

Appendix E1

Inclusion and Exclusion Criteria of the OAI

The goal of the OAI was to study participants who have knee OA or are at high risk for developing knee OA. Therefore the following inclusion and exclusion criteria were applied:

Must meet one of the following criteria:

- Overweight
- Previous knee injury or surgery
- Knee pain during the past year. Participants do not need to have current knee pain to take part in the study.
- Parent or sibling who had knee replacement

Exclusion Criteria:

- Rheumatoid arthritis
- Joint replacements in both knees
- Unable to walk without assistance
- Unable to undergo MRI of the knee

Multitask Model Training Parameter

During training, images were augmented with random horizontal flip, cut out, random rotation ($\leq 20^\circ$), random color jitter, manifold mixup, and drop-out layers were added (15,16). To account for the severe class imbalance, more uncommon grades were oversampled, and more common grades were undersampled during training so that each severity grade had the same probability of occurring. Categorical cross entropy was used as the loss criterion with Adam optimizer with a cyclic learning rate (max learning rate 0.001) and a batch size of 32 for 50 epochs (17). First, the DenseNet was trained as a shared convolutional features extractor for all radiographic features simultaneously with separate fully connected layers for each radiographic osteoarthritis feature using a multitask loss function. Then, fully connected layers were fine-tuned separately for severity grading and binary assessment into absence/presence of a feature. The architecture is demonstrated in Figure 2. Code can be found online (<https://github.com/Rad190925/Code>).