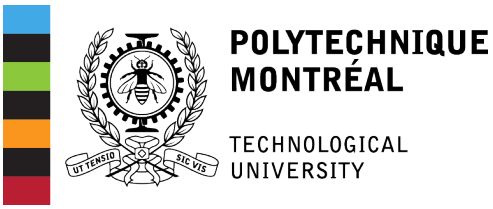

User Guide

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Contents

1 Accessing the platform

The platform has been developed in order to be web-based. This means that is does not require any sort of installation and can be launched directly from your web browser.
The platform can also run on mobile device. All operations are not optimized yet for tactile screen, but most of the tools already work on those.
Even if it should work on any browser, in its current phase, the tool has only been tested on Google Chrome and Mozilla Firefox. It is therefore recommended to use it on one of those two browsers.
The platform is currently available at the following address:

http://206.12.89.104:5050/

This is a provisional address, on a server provided temporally by Compute Canada. On it next release, the tool will be running on dedicated servers, with a proper domain name, and we will provide secured access. This means that currently, the access is not secured. While this isn't an important deal in the current stage of development, the user might receive a warning from the browser preventing him to open normally the web page. Nonetheless, most browsers will also propose to add a certificate exception, that should allow to connect to the platform.
Once the user accesses the page, a identification form will be prompted (Figure 1).

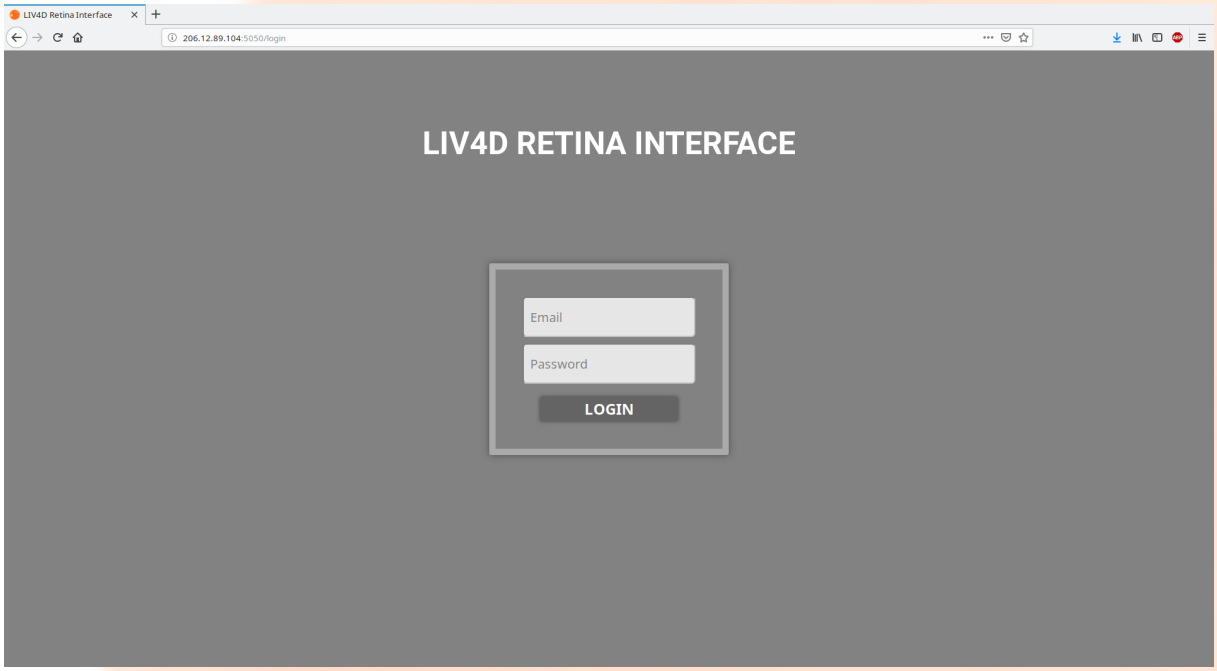

Figure 1: Identification page

Currently, there is no way of automatically reset the password. If the user has forgotten his password, it is mandatory to send us an email so we can manually reset it.

