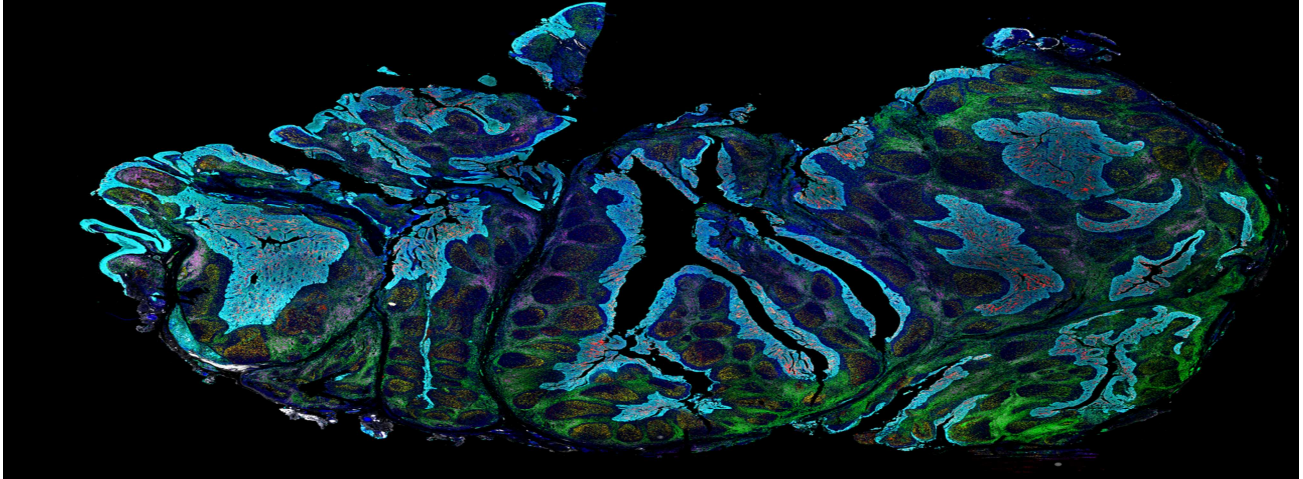


A Brief Introduction to Automated Tissue Classification

2021.04.05

TissueGnostics



Multiplexed IF staining on mouse embryo.

What is Tissue Classification?

Tissues are groups of cells in close proximity to one another which are organized to carry out one or more specific functions. There are four tissue classifications which are characterized by their morphology and function. These categories are; connective tissue, which underlies and supports other tissue types; nervous tissue, which transmits and integrates information across the central and nervous systems; epithelial tissue, which forms protective boundaries and is involved in the diffusion of ions and molecules; and muscle tissue, which contracts to facilitate movement in the body.

Tissue classification is the process of categorizing an unknown tissue sample into one of these categories, the ways in which these samples can be categorized will be

described in this article.

Connective tissue classification is centered around the composition of its cellular and extracellular elements and the internal bodily function. Tissues are either classified as proper, embryonic, or specialized.

Connective tissue is the most abundant tissue classification found in the human body.

Epithelium forms the covering of surfaces of the body. It has many purposes such as, adsorption, excretion, protection, filtration, and sensory reception. Epithelium fit closely together to form sheets of cells and are supported by connective tissue.

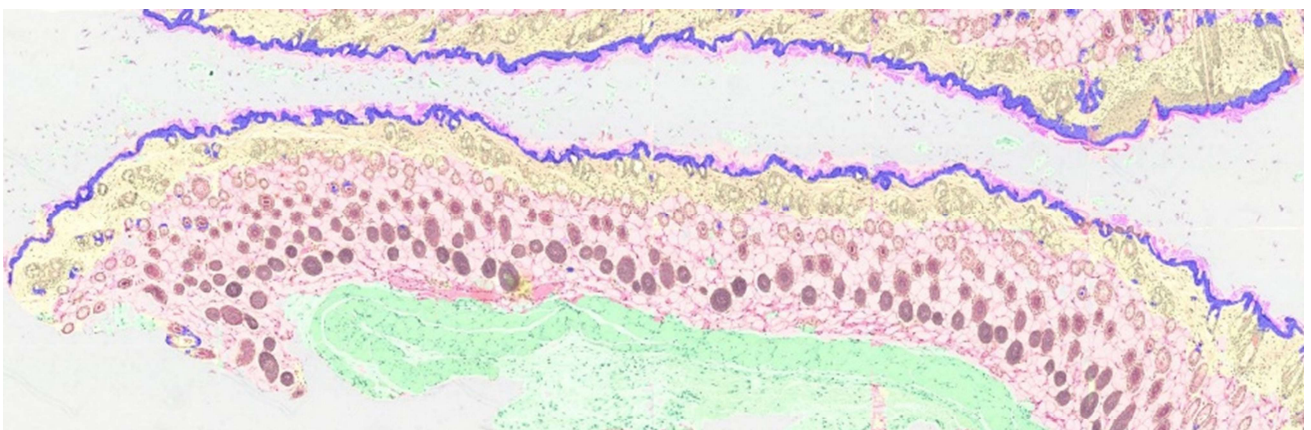
How is Tissue Classification Carried Out?

