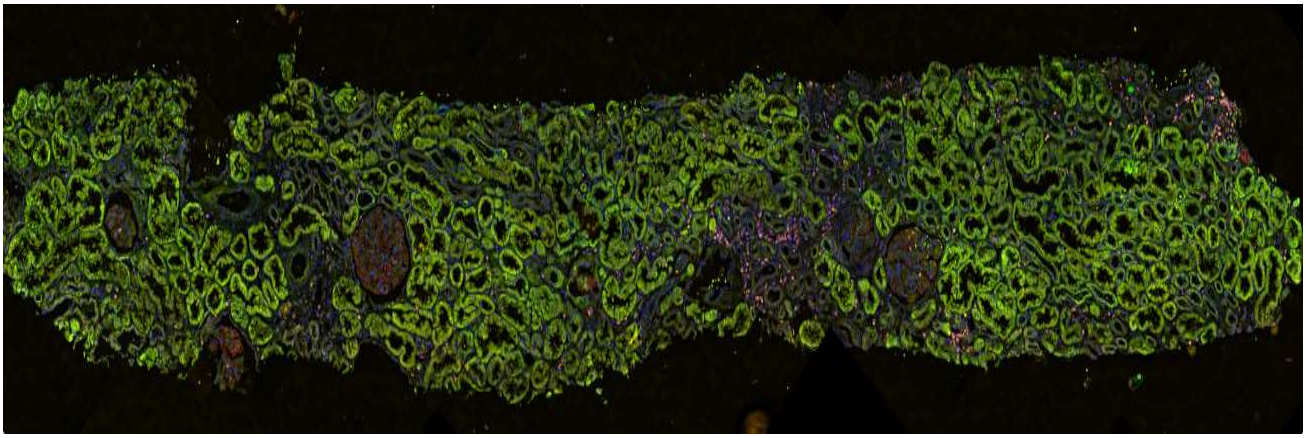
TISSUEGNOSTICS
PRECISION THAT INSPIRES

Machine Learning Tissue Classifier from TissueGnostics

2021.05.05 TissueGnostics



kidney biopsy stained for various markers including DAPI (blue), immune cell marker (white), glomeruli detection marker (red) and a marker to detect the tubules (green).

Healthcare systems stand to gain much from the application of artificial intelligence and machine learning algorithms. Currently, these cutting-edge technologies are deployed in medical applications in a fairly limited way; usually to complement the abilities of healthcare and surgical specialists. Deep learning software is typically used to expedite the analysis of visual data like computed tomographs (CTs) or histopathological imagery as medical professionals can easily validate findings that have been algorithmically derived.

Although machine learning has the potential to integrate extremely complicated data for in-depth diagnoses, their complex statistical structures may represent an issue of transparency which can make it difficult to meet regulatory standards.

Machine Learning Tissue Classifiers: Driving AI in Diagnostics

Machine learning tissue classifiers are among the most attractive AI-enhanced clinical solutions with feasible short-term applicability. They are powerful tools for all forms of tissue classification, providing data-driven insights into the morphology of diseased and healthy tissues alike. Additionally, the best machine learning tissue classifiers are equipped with intelligible algorithms that simultaneously provide more accurate detection of nuclei in difficult conditions while avoiding convoluted statistical structures.

Convoluted neural networks (CNNs) have parameters that are difficult to explain, thus it is difficult to ensure regulatory compliance when using CNN-based diagnostic systems.

At TissueGnostics, we have engineered a machine learning tissue classifier which can be combined with other algorithms integrated into the contextual image analysis software StrataQuest. One exceptional feature of the 7th generation StrataQuest package is a simple Deep Neural Network (DNN) designed for precise nuclear segmentation in challenging tissue environments including:

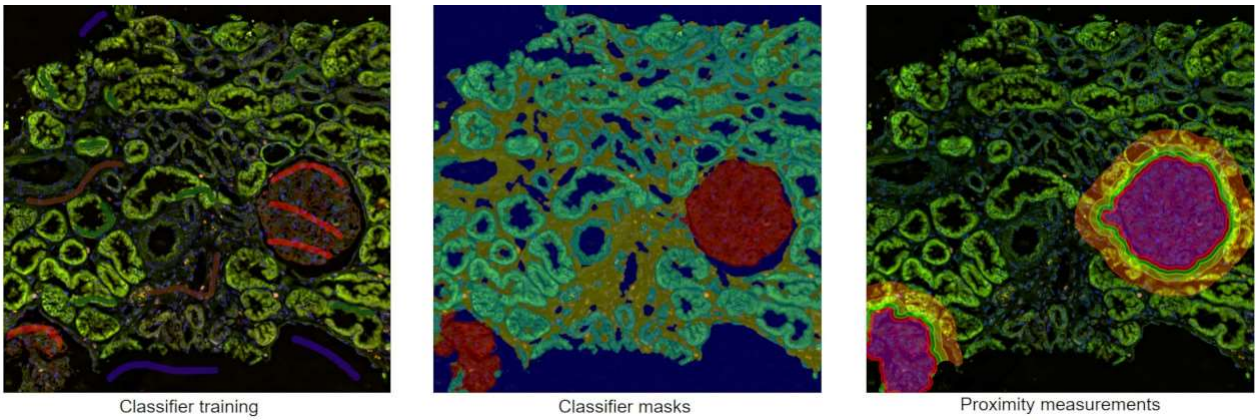
- Extreme cellular density
- High variation in nuclei size/texture
- Weak signal intensities

How Do Machine Learning Tissue Classifiers Work?

