Image Analysis and Artificial Intelligence

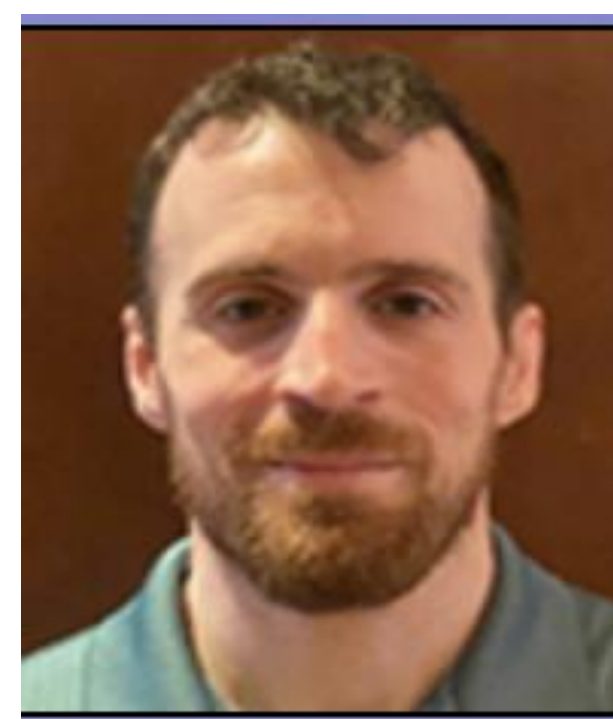## Pathology Support, Comparative & Molecular Pathogenesis Branch

Mission Statement

Provide automated image analysis and histopathological evaluation using artificial intelligence supported deep learning tools to enhance data rigor and reproducibility for DIR and DTT investigators and collaborating scientists
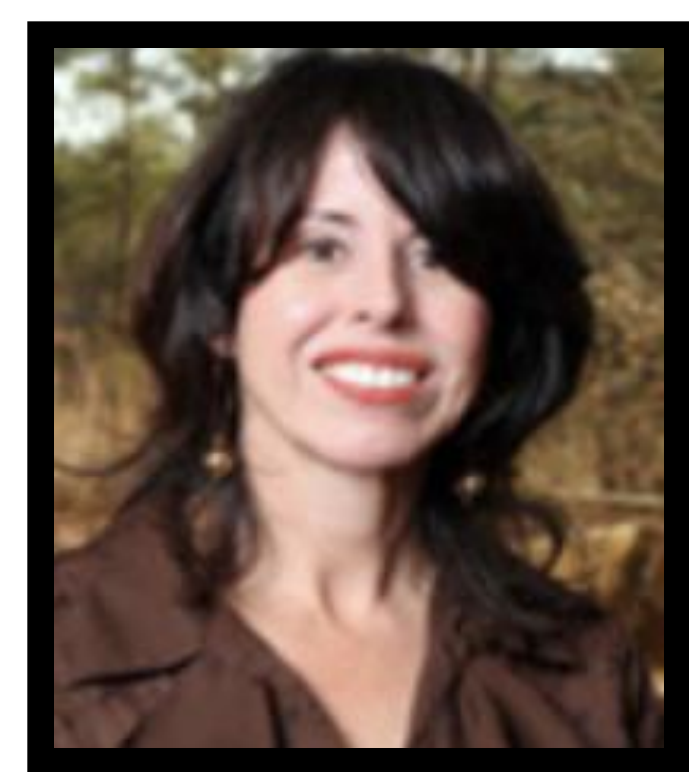
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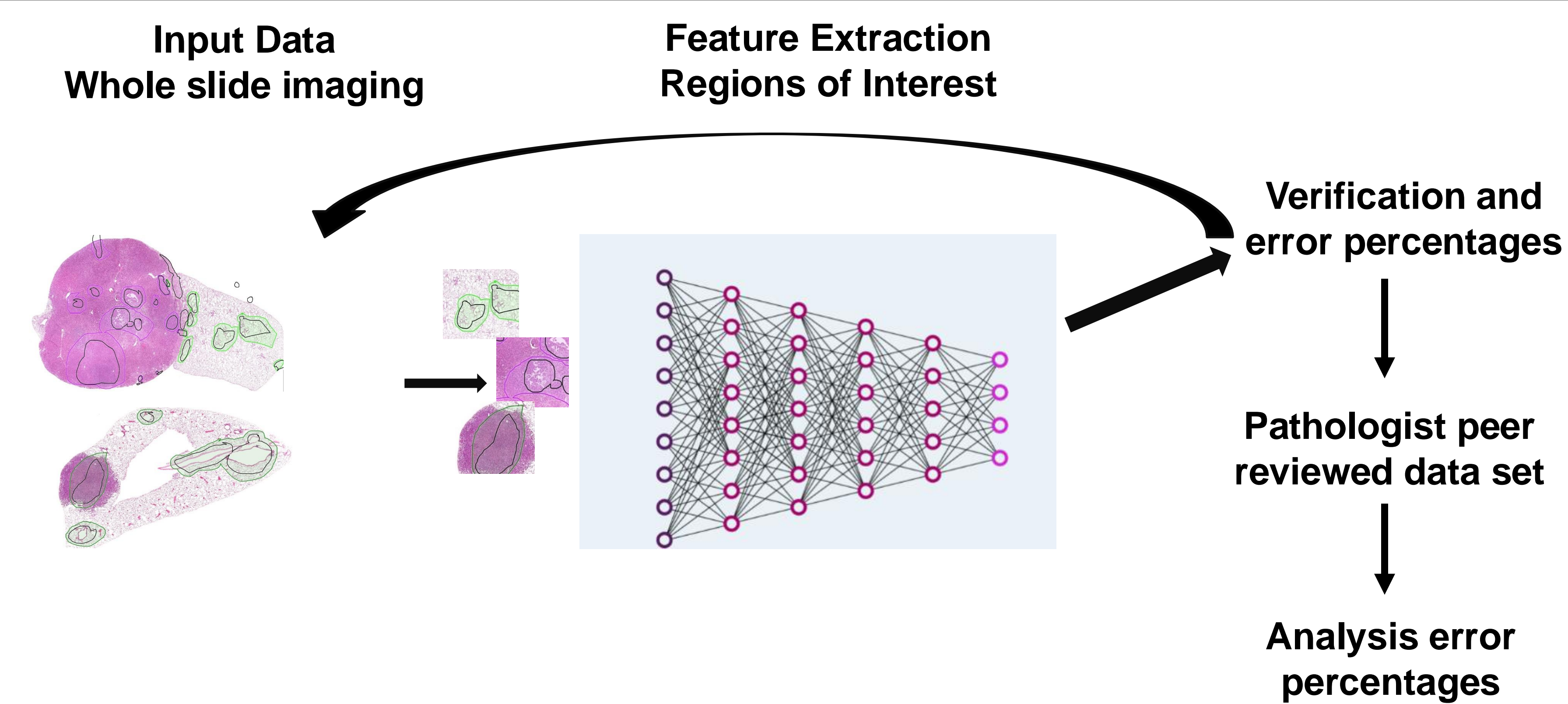Data Scientist
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Methodology

