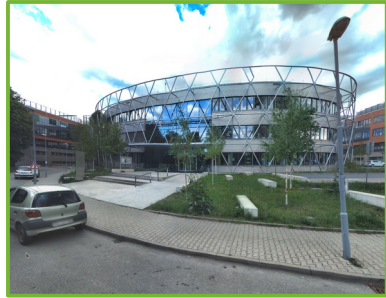


# Vladimír (Vlado) Ulman

Mastodon – DeepLineage kick off  
25<sup>th</sup> Feb 2022, online



# About Vlado:



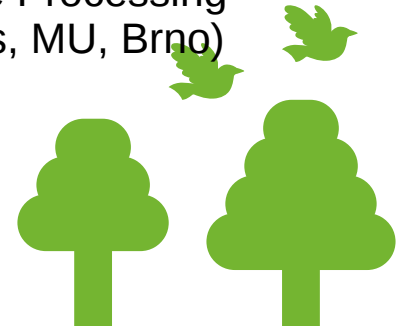
- Applied Computer Scientists & Mastodon + Imglib2 believer
- Image processing & analysis, big images in parallel
- Algorithms benchmarking (synth. data)
- Support for DL methods training (silver ground-truth)

- Central European Institute of Technology (CEITEC, Masaryk University, Brno)



- Centre for Biomedical Image Processing (CBIA, Faculty of Informatics, MU, Brno)
- [CellTrackingChallenge.net](https://CellTrackingChallenge.net)

- IT4Innovations National Supercomputing Center (IT4I, VSB – Technical University of Ostrava, Ostrava)
- [HPC Workflow Manager](#) (for Fiji) + [DataStore](#)



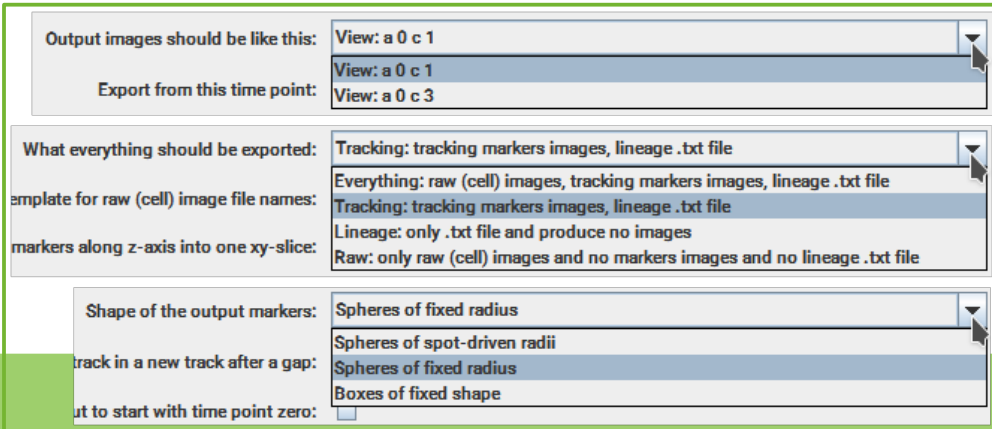
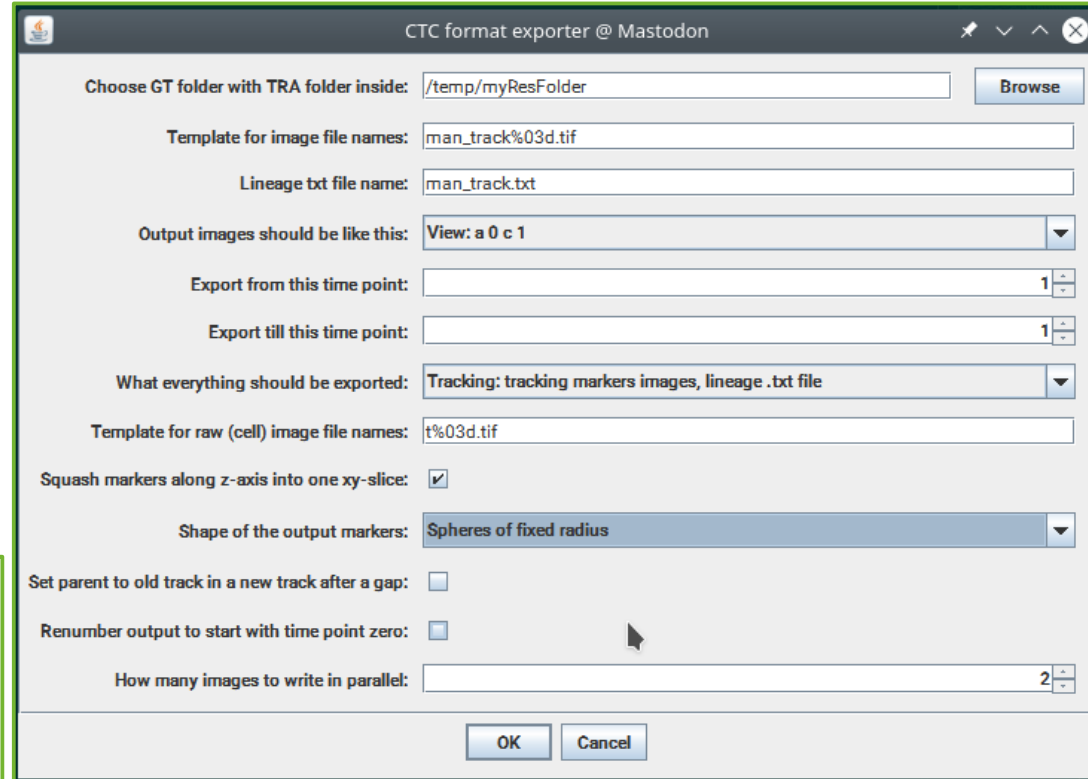
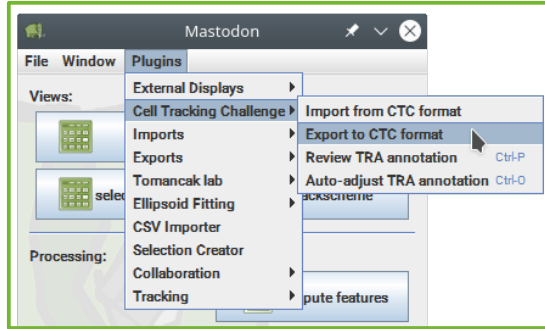
# Mastodon contra Vlado, history:

- I/O plugins (oldest, 2018)
  - Point coords/clouds in CSVs ↔ spots in Mastodon
  - Import spots from instance segmentation + overlap-based tracking
  - I/O for Cell Tracking Challenge
- SciView visualization (2020)
- Collaborative tracking (2020)
- Shared images via DataStore (2021)
- Blender visualization (newest, 2021)



# Mastodon contra Vlado, history:

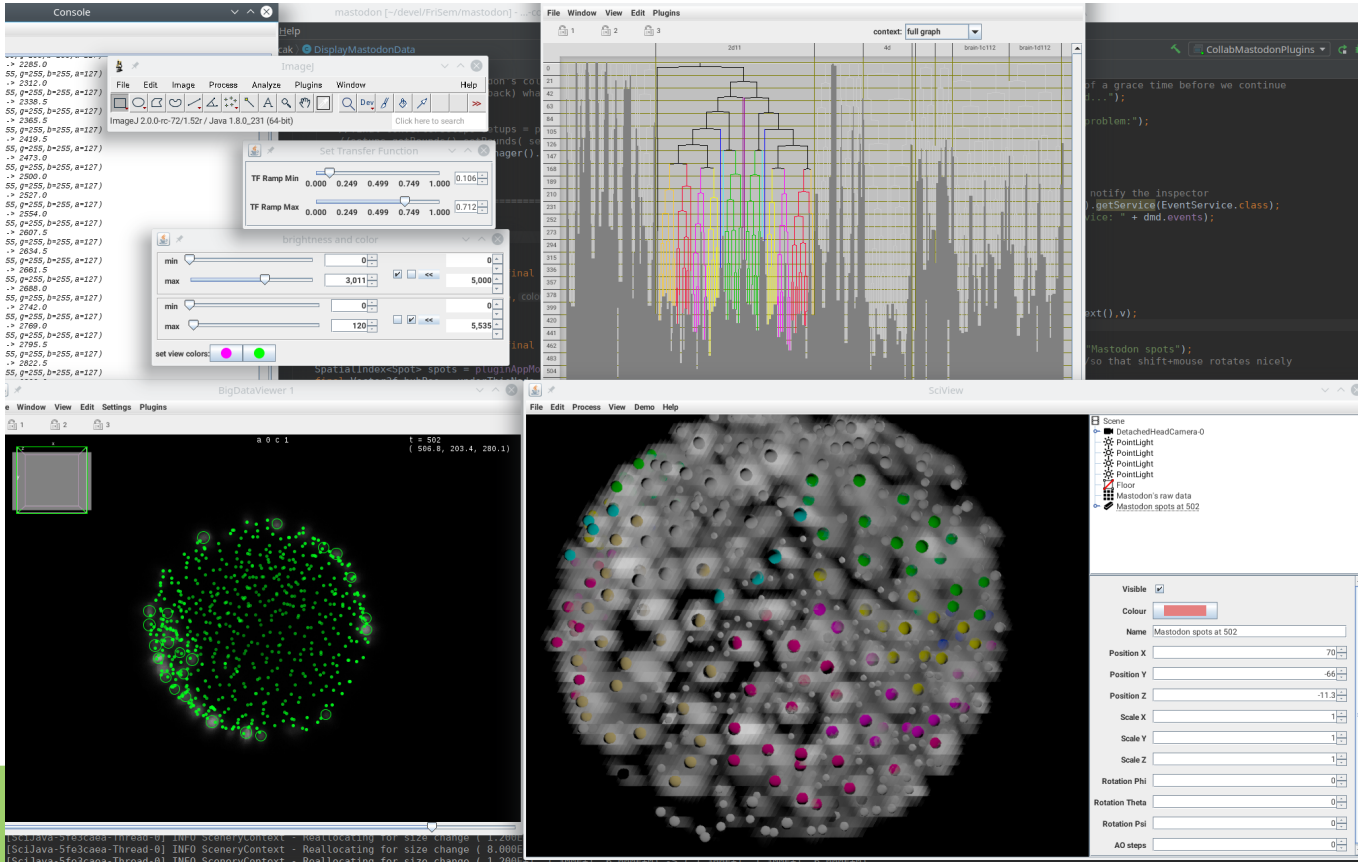
- I/O plugins (oldest, 2018)
  - I/O for Cell Tracking Ch.





