



Spatial Mapping and Detection of Ductal Carcinoma In Situ and Invasive Breast Carcinoma on Faxitron Radiographs

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Outline

- Introduction
- Objectives
- Data
- Methods
 - Raw Data Preparation
 - Registration Process
 - Results
 - Challenges

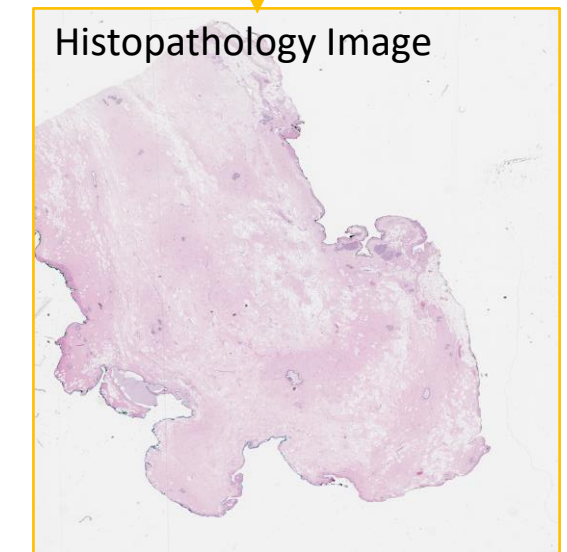
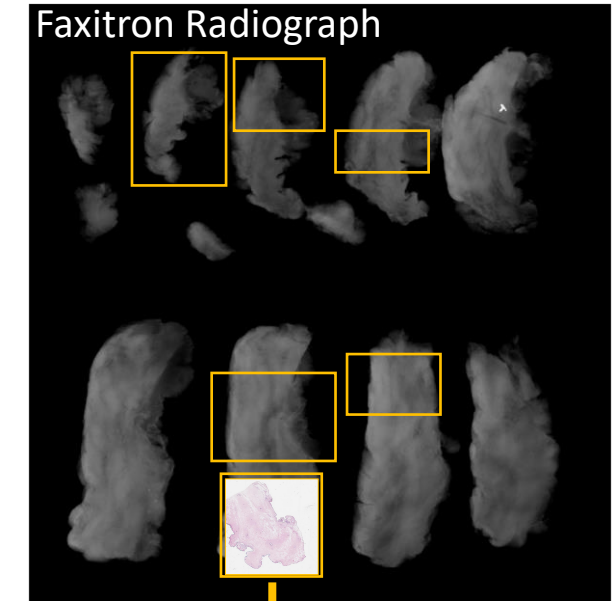
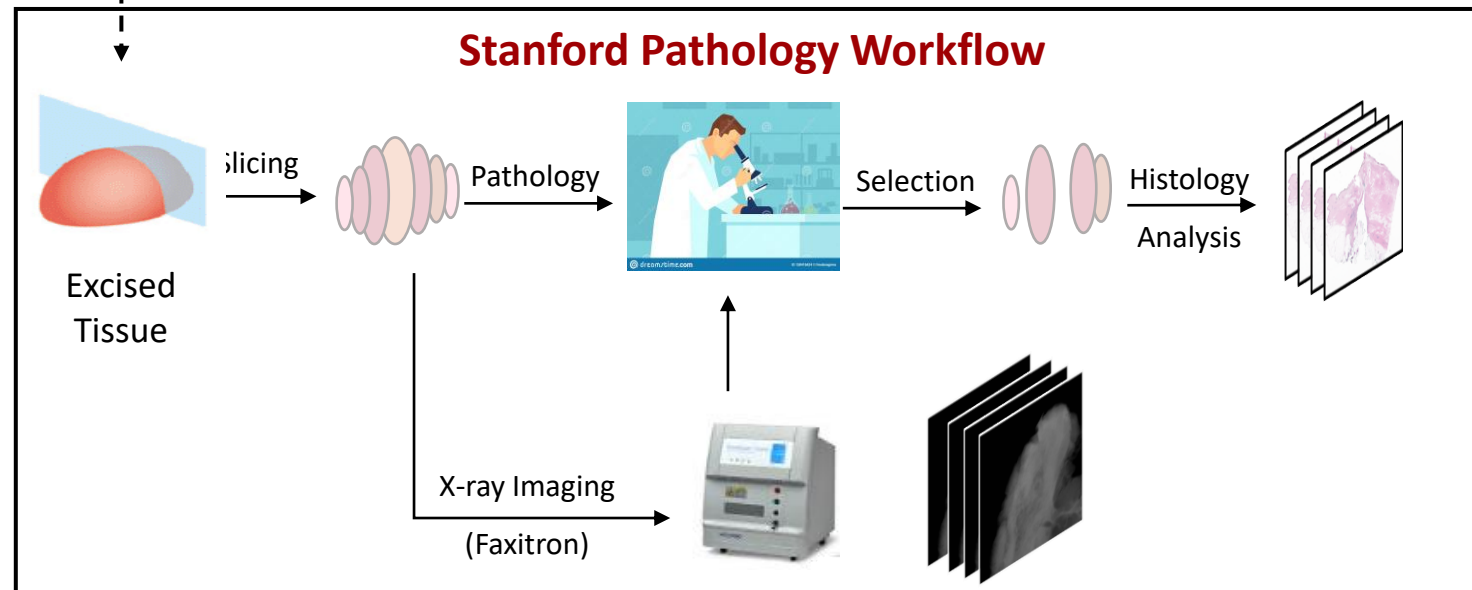
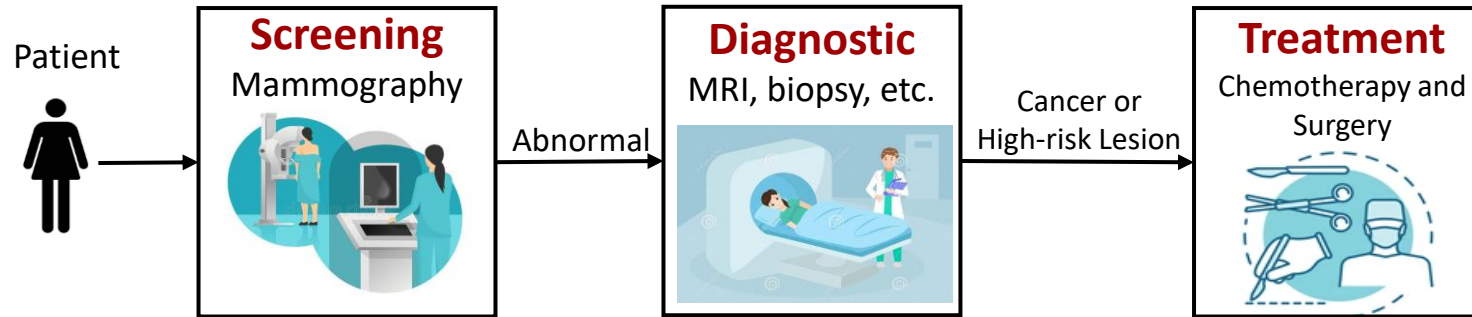
Introduction