2 First looks

Once connected, the platform will bring the user to the main gallery, that gives access to all the images in the database (Figure 2). The top left buttons (Figure 3) provide a link

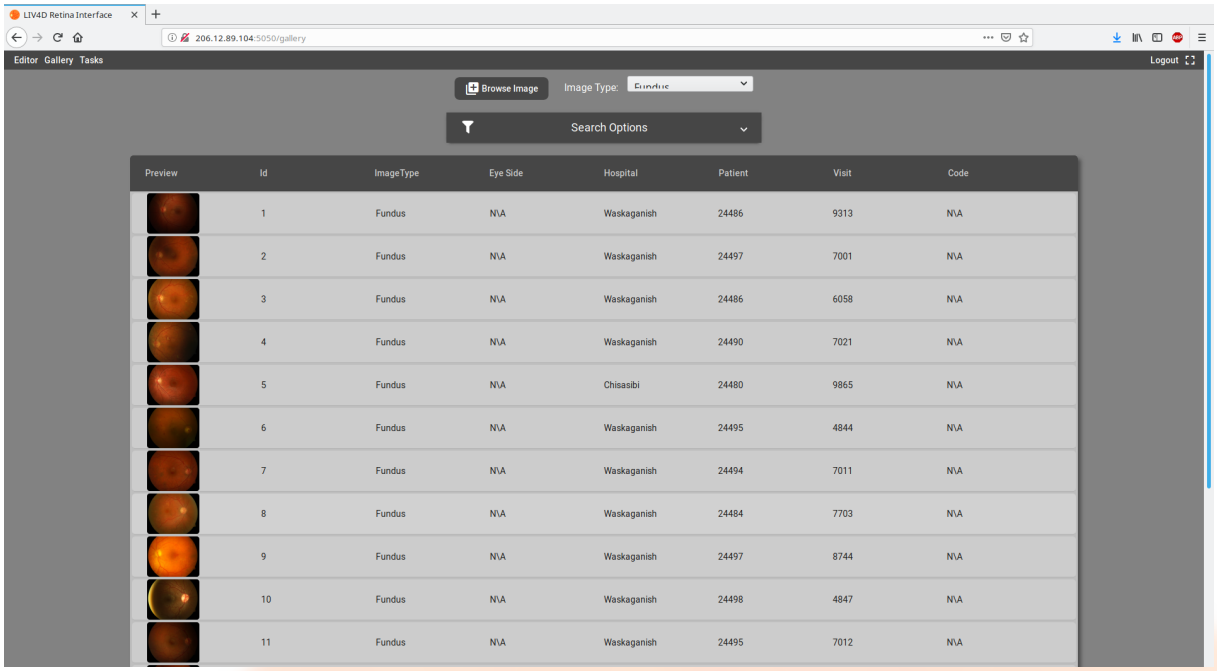

Figure 2: Gallery page

to the three main panels of the interface:

- Editor: that where the magic happens: all the drawing tool are in this panel.
- Gallery: this is the default start up page, where the user can browse the complete database.
- Tasks: This panels is customized specifically to each user's account. In it, the user will see the images that he is asked to validate. Therefore, even if the user can open any image in the editor, he should only open images from the task panel.

On the other side of the screen, a button allows the user to logout (Figure 4). Next to it, another button allows the platform to be displayed on fullscreen.