Input Data
Whole slide imaging

Feature Extraction
Regions of Interest

Verification and error percentages

↓

Pathologist peer reviewed data set

↓

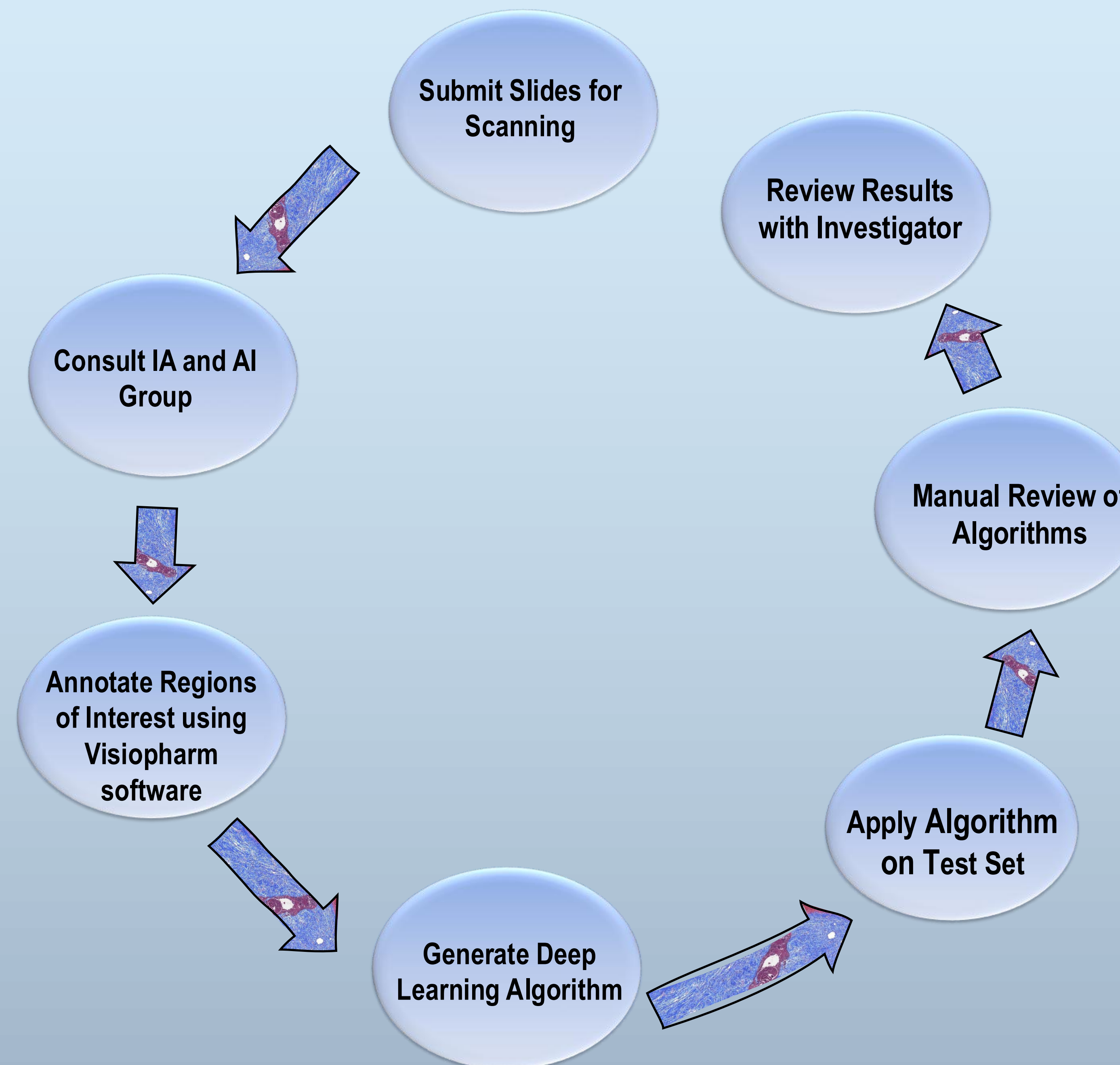Analysis error percentages

Capabilities

Supervised training of a convolutional neural network (CNN) using Visiopharm^R Digital Pathology & AI platform

We develop deep learning algorithms for automated image analysis, which include identification and quantification of immunohistochemical and special stains
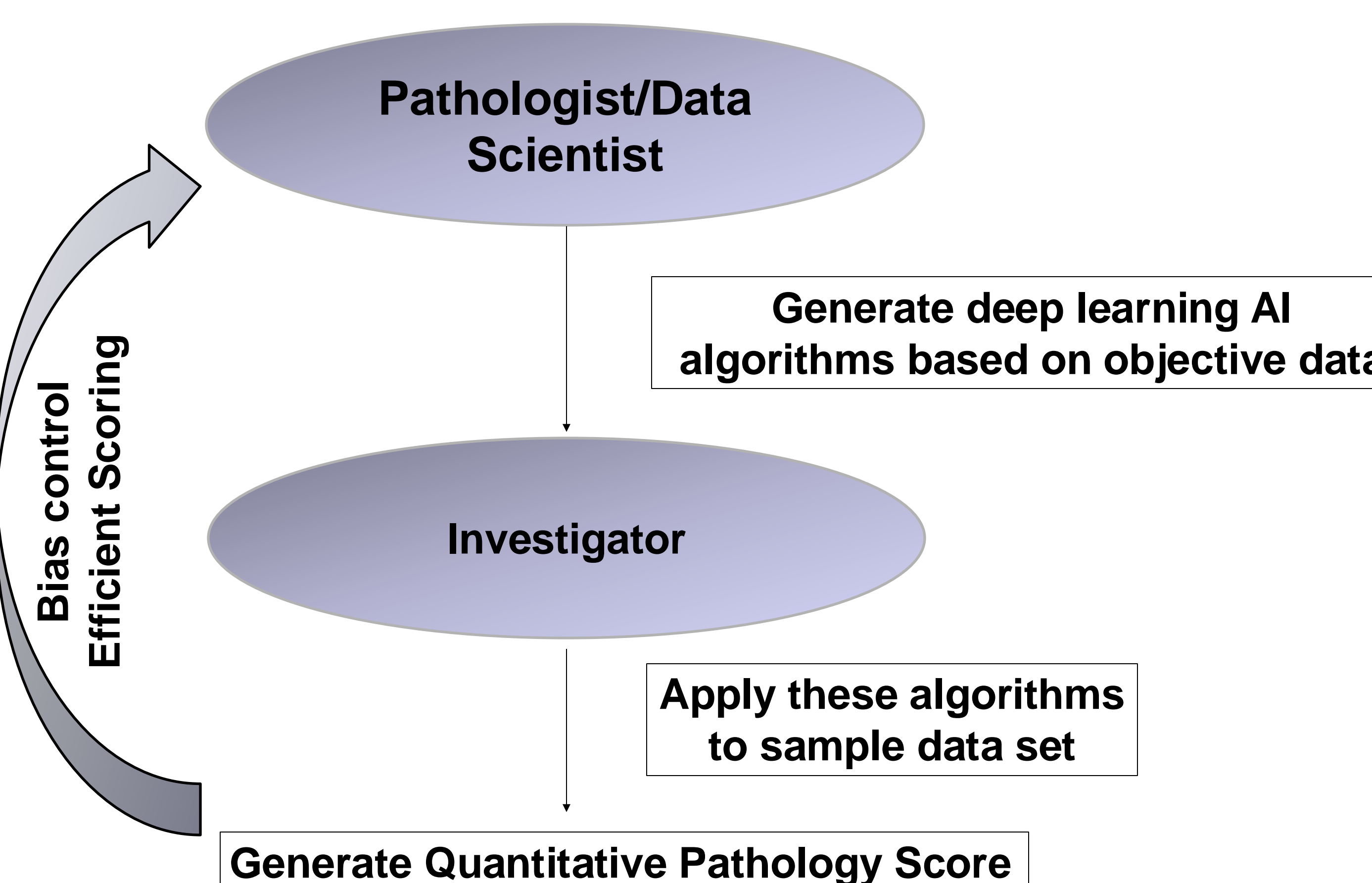
Develop deep learning algorithms for automated H&E whole slides image analysis for lesion identification and quantification

