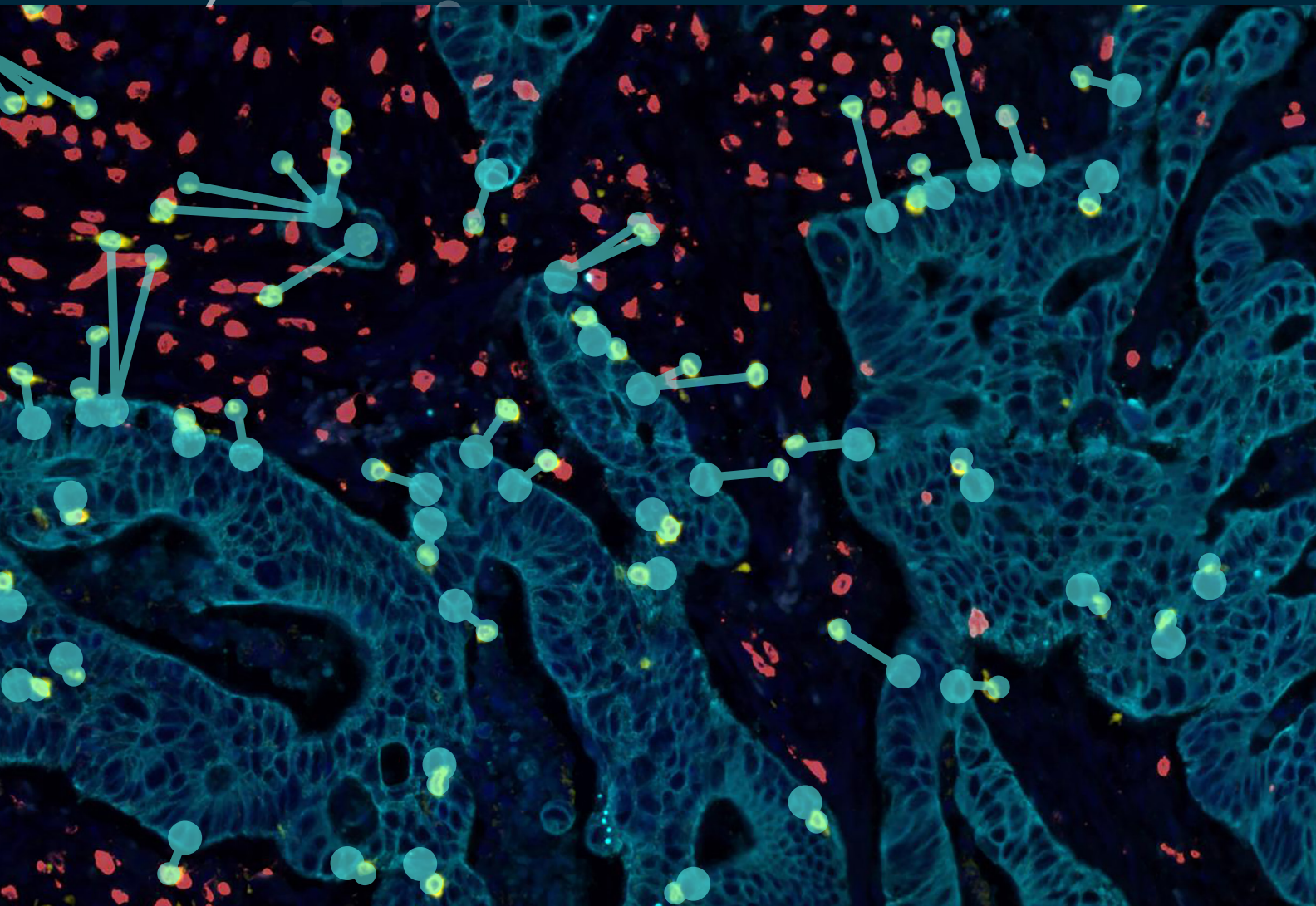




QUANTITATIVE TISSUE
INFORMATICS

indica labs



With unmatched ease-of-use, powerful analytic capabilities, and ultra-fast processing speeds, laboratories around the world depend on HALO® to achieve high-throughput, accurate analysis of their digital pathology slides in a broad range of research fields, including oncology, neuroscience, metabolism, transplant science, toxicological pathology and more.



