

The Path to Exascale: VP3

Activities and Results

RNDr. Vladimír Ulman, Ph.D.

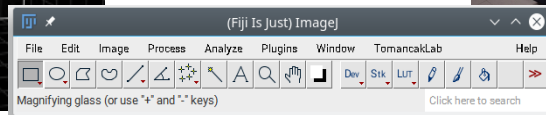
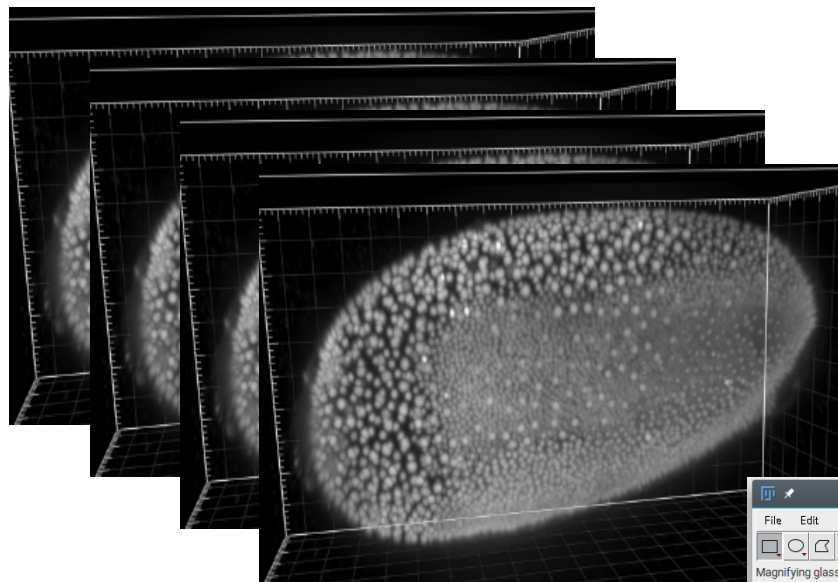
9.12. 2022

IT4Innovations, Ostrava

Special thanks to: Pavel Tomančák, Michal Kozubek

VP3: Main Goal

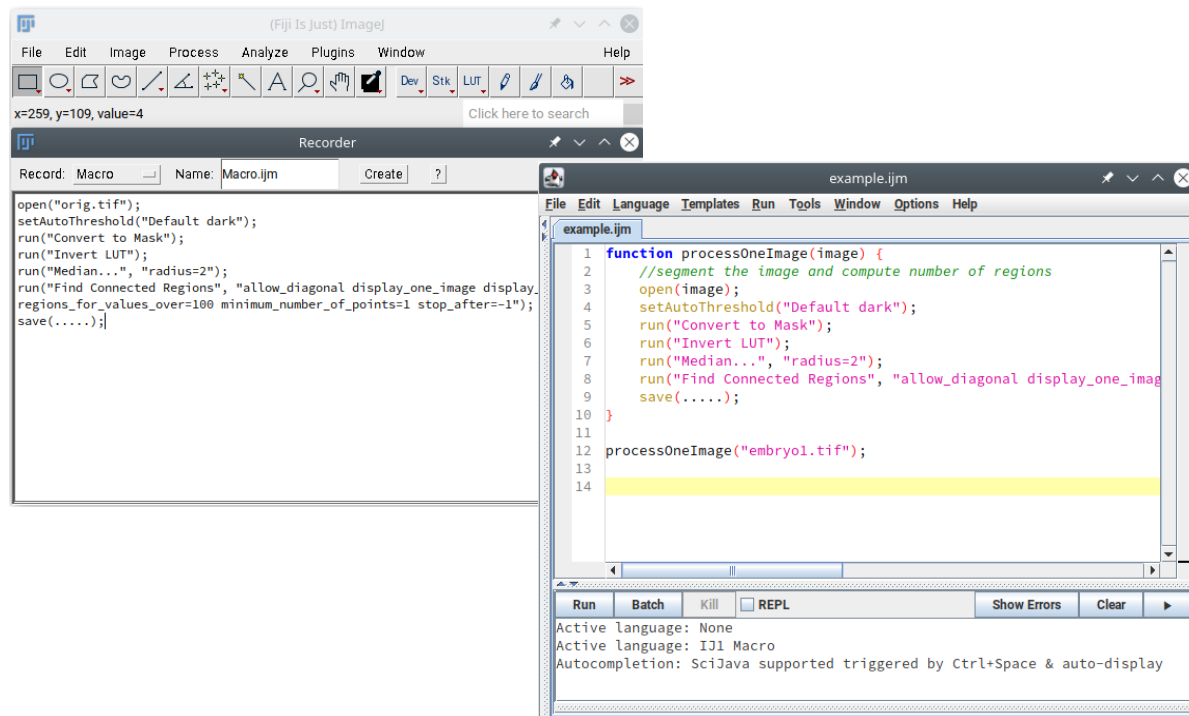
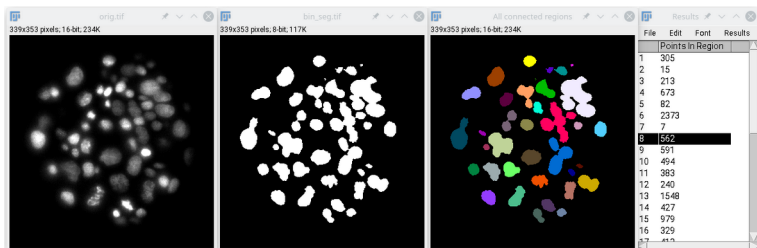
„To accelerate microscopy image processing in Fiji using a supercomputer.“



