

WimTube

Analysis results in detail

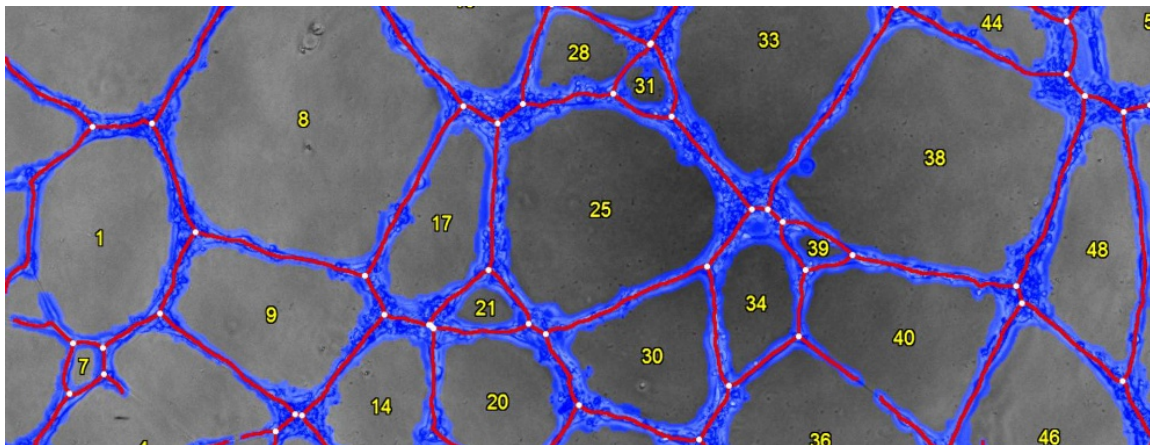
For every set of images that you upload to WimTube, you will receive the following data files, bundled inside a zip file:

- A Results Control Image for each uploaded image, consisting of your original images with an overlay of the detected tubes in it.
- CSV format Results Data Sheet with the tube-related measured data for each image.
- An extra CSV format Results Data Summary of the whole order.

Let's check them in detail.

1. Results Control Image

Every input image will produce a control image to assess the accuracy of the analysis output. It consists of the input image with the tubular structure and the other tube formation parameters outlined on it, as shown in the image below:



Sample result image where the tube covered area (blue), tubes (red), branching points (white) and loops ID (yellow) are marked.

This image will have the name of your input image followed by “_Exp01” and will be saved in “jpg” format.

This is our standard colour coding but it is not fixed. If you need a different colour combination or marking schematic for publishing your work, do not hesitate to ask us for it [here](#). We will be happy to change it to make your work stand out.

2. Results Data Sheet

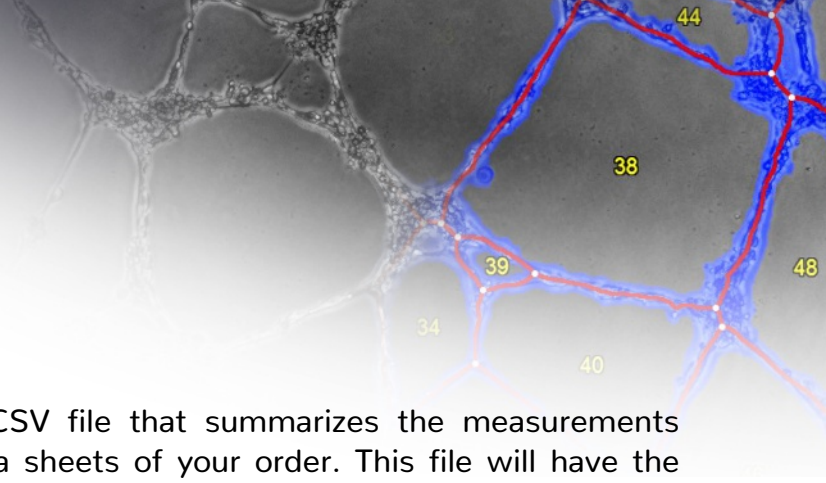
Every input image will also generate an output CSV file (comma separated value format, similar to an Excel sheet) with the following measurements:

General Metrics:

- **Covered Area [%]:** It is the percentage of covered area, that is, the percentage of tubular structure in the whole area of the image. It is calculated by dividing the total number of pixels of the image by the pixels that belong to the tubular structure.
- **Total Tubes:** The number of tubes in the image. In WimTube, a tube is the part of the tubular structure between two branching points or a branching point and a loose end.
- **Total Tube Length [px]:** The complete length in pixels of the tubular structure.
- **Mean Tube Length [px]:** The arithmetic mean of all tube lengths.
- **Standard Deviation Tube Length [px].**
- **Total Branching Points:** Count of branching points in the image. Branching points are parts of the skeleton where three or more tubes converge.
- **Total Loops:** Loop count in the image. A loop is an area of the background enclosed (or almost) by the tubular structure, identified by a yellow ID on the control image.
- **Mean Loop Area [px]:** For each loop, the area (number of pixels) enclosed by it is considered as its area. The mean loop area is the arithmetic mean of all loop areas.
- **Standard Deviation Loop Area [px].**
- **Mean Loop Perimeter [px]:** For each loop, the pixels that belong to its edge (pixels that are in contact with the blue tubular structure) are considered to be its border or perimeter. The mean loop perimeter is the arithmetic mean of all loop perimeters.
- **Standard Deviation Loop Perimeters [px]**
- **Total Nets:** A net is an isolated region of tubes that contains, at least, one branching point. Isolated tubes are not considered as nets.

Individual Loop Metrics:

- **Loop ID:** Yellow number on the control image that identifies each loop.
- **Area [px]:** Number of pixels that are enclosed within the corresponding loop.
- **Perimeter [px]:** Number of pixels that belong to the corresponding loop border.



3. Results Data Summary

Every uploaded order also produces a CSV file that summarizes the measurements contained in all the individual results data sheets of your order. This file will have the name of the order number followed by “_Summary”.