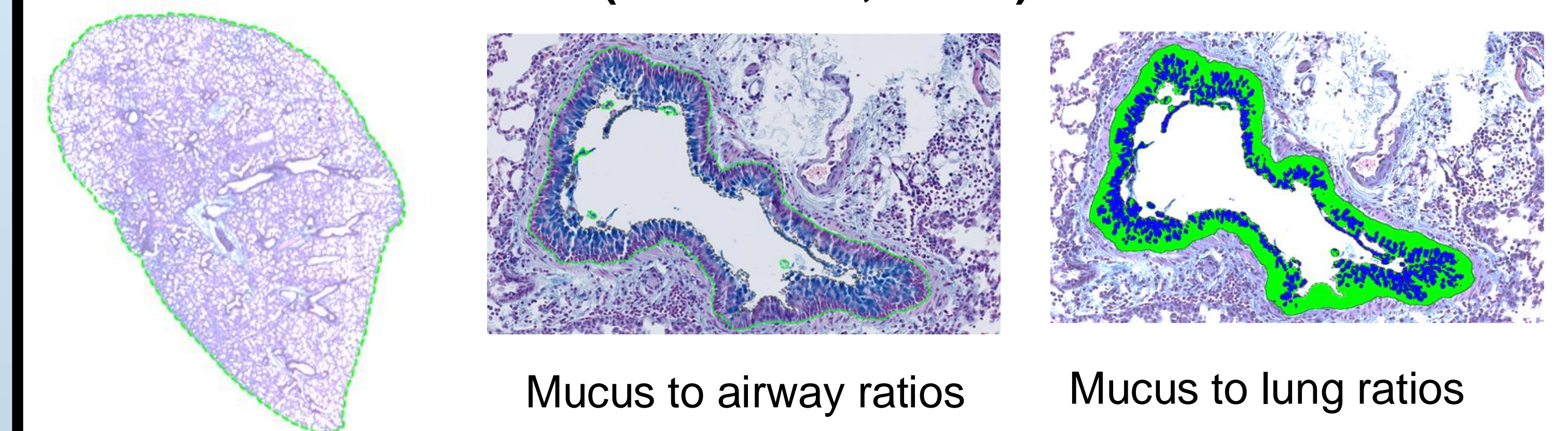Consultation with investigators

Work-Flow

- Submit Slides for Scanning
- Review Results with Investigator
- Consult IA and AI Group
- Manual Review of Algorithms
- Annotate Regions of Interest using Visiopharm software
- Apply Algorithm on Test Set
- Generate Deep Learning Algorithm

