



# IKOSA®

## Application Documentation

Application Name	Fibrin Tube Formation Assay
Version	1.0.1
Documentation Version	15.05.2020 - 1
Input Image(s)	Single Image (standard, grayscale) RGB images are automatically converted to grayscale images
Input Parameter(s)	None
Keywords	fibrin, tube, formation, in-vitro, angiogenesis, vessel, growth, microscopy
Short Description	Detection and quantification of endothelial cell tubes in a fibrin tube formation assay used for in-vitro angiogenesis research.
References / Literature	For more information regarding the assay check e.g. <a href="https://www.ncbi.nlm.nih.gov/pubmed/8601593">https://www.ncbi.nlm.nih.gov/pubmed/8601593</a> and <a href="https://www.ncbi.nlm.nih.gov/pubmed/31541300">https://www.ncbi.nlm.nih.gov/pubmed/31541300</a> ; Reference laboratory: Department of Obstetrics and Gynecology: Dr. Ursula Hiden; Jasmin Strutz, MSc;

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## IKOSA® Image Analysis

You can use this or any other of our image analysis applications through your IKOSA® account. If it is not listed in the available applications, please contact your organization's IKOSA® administrator or our team at [support@kmlvision.com](mailto:support@kmlvision.com).

## Application Description

This application automatically segments the tubes created by endothelial cells in a 3D fibrin matrix, and extracts relevant measures (total tube length, loops, covered area). This analysis is performed within the automatically detected focus area of the image.

In the following, the requirements for an accurate analysis are given and the output of the application is described.

## Further Information

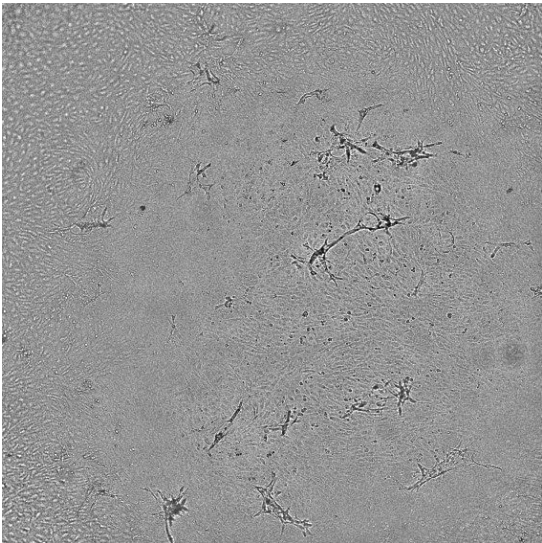
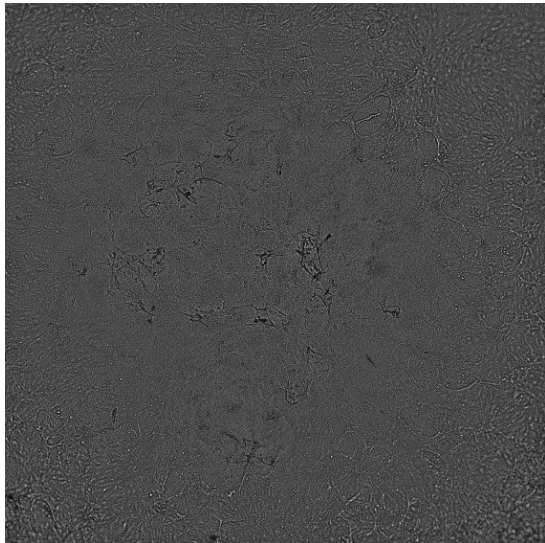
If you have any questions regarding this application or if you want to know if your specific type of images can be analyzed, please get in touch with us at [support@kmlvision.com](mailto:support@kmlvision.com). Also, if you have requests or ideas regarding additional image analysis applications that you would require, please get in touch with us at [support@kmlvision.com](mailto:support@kmlvision.com).

For more information, please visit [www.ikosa.ai](http://www.ikosa.ai).