# Mastodon contra Vlado, history:

- SciView visualization (2020): featuring tag colors, vol. rendering, spots, trajectories, adjustable vizu, interconnected!



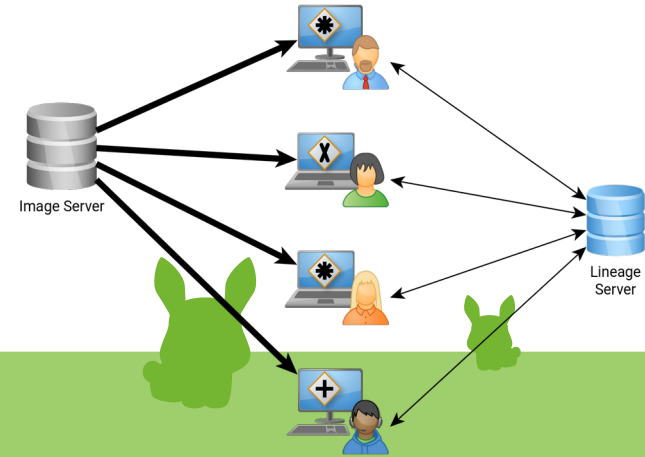
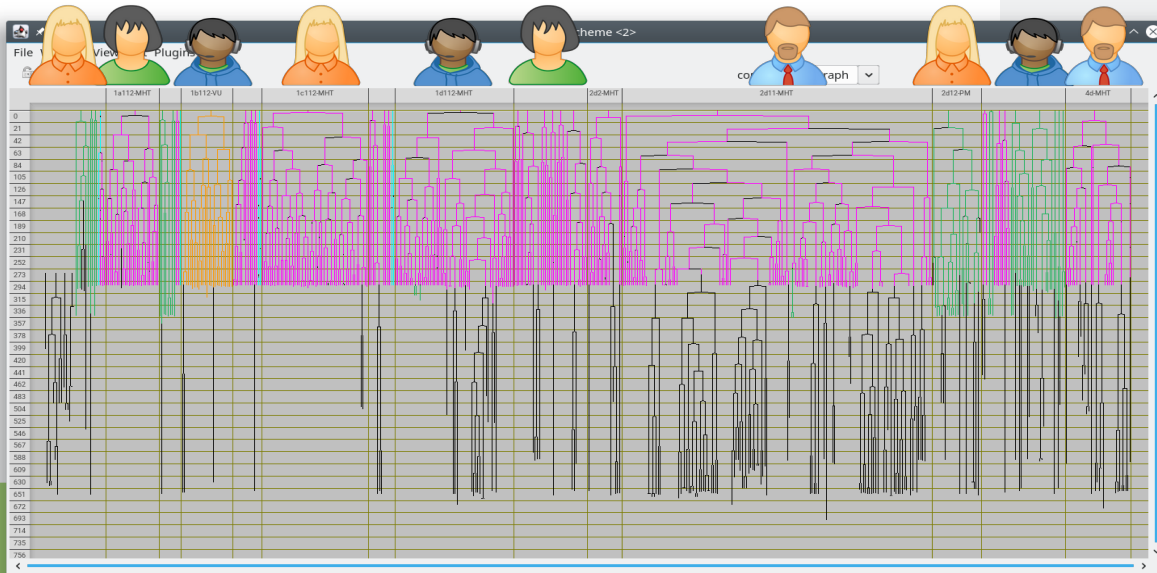
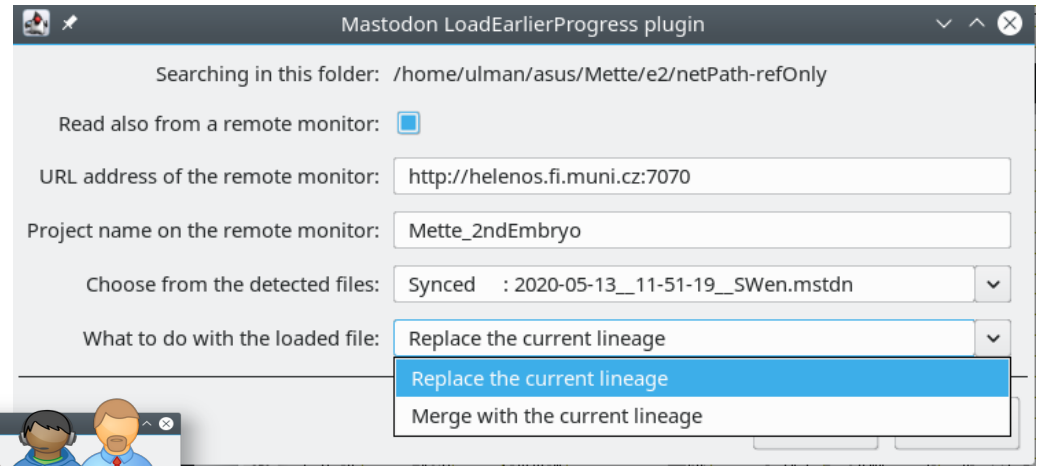
spots, trajectories,  
adjustable vizu,  
interconnected!