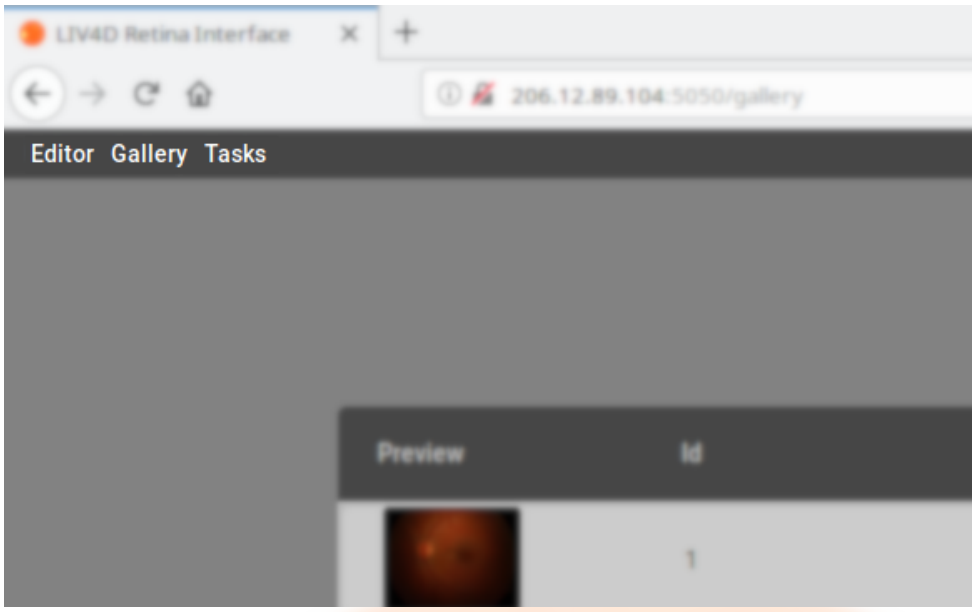

Figure 3: Access to the main panel of the interface

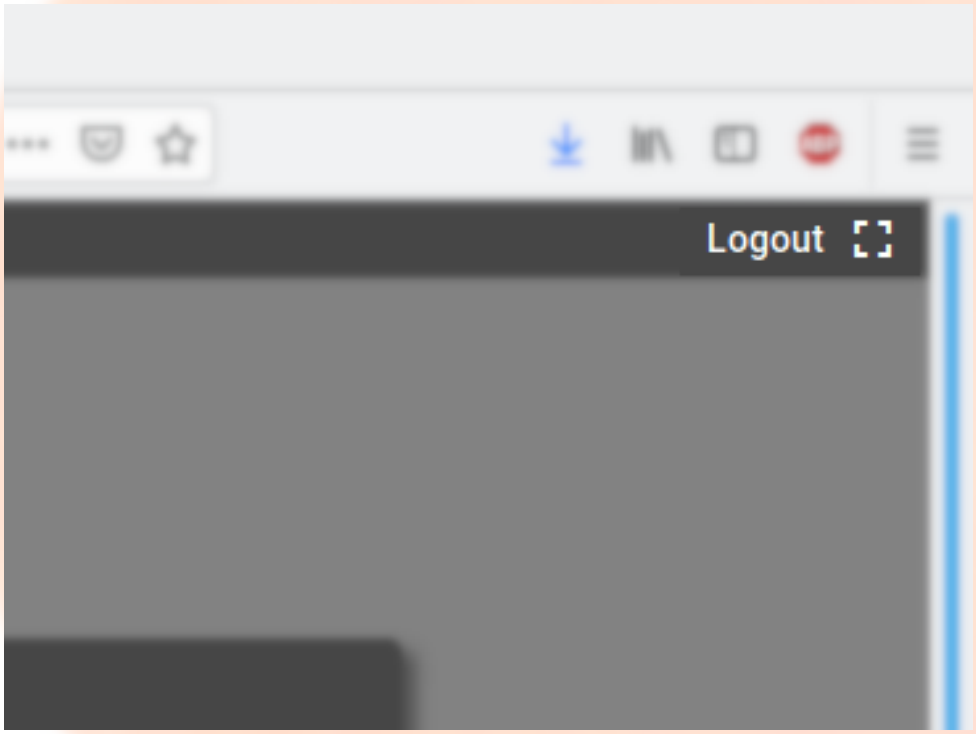

Figure 4: Logging out and fullscreen display option

3 Gallery

The gallery is meant to display the whole database. It also permits opening a image stored locally (i.e: on the user's computer). When browsing the database, the user can configure a set of filters. For that, click on the Search Options buttons. A new menu will expand (Figure 6). .

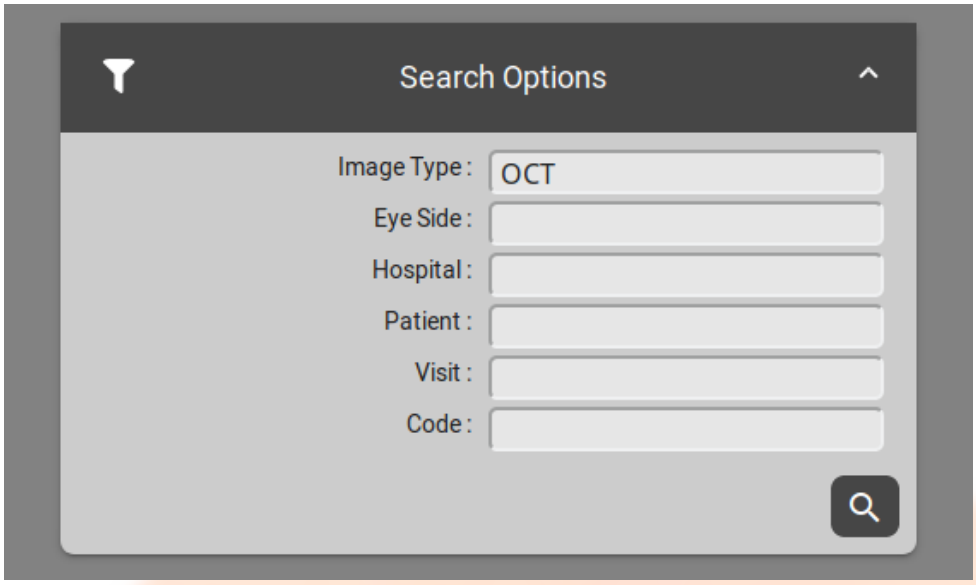

Figure 5: Using the search option button to filter images by their type (for example, to only display OCT images).