# Requirements

## Input Image(s)

Input for this application is the following image data:

No.	Image data	Type of image	Color Channels	Color Depth (per channel)	Size [Px]	Resolution [ $\mu\text{m}/\text{Px}$ ]
#1	Single image	Standard	1 (Greyscale) 3 (RGB)	8 Bit	Min: 256 x 256 Max: 4096 x 4096	typically: 0.80 - 2.85
<p><b>Image Content:</b> Microscopy image of fibrin tube formation assay, typically taken with 4x magnification.</p> <p><b>Additional requirements:</b> None</p> <p><b>Examples:</b></p> <div style="display: flex; justify-content: space-around;">   </div>						

For all images, the following requirements apply:

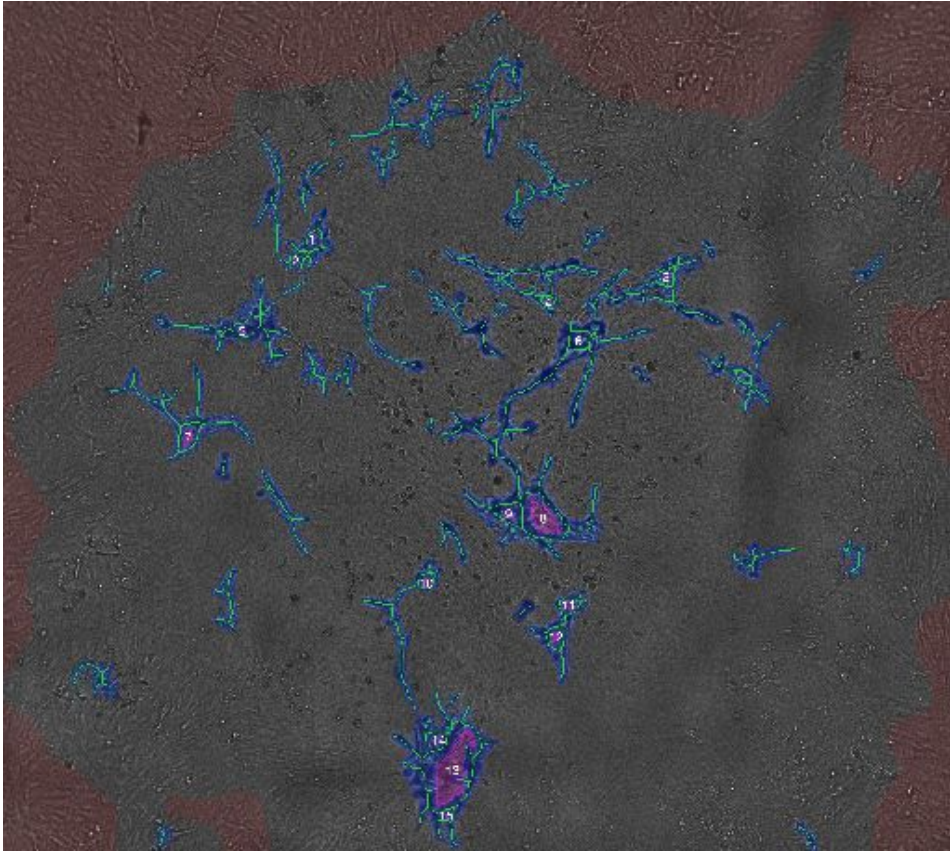
- The illumination must be constant throughout the image(s).
- The sample must be in focus, i.e. no blurry regions in image(s).

## Input Parameter(s)

No additional input parameters are required for this application.

# Results

## Files

No.	File type	Content and Description
1	csv	<i>results.csv</i> : A csv file containing the analysis results for the input image.
2	csv	<i>results_01_loops.csv</i> : A csv file containing statistics about detected loops.
3	jpg	<p><i>results_visualization.jpg</i>: A visualization of the detection:</p>  <ul style="list-style-type: none"> <li>• Out-of-focus area has a red overlay (no analysis is performed in this region).</li> <li>• Area covered by cells within the focus region has a blue overlay.</li> <li>• Tubes are visualized as green lines.</li> <li>• The loops are visualized in pink and labelled with the loop id. The loop id corresponds to the id in <i>results_01_loops.csv</i>.</li> </ul>



## Description of files

### File no. 1: Single csv-file with the following content (*results.csv*):

Col. no.	Column name	Examples	Value range	Description
1	num_tubes	48	0 -	Number of tubes (a tube may have connected sub-tubes).
2	total_tubes_area	56744	0 -	Total area covered by tubes in pixels <sup>2</sup> .
3	total_tubes_length	5640	0 -	Total length of all tubes in pixels.
4	num_tube_branch_points	122	0 -	Number of overall branch points on tubes.
5	num_loops	15	0 -	Number of loops.
6	total_loops_area	2126	0 -	Total area covered by loops in pixels <sup>2</sup> .

### File no. 2: Single csv-file with the following content (*results\_01\_loops.csv*):

Col. no.	Column name	Examples	Value range	Description
1	id	9	1 -	Loop id.
2	area	38	0 -	Area of the loop in pixels <sup>2</sup> .
3	perimeter	22.7	0 -	Perimeter of loop in pixels.