also: fragile,  
HW heavy, unstable



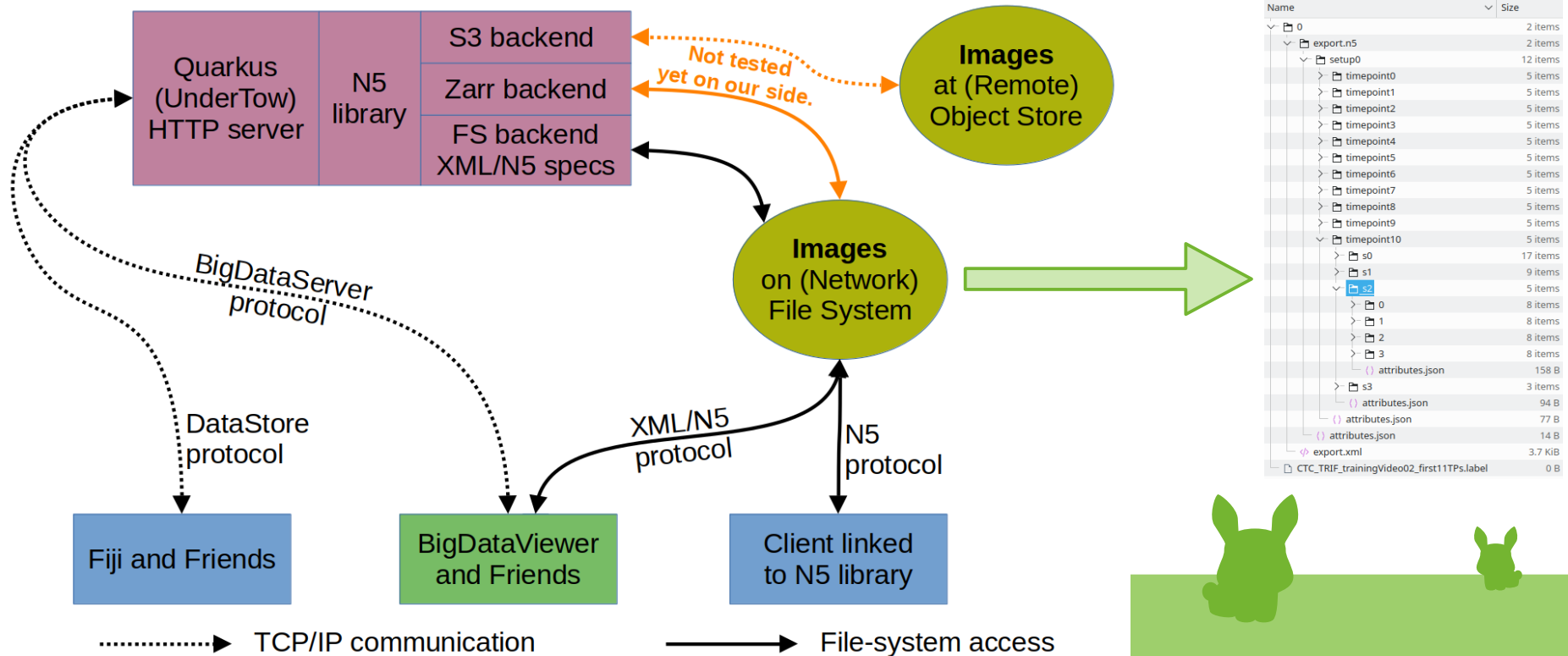
# Mastodon contra Vlado, history:

- Collaborative tracking (2020):  
I/O works, server works,  
merging is a pain



# Mastodon contra Vlado, history:

- Shared images via DataStore (2021): works & smoothing edges



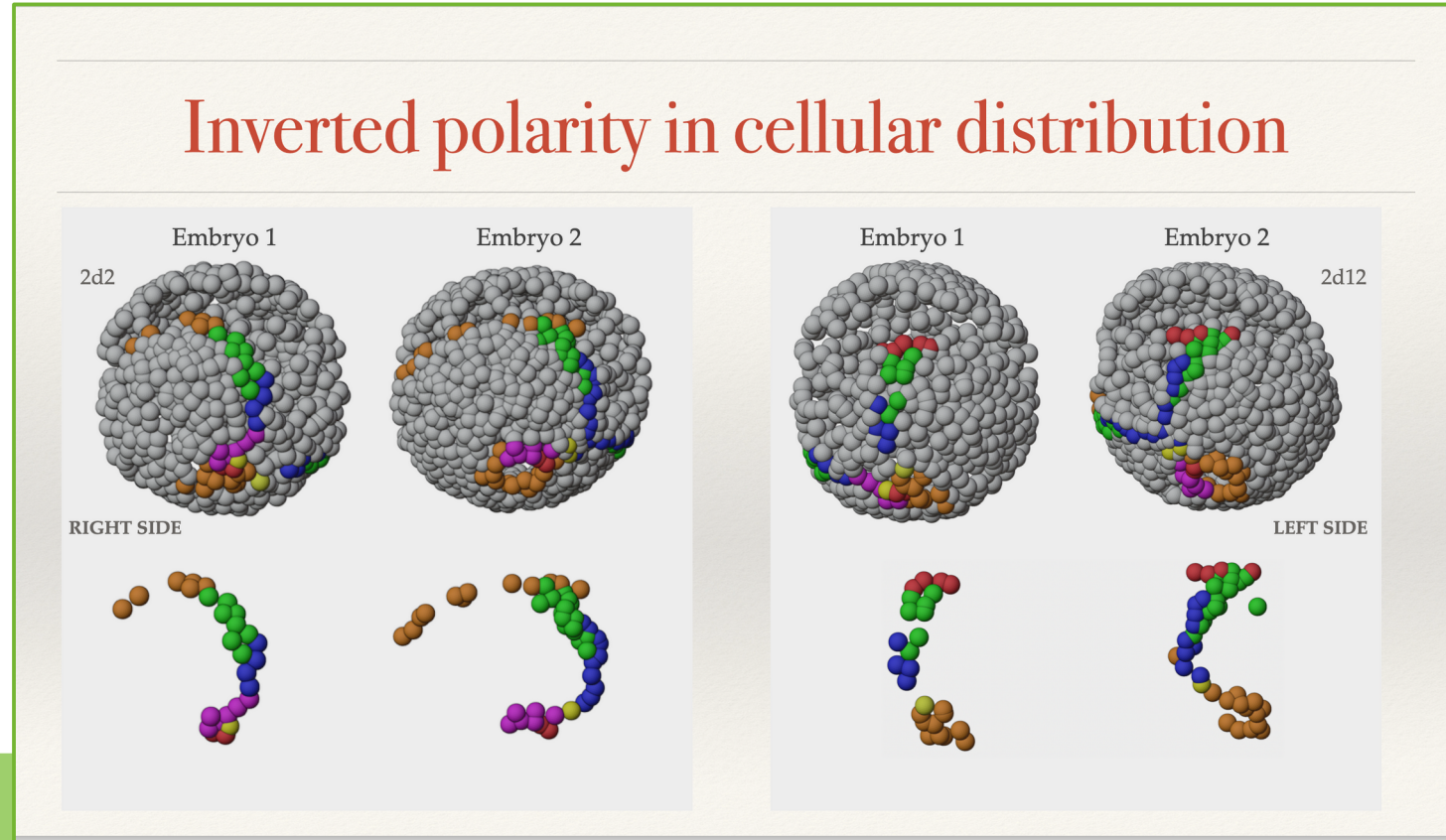
# Mastodon contra Vlado, history:

- Blender visualization (newest, 2021):

stable, known,  
advanced...

