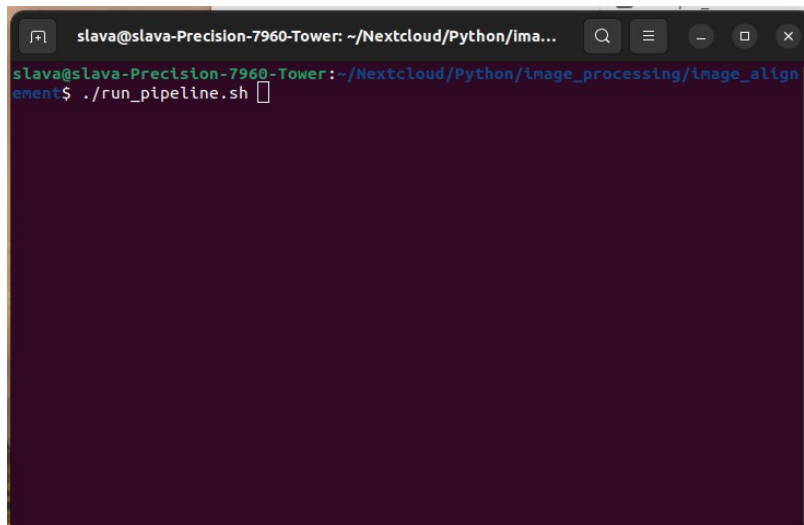


Short example of script usage on the example data

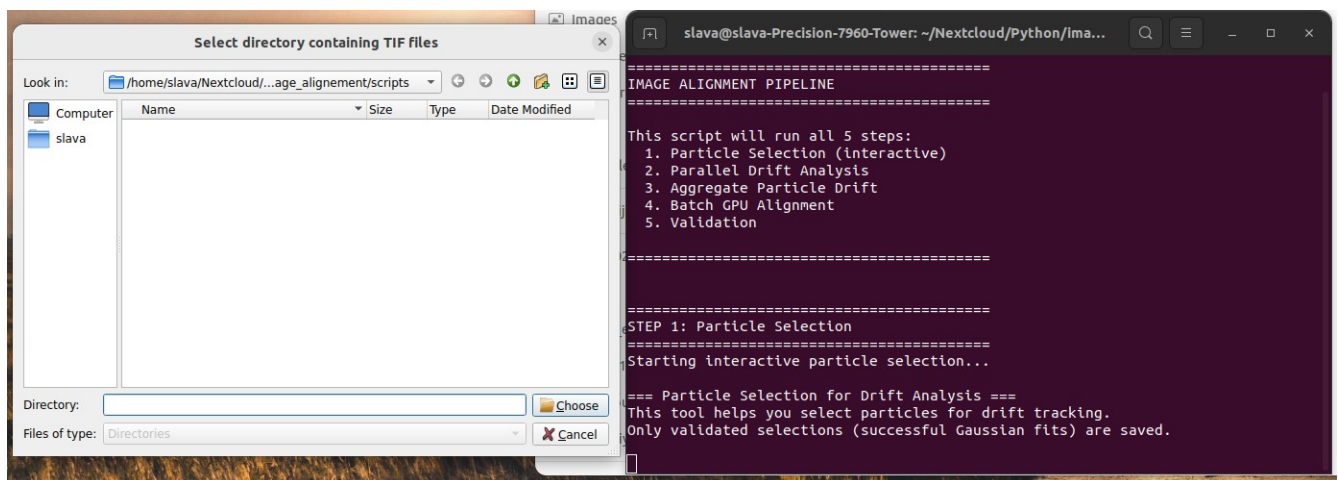
Run run_pipeline.sh in the terminal window, making sure to install all requirements beforehand.

Nom	Taille	Dernière m
example_data	3 éléments	
scripts	5 éléments	
README.md	5,9 ko	
requirements.txt	563 octets	
run_pipeline.sh	3,8 ko	