The user can also choose to sort the gallery given different criteria, clicking on the label of each column. Double-clicking will reverse the sort ordering.

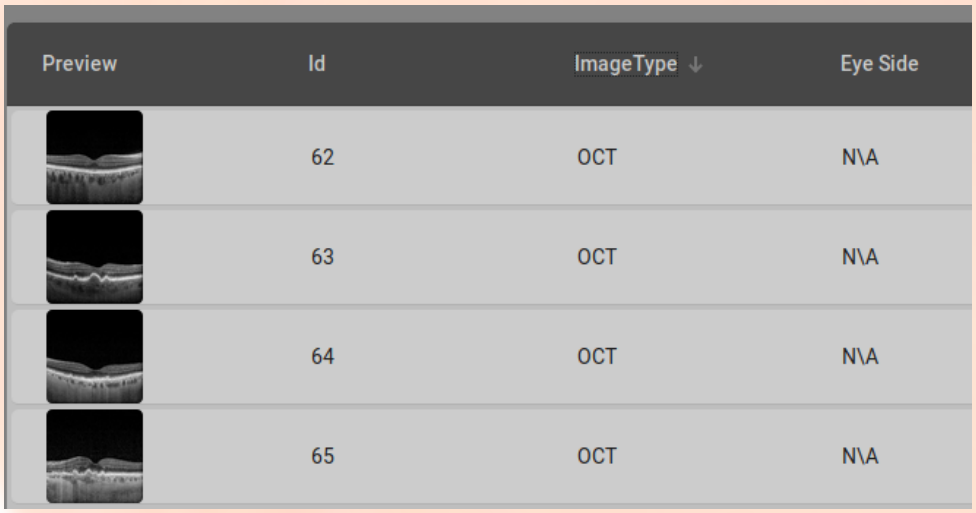

Figure 6: On double-clicking on the ImageType header, we can choose to sort the display such that OCT appears in the top results of the gallery.

.

The "Browse Image" (Figure 7) button will allow the user to open a folder explorer and look in his local files. Nonetheless, unlike when requesting an image to the database, the

platform won't be able to which kinds of image the user chooses to open. Therefore, a scrolling menu allows to manually choose the image type (fundus or OCT). .

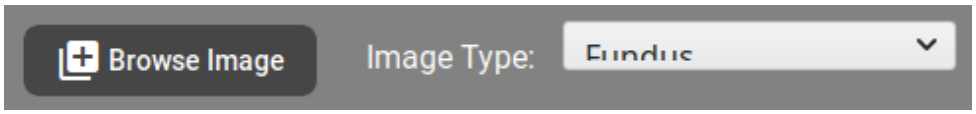

Figure 7: Local files browser. The scrolling menu uses to manually select the type of the opened image.

4 Tasks panel

The task panel is in appearance very similar to the gallery (Figure 8). Nonetheless, it differs in the sense that each user has a specific set of tasks, which are specifics to his account. The task panel is therefore used to allow a regulation of the labeling process among the ophthalmologist. Each task is designed by the administrator and assigned individually to each user.

