

# Web & Cloud-Based Platforms for AI-powered Biolimage Analysis

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A world-leading Swedish national center for  
large-scale research and innovation in life sciences



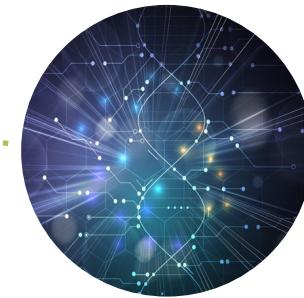
### Research environment

Approx. 190 affiliated  
research groups



### Infrastructure

Service to ~ 1400 Swedish researchers  
annually (2020)



### Data-driven life science

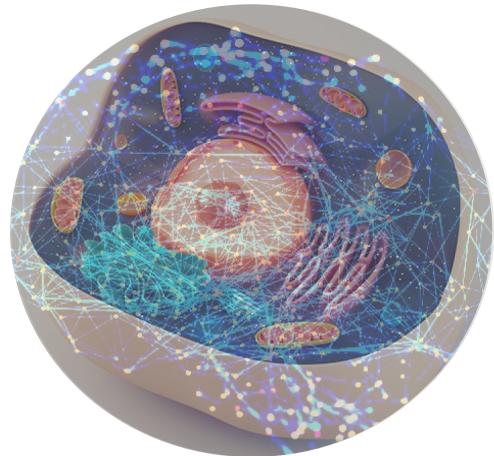
3.1 billion SEK, 12-year-program

### DDLS Fellows Program



## Building AI Systems for Data-driven Cell and Molecular Biology

Data-driven Human Cell Simulator

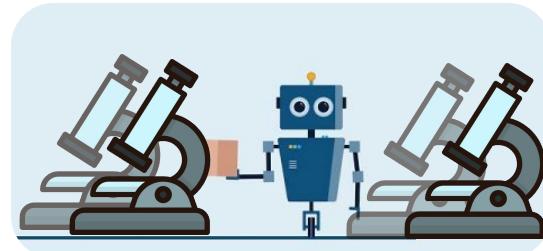


Data Generation

AI Models Execution

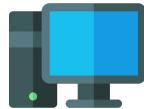
AI: Data- & Compute-hungry!

