ITCR: A Unified Machine Learning Platform for Cancer Diagnosis

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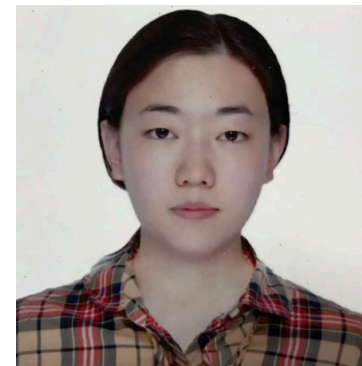
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Motivation

- GOAL: Develop a unified software package for sharing image analysis and machine learning tools to improve the accuracy and efficiency of cancer diagnosis

- REASONS (for breast biopsy diagnosis):

  - Millions of women depend on pathologists' interpretive accuracy.

  - Diagnostic errors are alarmingly frequent.

  - Particularly critical are the diagnostic thresholds of atypia and ductal carcinoma *in situ*, where up to 50% of cases are misclassified.

Aims

- Aim 1: Regions of Interest. Produce
  - 1a) a *ROI-finder classifier* and associated tools for use by researchers or pathologists for automatic identification of potential ROIs on whole slide images of breast biopsy slides and

  - 1b) a *ROI-analysis classifier* and associated tools that can point out image regions that tend to cause misdiagnosis and produce suitable warnings as to why such regions may either be distractors or indicate cancer.

Aims (continued)

- Aim 2: Diagnosis: Produce a *diagnostic classifier* and associated tools that can not only suggest the potential diagnosis of a whole slide image, but can also produce the reasons for the diagnosis in terms of regions on the image, their color, their texture, and their structure.

- Aim 3: Dissemination: Develop a *unified software package* containing this suite of tools, so they can be easily shared and provided (standalone and through the existing Pathology Image Informatics Platform (PIIP)) to both cancer researchers and clinical pathologists.

- Provide the *methodology to train related classifiers* for other biopsy-diagnosed cancers, such as melanoma, prostate, lung, and colon cancer.

Collaborators

- Close Collaborators
  - Dr. Joann Elmore, UCLA. Co-PI
  - Dr. Donald Weaver, U of Vermont, consultant
  - Dr. Selim Aksoy, Bilkent University, long-time collaborator
  - Dr. Stevan Knezevich, melanoma pathologist in practice
- Others
  - Dr. Anant Madabhushi, Case Western University
  - Dr. Anne Martel, PathCore
  - Dr. Larry True, Genitourinary Pathology, UW
  - Dr. Mrinal Mandal, U of Alberta, works on melanoma pathology