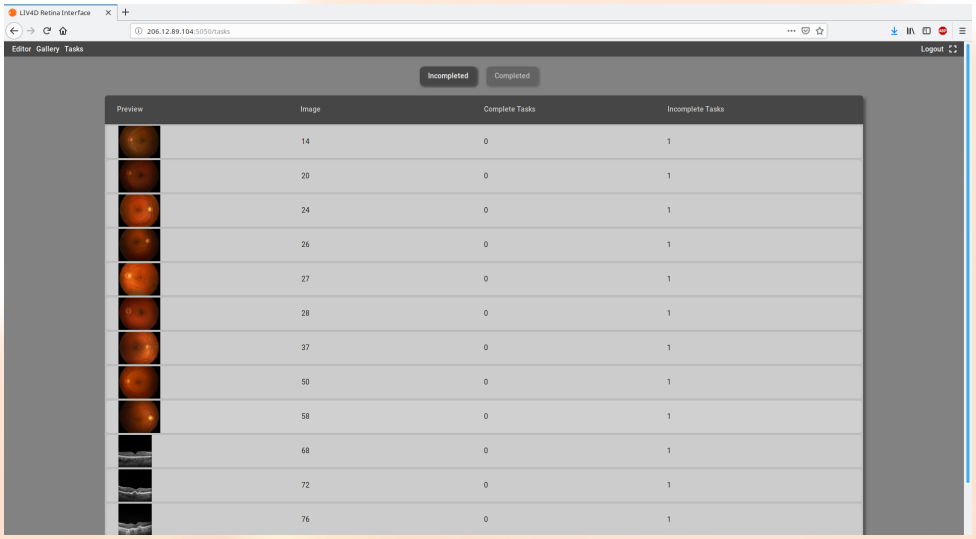

Figure 8: Tasks panel. Each row indicates the image that is asked to be validated. For each image, there is a certain amount of requested task (for example "Segment macula", "Evaluate quality", "Validate lesions detection"...). Once a task is finished on an image, the corresponding image will be moved from the "Incompleted" section to the "Completed" section

.

As in the gallery, clicking on a thumbnail opens the corresponding image in the editor.

5 Editor

The editor panel represents the core of the program. All the drawing tools are contained in it, as well as the visualization tools and the validation module.
The main part of the editor is the canvas, in which the image is drawn. You navigate in

the canvas with the scroll wheel: a scroll in/out will zoom in/out of the image. Pressing the scroll wheel allows to navigate in the canvas.
For most of the components of the canvas, a tooltip will open is the user leaves the mouse above them. This tooltip indicates the name of the function accomplished by the element, as well as the keyboard shortcut that calls that function.

5.1 Biomarkers layers

This platforms aims at collecting annotations at a pixel level. A set of categories has been designed to regroup those annotations according to their types. This set is fixed and cannot be changed by the user. In case of missing categories, a general category (called "Others") is provided. The user is also free to use the "Comments" section to indicate to which category corresponds the undefined biomarkers.
Biomarkers are organized in categories and sub-categories, in a tree shaped model. The leaves represent actual biomarkers types, while the branches correspond to the categories encompassing those biomarkers types. For example, for fundus images, "Lesions" is a branch, that includes two sub-categories "Red" and "Bright", as well as a leaf called "Others. In turn, the "Bright" category contains four leaves (biomarkers types): "Cotton Wool Spot", "Drusen", "Exudates", "Uncertain-Bright". There is a hierarchy in the categorical organization. The properties of the branches control the properties of the associated sub-branches and leaves. For example, the visibility of a branch will affect the visibility of the elements that it contains. Therefore, in a single click, the user can choose to mask all the Red lesions (for example). The "Biomarkers" panel show this hierarchical organization (Figure 9). .

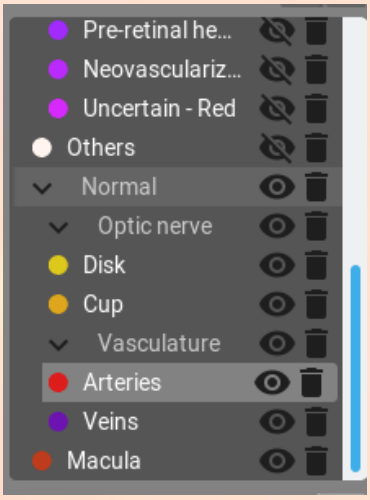

Figure 9: List of all the existing biomarkers layers and their organization. This panel also controls the visibility and each layers

On the editor, there is always one active biomarker layer (Figure 10), which correspond to the one that the user is modifying. It is possible add pixels to the active category, erase some or transfer pixels from others biomarkers to the active one (see section 5.2). .

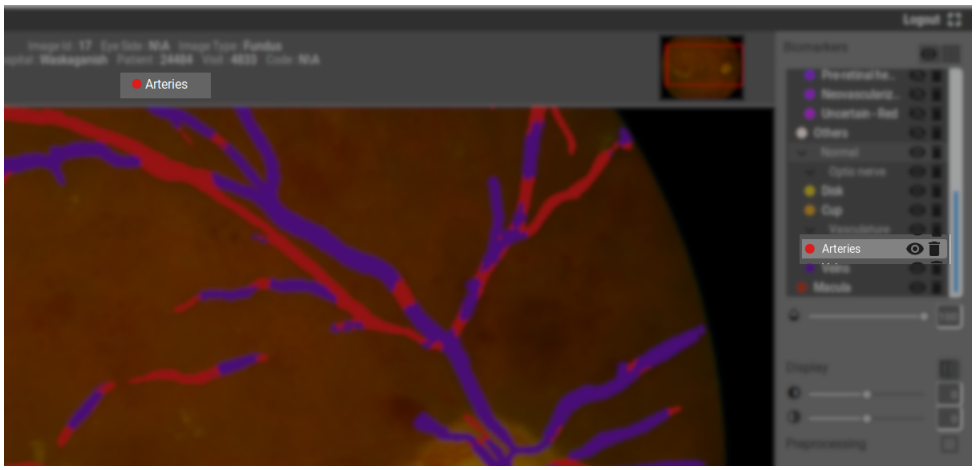

Figure 10: There is always one active biomarker layer. This layer is displayed both on the top of the screen and is highlighted in the "Biomarkers" panel ("Artery" in the given example)