- **Breast cancer** is a common and deadly disease.
- **One woman in eight** will develop invasive breast cancer over her lifetime.
- Resulting in an estimated 281,550 new cases and 43,600 deaths among women in the US in 2021.
- **Neoadjuvant chemotherapy** is used to treat breast cancers before surgical excision, which helps reduce
 - The risk for distant recurrence
 - The extent of surgery
 - Post-operative complications
- Presence and extent of residual invasive cancer is a strong prognostic factor for risk recurrence.



Introduction

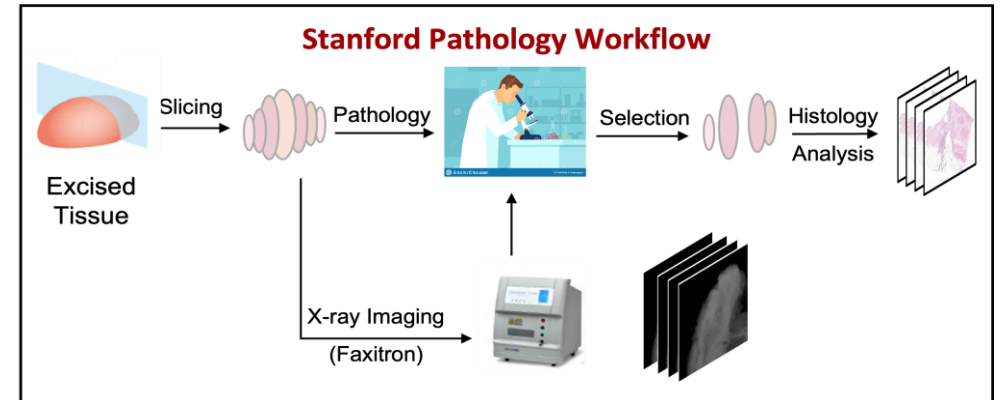
Pathology Workflow



• Photos: <https://www.vectorstock.com>, <https://www.dreamstime.com>

Objective

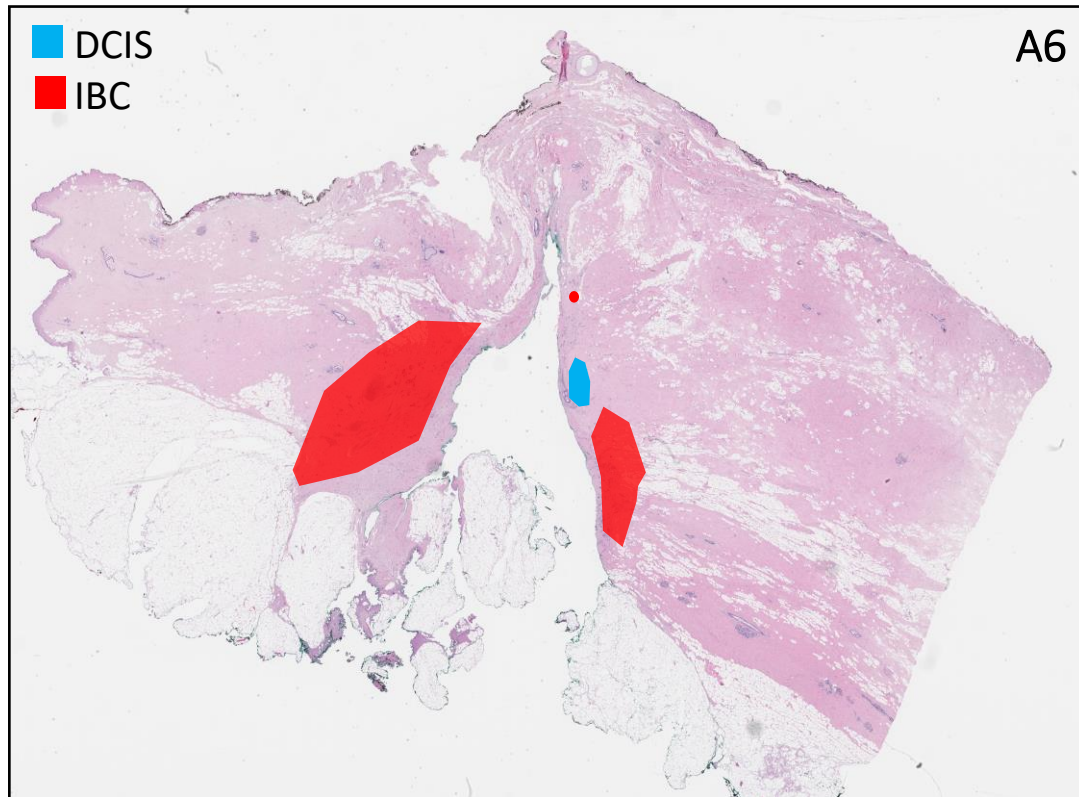
- Integrate radiology and pathology information to streamline pathology workflow.
- Automatic identification of invasive and in situ carcinoma on faxitron radiographs of excised tissue using AI methods.
- Allows pathologists to select regions with high likelihood of invasive cancer for histologic evaluation more accurately and efficiently.
- Use pathology data to create accurate ground truth labels on faxitron radiographs for training the detection model.
- Register histology and faxitron data in order to map the labels (invasive and in situ carcinoma) from histopathology onto Faxitron images.