Microscopy Imaging Farm



AI Cloud Infrastructure





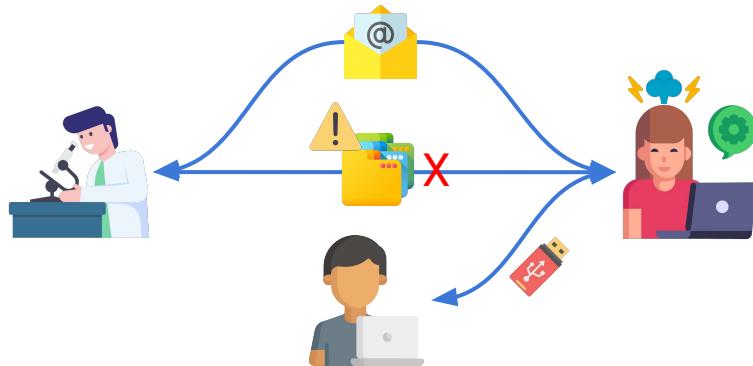
## Desktop Software



Storage & Compute Capacity Determined Locally



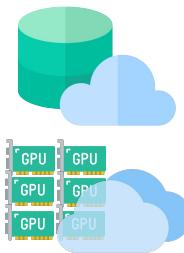
Challenging Installation



Significant Collaboration Barriers



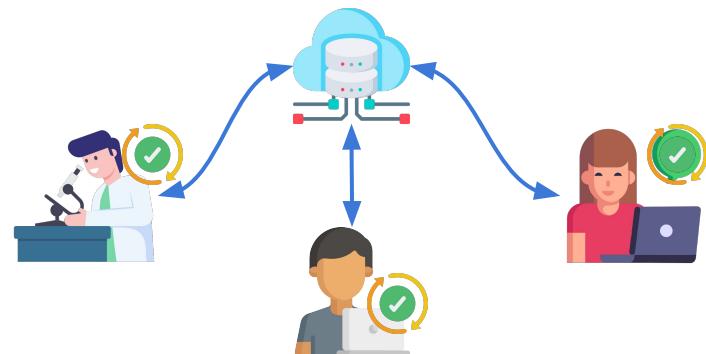
## Web & Cloud Application



Storage & Compute Pull From Globally Available Resources



Zero-Installation with mobile support



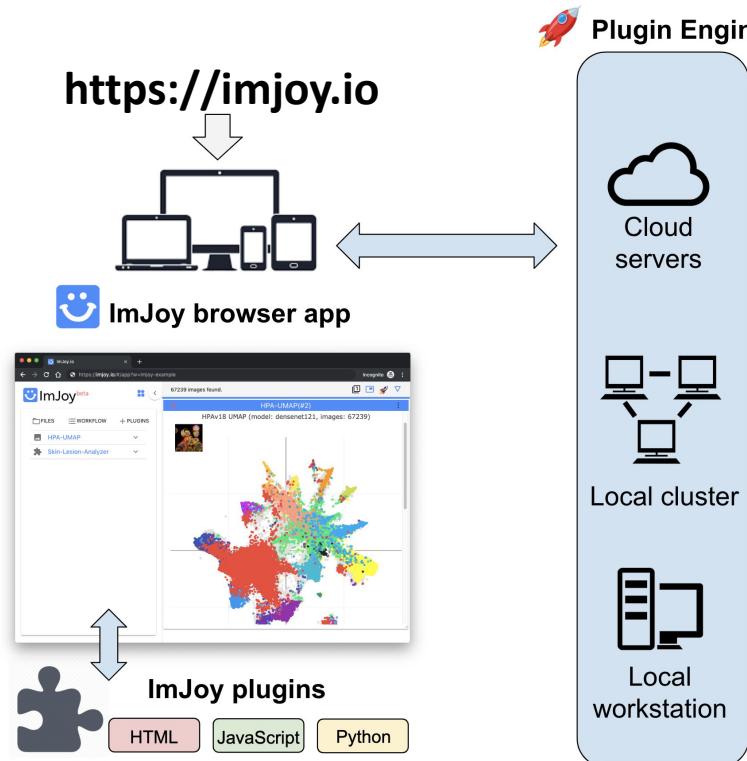