5.2 Editor tools

All the editors tools are available on the vertical panel on the left of the screen (Figure 13). Some tools have properties, for example the size of the brush (Figure 11) , whereas others don't (Figure 12). From top to bottom, the different tools are (the keyboard

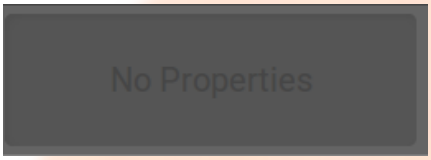

Figure 11: Panel when no properties are available for a given tool

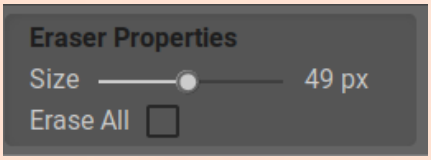

Figure 12: Properties of the eraser.

shortcut are indicated in parenthesis):

1. Pan (P). This tool will pan the canvas (element in which the image is drawn), which allows navigating in all part of the image. This tool is also available by pressing the middle button of the mouse (the Scroll Wheel).

2. Eraser (E). This tool will erase the region under the mouse where the user clicks. There are two associated properties. The size in pixel represents the area cover by a stroke (it is the size of the brush). By default, the eraser only erases pixel in the current active biomarker layer (if visible). The toggle "Erase All" permits to extend the effect to all the visible layers.

3. Erase Brush (G). This tool works similarly than the eraser. Nonetheless, instead of choosing a radius for the brush, the user only has to draw the border of a region. When the user releases the left mouse button, this region is automatically closed and all the pixels contained in it are erased. As previously, the toggle "Erase all" extends the effect to all the visible biomarkers layers.

Figure 13: Editor tools. A selected tool has a white background.

4. Brush (B). This is the default drawing tool. It will draw in the current active biomarker. There are two properties associated to this tool. The first one is the size of the brush and works as for the eraser. The toggle "Keep Shape" is more subtle, but allows gaining a lot of time. When activated, instead of drawing under the mouse click, the tool will try to convert the pixels under the mouse from all visible biomarkers layers to the active one. This is a quick way of correcting a biomarker that has the right shape but not the right class.

5. Fill Brush (F). This tool is the equivalent of the Erase Brush but for drawing. The user specifies the border of a region that will be filled to match the active biomarker layer. This tool also contains a "Keep shape" toggle that works exactly the same way as for drawing.

6. Pick Biomarker (K). This tool picks the color of the visible biomarker under the mouse-left click and changes the active biomarker layer to be of the type of the selected pixel. This tool is equivalent to a right-mouse click.

7. Undo (Ctrl + Z): cancel the precedent operation.

8. Redo (Ctrl + Y): redo the previously canceled operation.

5.3 Visualization options

There are many tools provided to improve the visualization. In addition to the visibility toggle, already mentioned in section 5.1, the user can increase the contrast, the brightness, play with the opacity of the different biomarkers or even display a complex preprocessed version of the background image (currently only on fundus images).
This section provides a description of those different options.

5.3.1 Border mode

The user can choose between display the full annotations or only the borders of it by using the toggle "Hide/Show border" (Figure 14). Figure 18 and figure 19 show the difference between the two modes.