VP3: Motivation

„To accelerate microscopy image processing in Fiji using a supercomputer.“

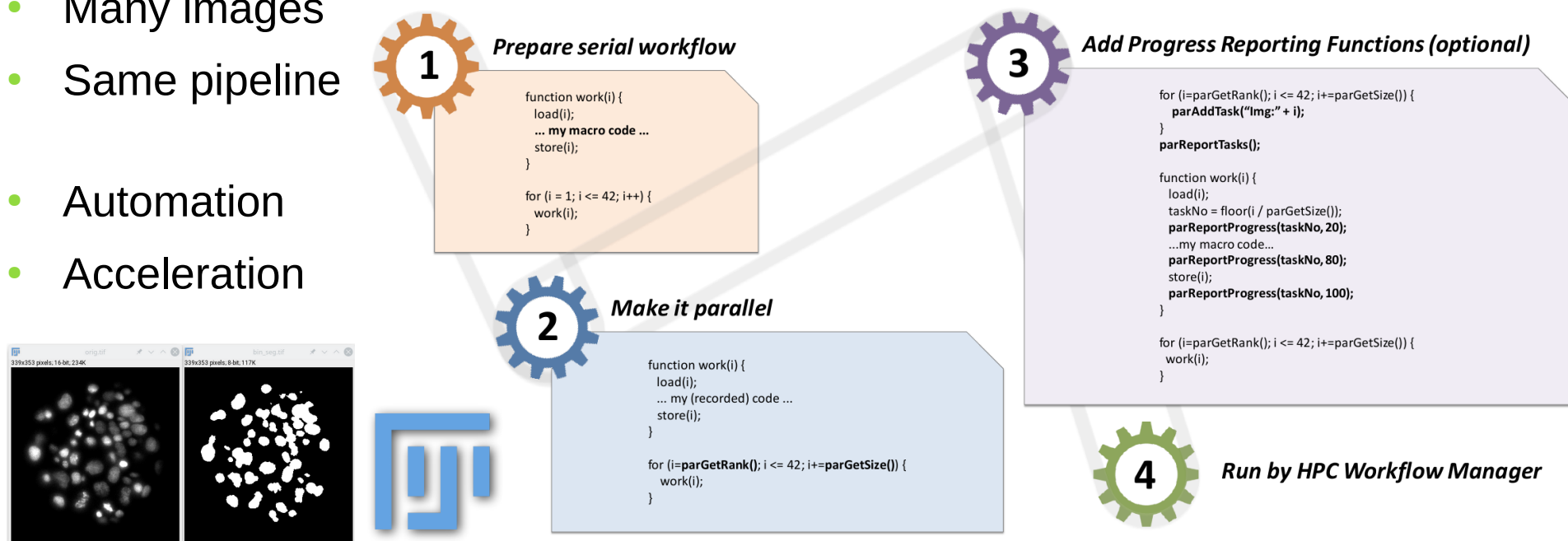
- Many images
- Same pipeline
- Automation
- Acceleration