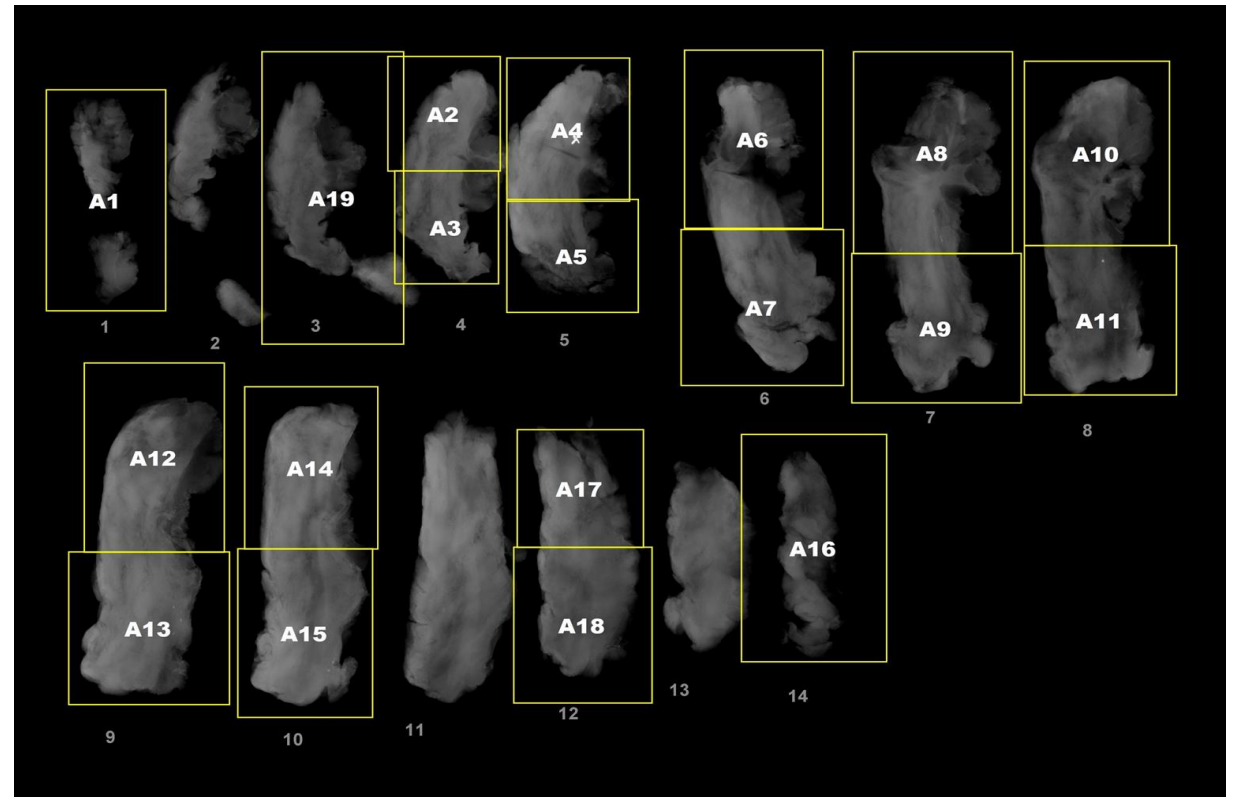
Data

This study includes data of 100 women including Faxitron radiographs showing all gross sections of the excised tissue and partial or fully corresponding histopathology slides.

