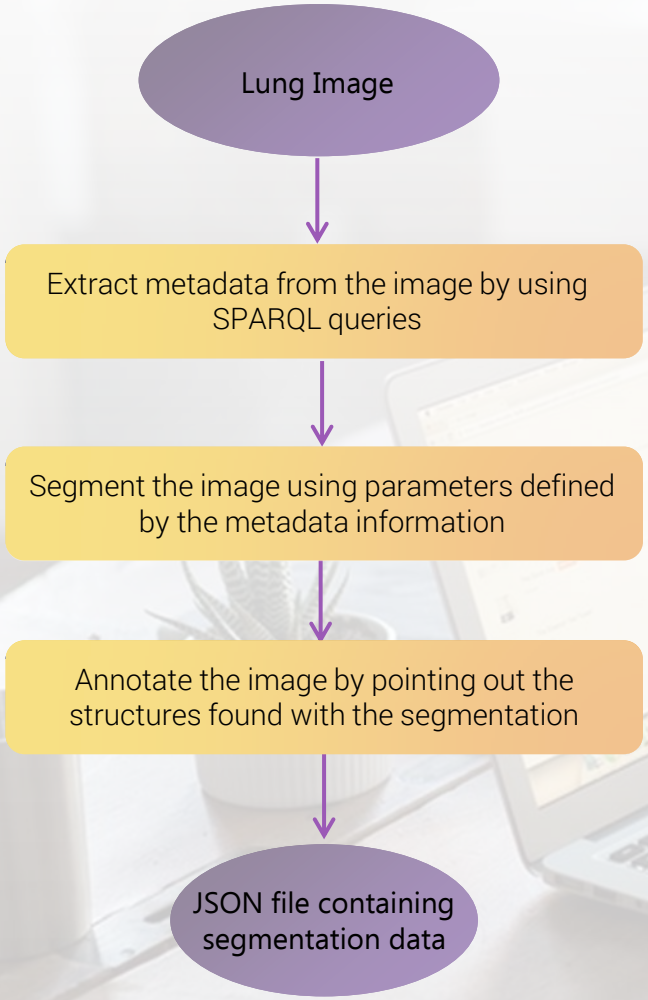
LungMap

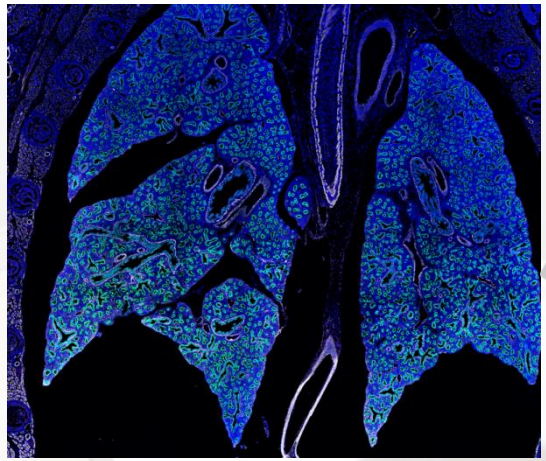
- Purpose and Strategy
- Image Segmentation
- Results and Future Steps

Introduction | Purpose and Strategy

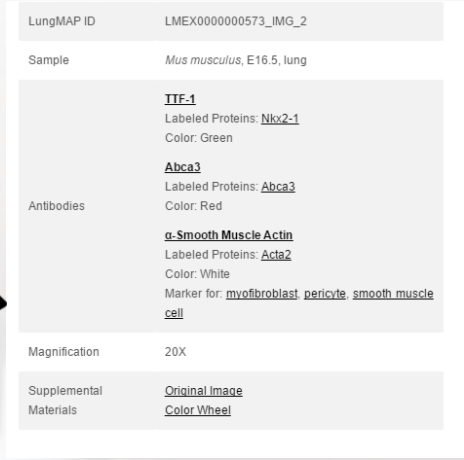
Purpose: develop a statistical learning pipeline to automatically classify immunofluorescent images of developing mouse lungs in the LungMAP database

Strategy:





Image



LungMAP ID	LMEX0000000573_IMG_2
Sample	*Mus musculus*, E16.5, lung
Antibodies	**TTF-1** Labeled Proteins: Nkx2-1 Color: Green **Abca3** Labeled Proteins: Abca3 Color: Red **α-Smooth Muscle Actin** Labeled Proteins: Acta2 Color: White Marker for: myofibroblast, pericyte, smooth muscle cell
Magnification	20X
Supplemental Materials	Original Image Color Wheel

Image Metadata

- Number of Bronchioles
- Number of Acinar Tubules
- Percentage area of muscle
- Etc…

Image information file

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Data

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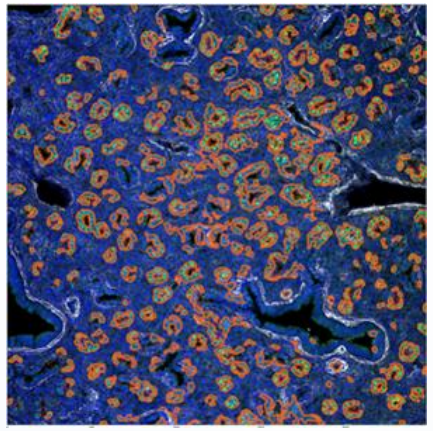
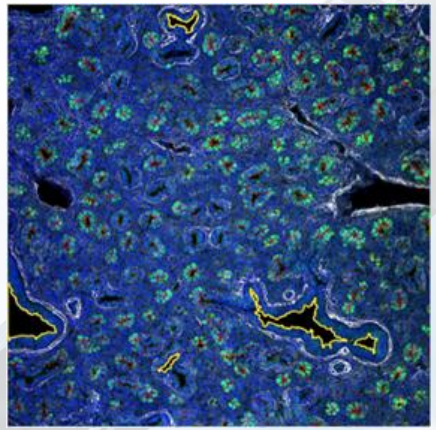
Progress | Image Segmenting



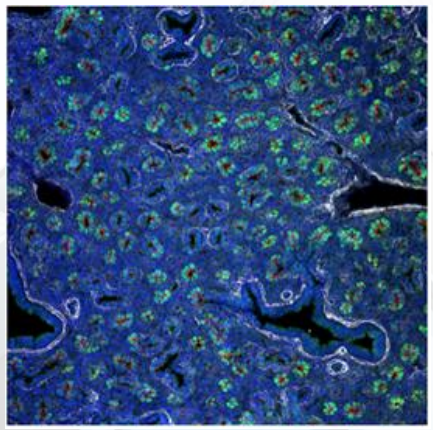
Acinar Tubule

Area Threshold: 400 pixels
Color: Green
Normalization of Green: Yes

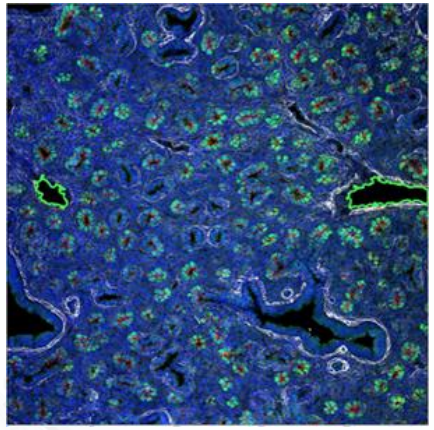


Bronchioles

Area Threshold: 3000 pixels
Color: Blue
Normalization of Green: No

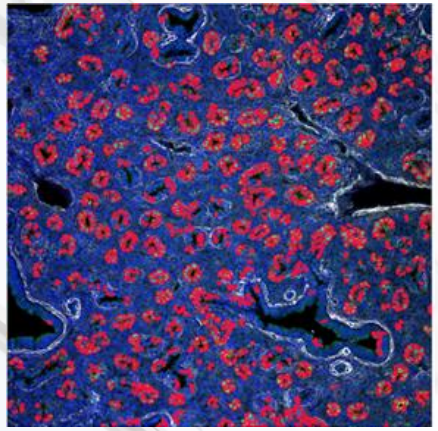


Original Image



Veins and Arteries

Area Threshold: 3000 pixels
Color: White
Normalization of Green: No



Sox9 marked cells

Area Threshold: 100 pixels
Color: Green
Normalization of Green: Yes

Using information gathered from the metadata for each image, we determine the specific combination of segmentation rules we wish to apply, as different images