Traditionally, tissue classification is carried out via pathologist inspection of biopsy slides. Historically this has been the only way to get an accurate diagnosis, however there are now less pathologists working and more tissue classifications that need to be carried out. This is causing turnaround times to exceed standards. Using experts for classification can also result in discrepancies between practices of pathologists. High-resolution microscopy images or whole slide scans of tissue specimens offer comprehensive information about the morphology of normal and diseased tissue and are the basis for high-content image analysis. Tissue classification is a common task in tissue image analysis, however fully automated algorithms for tissue classification can be difficult to implement due to the complexity and heterogeneity of tissue morphology.

Automated tissue classification has achieved high levels of accuracy and tissue cytometers can be used to carry out tissue classification. This brings the same type of phenotypical and functional analysis which is used in flow cytometry (FACS) into the context of tissue on the level of single cells.

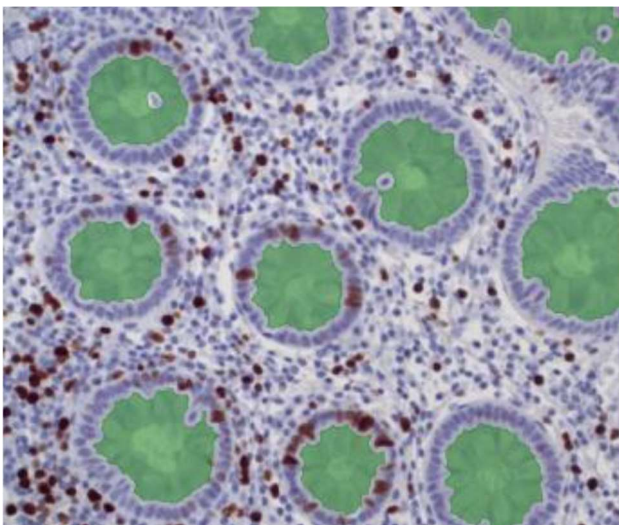
Machine Learning-based Tissue Classification Solutions from TissueGnostics

TissueGnostics is a solution provider for precision medicine and next-generation digital pathology, offering fully integrated, cutting-edge tissue cytometers. TissueGnostics' fully automated machine learning based tissue classification system works by marking a small number of areas representative for the morphological entities in question (i.e. tumor, stroma, epithelium, glands) including the background.

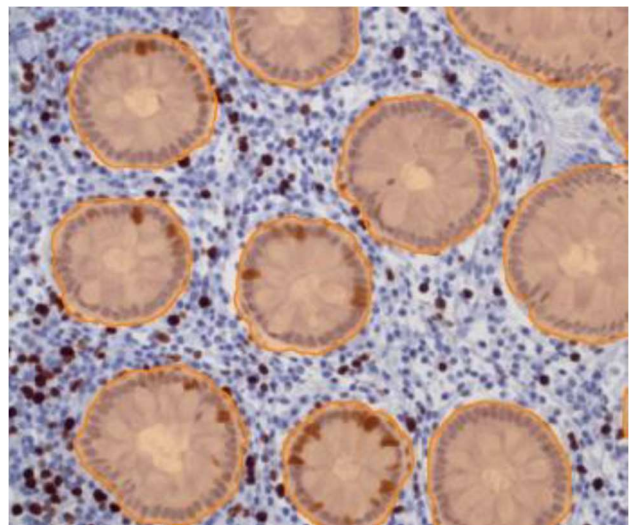


Tissue classifier identified 7 histological structures on H&E tissue section. 1. Background 2. Epidermis (blue) 3. Dermis (Yellow) 4. Subcutaneous fat (red) 5. Subcutaneous layer (green) 6. Glands (orange) 7. Artefacts, or dead tissue (magenta)

These defined areas will allow the classifier to separate the tissue into individual tissue classes, including the background and will generate binary masks for the detected areas. These classifying masks can be examined further by single cell analysis for high-content phenotyping including spatial analysis.



Classifier separated lumen areas in green contour



Classifier separated gland areas in orange contour

For more information about automated tissue classification from TissueGnostics, please contact us today.

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