This depends on the software, so our answer to this question is exclusive to TissueGnostics' machine learning tissue classifiers equipped with StrataQuest 7 software.

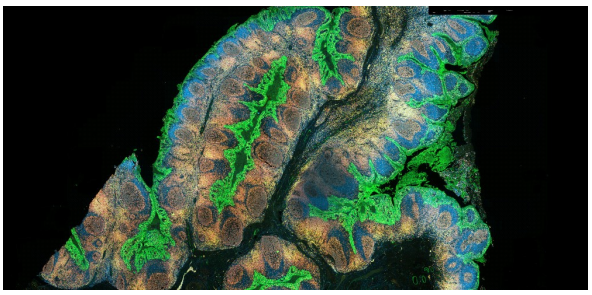
Our machine learning tissue classifier operates by highlighting the morphological entities in question via brushstrokes directly on the image – for example from interstitium, glands, tumor, colon crypts to tubules – and the background. The classifier only needs a representative number of these brushstrokes to discriminate between one tissue class and another. This enables the tissue classifier to generate binary masks for each detected morphological tissue entity. It does so autonomously, and with high degrees of accuracy. These classifier masks can be run through further analysis to gather even richer insights into tissue class-specific properties, from cell count to size.

The benefits of compliant machine learning tissue classifiers are self-evident when it comes to histopathology. Diagnosticians and pathologists can go beyond classical biopsy analysis by examining diseased tissues faster and with a greater depth of insight than ever before. Machine learning algorithms represent one of the best solutions for computer-aided histopathology due to their speed, accuracy, and relative simplicity.

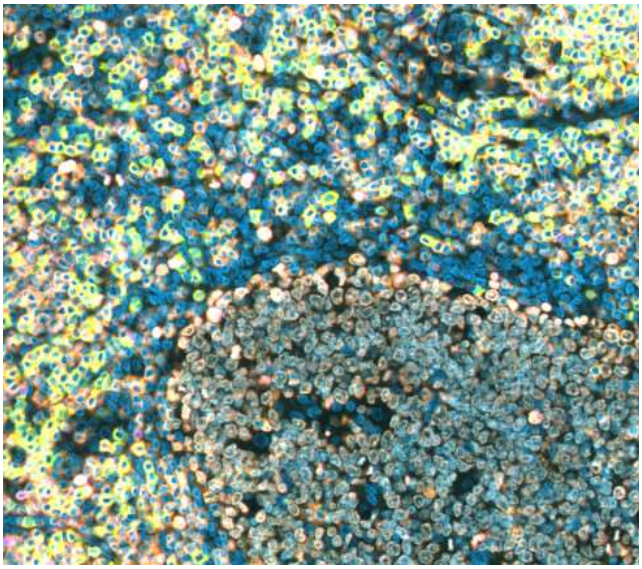


Tissue classifier operates by highlighting the morphological entities in question via brushstrokes directly on the image.

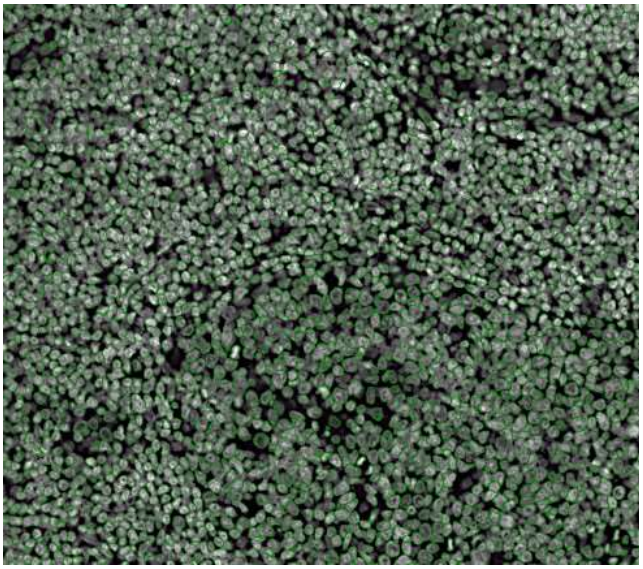
Refer to our example on the detection of nuclei within high density immune cell organs using the Deep Neural Network and the classifier for information on how our machine learning tissue classifiers are used in real-world scenarios.



Lymphoid organ



Detail view



DNN-based nuclear segmentation

If you have any questions about the specifications and costing of our AI-based classifier, why not contact a member of the team today?

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