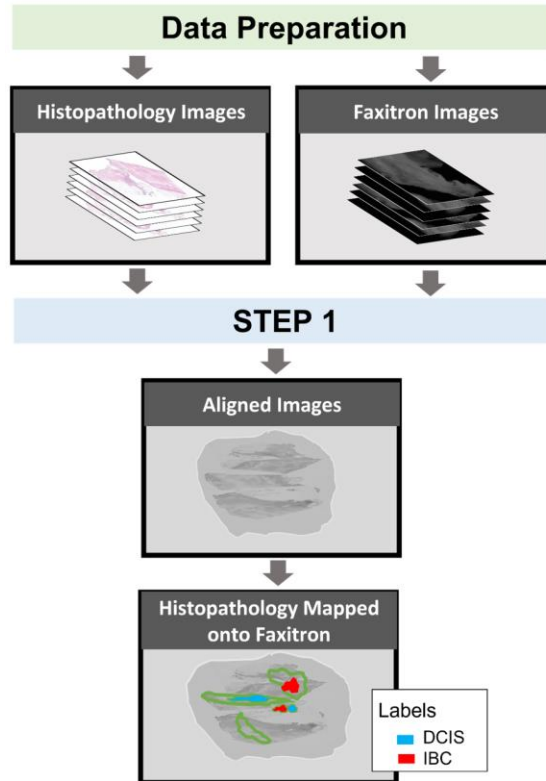
Histopathology Image



Faxitron Radiograph



Methods Framework



Data Preparation

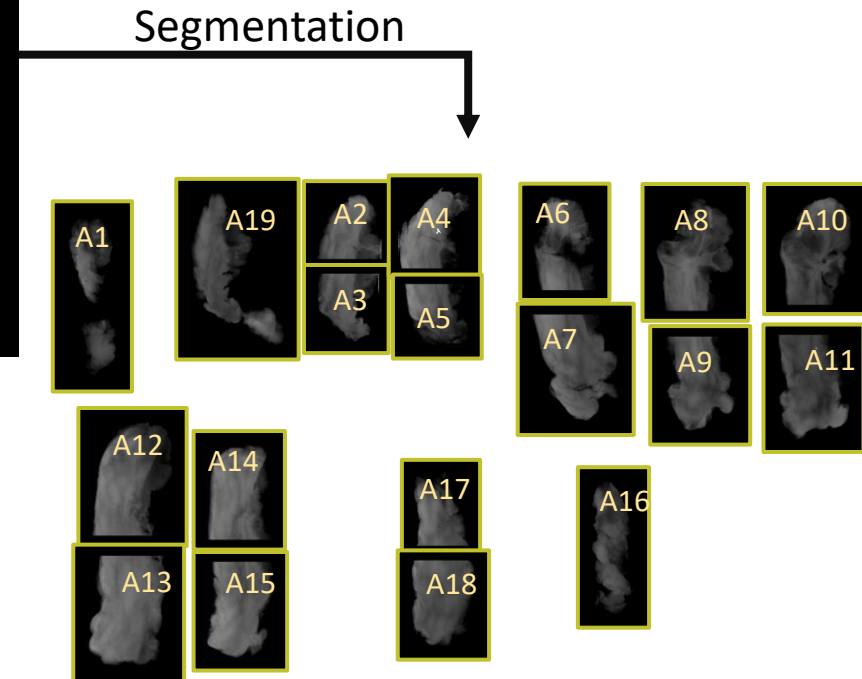
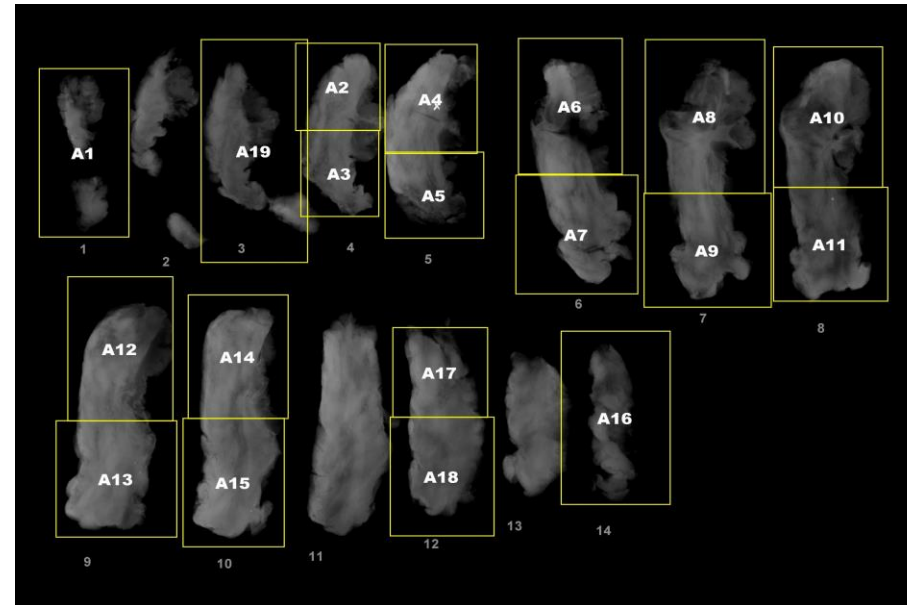
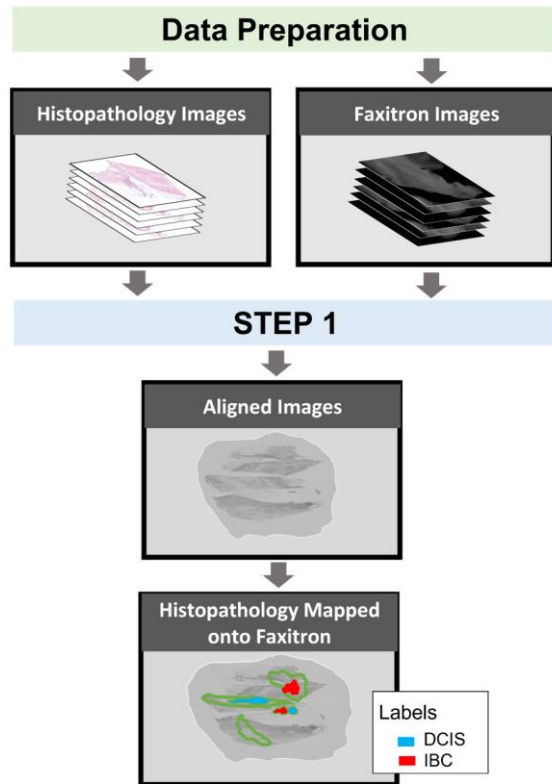
Save raw data of all sections including faxitron and histopathology images.