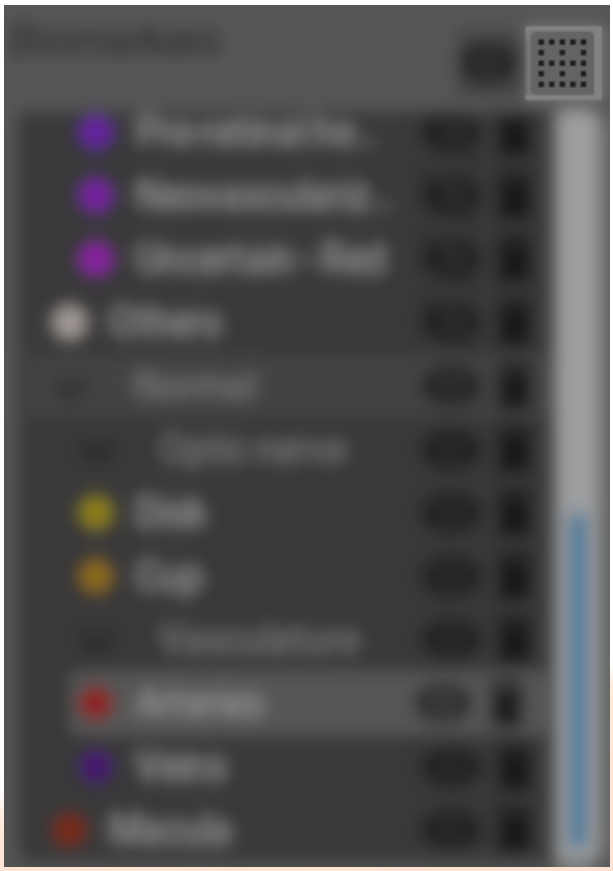

Figure 14: Toggle the border mode.

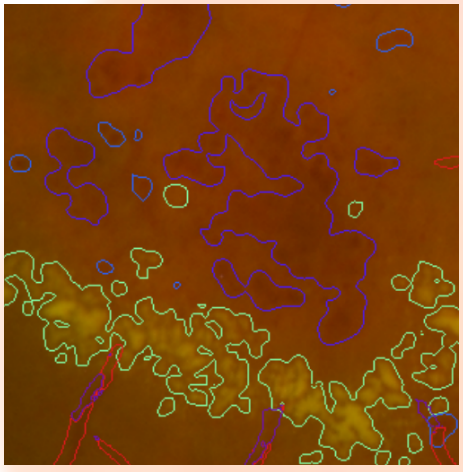

Figure 15: Border mode activated

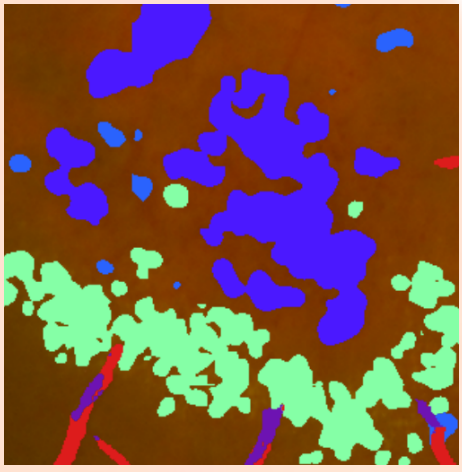

Figure 16: Normal mode

5.3.2 Contrast/Brightness

The two sliders in Figure 17 control the contrast and the brightness. By double-clicking on the corresponding icons, the sliders are reset.

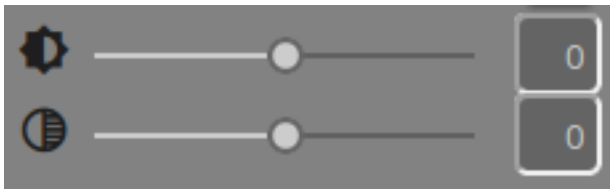

Figure 17: Sliders for contrast and brightness.

5.3.3 Preprocessing

The preprocessing toggle changes the background image to another version of the image. This image has been through various algorithm to enhance the contrast, homogenize the illumination and denoise the image.

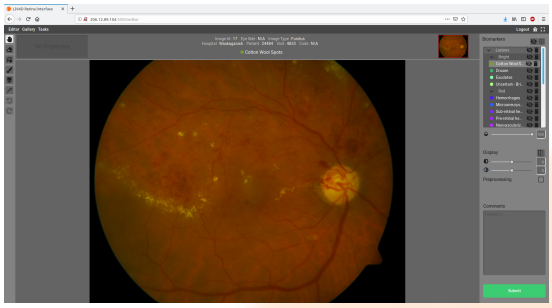

Figure 18: Original image

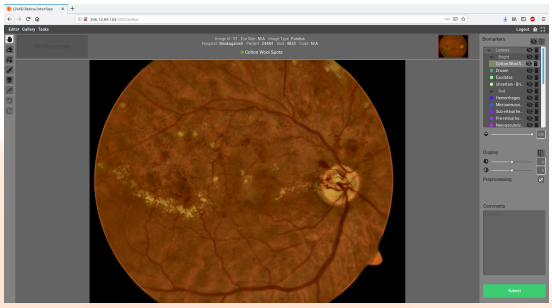

Figure 19: With preprocessing activated

5.4 Validate annotation

To validate an annotation, the user simply presses the green button called "Submit". A new version of the labeling is then sent and stored in the database.

6 Bug trackers

As this is still a beta version of the platform under development, we have setup a bug tracker. It will serve us to track the bugs that the user might encounter. It is also a way for us to collect directly the feedback from the user, who can write in real time his feeling/impression about the interface. To open the bug tracker, the user simply need to press the little "Bug" icon (Figure 20).