Streamlined Collaboration

Image credit: Flaticon.com

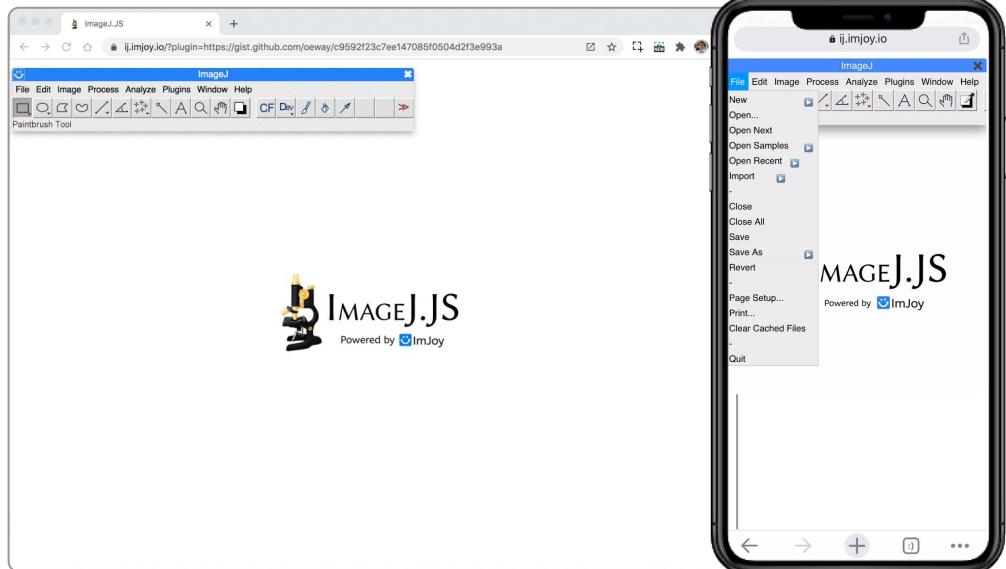


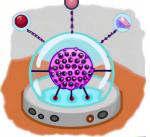
# ImJoy AI computing platform

Supercharging interactivity and scalability in AI-powered life science

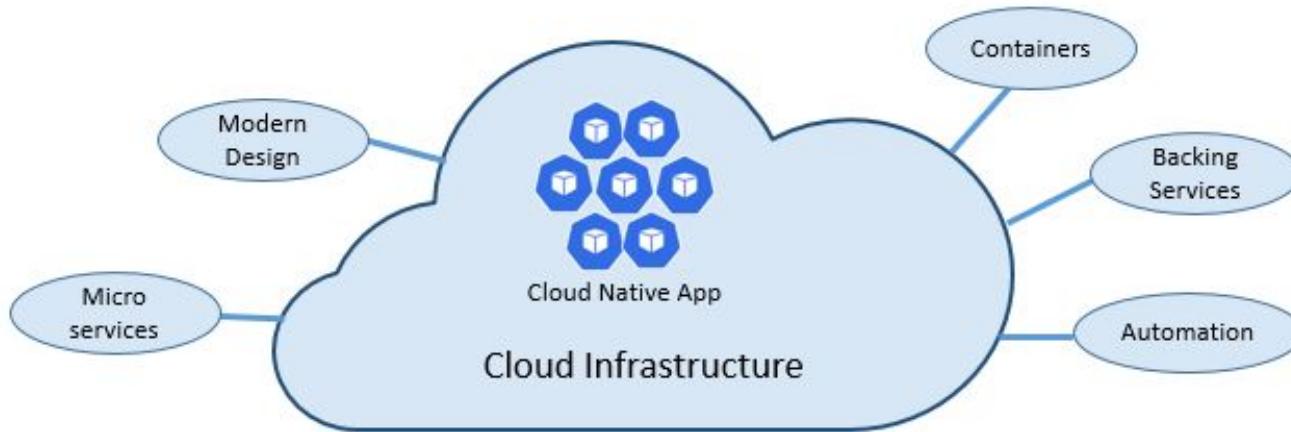


ImageJ.JS: ~1000 users / day





# Web & Cloud Application for Bioimaging



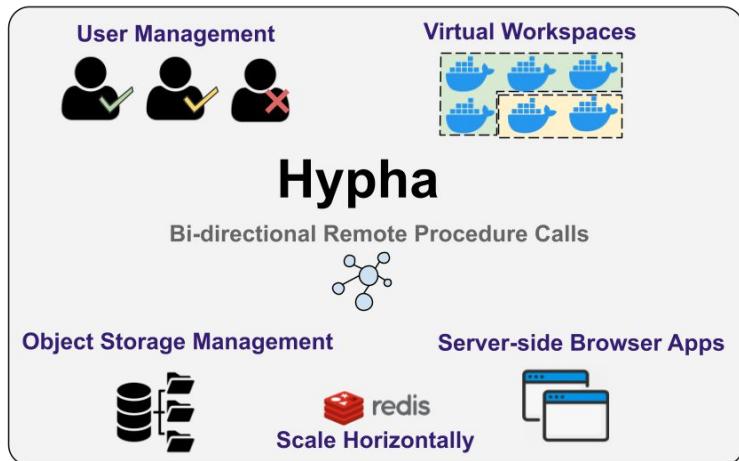
- Handle data and computation in the cloud
- Desktop software and browser as a interface