IMAGE ANALYSIS SIMPLIFIED

Spend less time learning software and more time analyzing data. HALO's analysis tuning is fast and easy for experts and novices alike, without sacrificing data quality. No need to "build" analysis algorithms from scratch. HALO's flexible, purpose-built modules provide quick, quantitative results for a wide variety of tissue types.



RAPIDLY ANNOTATE SLIDES

Do you dread annotating digital slides using your current system? Cut annotation time in half with HALO's intuitive, flexible annotation tools. Draw free-hand or use the magnet pen tool to automatically 'snap' annotations to your tissues. Easily redraw, amend, move, rotate or copy-paste existing annotations. Better still, teach the classifier module to automatically select tissues of interest for analysis across all images in a study.



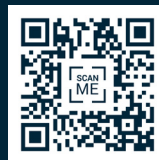
ACCELERATE YOUR ANALYSIS

Digital slides are large and bog down conventional analysis systems. HALO's parallel processing technology and optimized algorithms yield up to 4 times the analysis rate of competitive solutions using the same standard hardware. Organizations with greater throughput demands can couple HALO with our performance boosting analysis clusters.



EASILY **EXPLORE** CELLULAR DATA

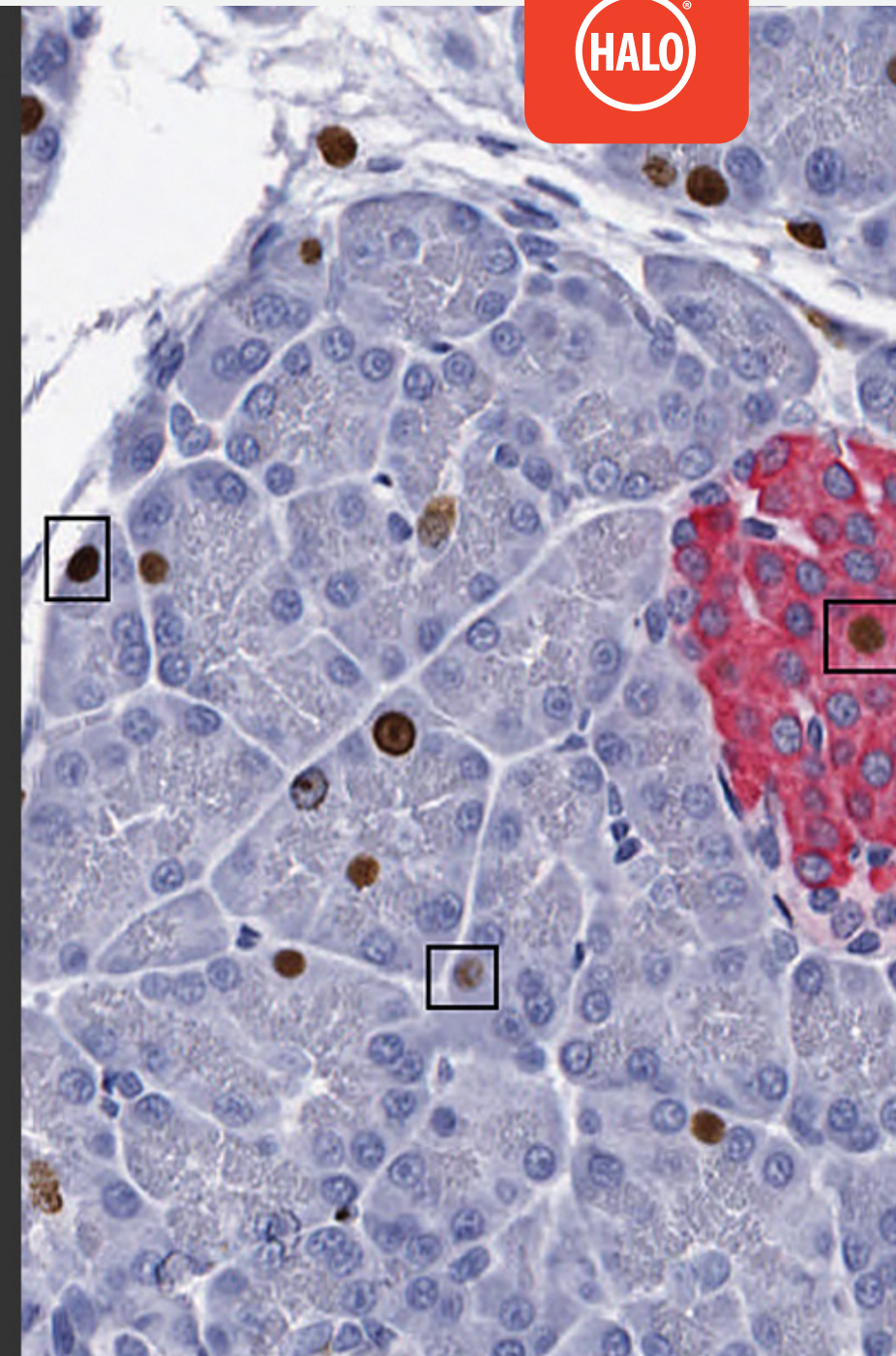
HALO reports morphological and multiplexed expression data on a cell-by-cell basis across entire tissue sections and maintains an interactive link between cell data and cell image. Sorting and filtering capabilities allow the user to mine millions of cells while visually assessing corresponding cell populations. For example, sort cells according to biomarker intensity and immediately locate cells with highest intensity in the image. Just imagine the endless possibilities.



