LUMI AI Factory

Vision models use cases with AI

with Vladimir Ulman

13 October

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Main Topic and Assumptions

- Eventually, one wants to segment cells well.

- Traditional methods gave up for AI methods.
- AI methods still don’t deliver superb quality for any cell images.
  - But often they can be rather close...

- AI method must be trained for given data specifically.
  - Human-curated segmentation data must be prepared.
  - AI method can be used as a primer...

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SW Ecosystem

- Fiji
- Labkit
- BigDataViewer
- Imglib2 featuring *lazy data paradigm*
- SAI – SegmentationAI server
- *Work on a laptop, have AI-aiding happen on a server*

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SW Ecosystem

Fiji, on your laptop:

- Visit https://fiji.sc/ and, please, download
- the **Latest** Distribution of Fiji
  - Make sure, the system has detected your OS correctly
  - US mirror is usually the fastest….
- Update sites to enable:
  - OME-Zarr (find it among the listed update sites)
  - Let’s add “Vladimir Ulman’s not-yet-public experimental site” by
    - clicking Add unlisted update site, and
    - provide this URL: https://sites.imagej.net/xulman/

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SW Ecosystem

AI tools, on your server:

- The SW can be taken from https://github.com/xulman/Labkit-SAI-server
  - There are up-to-date instructions in a README.md

- Follow the instructions there, in short these are:
  - git clone https://github.com/xulman/Labkit-SAI-server
  - cd Labkit-SAI-server/server-pytorch
  - cp server.cfg.example server.cfg
  - pixi shell
  - fastapi run server.py

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SW Ecosystem

AI tools, (temporarily) for the workshop:

- There are several demo servers running
  - They can be entered into Labkit at once
  - Note the servers URLs are “white space” separated

- URLs and a common secret key for the servers will be provided during the workshop

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BigDataViewer

- BigDataViewer is often shortened to **BDV**.
- The original www documentation about the BigDataViewer: https://imagej.net/plugins/bdv/index
- There's also interactive, wizard-like documentation: https://xnoskova.github.io/Wizard/

- A brief overview of the keys used on the next slide:

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I went through BDV's default keymap (bdv-core 10.6.0, the version Labkit pins), all key and mouse bindings in the `labkit-ui` sources on your branch, and the prompt and navigation actions from the current `BIG_OVERHAUL`.

What's taken inside Labkit's BDV panel

Keys	Owner
Arrows, `,` `.`, X Y Z, mouse buttons, scroll (+ shift/ctrl variants)	BDV navigation
S, F6, B, shift B, O, T, P, shift P, shift ESC, I, G, 0–9, shift 0–9, M N `[` `]`, shift X/Y/Z/A	BDV (only what `BdvHandlePanel` installs)
D, E, SPACE (hold, scroll, + mouse), F/R + click, shift + click	Labkit brush, flood fill, label picking
F (empty action, blocks BDV's fused-mode toggle), N (label change)	Labkit
ctrl A, ctrl D/E/F/G/R, ctrl S, ctrl O, ctrl shift T	Labkit tools, label panel, menus
L, shift L, ctrl L, J, K, shift K, shift N, shift M	prompts
ctrl I, ctrl J, ctrl K, ctrl N, ctrl M	prompts navigation

`BdvHandlePanel` doesn't install BDV's help (H, F1), crop (F9), movie recording (F8, F10), save/load settings (F11, F12), preferences (ctrl COMMA) or close window (ctrl W), so those keys are free in Labkit.

Datasets

- Fiji's internal blobs (Ctrl/Cmd shift B) and cells
  - Fiji → File → Open Samples...
- https://ngff.openmicroscopy.org/ → Resources → Data → Choose "IDR" repository
  - Don't have to download; it's an online resource
- OME-Zarr from https://livingobjects.ebi.ac.uk/idr/zarr/v0.5/idr0062A/6001240_labels.zarr
  - Don't have to download; it's an online resource
- HDF5 remote, BDV's legacy .xml'ed
  - https://github.com/mobie/mobie/tree/master/data/platynereis/images/remote
  - Choose, e.g., sbem-6dpf-1-whole-raw.xml
- Last resort, download the three images from here
  - https://www.fi.muni.cz/~xulman/files/LAIF/
  - Worth adjusting their pixel resolution (Ctrl+Shift+P in Fiji) before Labkit…

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More Tutorials

- Labkit as a segmentation tool
  - Annotation using Labkit | FAIR workflows session
- More Labkit with SAMJ (or any other SAI) for annotation
  - https://www.fi.muni.cz/~xulman/files/Labkit_SAMJ/
  - (The last two videos in that folder come with subtitles.)
- Using Fiji on HPC, Labkit batch processing taken as an example
  - Scripting in ImageJ | FAIR workflows session
- Using Fiji with remote images, OME-Zarr
  - OME-Zarr in Fiji | Vladimir Ulman

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