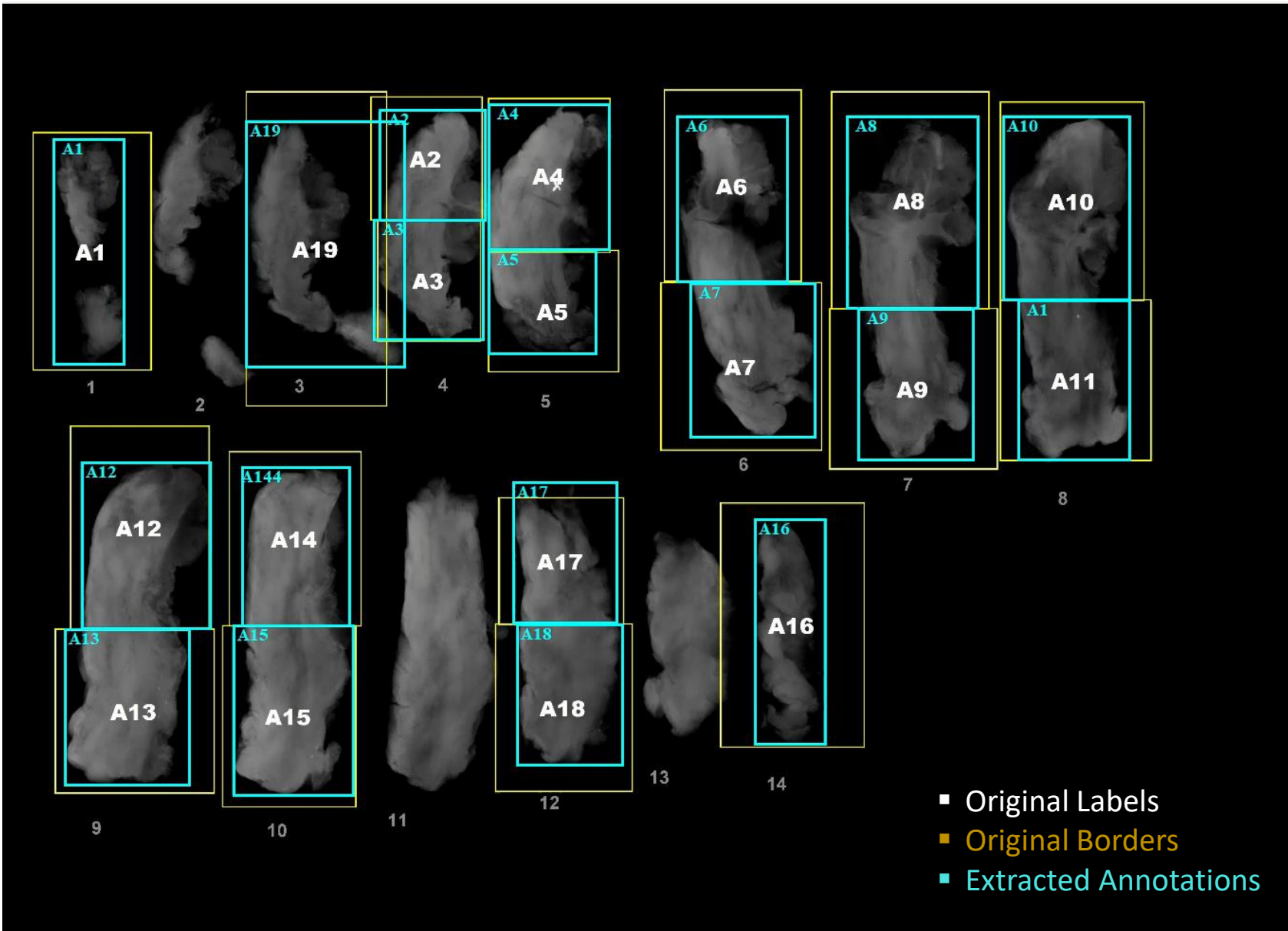
Step 1

Create accurate spatial ground truth labels of DCIS and IBC on Faxitron radiographs.

Data Preparation

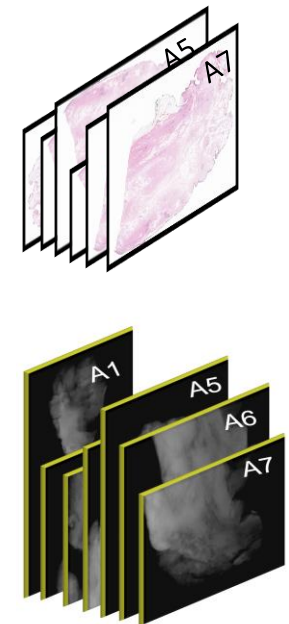
Faxitron Labeling and Segmentation



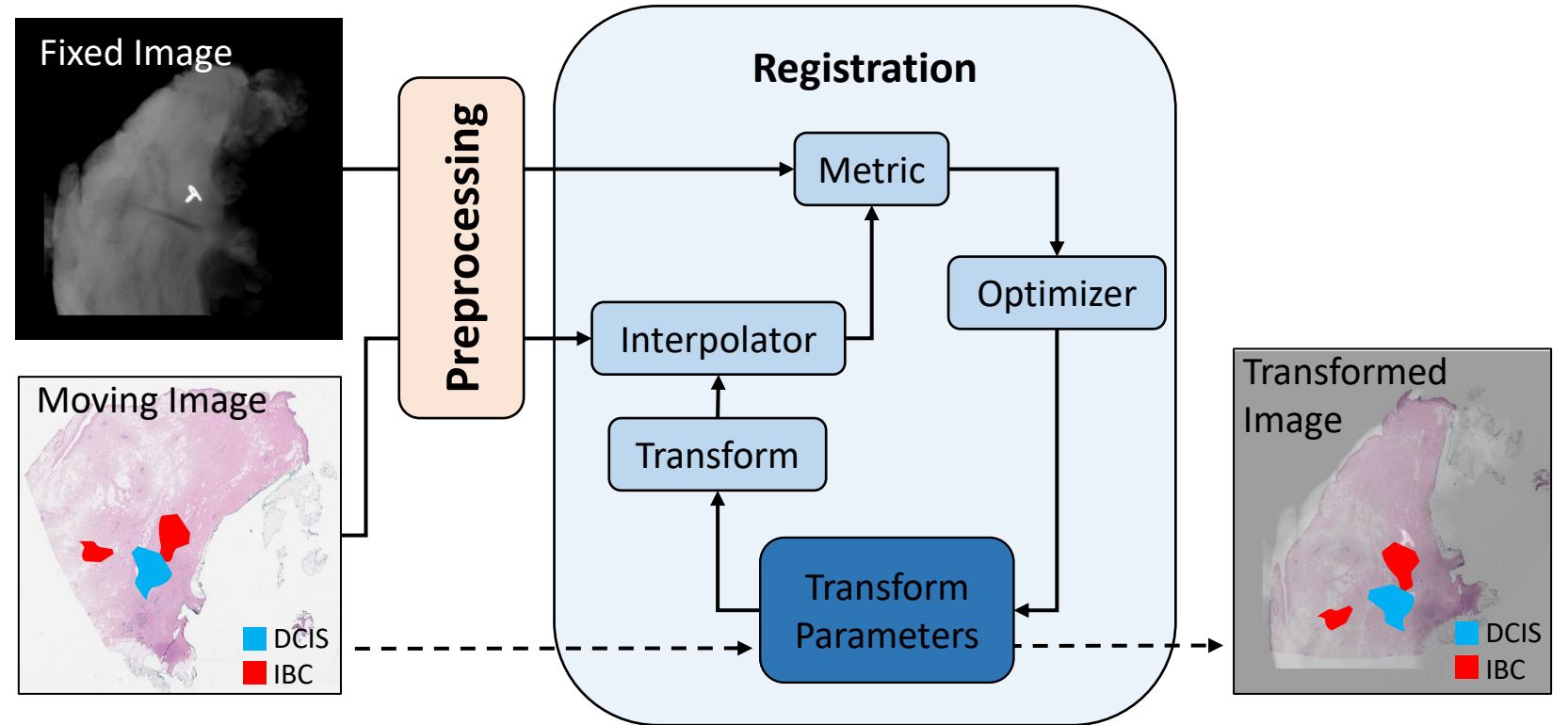
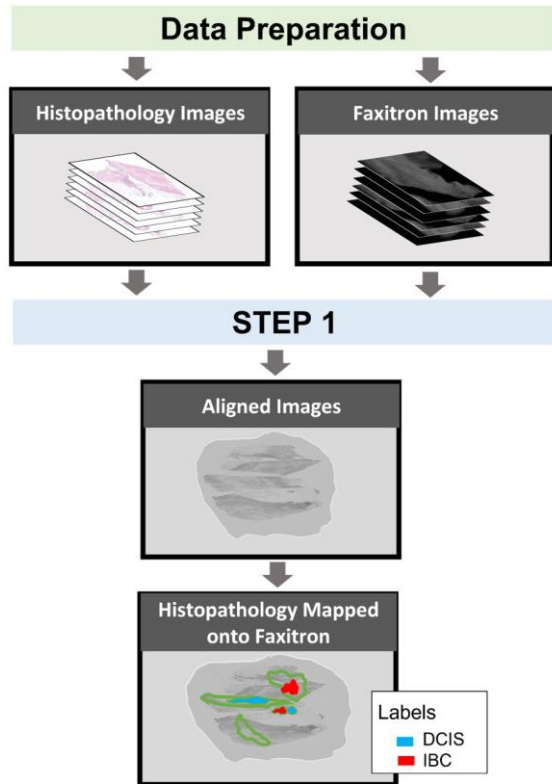