| Studies | TMA | Annotations | Classifiers | Analysis | Results |
|---|-----|--------------|-------------|----------|---------|
| 8/16/2016 8:12:36 AM - CytoNuclear [field of view] Result Actions | | | | | |
| % Stain 1 Positive Cells | | 35.9223 | | | |
| % Stain 1 0+ Cells | | 64.0777 | | | |
| % Stain 1 1+ Cells | | 0.970874 | | | |
| % Stain 1 2+ Cells | | 6.79612 | | | |
| % Stain 1 3+ Cells | | 28.1553 | | | |
| % Stain 2 Positive Cells | | 66.0194 | | | |
| % Stain 2 0+ Cells | | 33.9806 | | | |
| % Stain 2 1+ Cells | | 21.3592 | | | |
| % Stain 2 2+ Cells | | 43.6893 | | | |
| % Stain 2 3+ Cells | | 0.970874 | | | |
| % Dual Positive Cells | | 1.94175 | | | |
| % Dual Negative Cells | | 0. | | | |
| Avg Stain 1 Nuclear OD | | 0.209967 | | | |
| Avg Stain 2 Nuclear OD | | 0.11562 | | | |
| Avg Stain 1 Cytoplasmic OD | | 4.89367e-002 | | | |
| Avg Stain 2 Cytoplasmic OD | | 0.16623 | | | |

| HALO Stain 2 Cell Bins | | | | | |
|------------------------|--|--|--|--|--|
| | | | | | |

| Object Actions 4 Object(s) Selected | | | | | |
|-------------------------------------|--------------------|----------------------|-----------------------|--------------------|-----------------|
| Stain 1 Classifica... | Stain 1 Nucleus OD | Stain 1 Cytoplasm OD | Stain 2 Classifica... | Stain 2 Nucleus OD | Stain 2 Cyto OD |
| 2 | 0.302737 | 0.0700805 | 0 | 0.0354724 | |
| 3 | 0.69897 | 0.0720863 | 0 | 0.0700805 | |
| 3 | 0.574031 | 0.0905697 | 0 | 0.0486052 | |
| 3 | 0.410905 | 0.0720863 | 0 | 0.0373242 | |
| 3 | 0.6072 | 0.0582354 | 2 | 0.0926728 | |
| 3 | 0.690537 | 0.0700805 | 0 | 0.0582354 | |
| 2 | 0.242187 | 0.0822577 | 0 | 0.0410521 | |
| 3 | 0.520049 | 0.0562921 | 2 | 0.0947864 | |
| 3 | 0.62121 | 0.0680838 | 0 | 0.0562921 | |
| 3 | 0.628389 | 0.0601871 | 0 | 0.0621479 | |
| 2 | 0.273001 | 0.0621479 | 0 | 0.0429282 | |
| 3 | 0.62121 | 0.101189 | 0 | 0.0486052 | |



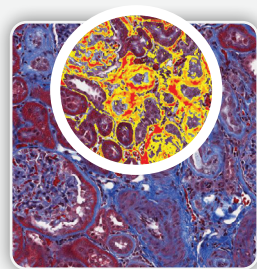


GROW WITH HALO

HALO offers a modular platform that can expand with your needs. Start with a few modules and add more as your needs change. Use HALO on a single workstation or ramp up to a server-based license for your entire group. HALO is flexible enough for any budget.



