

# Automatic regions of interest detection and classification for screening microscopy

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## Motivation

For high-throughput imaging in well plate format, automated strategies like autofocus are used to find and image the samples. For the X,Y position, either a fixed position like the centre of each well or some random patches within the well are classically imaged.

While this is satisfactory for dense cell culture, for more “localized” samples like zebrafish larvae or organoids, this strategy is not applicable as the specimen do not have exactly the same position in every well. Especially with high-magnification objectives, the field of view is much smaller, so it is virtually impossible to automatically image a specific region-of-interest (ROI) at high-resolution if the position of the sample is not precisely known.

The imaging is thus usually limited to low-magnification objectives that offer large fields of view but limited resolution.

## Solution

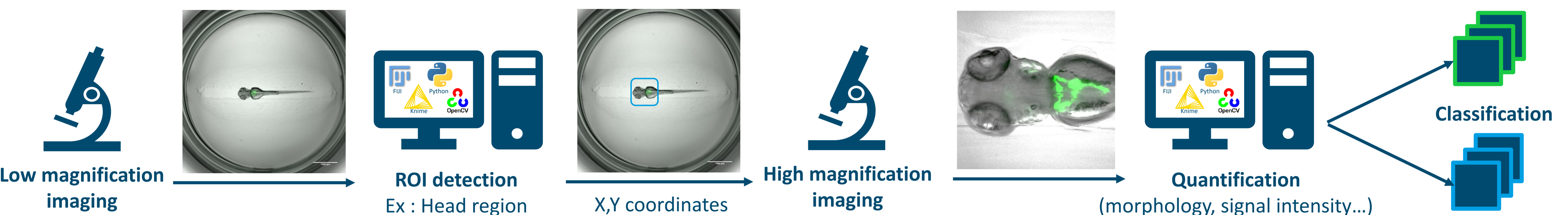
We use feedback microscopy to couple the acquisition with object-detection routines localizing the regions of interest from low magnification images. Once the object localized, the high-magnification imaging is triggered (“Find and zoom-in”). For the object-detection, we provide a robust and easy-to-use solution relying on template matching.

Alternatively, the same detection algorithms can be used for image-analysis, to localize ROI (“Find and analyse”) or for the classification of the detected regions.