Multicloud: private, public, hybrid => **cloud of clouds**



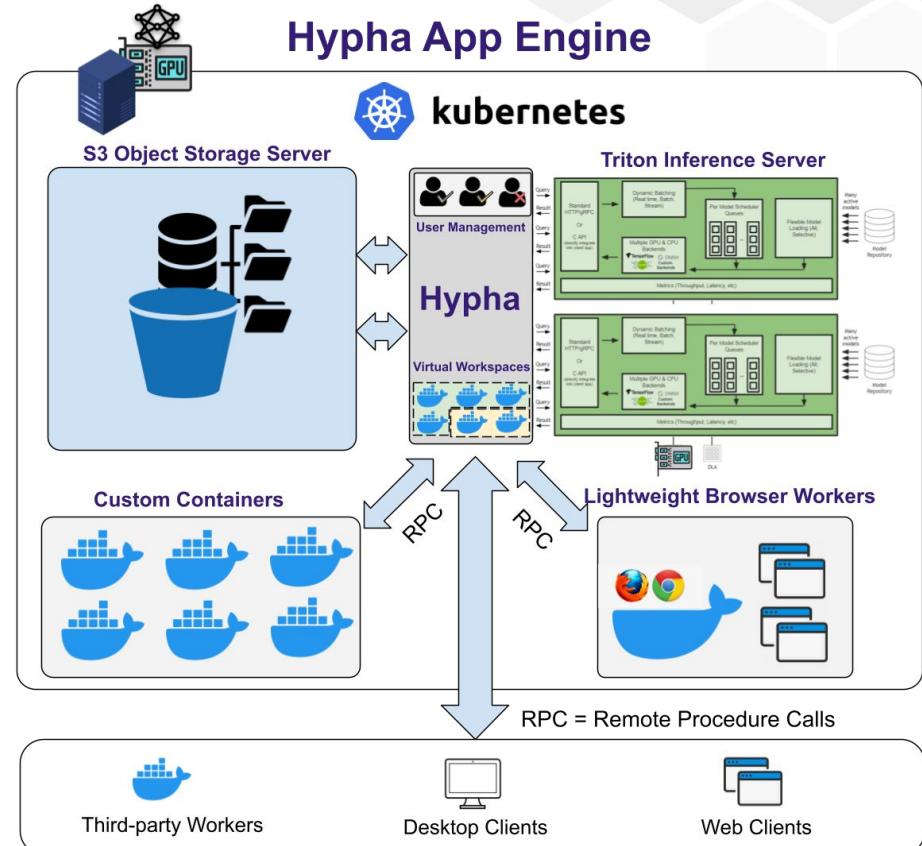
# Hypha for Data & AI in the Cloud

A Python package for Scalable Data Management and AI Model Serving



Freely available here:

<https://github.com/amun-ai/hypha>





- Model description file standard
- Repository for sharing models
- Continuous integration for model testing