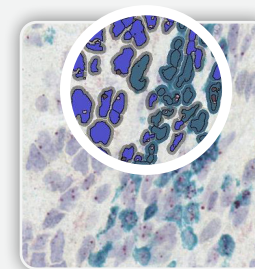
GENERAL **BRIGHTFIELD** MODULES



AREA QUANTIFICATION

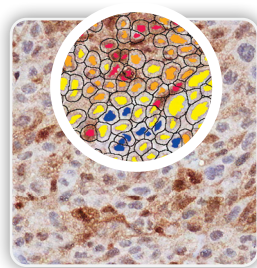
Measure positive stain area and optical density for up to five stains, categorize pixels according to stain density (negative, weak, moderate, or strong positive), and measure percentage colocalization of stains.

Included free with any HALO bundle.



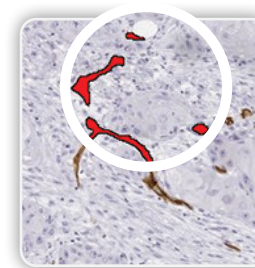
ISH-IHC QUANTIFICATION

Measures one IHC stain and up to two chromogenic and/or silver-labeled DNA or RNA ISH probes on a per cell basis. The ISH-IHC module supports the recommended H-score protocol for RNAscope® quantification.



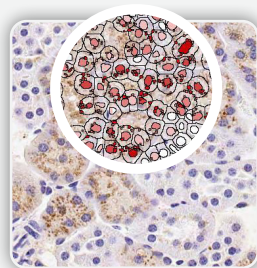
SINGLE & MULTIPLEXED IHC

Quantify positivity for up to 5 stains in any cellular compartment (nucleus, cytoplasm, and membrane) and output user-defined cell phenotypes based on stain positivity on a per cell basis.



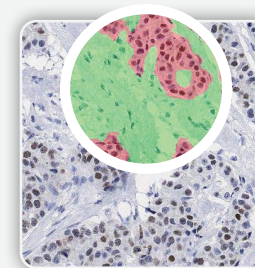
OBJECT QUANTIFICATION

Count microvessels and other macro-cellular objects. Measure one or two differently stained objects in a single tissue, quantify object area, optical density, and colocalization of object(s).



ISH QUANTIFICATION

Analyze CISH, SISH, RNA ISH, or virtually any type of 'spot' within the nucleus and/or cytoplasm. Quantify one or two probes and report number of probe signals per unit area or per cell. Supports the recommended H-score protocol for RNAscope® quantification.

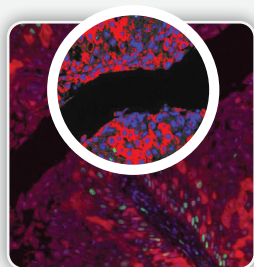


TISSUE CLASSIFICATION

Separate tissues classes, such as tumor and stroma, across whole slides using a learn-by-example approach. Can be used in conjunction with all other modules to select specific tissue classes for further analysis.

Available for both brightfield and fluorescent applications.

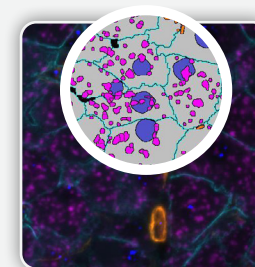
GENERAL **FLUORESCENCE** MODULES



AREA QUANTIFICATION FL

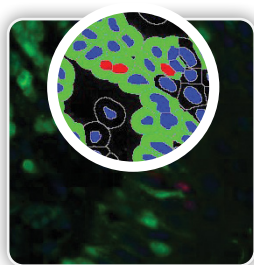
Measure positive dye area and intensity for an unlimited number, categorize pixels according to stain intensity (negative, weak, moderate, or strong positive), and measure percentage colocalization of dyes.

Included free with any HALO bundle.