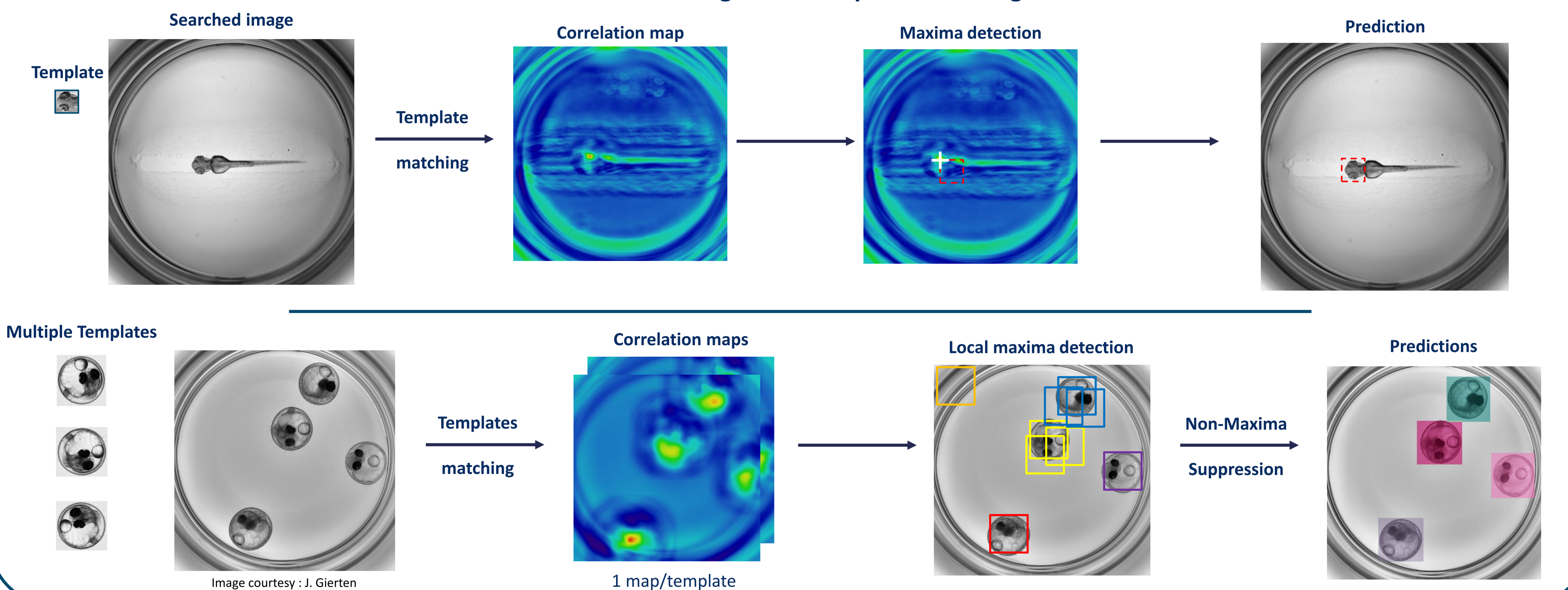
## Challenges

The specimen show variable positions, fluorescence expression and morphologies, especially with toxicity screening assays. Therefore classical strategies for ROI localisation like thresholding fails or requires a lot of engineering. Our novel Multi-Template matching offers a generic alternative to those strategies and can be used with brightfield or fluorescent images.

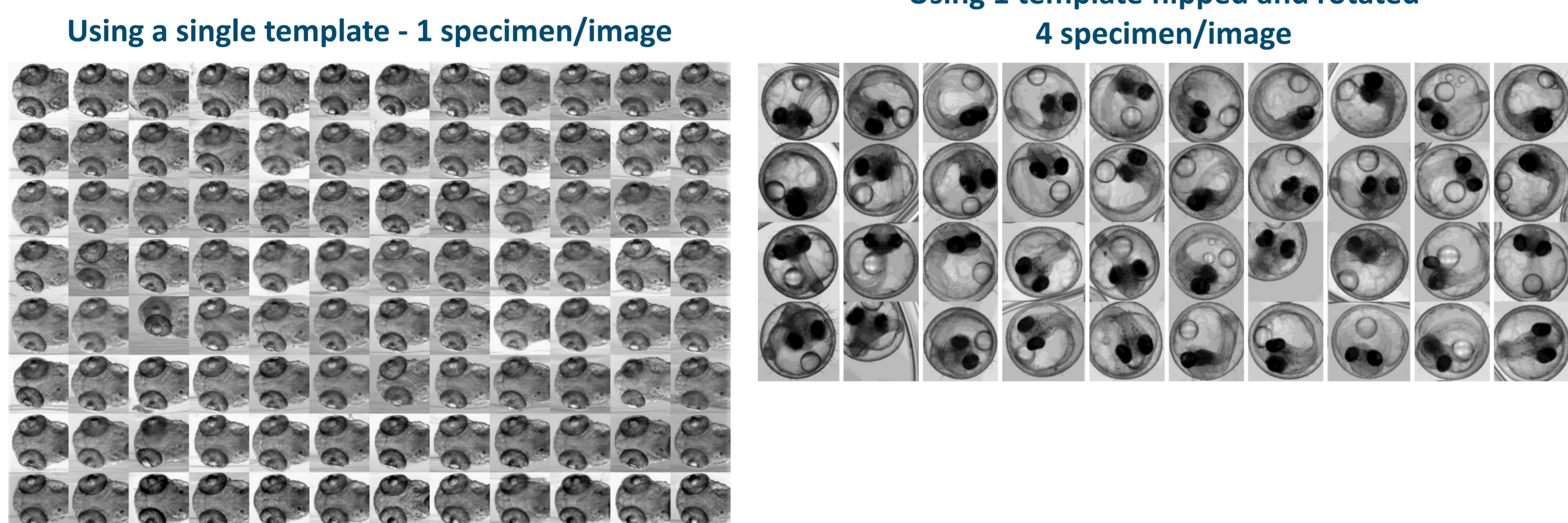
## Automated screening workflow using feedback microscopy



