning model on ~80% of the data, and use the remaining ~20% to test its accuracy. We will compare the accuracy of our model to the accuracy of musculoskeletal radiologists.

Results: We anticipate that our model will have comparable accuracy predicting ACL tears and posterolateral corner injuries to that of musculoskeletal radiologists. By having access to our model's predictions, we expect radiologists will be able to detect ACL tears with posterolateral corner injuries with improved accuracy and speed.

Discussion:

While we do not have results yet, we anticipate that our model will be an early step to developing useful tools that aid radiologists. Our model will be trained on a large dataset which will increase its generalizability for future implementation. Radiologists can use our model's predictions to aid them in diagnosis of pathology on knee MRI. We expect that improved diagnosis will improve patient treatment outcomes.