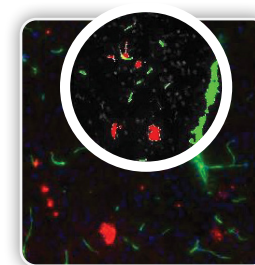
FISH-IF QUANTIFICATION

Quantify an unlimited number of fluorescently-labeled proteins and DNA/RNA probes on a per cell basis. FISH-IF supports the recommended H-score protocol for RNAscope® quantification.



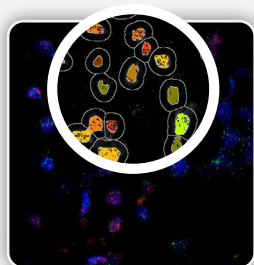
SINGLE & MULTIPLEXED IF

Quantify intensity and overall positivity for an unlimited number of biomarkers in any cellular compartment (nucleus, cytoplasm, and membrane) and output user-defined cell phenotypes based on biomarker positivity on a per cell basis.



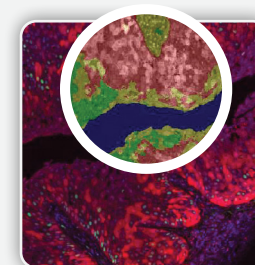
OBJECT QUANTIFICATION IF

Count microvessels and other macro-cellular objects. Measure one or two objects stained with different fluorophores, quantify object area, intensity, and colocalization.



FISH QUANTIFICATION

A collection of modules for quantifying fluorescence in situ hybridization, including amplification-deletion, break-apart-fusion, and multiplexed RNA and DNA analysis (unlimited probes). Multiplex FISH supports the recommended H-score protocol for RNAscope® quantification.

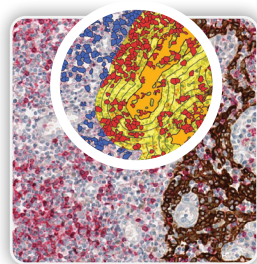


TISSUE CLASSIFICATION

Separate tissues classes, such as tumor and stroma, across whole slides using a learn-by-example approach. Can be used in conjunction with all other modules to select specific tissue classes for further analysis.

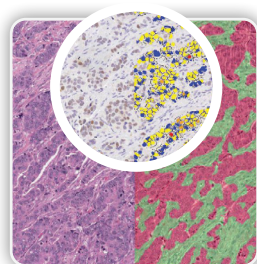
Available for both brightfield and fluorescent applications.

ONCOLOGY MODULES



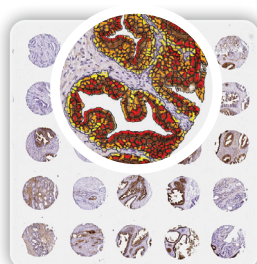
IMMUNE CELL QUANTIFICATION

Quantify cells labeled with common immune cell markers (CD3, CD4, CD8, PD1, PDL1). When used in combination with a second stain, the proximity of immune cells to the second stain can also be measured. For example, proximity of CD8+ immune cells to cytokeratin + tumor area.



SERIAL SECTION AND STAIN ANALYSIS

Serial section analysis allows you to transfer tissue classification masks to registered serial sections so that the same overlapping areas are analyzed on adjacent slides. Serial stain analysis facilitates overlay of images captured through repeated staining and stripping of the same slide so that all markers are analyzed in a single image.



TISSUE MICROARRAY SEGMENTATION

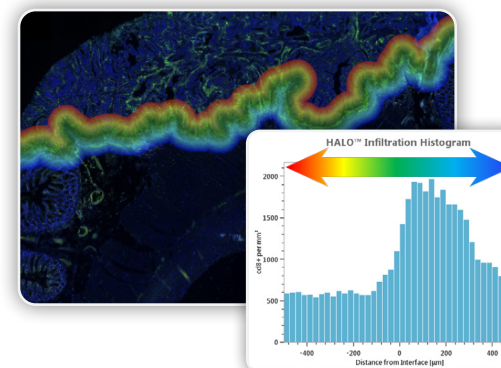
Easily segment TMA slides into individual spots for further analysis. Create TMA maps manually or import from spreadsheet, remove spots with insufficient tissue or artifacts, and run analysis across one or all TMA spots in batch.