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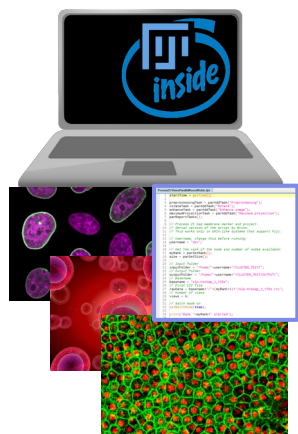
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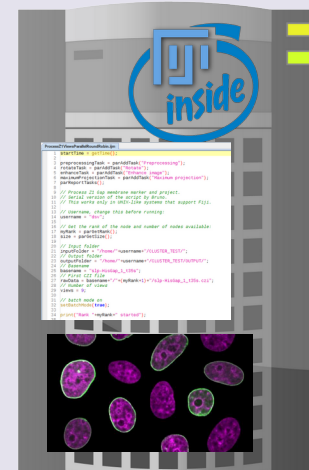
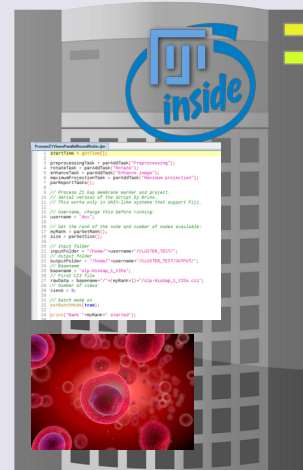
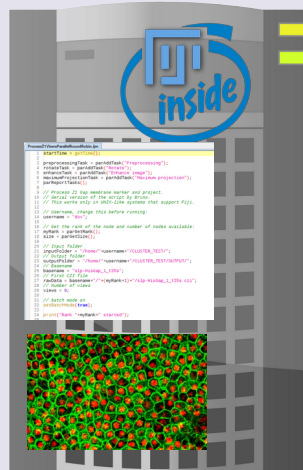
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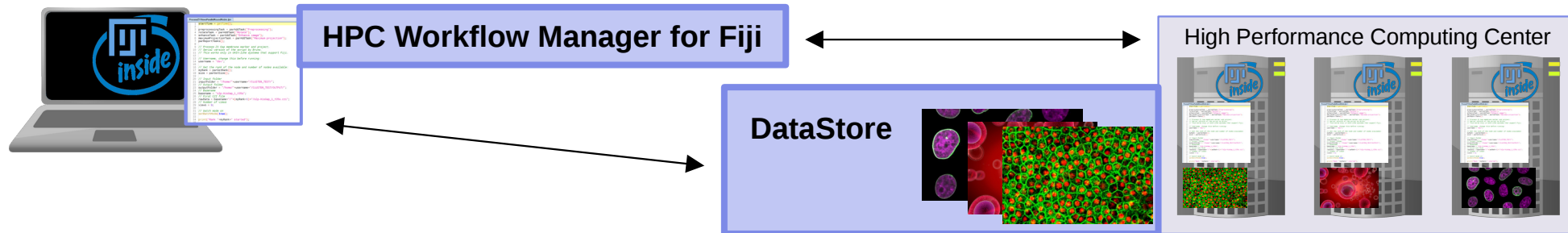
- Fiji:
 - Batches (using Scripts)
 - Image processing



High Performance Computing Center



VP3: Remote Computing



Deep Learning: **SilverGT, EmbryoGen**

Image volumes: **BDV komprese, Kartographic projections**

Follow up applications: **Mastodon, Vizualizace**

VP3: Results

HPC Workflow Manager for Fiji

- Graphical interface (plugin) in Fiji
- Extends Fiji scripting, supports parallelism
- Define tasks, manage and monitor
- Communication to HPC
- Works on users' HPC !

