An Active Learning based annotation tool for classifying Retinal Fundus Images based on Hypo-pigmentation grades

Need for Annotation Tools

◉ Medical Image Annotation plays a vital role in the healthcare sector.
◉ These tools help in creating training datasets which in turn would come in handy when training models for classifying and predicting diseases from medical images.

Challenge(s) in Annotation Process for the domain expert

◉ Although, annotation process demands the involvement of a domain expert for integrity of the labels, the process itself becomes tedious if the target is to annotate a large number of unlabelled images.

What's Active Learning?

◉ Active Learning an ML technique, is centered around the idea of selecting the most informative points from an unseen pool of dataset based on various functions.
◉ Some of these functions also called acquisition functions in the literature are:
  • Maximum Entropy
  • Bayesian Active Learning by Disagreement
  • Variational Ratios

Role of Active Learning in accelerating the annotation process

◉ To speed up the annotation process by minimising the number of images to be manually annotated, we use Active Learning for predicting the labels of the next set of images by an ML model which learns from the images manually annotated by a domain expert using the Annotation Tool UI. The flow of the process is described in Fig. 3.
◉ We compare different acquisition functions and pick the function that makes the learner/model learn the 'fastest' (i.e reaches a considerable validation accuracy with least number of manual annotations). This is described in Fig. 1.
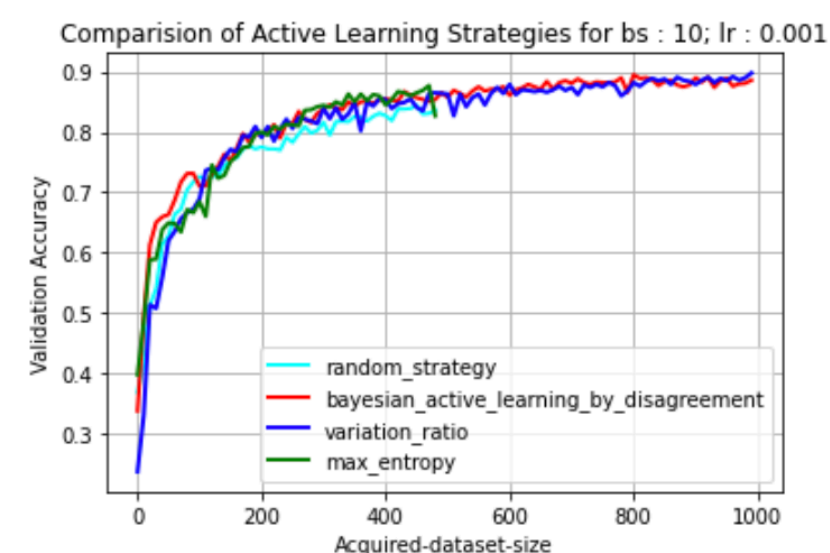

Fig 1: Comparison of different Acquisition functions
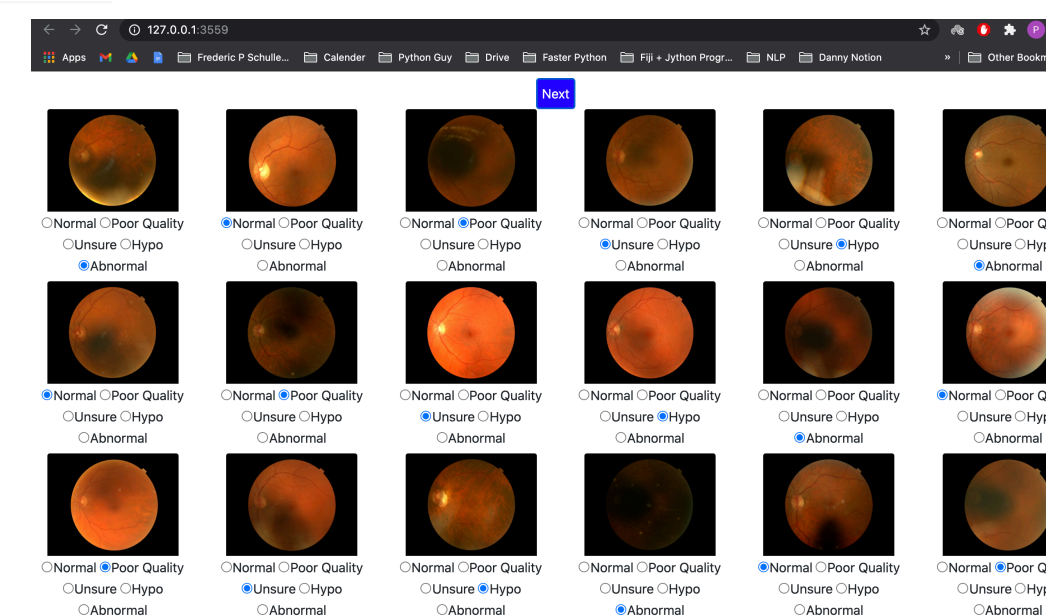