Preprint for the BioImage Model Zoo

<https://doi.org/10.1101/2022.06.07.495102>

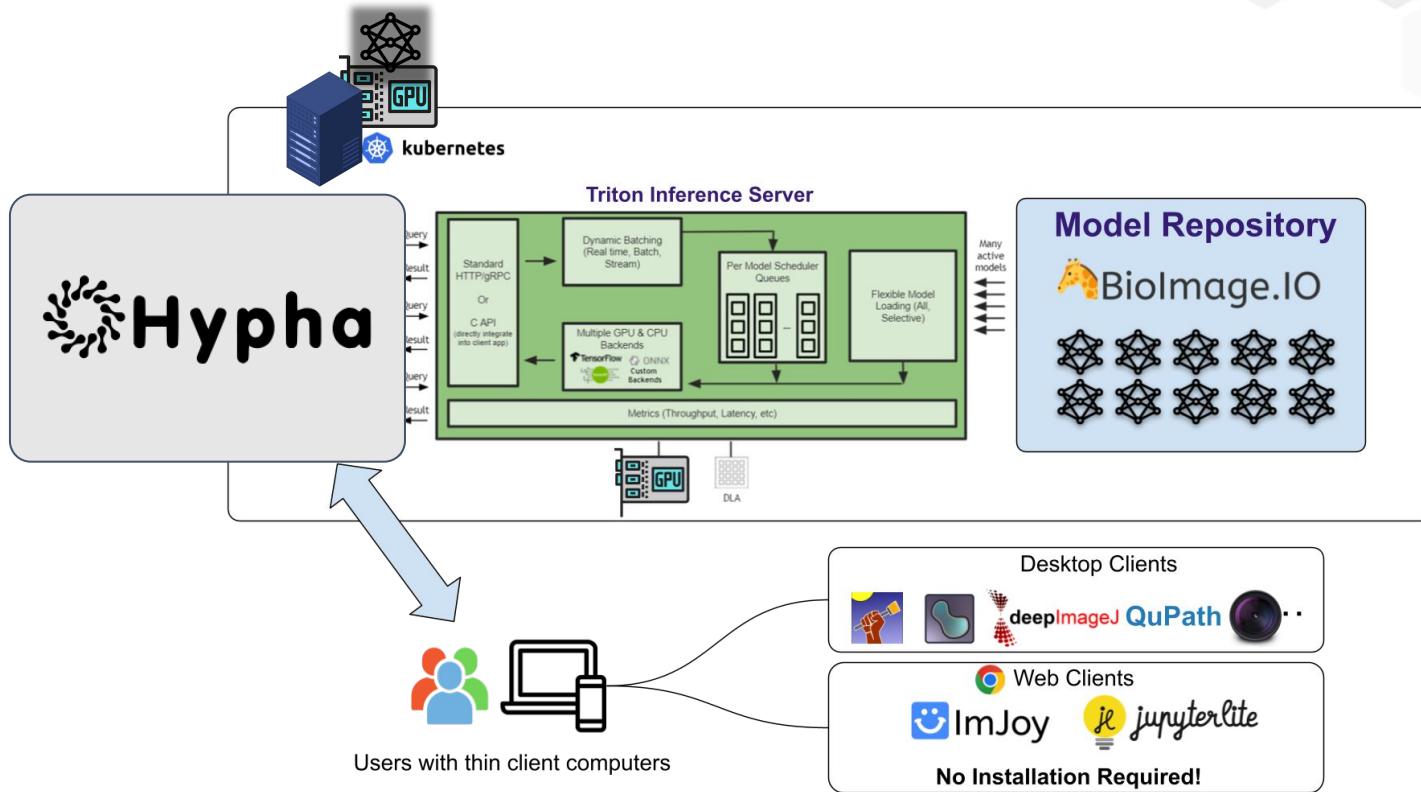
<https://bioimage.io>

The screenshot shows the BioImage Model Zoo homepage. At the top, there's a header with the BioImage.IO logo, a search bar, and links for 'Upload', 'Documentation', and 'About'. Below the header is a section titled 'BioImage Model Zoo' with the subtitle 'Advanced AI models in one-click'. It includes a brief description: 'Integrate with Fiji, Ilastik, ImJoy and more. Try model instantly with BioEngine. Contribute your models via Github. Link models to datasets and applications.' A 'Explore the Zoo' button is present. The main area features a grid of 12 model cards, each with a thumbnail image, title, description, and license information. The cards include:

- Mitochondria Segmentation... (3d electron-microscopy, mitochondria instance-segmentation)
- Neuron Segmentation in EM... (unet, neurons, instance-segmentation, electron-microscopy)
- NucleiSegmentationBound... (fluorescence-light-microscopy, nuclei instance-segmentation, unet)
- LiveCellSegmentationBound... (2d transmission-light-microscopy, label-free)
- PlatynereisEMcellsSegment... (cell segmentation in EM of platynereis, cells, instance-segmentation, electron-microscopy)
- PlatynereisEMnucleiSegment... (organelle) segmentation in EM of platynereis, unet, nuclei, instance-segmentation, electron-microscopy)
- HPA Cell Segmentation (DP...) (Cell segmentation model for segmenting images from the Human Protein Atlas, nucleus segmentation, editable)
- Cell Segmentation from Me... (A 3D U-Net to predict cell membranes in plant tissues, trained on zero-cost 3D deepimagej segmentation, 3d)