overwhelming,  
google-able

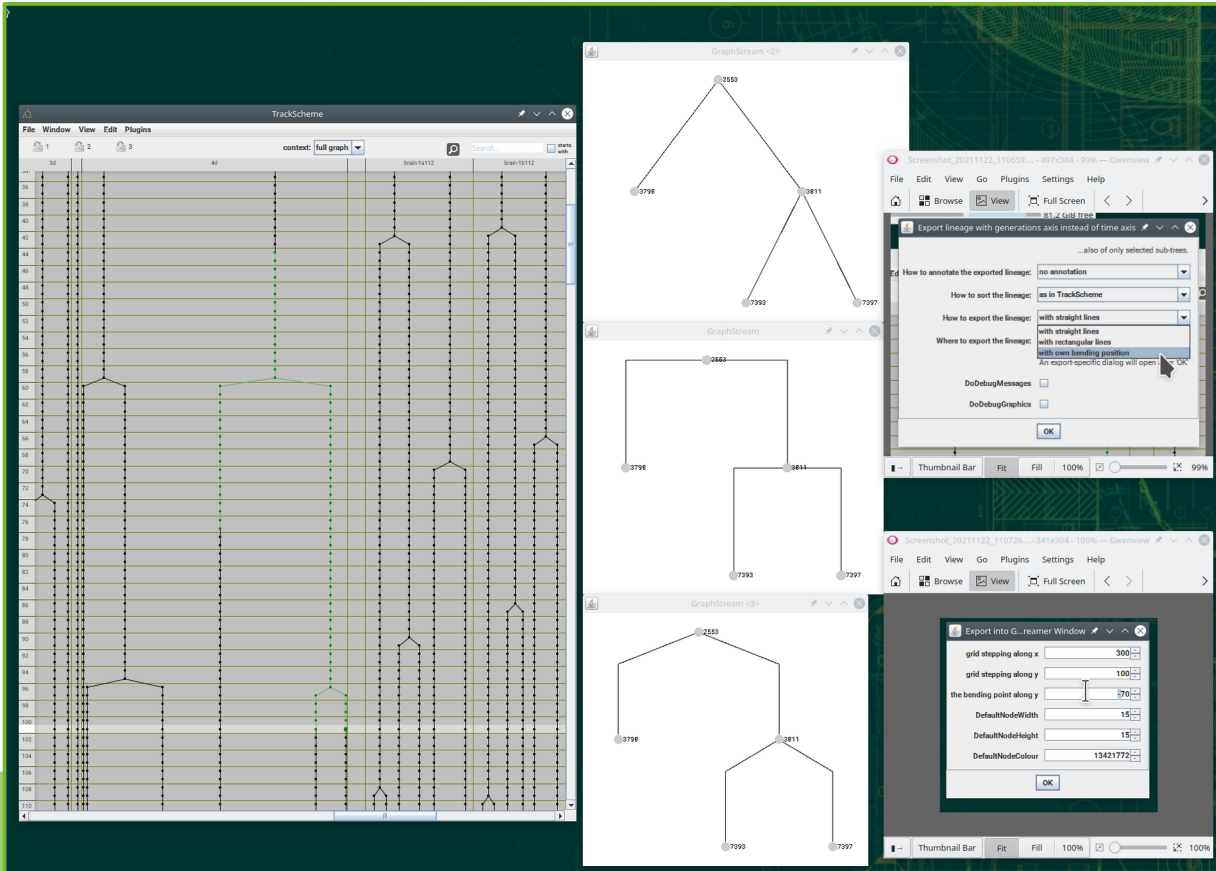
capable,  
performant



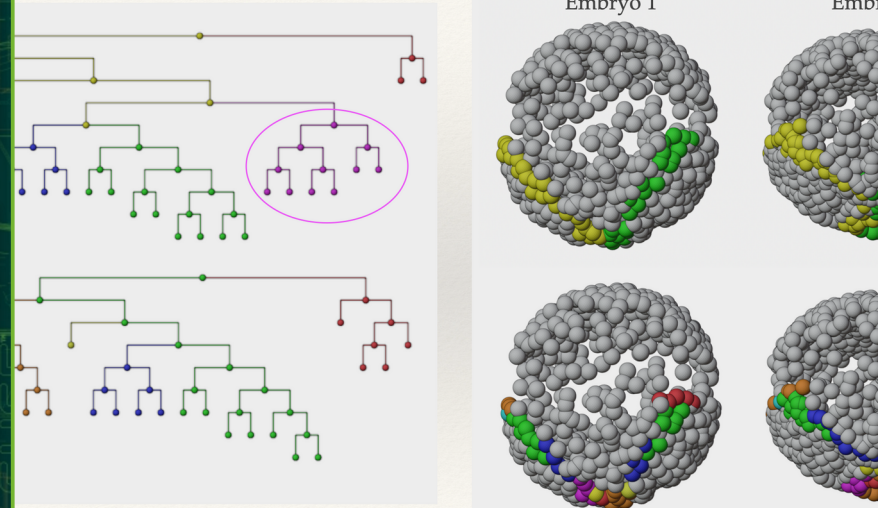
# Mastodon contra Vlado, history:

- Blender visualization (newest, 2021):

lineage vizu (options)



## Comparison of sister cell lineages





# Mastodon contra Vlado, history:

- Blender visualization (newest, 2021): comparing trees (4K LCD)