The image displays several screenshots of the HPC Workflow Manager for Fiji interface. The top-left screenshot shows the 'parallelMacro.ijm' script editor with a macro for processing images in parallel. The top-right screenshot shows the 'Macro Progress' table with columns for Task name, Node 0 pr..., Node 1 pr..., Node 2 pr..., and Node 3 pr... The table lists tasks for 'Img: 0', 'Img: 4', 'Img: 8', 'Img: 1', and 'Img: 5', with progress indicators (checkmarks or loading circles) for each node. The bottom-left screenshot shows the 'Job dashboard for job #1' with a table of job details: Job ID, Status, Creation time, Start time, and End time. The bottom-right screenshot shows the 'Create job' dialog with options for Job Type (SPIM Workflow, Macro, Script), Input Data Location, Node Configuration (Number of nodes, Max amount of time needed, PBS Professional queue), and Output Data Location.

Task name	Node 0 pr...	Node 1 pr...	Node 2 pr...	Node 3 pr...
Img: 0	Done			
Img: 4	Done			
Img: 8				
Img: 1		Done		
Img: 5		Done		

Job ID	Status	Creation time	Start time	End time
1	Configured	N/A	N/A	N/A

Macro Progress	Error output	Other output	Job directories	Data upload	Remote job info
Number of nodes: 50 Number of cores per nodes: 24 Queue: qprod Walltime: 2:0 User script name: parallelMacro.ijm Max memory per node: 8 Scheduler job id: null					

Job Type: ☒ SPIM Workflow, ☒ Macro, ☐ Script

Input Data Location: ☐ Demonstration data on the Salomon IT4I cluster, ☐ Job subdirectory, Select

Node Configuration: Basic, Advanced
Number of nodes: 1
Max amount of time needed: 1 Hours, 0 Minutes
PBS Professional queue: qexp

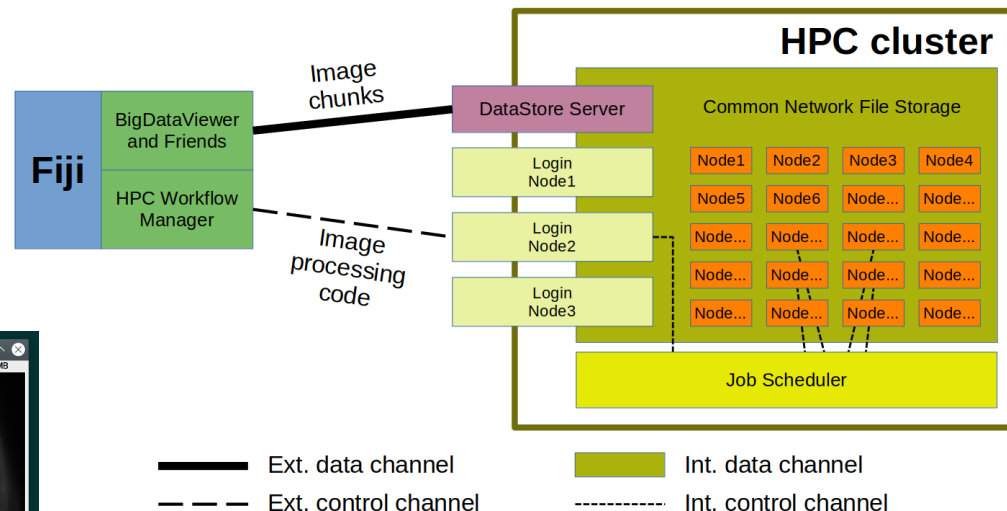
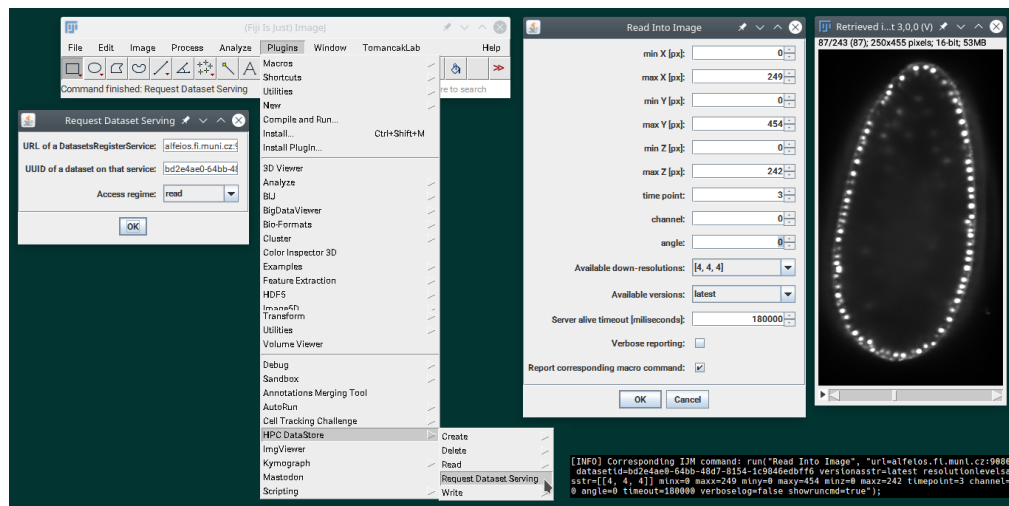
Output Data Location: ☒ Job subdirectory, Select