Fig 2: User-Interface of the Annotation Tool
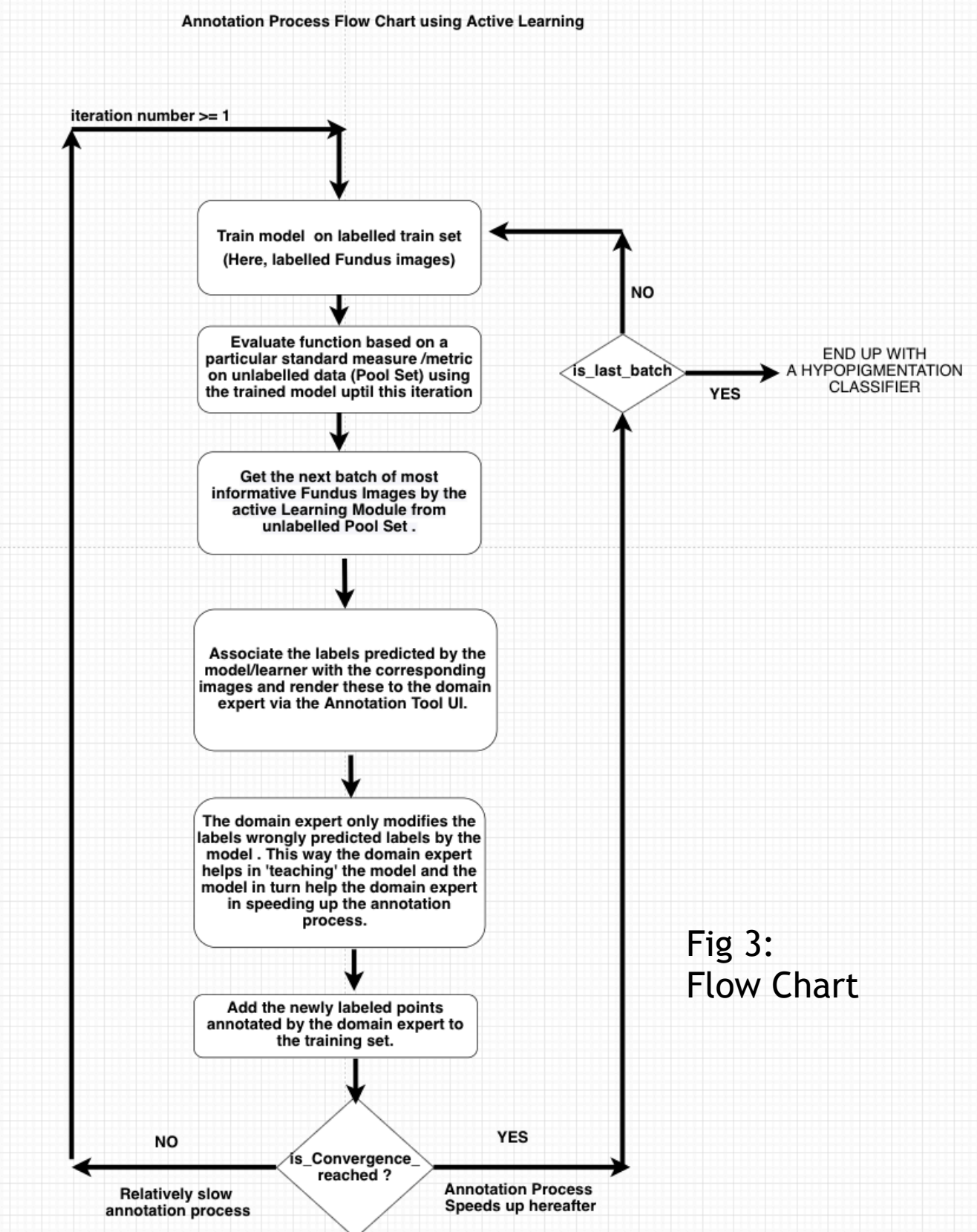
Flow Chart of the Annotation Process

Fig 3: Flow Chart

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