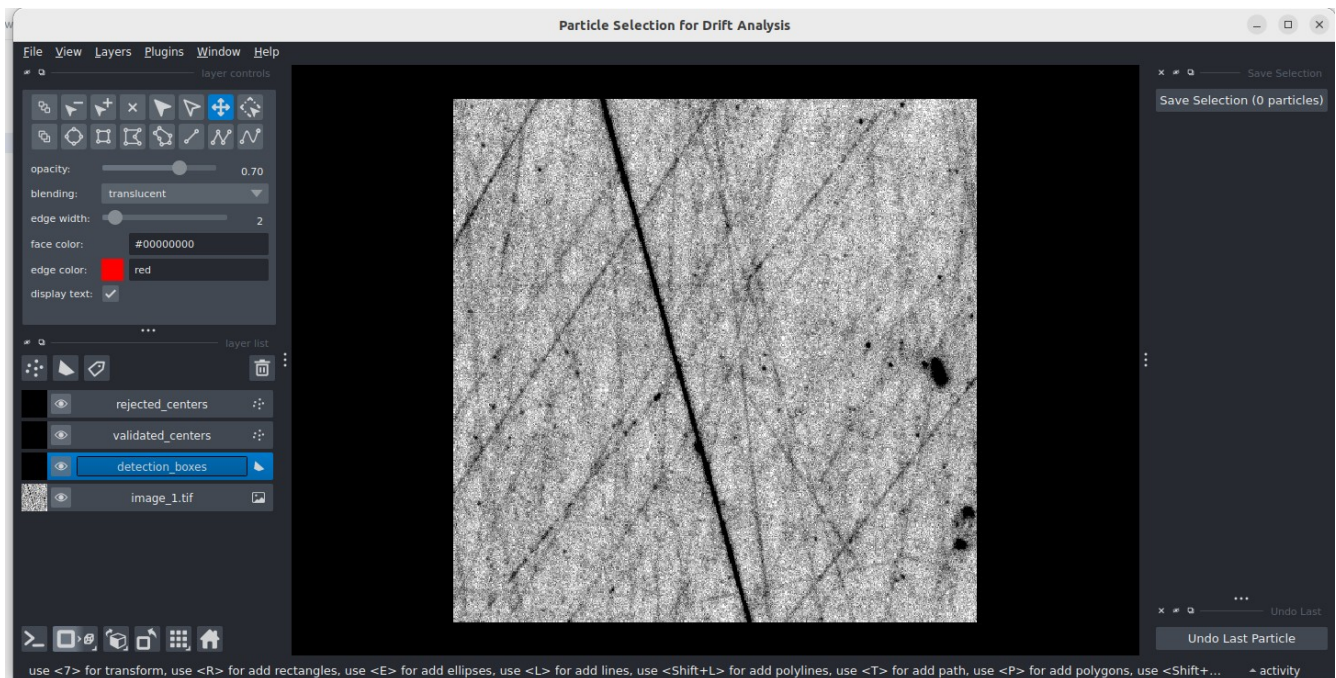
```
slava@slava-Precision-7960-Tower: ~/Nextcloud/Python/Ima...
slava@slava-Precision-7960-Tower:~/Nextcloud/Python/image_processing/image_align
ment$ ./run_pipeline.sh
```

Follow the instruction appearing and guiding you through 5 steps of image alignment.

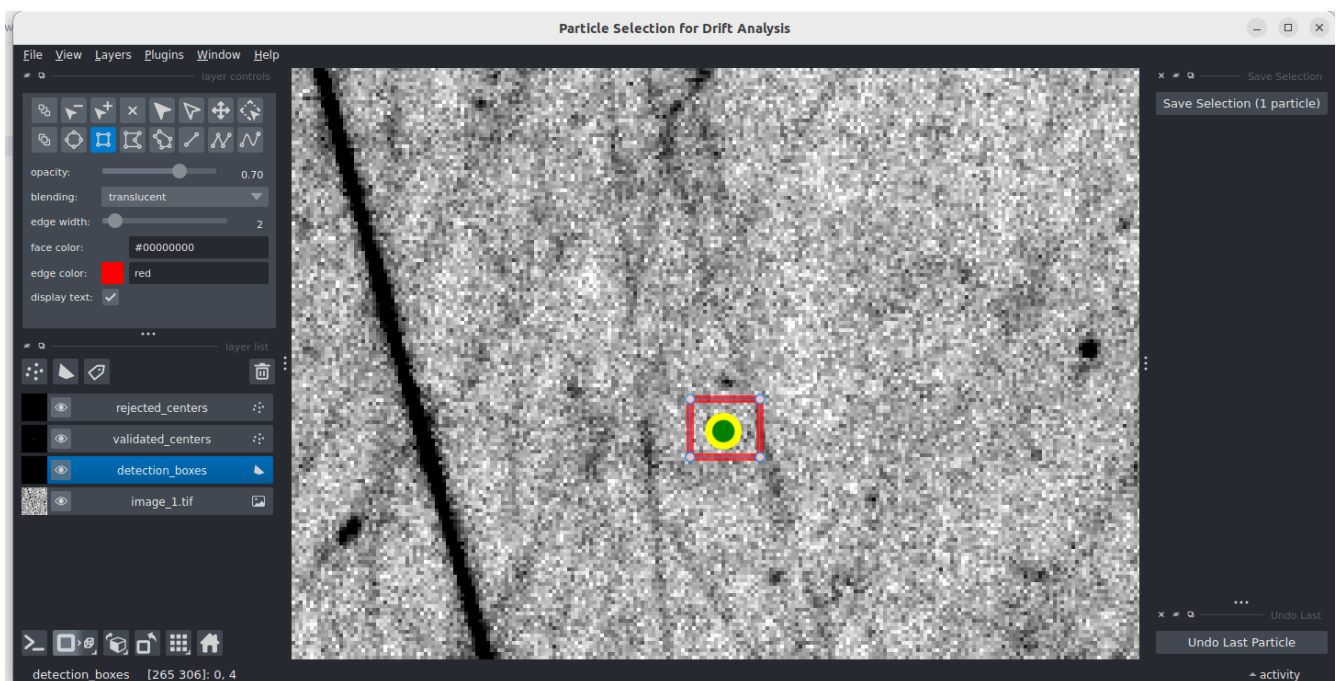


In the first step, select a folder containing TIFF files. The script will then prompt you to choose multiple sets of folders with corresponding data, if necessary, as it can process several data sets in parallel.