Summary

Pathologist/Data Scientist

Generate deep learning AI algorithms based on objective data

Bias control
Efficient Scoring

Investigator

Apply these algorithms to sample data set
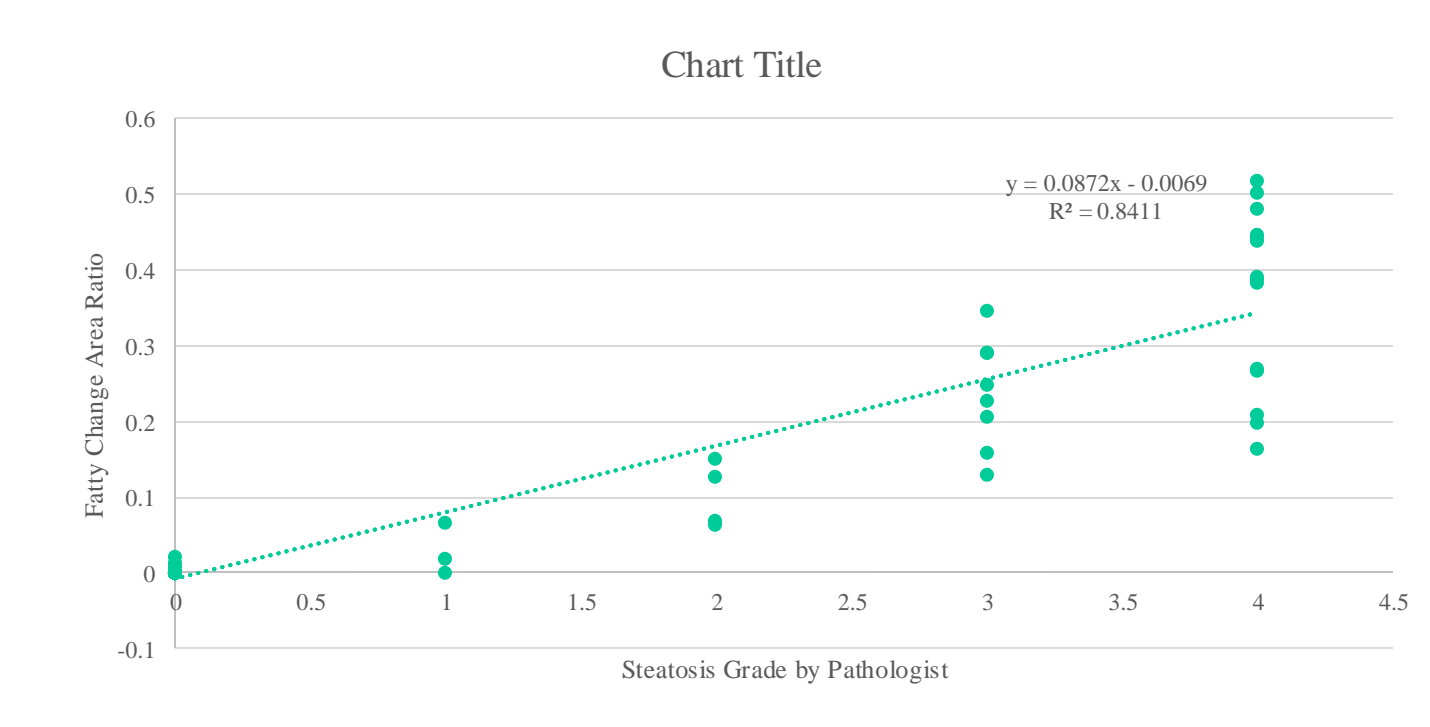
Generate Quantitative Pathology Score
