Comparative Analysis of Changes in Pathologists’ Diagnostic Approaches Over Time
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Abstract
In pathology training, one way to show that a learning process is taking place is to compare a pathologist’s diagnostic performance over the same cancer case after a certain amount of training. In this work we look at repeated diagnostic activities separated by two years.

Introduction
- A lymphoma diagnosis involves a complex mental process influenced by a multitude of factors ranging from pathologist’s experience to circumstances of the clinical case. Our research is focused on revealing diagnosis-related details and heuristics that can be used to quantify and potentially improve the diagnostic process in pathology using whole-slide imaging and analytical tools.
- We are interested in looking at changes in pathologists’ approach to diagnosis as a function of time by capturing their diagnostic activities and comparing them to an earlier set captured two years prior, and whether we can quantify them as “experience.”

Methods
- We used our PathEdEx whole-slide imaging platform [1] with realistic diagnostic workflow, whole-slide imaging viewing capability, and gaze tracking capture to record user activities related to diagnosing a cancerous tissue slide.
- Four pathologists with experience ranging from expert to trainee recorded their diagnostic sessions in 2016 and then again in 2018 over the same four hematopathology cases using PathEdEx. We represented diagnostic activities and clues recorded during tissue examination as graphs and matrices for comparison. We applied novel frameworks developed concurrently in our lab to see if there are any changes in individual diagnostic approaches and results over time that could be summarized as practical advice.

Results and Discussion
- As expected, changes in experts’ results were minimal. Junior pathologists showed a small improvement in time and choice of stains considered, as well as a more orderly approach to proceeding through the case. We were not able to detect significant actionable differences in individual pathologist’s approaches to diagnosis over time.
- In the majority of cases, pathologists chose dissimilar paths early on during diagnosis, making direct graph comparisons complicated and the derived differential (or merged) graphs meaningless. To further analyze similarities between these graphs, string alignment measures for generalized trees [2] may be applied.
- We suspect that the information captured did not represent a complete set of descriptive parameters to judge learning progress over time with complete confidence. Further research is needed to determine the necessary details for a better evaluation of pathologists’ performance in order to create personalized educational recommendations for diagnostic improvement.

References

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