User Interface for Data Preparation

Enter

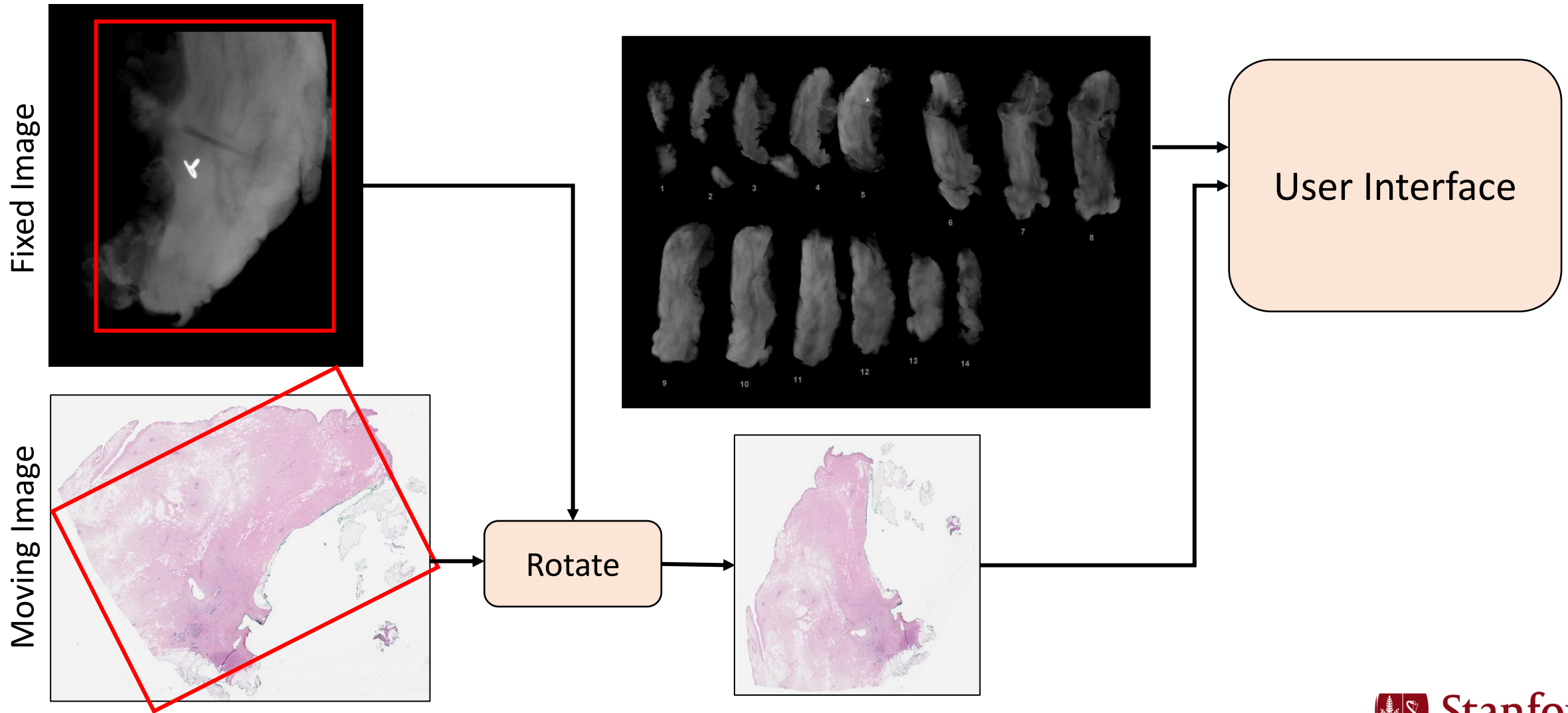


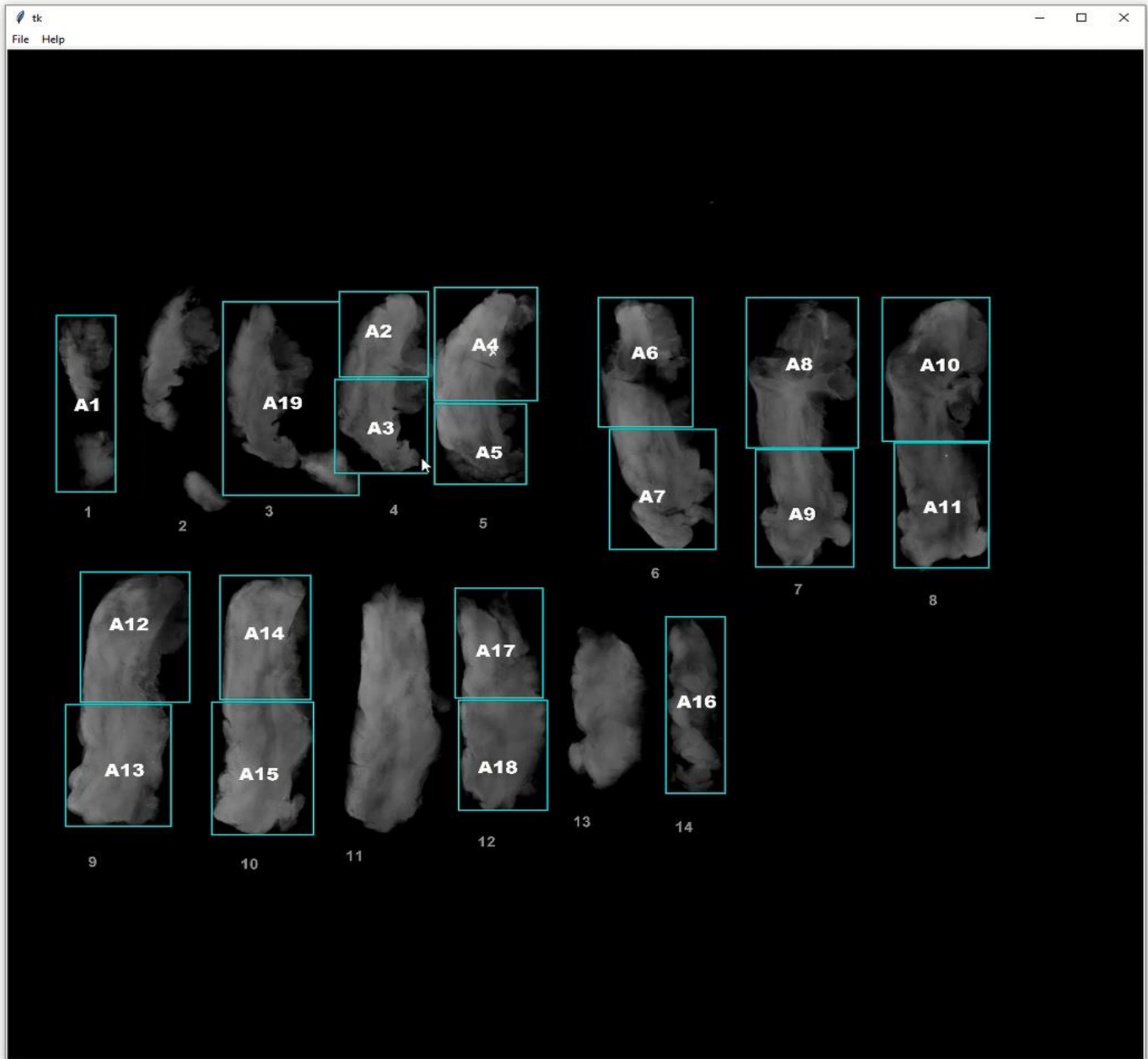