We apply Gaussian blurring and normalization of colors, as well as area and color thresholding, to pick out the specific structures or cells that we want to identify

The images to the left depict various types of segmentation of the same image, all for different structures

Anatomical Structure	Number of Images Containing this Structure
Acinar Tubules	85
Sox9 marked cells	46
Club cells	133
Bronchioles and Veins	495

Data from the segmentation

Data+

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Conclusion | Results and Future Steps

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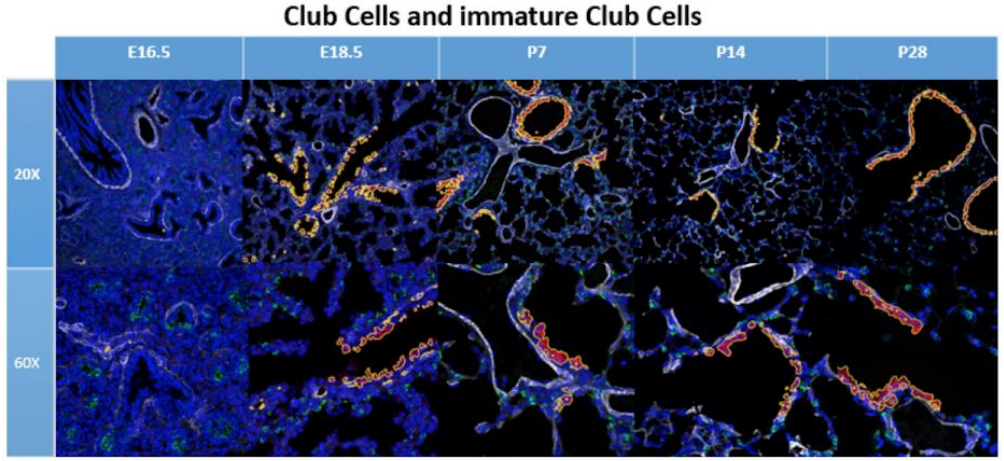
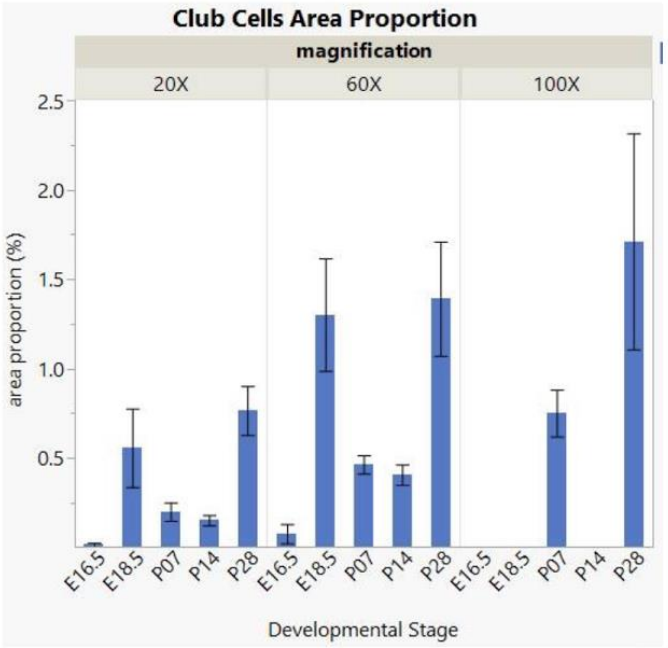
Results:





Data from various types of images from lungs at different stages of development

Future Steps:

- Developing pipeline for higher resolution image segmentation to detect more entity types.
- Making segmentation rules more robust with better normalization and the use of different algorithms
- Making functions more flexible and generic
- Enhancing web application usability and features
- Integrating of pipeline and web visualization application into LungMAP website

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