Development of Automated Angiogram Labeling via AI Active Learning Pipeline

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Background and Objective: As technology is integrated further into medicine, more specialties are discovering new uses for it in their clinical practice. However, the tasks that we want technology to complete are often removed from developer's intended tasks. A field of research is growing that integrates medicine with current AI technology to bridge the gap and utilize already existing technology for medical uses. We desire to use an active learning pipeline (a form of machine learning) to automate the labeling of blood vessels on angiograms and potentially develop the ability to detect occlusions. By using machine learning, it would essentially allow the machine to teach itself with human guidance.

Methods: A machine learning pipeline is in development for automation of the process. To create a baseline for the machine to start learning, the first set of angiograms are being labeled by hand using the program 3D Slicer. For the first pass, we have been quickly labeling the blood vessels by changing the color sensitivity threshold to highlight the darker blood vessels juxtaposed next to lighter tissue. For the second pass, we have erased any erroneous highlighting that was picked up in the first pass such as tools, tissue, contrast outside the injection site, and sutures. For the third pass, we have labeled and segmented the arteries into specific vessels such as femoral, common iliac, internal iliac, etc. This will then be entered into the machine for automated learning.

Results: We are in the process of labeling the initial image set.

Potential Impact: By creating a lab for angiogram automation, it will allow physicians to efficiently search images for specific arteries and save valuable time usually spent searching images. This would also allow for automated labeling of occlusions that a physician could then look at to verify.