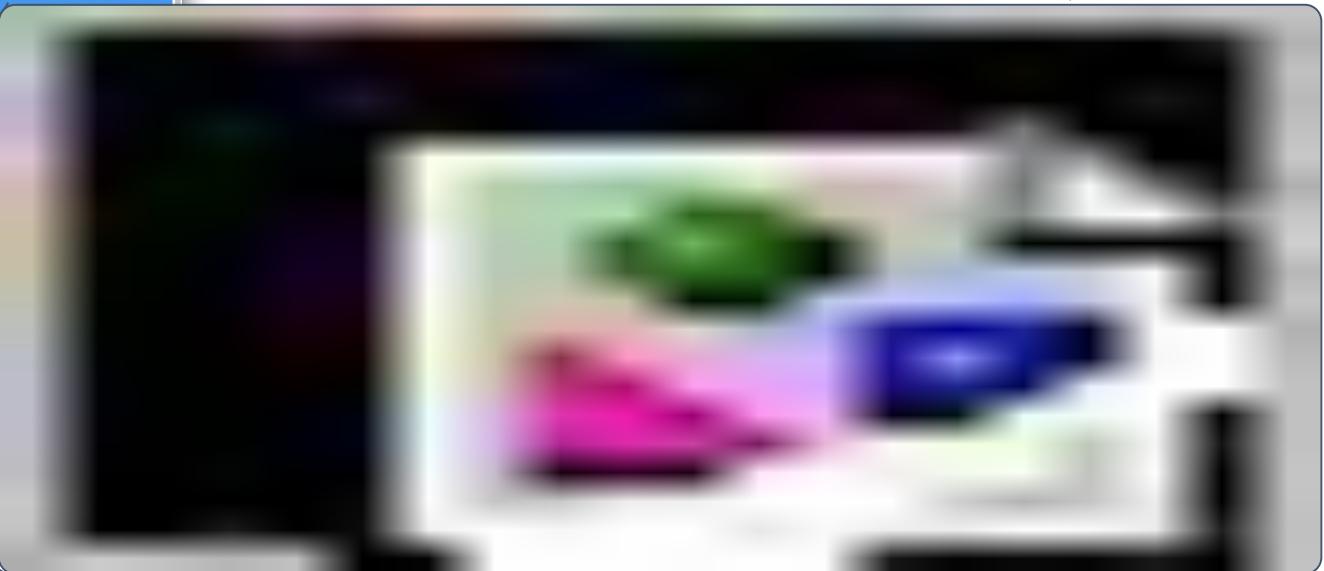
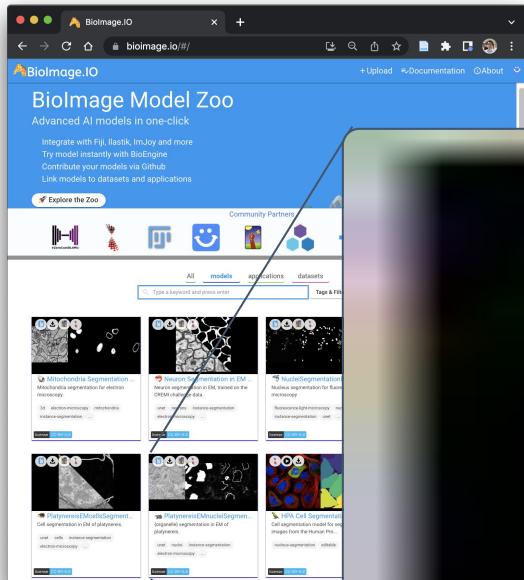
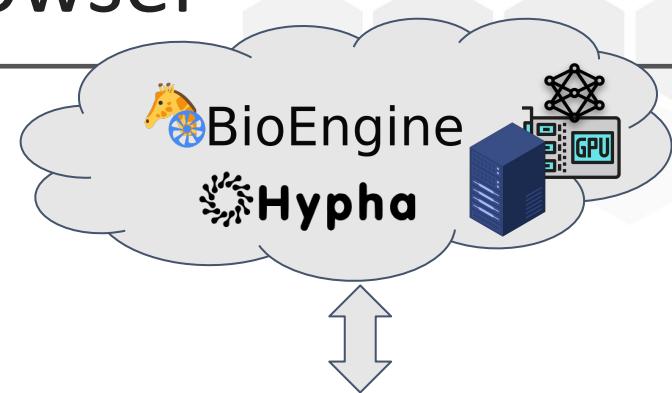