Create

VP3: Results

DataStore

- Provides images per chunks
- Remote (Internet) & local access
- Fully in Fiji, in BigDataViewer

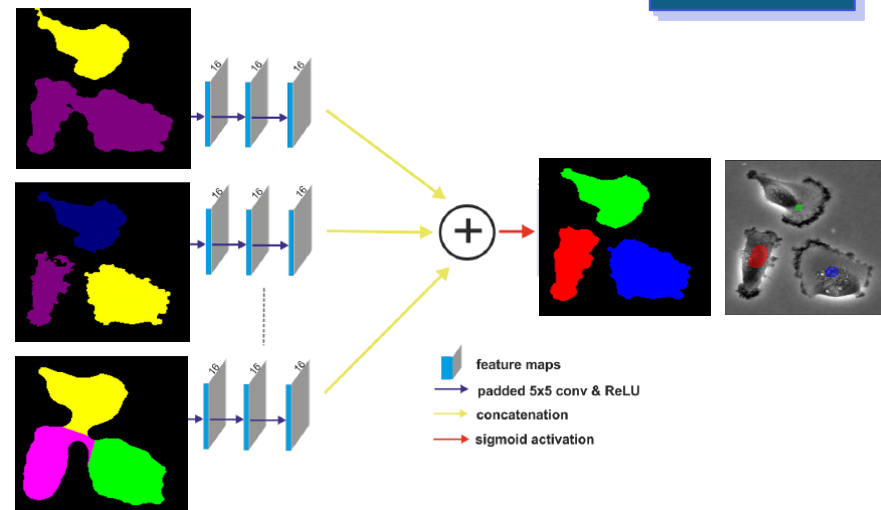


- Supports programming lang'es
 - Java, C++, Python
 - Fiji scripts

VP3: Results

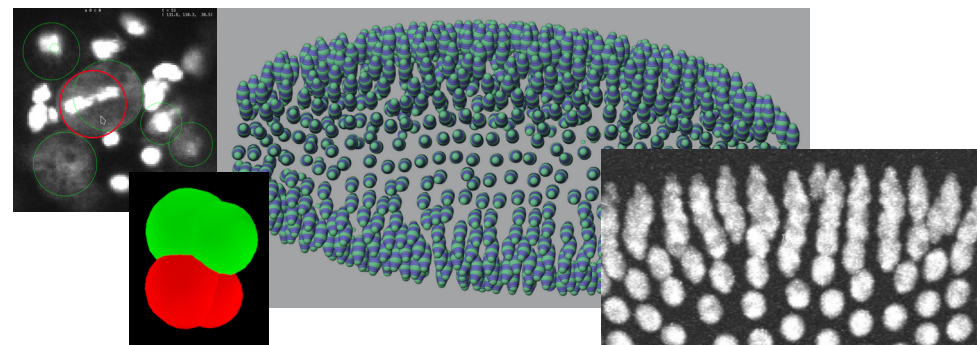
SilverGT

- Annotated real images
- More segmentations into one superb
- Training data for deep learning
- Available on CellTrackingChallenge.org