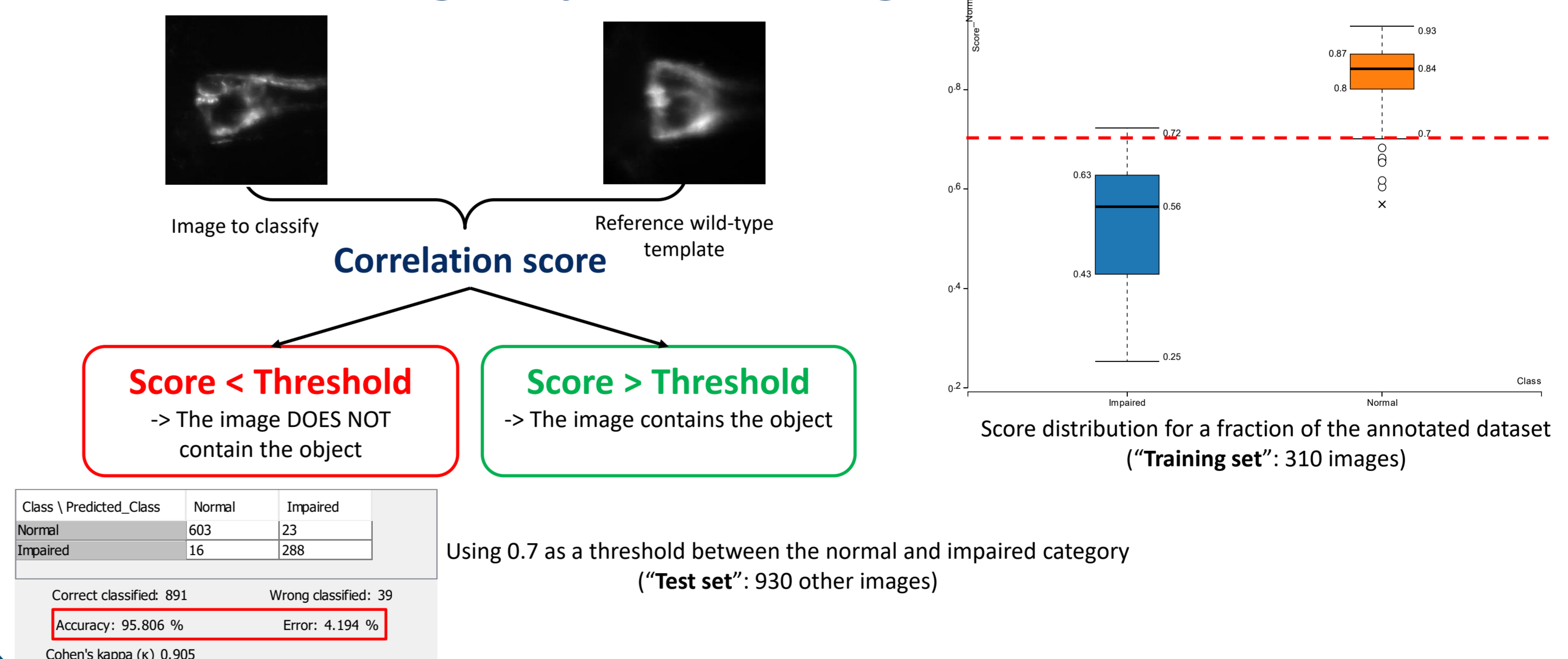
## ROI detection using Multi-Template Matching



## ROI detection results



## Classification using template matching



Multi-Template Matching is available for :

- Fiji** : Activate the *Multi-Template Matching* AND *IJ-OpenCV* update sites
- Python** : `pip install Multi-Template-Matching` (case sensitive) or run the notebook tutorials in a browser with Binder (see repo) !
- KNIME** : Download the workflow from [hub.knime.com](https://hub.knime.com) (see link on repo)

## Multi-Template Matching