# BioEngine - AI models for Bioimage Analysis



# Test Run AI Models in the browser

Try it yourself: <https://bioimage.io>



# Deploy Your Own BioEngine

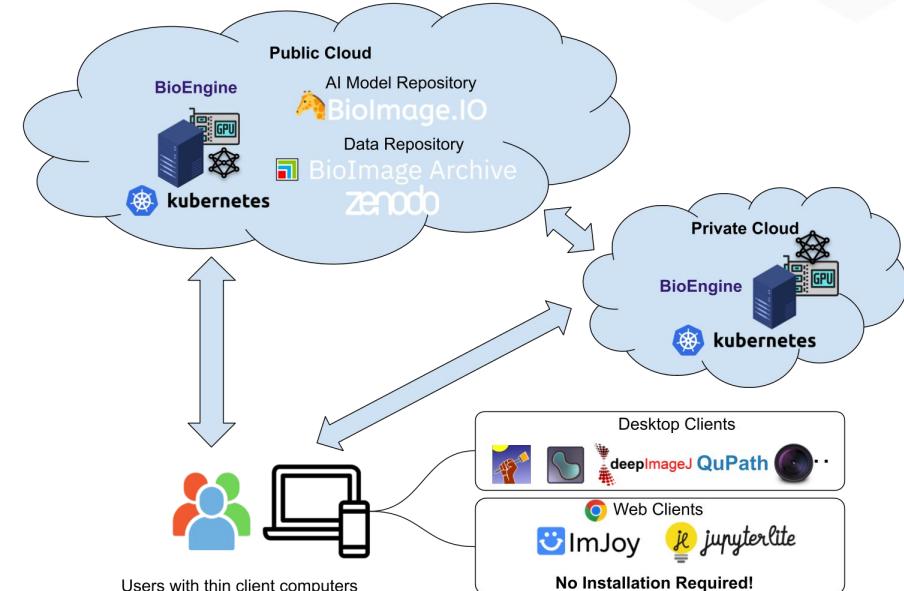
## BioEngine for Desktop



## BioEngine for Kubernetes & HPC



kubernetes



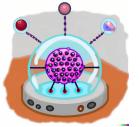
Stay tuned!

# Hands on: Accessing BioEngine in Jupyter notebooks

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- Start Chrome
- Create an **Incognito** window, via the `...` menu in Chrome
- Start the following jupyter notebook:  
<https://imjoy-notebook.netlify.app/lab/index.html?load=https://raw.githubusercontent.com/bioimage-io/bioengine/main/notebooks/bioengine-tutorial-embl-2024.ipynb&open=1>

# Acknowledgements



## AICell Lab



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Songtao Cheng  
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Wei Ouyang  
Principle Investigator



Weize Xu  
Visiting PhD



Yanhong Su  
Postdoc Researcher



We are recruiting PhDs and Postdocs!

AICell Lab Website: <https://aicell.io>



# AI4Life



# SciLifeLab



Knut and Alice  
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# A Future of Collaborative Biolmaging