Step 1



Step 1

Registration Preprocessing



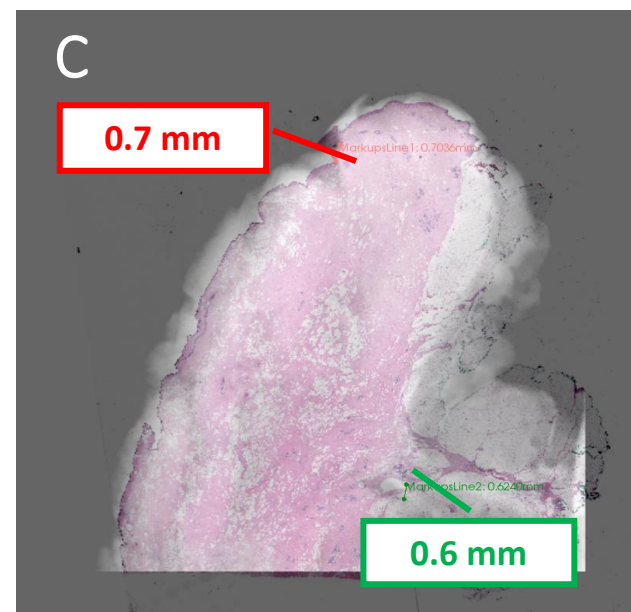
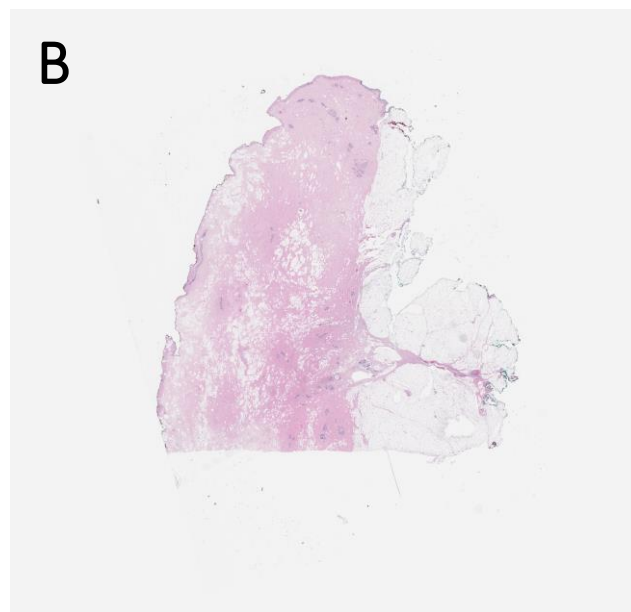