Choose 'detection boxes':



Then use the rectangle tool from the toolbox to manually locate the particles. Each particle will be fitted to a Gaussian distribution and, if successful, marked with a dot; if not, it will be indicated with a red cross. To remove a particle, click on "Undo last particle" (bottom right). Once you've made your selections, click on "Save selection" (top right) and proceed to another dataset if prompted by the interface. We recommend selecting at least 4 particles in each corner of the image. Ideally, aim for 4–6 particles per corner. Keep in mind that selecting more particles increases the chances of successful fits, especially if some image areas are not fitted correctly.



After you finish, observe the terminal as the script executes all necessary image processing steps, providing information about the results and the output folder containing all data, along with the before and after drift values.

```
=====
STEP 5: Validation
=====

=== Validation of Aligned Images ===

Using user-specified JSON file: ../scripts_output/particle_selections_20251016_133257.json
Loading configuration from: ../scripts_output/particle_selections_20251016_133257.json
Found 1 aligned image set(s) to validate

Set 0: example_data1
  Aligned folder: /home/slava/Nextcloud/Python/image_processing/image_alignement/example_data/example_data1_aligned
  Particles: 5

=====
Step 1: Validating aligned images (Gaussian fitting)...
=====

Using 1 parallel workers

Set 0: Validating example_data1: 0%|          | 0/Set 0: Validating example_data1: 24%|          |
      | 6/25 [00:00Set 0: Validating example_data1: 100%|          | 25/25 [00:00<00:00, 32.60fit/s]

=====
Step 1 complete: Gaussian fitting on aligned images
=====

[Set 0] Validation CSV: example_data1_z6z.csv

=====
Step 2: Aggregating validation drift data...
=====

Set 0: Aggregating example_data1_z6z.csv: 0%|          | 0/
      [Set 0] Loaded 25 records, 5 images
Set 0: Aggregating example_data1_z6z.csv: 0%|          | 0/
      [Set 0] Successful fits: 24/25 (96.0%)
Set 0: Aggregating example_data1_z6z.csv: 0%|          | 0/
      [Set 0] ✓ Aggregated CSV: drift_example_data1_z6z.csv
Set 0: Aggregating example_data1_z6z.csv: 0%|          | 0/
      [Set 0] Images: 5, Avg particles/image: 4.8
Set 0: Aggregating example_data1_z6z.csv: 0%|          | 0/
      [Set 0] Residual Drift X: 0.0000 to 0.1862 px
Set 0: Aggregating example_data1_z6z.csv: 0%|          | 0/
      [Set 0] Residual Drift Y: 0.0000 to 0.4052 px
Set 0: Aggregating example_data1_z6z.csv: 0%|          | 0/
      [Set 0] Residual Rotation: -0.104931 to 0.000000°
Set 0: Aggregating example_data1_z6z.csv: 0%|          | 0/Set 0: Aggregating example_data1_z6z.csv: 100%|          |
      | 1/1 [00:00<00:00, 68.03file/s]

=====
Step 2 complete: Aggregation finished
=====

Step 3: Generating validation comparison plots...
=====

[Set 0] ✓ Validation plot: validation_plot_example_data1_z6z.png

=====
VALIDATION SUMMARY
=====

Total processing time: 0.79 seconds
Image sets validated: 1
Successful validations: 1

Set 0: example_data1
  Total fits attempted: 25
  Successful fits: 24
  Success rate: 96.0%

Updating JSON file with validation file paths...
✓ JSON file updated: particle_selections_20251016_133257.json
  Added validation file paths to each image set

Validation files saved to: ../scripts_output/validation

=== VALIDATION COMPLETE ===

If residual drift is near zero (< 0.1 px) and rotation is near zero (< 0.01°),
then the alignment was successful!

=====
PIPELINE COMPLETE!
=====

All steps completed successfully!

Results:
- JSON file: scripts_output/particle_selections_20251016_133257.json
- Particle tracking CSV: scripts_output/particles_tracking/
- Drift analysis CSV: scripts_output/particle_drift/
- Aligned images: (sibling to input folders with _aligned suffix)
- Validation results: scripts_output/validation/
```

Validation: example_data1_z6z
Before vs. After Alignment