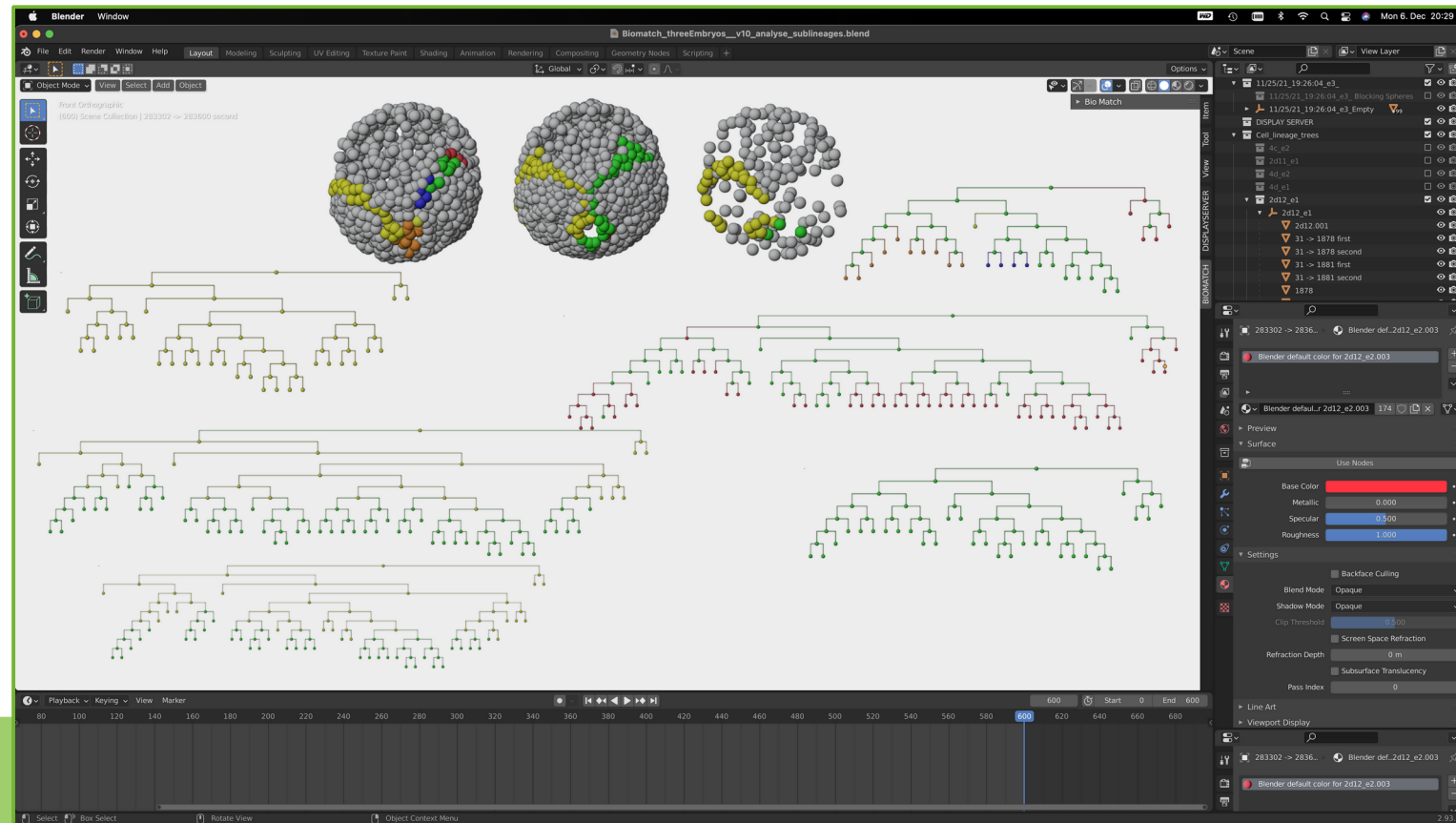
The image is a collage of screenshots from a Blender 2.83.1 interface, illustrating the Mastodon visualization process. The main window shows three hierarchical tree structures: a small orange tree at the top, a large green tree in the middle, and a blue tree at the bottom. The interface includes various panels like 'Properties', 'Outliner', and 'Dope Sheet'. An 'Export into Blender' dialog box is open, showing settings for grid stepping (40), DefaultNodeWidth (10), DefaultNodeColour (13421772), Connecting line width (5), and Use this Z-position (0). The dialog also shows a Nickname of this Mastodon instance (ns) as 'e1' and the Address of the listening Blender as 'localhost:9081'. A 'Display Server' panel is visible on the right, with controls for 'Main Controls' (Set Collection, Start Server, Report Current Status) and 'Housekeeping' (Start Server, Stop Server, Clear Recent, Clear All). A 'Recent' list is also present. In the bottom right, a circular arrangement of grey spheres is shown, with a smaller tree structure overlaid on it. The bottom of the image shows a 'Dope Sheet' editor with multiple tracks for 'mastodon' objects, displaying a complex timeline of keyframes and object states.

# Mastodon contra Vlado, history:

- Blender visualization (newest, 2021):

flexibility,  
animations,  
interactivity,

ATM: very  
much a  
prototype



# Mastodon contra Vlado, wishes:

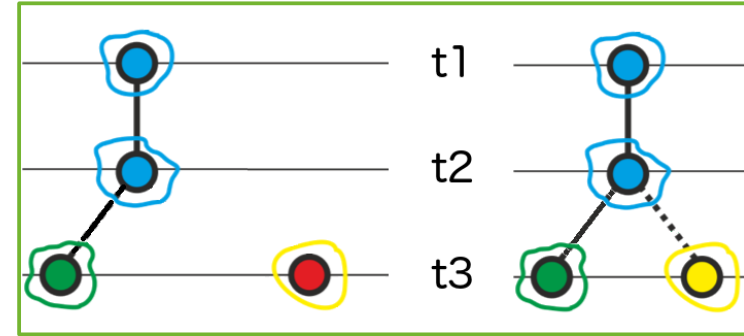
- CellTrackingChallenge
  - SEG, DET, TRA measures
  - Tracking (reference) annotation, annotation review & fixes
- Inter-process communication API for
  - Data sharing (images & tracks)
  - Events sharing (synchronized views, focus events)
- Python access for track analyses
  - No-compilation → Faster development
  - More popular, attractive
  - Deep-learning friendlier