SPATIAL ANALYSIS



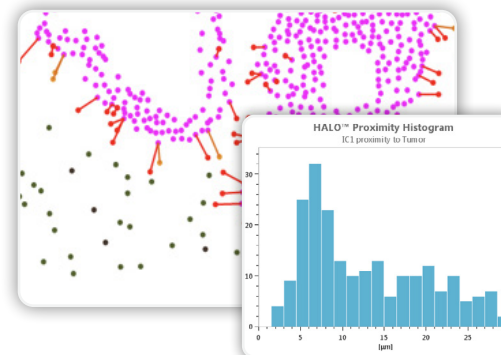
NEAREST NEIGHBOR ANALYSIS

Calculates the average distance between any two cell or object populations. In this example, we measure the average distance between tumor cells (blue) and CD4+ cells (red).



INFILTRATION ANALYSIS

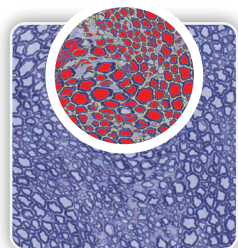
Quantify the number of cells or objects within a user defined range of an annotated region of interest. Here a tumor boundary (green line) is drawn by the pathologist and the density of CD8+ cells within 500 μm on either side of this boundary are quantified and plotted as a histogram.



PROXIMITY ANALYSIS

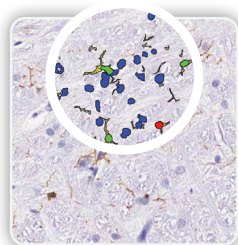
Quantify the number of cells within a user-defined distance of another cell population and output a customizable histogram. In this example, we quantify CD8+ cells within 30 μm of tumor cells (pink). Proximal CD8+ cells (red) are connected to the nearest neighboring tumor cell by a red proximity line. Non-proximal CD8+ cells are labeled in green.

NEURO | MUSCULAR | VASCULAR MODULES



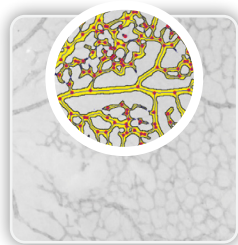
AXON QUANTIFICATION

Quantify axons in cross sections. Calculate axon area, myelin area, myelin thickness, inner and outer axon diameter, and G-ratio.



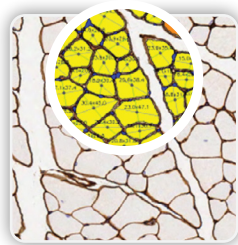
MICROGLIAL QUANTIFICATION

Quantify microglial activation based on length and thickness of microglial processes. Outputs total number of active and inactive microglia, average number of processes per cell and area, length, and thickness of processes per cell.



BRANCH STRUCTURE

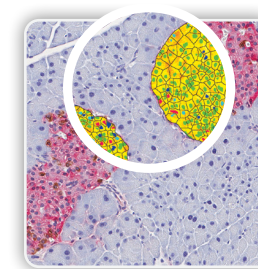
Quantify labeled branched objects, for example retinal vascularization or nerve branching. Measure number of branch points and end points, length, thickness and area of branches. Available for both brightfield and fluorescent applications.



MUSCLE FIBER QUANTIFICATION

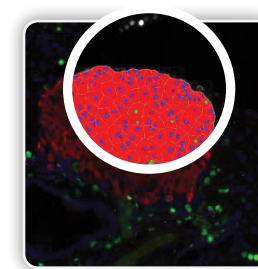
Quantify area, perimeter and mean/median/maximum diameter of muscle fibers stained with laminin or other stain to highlight fiber membrane. Count muscle fibers with central nucleus (indicative of regeneration).

METABOLISM MODULES



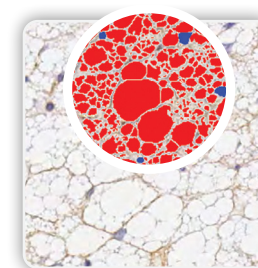
ISLET QUANTIFICATION IHC

Count islets stained with up to two stains in addition to nuclear counterstain, quantify number of stained cells in each islet, and determine area of islets stained with each islet-specific stains. For example, count insulin – and glucagon-positive cells per islet.



ISLET QUANTIFICATION FL

Count islets stained with up to three dyes in addition to nuclear dye, determine number of cells positive for each dye within each islet, and quantify islet area and total tissue area that is positive for each dye. For example, count number of insulin, glucagon, and somatostatin-positive cells per islet.