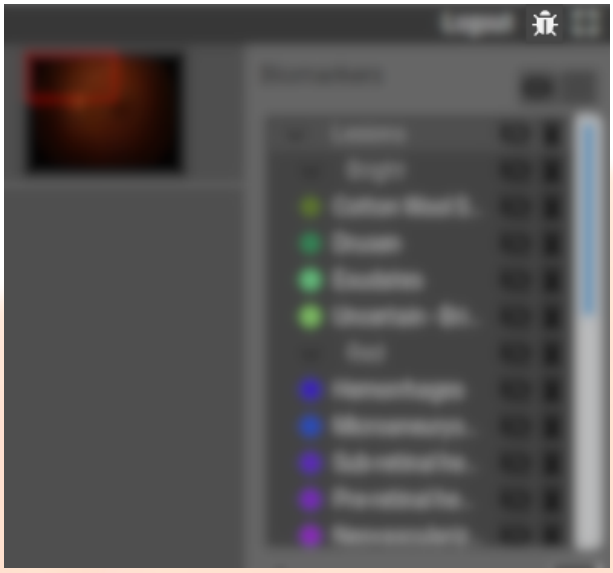

Figure 20: Open the bug tracker.

It will open a notepad where the user can give his feedback (Figure 21) or a description of the bug. From this tab, we automatically collect the text of the description, the id of the user and the date of submission.

The tracked bug are automatically sent to a google spreadsheet, that the user can access following this link. We will indicate on this spreadsheet if the bug was corrected or if there is a solution to avoid it. Don't hesitate to often consult it!

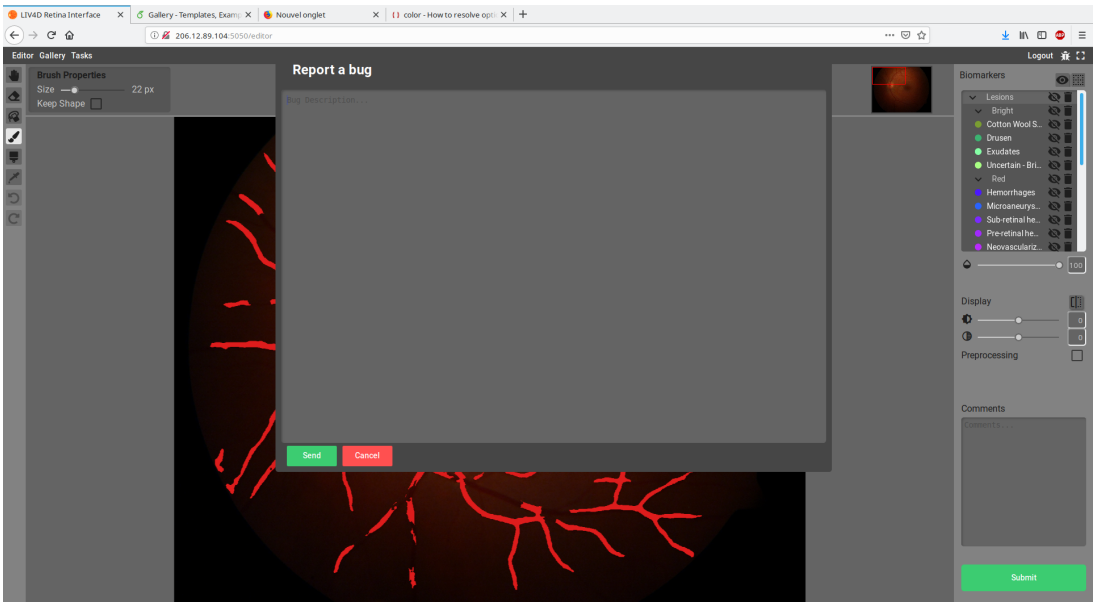

Figure 21: The bug tracker in which the user can write his feedback.

7 Keyboard Shortcuts

Description	Keys
Pan the view	Middle mouse button pressed
Eraser	E
Erase Brush	G
Brush	B
Fill Brush	F
Pick Biomarker	K - Right mouse button pressed
Undo	Ctrl + Z
Redo	Ctrl + Y
Validate	Ctrl + S
Hide all except active layers	H
Hide all layers	O
Toggle border mode	L
Toggle preprocessing	T
Change brush size	Ctrl + Middle mouse button scroll
Go to next biomarker in the list	D
Go to previous biomarker in the list	A
Display list of biomarkers under mouse (in empty area)	Right mouse button pressed