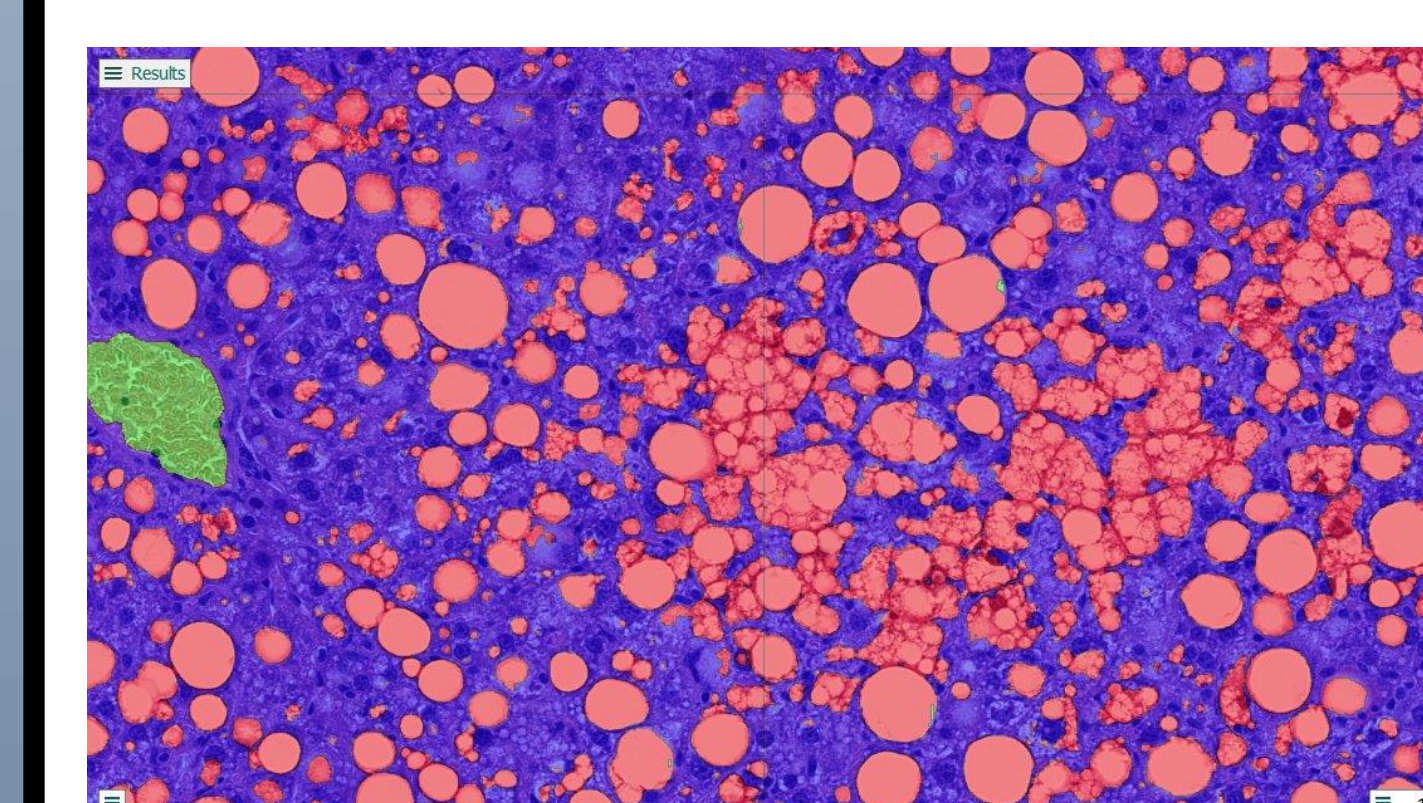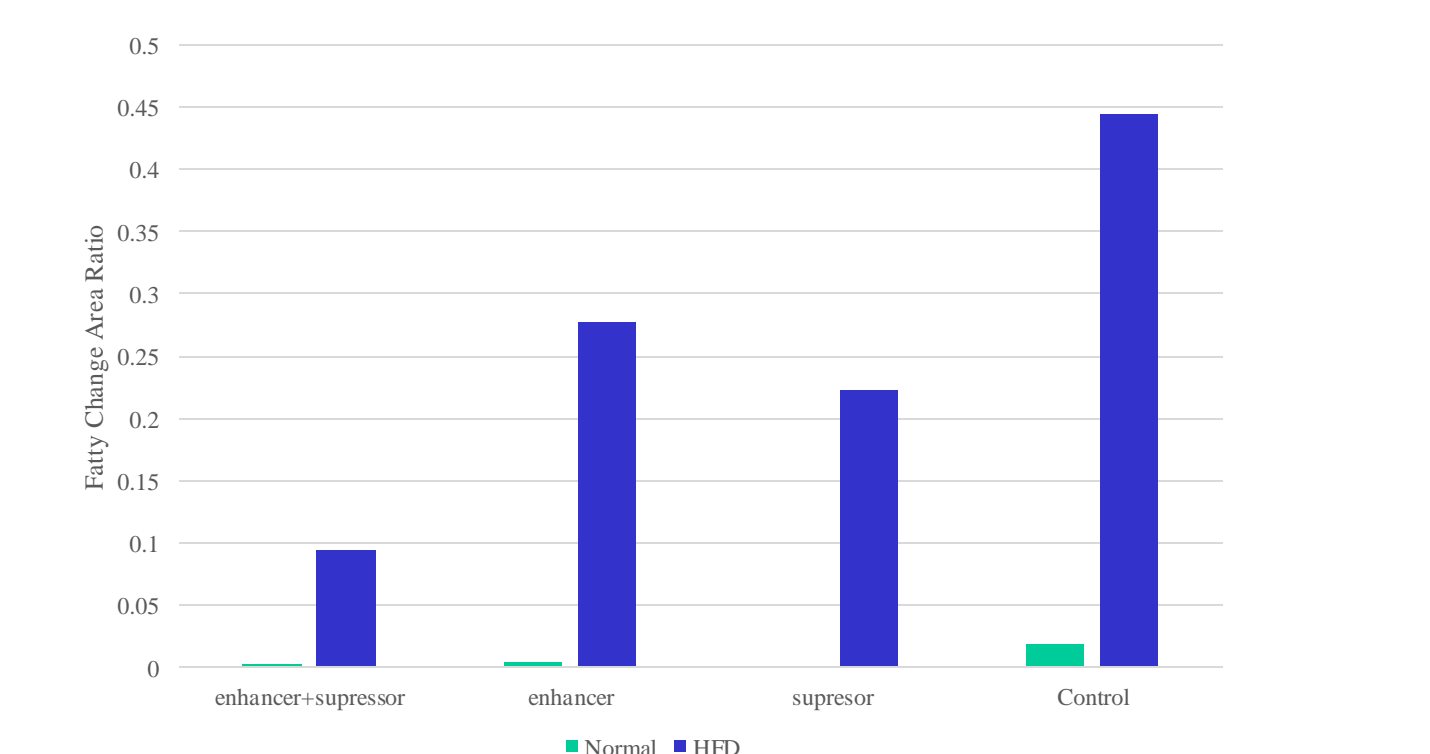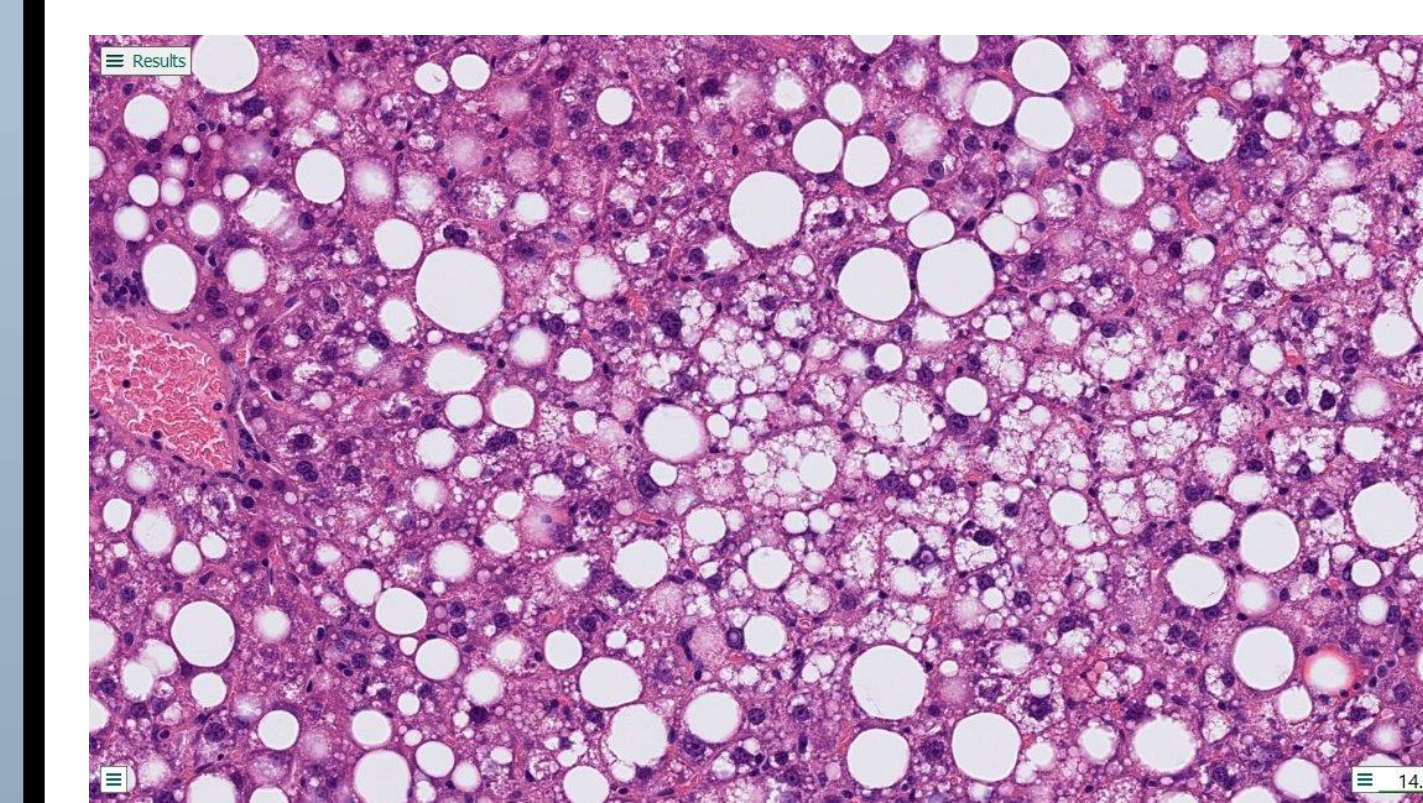
Projects Completed