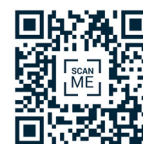
VACUOLE QUANTIFICATION

Measure vacuole area, diameter, perimeter and number of vacuoles per cell. Quantify lipid droplets in any tissue, including liver (steatosis) and adipose tissue.



HALO Link combines image management with HALO image analysis and takes it to the web to allow **secure anywhere, anytime access** to study data, slides and analysis results.

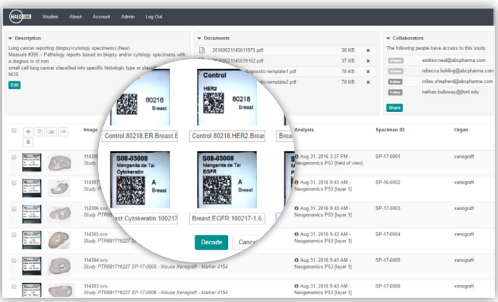
With support for almost every digital slide format on the market including multi-channel fluorescence, HALO Link is the perfect solution for multi-user HALO installations, large labs/ departments, core facilities, contract research organizations or any other organization that need to securely manage and share slides and analysis data.



HALO LINK FEATURES

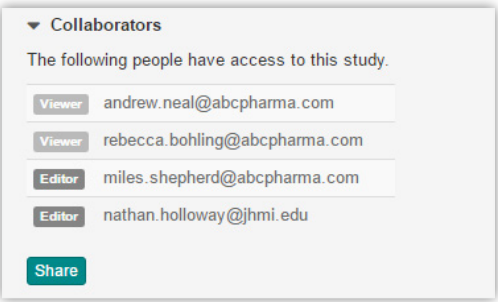
MANAGE SLIDES

Organize slides into studies with a uniquely flexible design through customizing study fields, automatically importing metadata using barcodes, and integration with LIS systems or other databases.



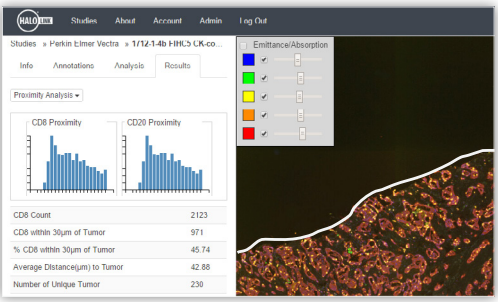
SHARE SECURELY

Securely share pathology images and study data with colleagues inside or outside of your organization by assigning user and study-specific access controls, and collaborate in real-time with integrated slide conferencing.



ANALYZE REMOTELY

Full integration with HALO allows users to analyze slides remotely and view HALO analysis results and markups anywhere, anytime.



VISUALIZE TRENDS

Create scatterplots from analysis results for all slides in a study to visualize data trends and perform quality control.





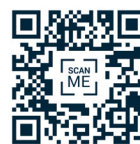
THE POWER OF ARTIFICIAL INTELLIGENCE IN THE HANDS OF THE PATHOLOGISTS

Neural network driven tissue classification & segmentation for research & routine pathology

HALO AI includes a collection of train-by-example classification and segmentation tools underpinned by advanced deep learning neural network algorithms. HALO AI classifiers can be trained to segment challenging nuclei, to categorize cell populations into specific phenotypes, to quantify tissue classes, and to select specific tissue classes for analysis with other HALO modules.

HALO AI is integrated with **HALO** and **HALO Link** providing users an intuitive interface for training and the ability to seamlessly collaborate with pathologists and scientists around the world on HALO AI projects.

HALO AI puts the power of deep learning artificial intelligence into the hands of pathologists and researchers.