User Interface for Registration Preprocessing

Step 1

Registration Results

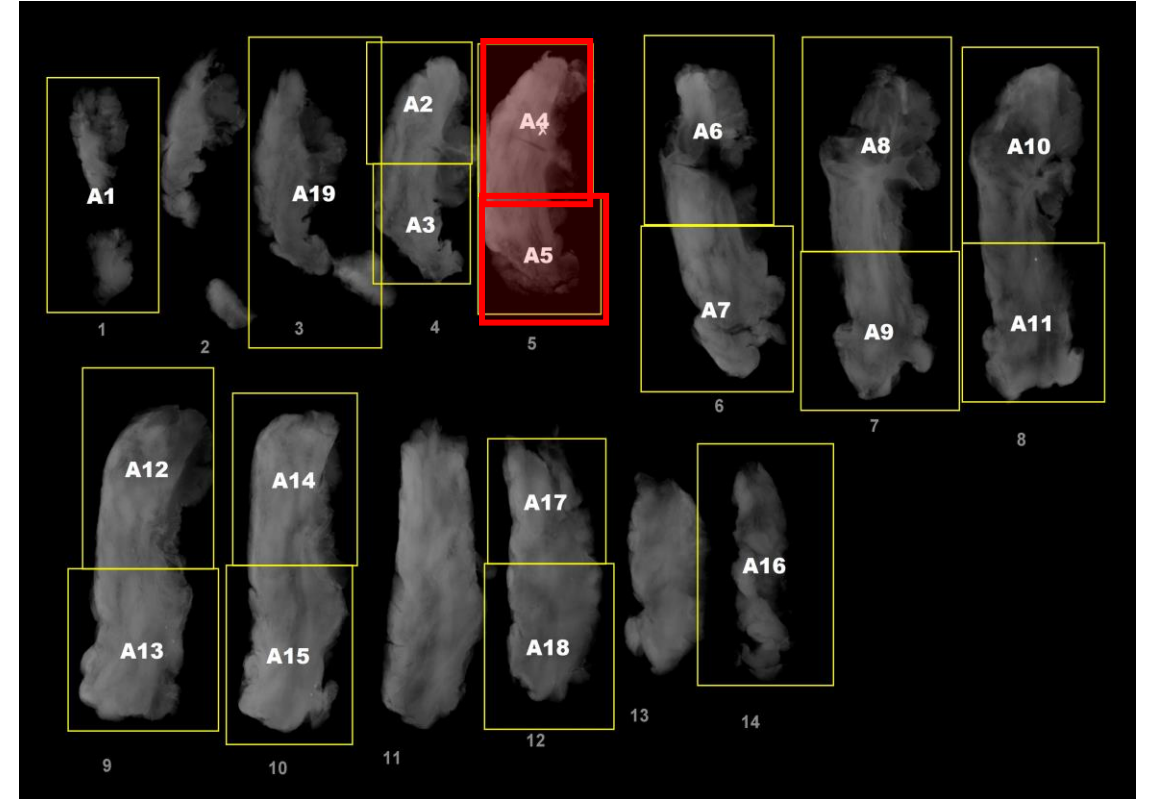
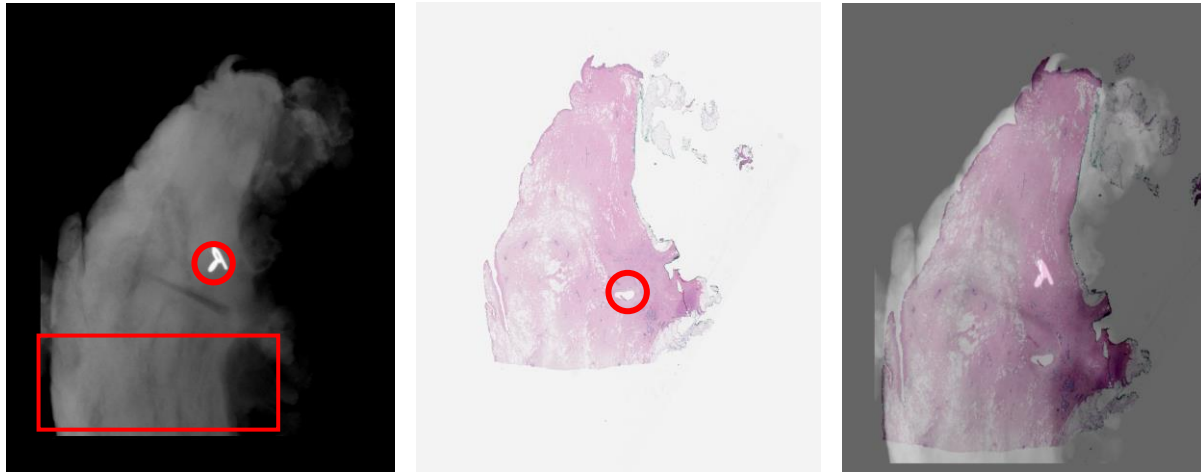
Performed 2D affine transformation between images of different modalities using the multi-resolution framework with a three-tier pyramid.



Preliminary registration results of Faxitron and histopathology images based on affine transforms. A) Fixed image, B) Moving image (preprocessed), C) Overlaid representation of registration result and corresponding landmark distance errors.

Step 1

Registration Challenges



Fixed image

Moving Image

Registration Result



Stanford
M E D I C I N E