AI-based image analysis in lung Alcian blue stained sections Chemokine CCL19 promotes type 2 T cell.
(Nakano H., et. al.)

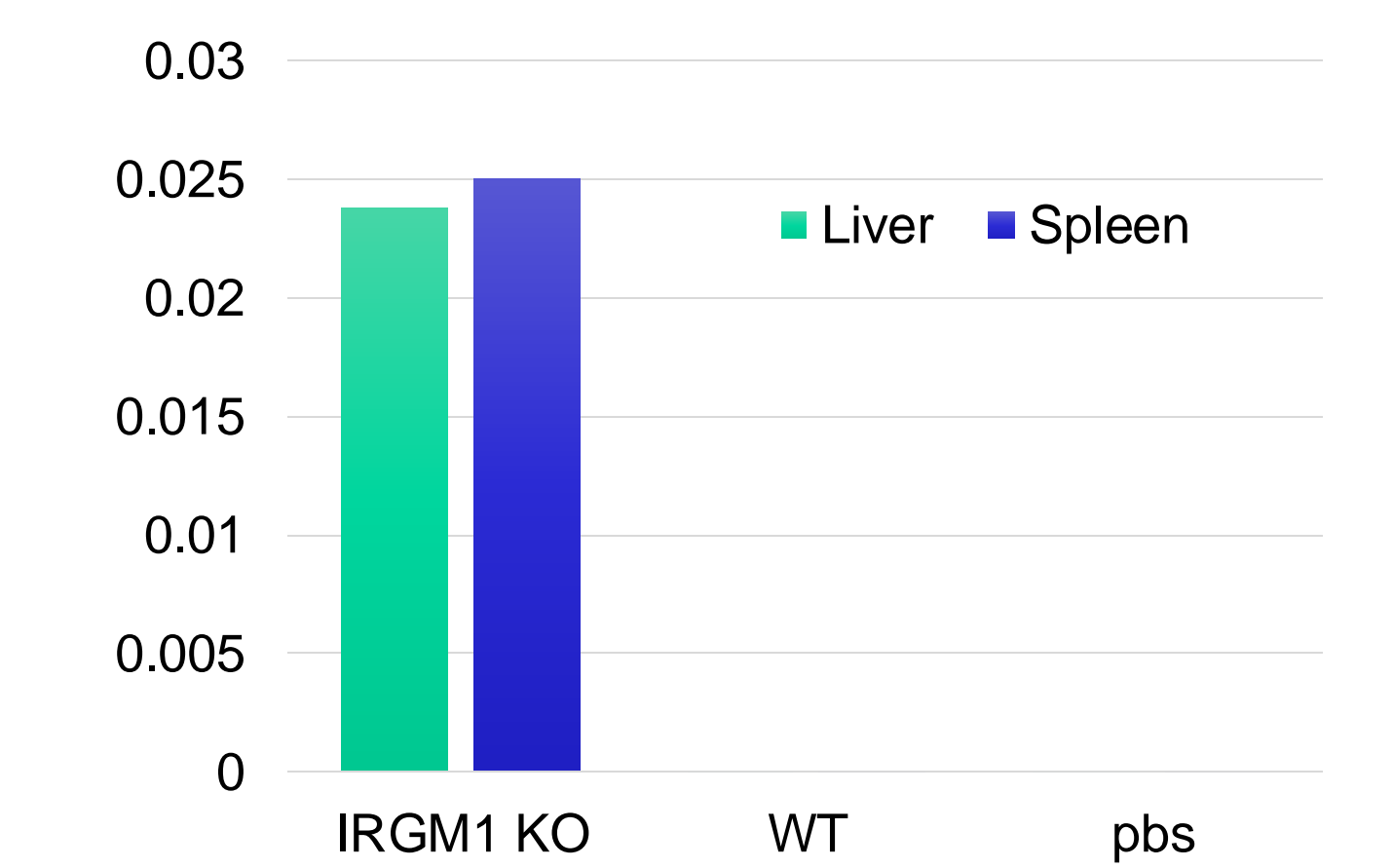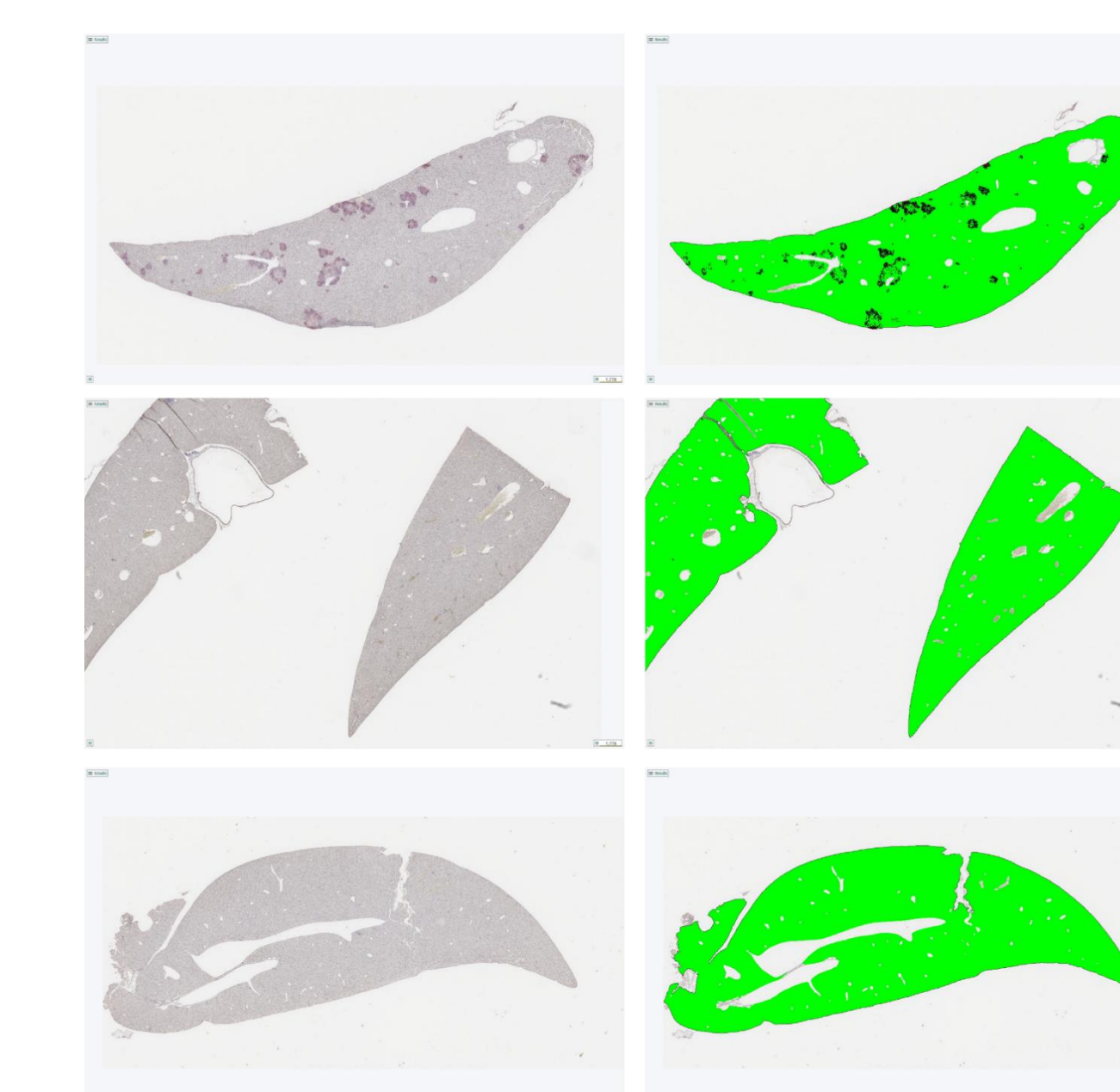Mucus to airway ratios   Mucus to lung ratios

Group	2	3	5	6
Mean	0.00077	0.00087	0.07402	0.08027
SD	0.00176	0.00082	0.06871	0.06855

Group	2	3	5	6
Mean	0.000016	0.000014	0.002249	0.002120
SD	0.000037	0.000013	0.002751	0.002018

Phenotypic characterization of genetically modified mice fed with normal and high fat diet.
(Drs. Blackshear and Arao et. al.)

Quantification of Listeria IHC staining

	IRGM1 KO	WT	pbs
Liver	0.0238468	0.0000313	0.0000038
Spleen	0.0250052	0.0000177	0.0000029