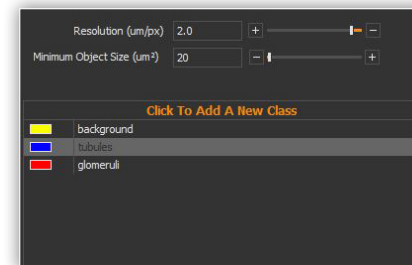


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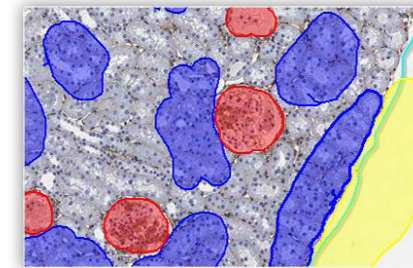
HALO AI FEATURES

SIMPLE & INTUITIVE WORKFLOW

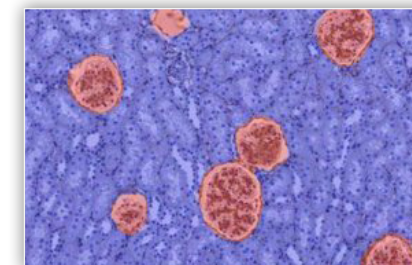
HALO AI employs a simple three-step workflow. After defining what tissue classes to segment, pathologists can train the neural network by drawing annotations – no computer programming or AI knowledge required. After training, classifiers can be used to classify whole slide images or to select specific tissue classes for analysis with other HALO modules.



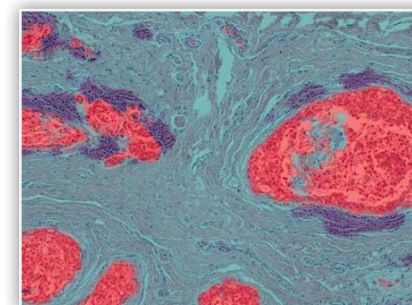
01 DEFINE CLASSES



02 TRAIN NETWORK



03 APPLY CLASSIFIER

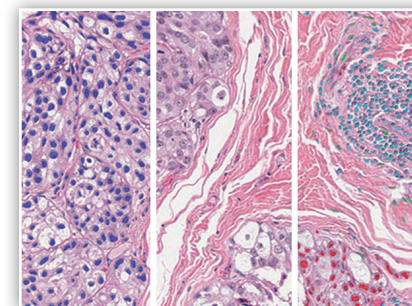


POWERFUL NEW NETWORKS

HALO AI includes three powerful neural networks – **VGG**, a well-known and traditional network, **DenseNet**, a modern network capable of creating robust classifiers at higher resolution, and finally **MiniNet**, a shallow custom network developed at Indica Labs, that can produce a solution quickly with limited training data.

EXCEPTIONAL CELL CLASSIFICATION

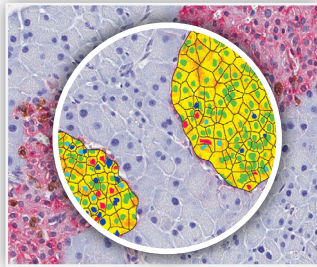
Segment nuclei with the Nuclei Segmentation classifier. Utilize HALO AI's pretrained networks for H&E, single IHC, or DAPI stained images for an out of the box solution. Or train your own Nuclei Segmentation network. Once nuclei are segmented, take it a step further using the Nuclei Phenotyper classifier to automatically assign cells into user defined phenotypes.



PHARMA SERVICES

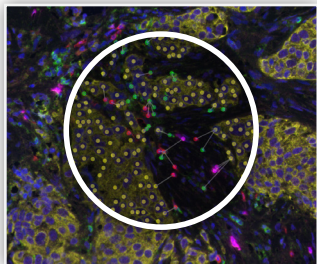
powered by **indica labs**

Quantitative Biomarker and Image Analysis services
utilizing industry-leading software platforms.



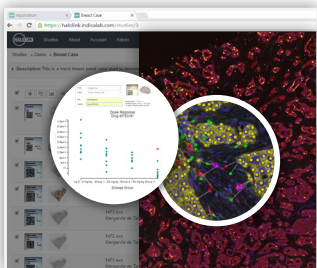
BIOMARKER ASSAYS

Immune phenotype, pharmacodynamic, expression
profile assays, etc.



ADVANCED ANALYTICS

Biomarker spatial relationships, cohort analysis, and
bioinformatics.



CLOUD DEPLOYMENT

Collaborative web-based study management
system.



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Indica Labs software solutions provide fast, quantitative evaluation
of whole slide tissues using HALO® and HALO AI™ for image analysis
and HALO Link™ to manage images, data, and facilitate collaboration.

Backed by cutting edge technology, an uncompromising focus on ease-of-use
and dedicated customer service, Indica Labs' software and services are being
used to make vital discoveries in pathology labs and research organizations
around the world.

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