Exercise 6 - Napari

Please open and follow instructions for Exercise 6:

- file: **E06_create_napari_env.md**
- link: `https://github.com/IMCF-Biocev/PAPI/blob/papi_2025/materials/session_1/E06_create_napari_env.md`

Napari Viewer

We've been using `matplotlib` to view images — ideal for creating static, publication-ready plots. `Stackview` adds basic interactivity for exploring multidimensional images but remains limited.

Napari: is an open-source, Python-based image viewer designed for scientists. It excels at being fast, interactive, and extensible.

The Core Concept: **Layers**

- You can have an image layer, a labels layer (for segmentation masks), a points layer, a shapes layer, etc.
- You can add, remove, reorder, and change the properties (color, opacity, contrast) of each layer independently.

The Napari GUI: A Quick Tour

Let's launch Napari (by typing `napari` in terminal/prompt) and explore the interface.

1. **The Canvas:** The main window where your image is displayed.

2. **The Layer List (Bottom Left):** You can add, select, reorder, and toggle the visibility of layers here.

3. **The Layer Controls (Top Left):** This panel is **context-aware**. Its contents change depending on which layer you have active (selected). For an image layer, you'll see controls for colormap, contrast, and opacity. For a points layer, you'll see controls for point size and color.

4. **The Dimension Sliders (Bottom):** If you load a 3D or 4D image, sliders will automatically appear here to let you scroll through the dimensions.

Exploring Plugins

Napari has a vast plugin ecosystem. The community has built hundreds of tools that you can install directly through the Napari GUI.

How to Install:

- *From terminal:* You can install plugins just as any other package with conda/mamba/pip.
- *From Napari GUI:* Go to `Plugins > Install/Uninstall Plugins...`

Install example plugin: `napari-skimage-regionprops`

- This is a GUI-based way to perform the same measurements as we did in code with `measure.regionprops_table`.

After plugin installation, you need to **restart Napari**.

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Exercise Session

1. **Open Napari GUI**

2. **Load the image**: Drag and drop `nuclei_3d.tif` into Napari. Then rename the image layer to **nuclei**.

3. **Adjust visualization**: Change **contrast** and **colormap** as preferred.

4. **Calibrate pixel size**
   - Switch to **3D view** and rotate the image - looks nice, but pixel size is not yet calibrated.
   - Open the **console** and enter the calibration commands:
     - layer = viewer.layers['nuclei']
     - layer.scale = (2, 1, 1)
   - Return to 2D view

6. **Create a labels layer** - Draw around a nucleus using the annotation tools. Save the layer: `File > Save selected layers` > save it as `labels.tif`

7. **Convert image to labels layer**
   - Open the image `nuclei_3d-L.tif` and rename it to **labels**.
   - Right-click on the new layer and select **Convert to labels**.
   - Calibrate it with the same parameters:
     - layer2 = viewer.layers['labels']
     - layer2.scale = (2, 1, 1)

8. **Explore different views** - try **3D view** and **grid view** switch on/off visibility of layers

9. **Measure object properties with installed plugin**
   - `Tools > Measurement Tables > Object Feature / Properties`
   - Measure **size** and **intensity** of objects.