EmbryoGen

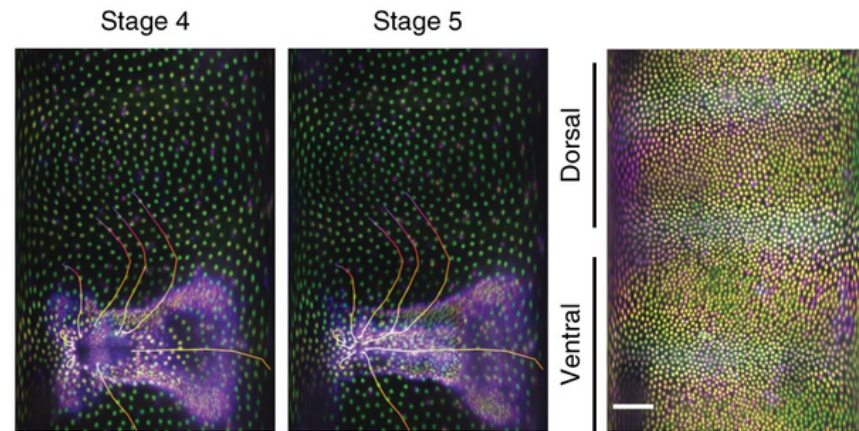
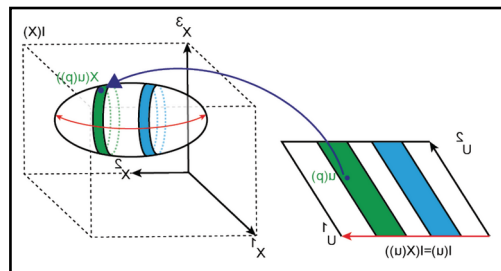
- Annotated synthetic images
- Simulated life of a cell population
- Training data for deep learning



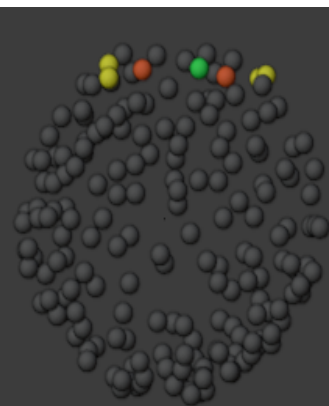
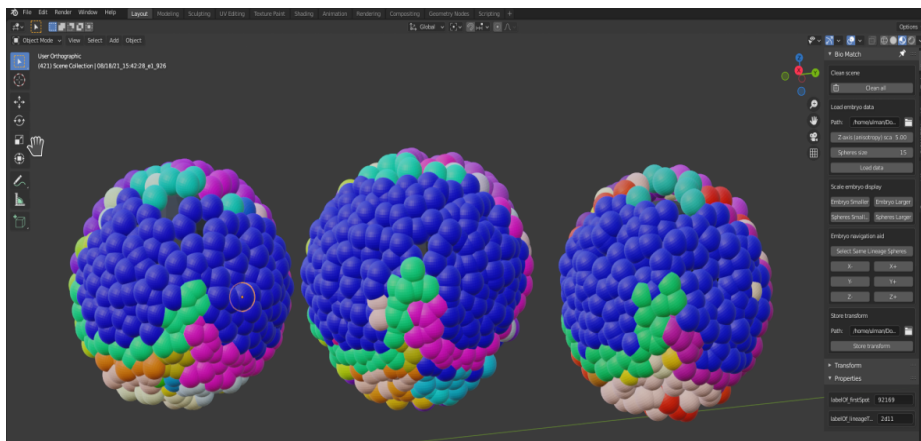
VP3: Results

Cartography image processing

- Reduces image volume by resaving with the projection
- Specimens with „surface“ – embryos, organoids
- Requires new image processing algorithms (distortions)



VP3: Results



Vizualization

- Extends Blender
- Big (non-image) data, extensibility
- Connects bio-SW_s with Blender