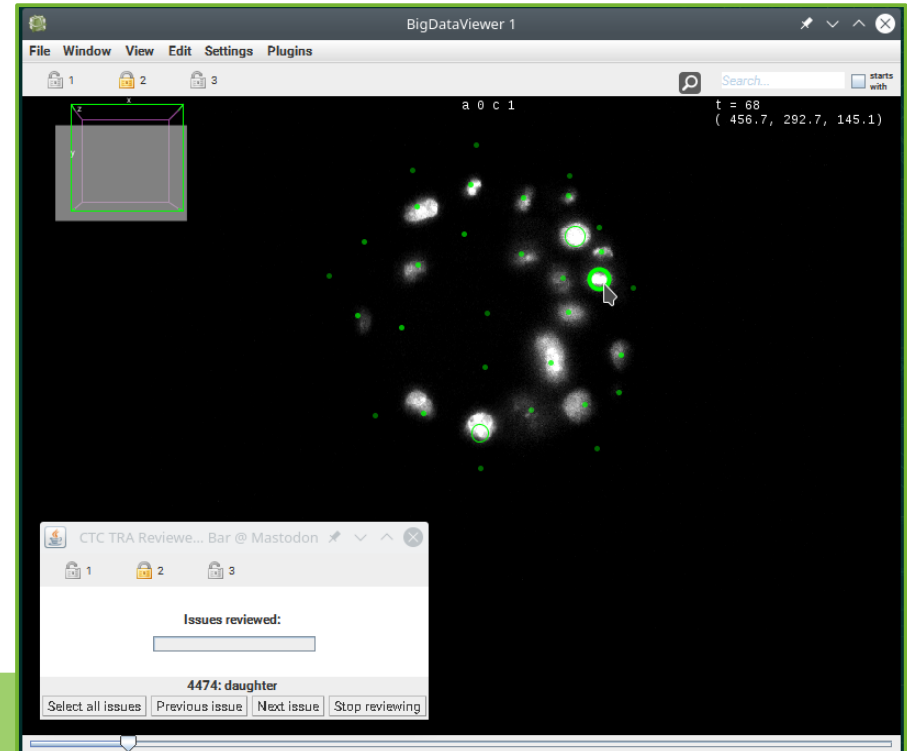
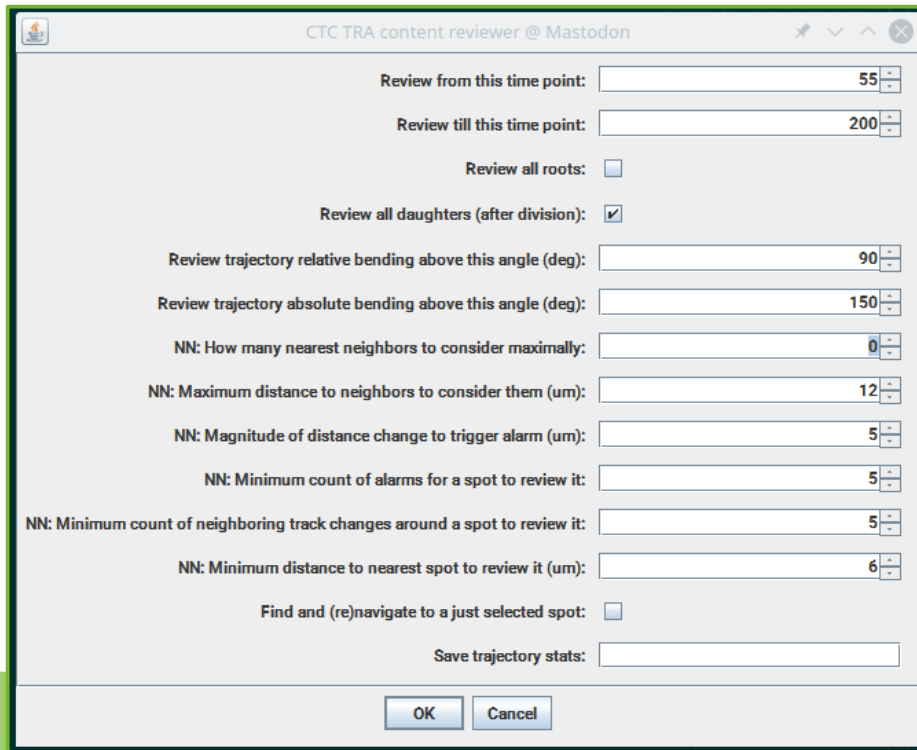
# Mastodon contra Vlado, wishes:

- CellTrackingChallenge
  - SEG, DET, TRA measures
    - Useful for tracking alg. developers
      - coupled with “inspect/review feature”
    - Informative for users
      - can discover zones of good/bad alg. functionality (color coding SEG)
    - Useful for lineage analyses
      - DET, TRA quantify differences between two lineages
  - Tracking (reference) annotation, annotation review & fixes
    - May offer a de facto standard format for storing+sharing tracking data
      - current one is image-centric (and thus “heavy”)
    - “Cases review panel” – brings user over “reported cases”
      - ...detection of anomaly in tracks



# Mastodon contra Vlado, wishes:

- CellTrackingChallenge
  - SEG, DET, TRA measures
    - Useful for tracking alg. developers: “inspect/review feature”



# Mastodon contra Vlado, wishes:

- Inter-process communication API for
  - Data sharing
    - Images: S3 (cloud), DataStore (server), local storage – .one.zarr files
    - Tracks: “Matthias – GIT for lineage”
    - Full and partial (per partes) data
    - ...to/from 3<sup>rd</sup>-party SW ...data interoperability
  - Events sharing
    - Synchronized views
    - Focus events ...between SWs ‘cause “vizu means data reduction”
  - Bonus:
    - Across prog. languages, across computers... rooms... institutes
    - Enables: ext. visualization and/or parallel computing



# Mastodon contra Vlado, wishes:

- Python access (to Mastodon internals) for track+img analyses
  - No-compilation → Faster development
    - e.g. don't need to re-open project & re-navigate to somewhere
  - More popular, attractive
    - feeling: currently general more interest in Python than Java programming
  - Deep-learning friendlier
    - Python is the home of deep learning (of anything... not only cell seg.)
  - Essentially done... needs more education and enlightenment
  - Bonus: IT4I's HPC Workflow manager is designed/oriented towards macros and Jython...

