COMPUTATIONAL BIOMEDICAL IMAGING

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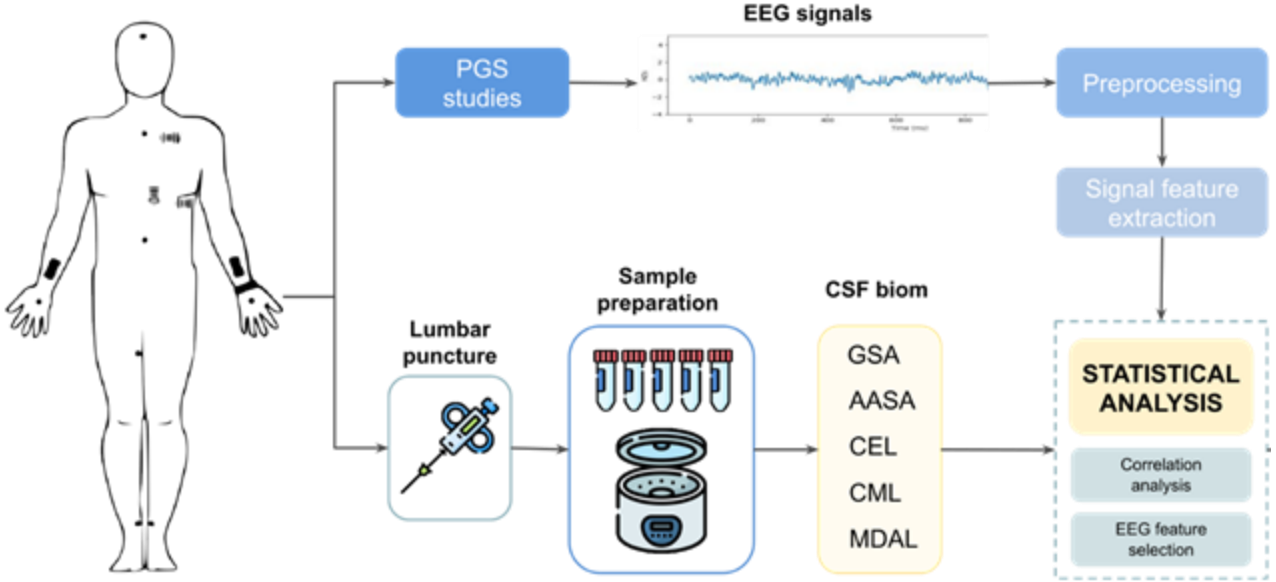
https://www.youtube.com/watch?v=l72QSPTzsBQ

COMPUTATIONAL BIOMEDICAL IMAGING

PREDICTION OF STRESS OXIDATIVE MARKERS

Workflow



A. M. Gaeta et al. bioRxiv (2025)
L. Gallego et al., IEEE J Biomed & Health Inf (2025)
A. M. Gaeta et al. Front Aging Neuroscience (2024)

Cerebrospinal Fluid Biomarkers

GSA (glutamic semialdehyde)

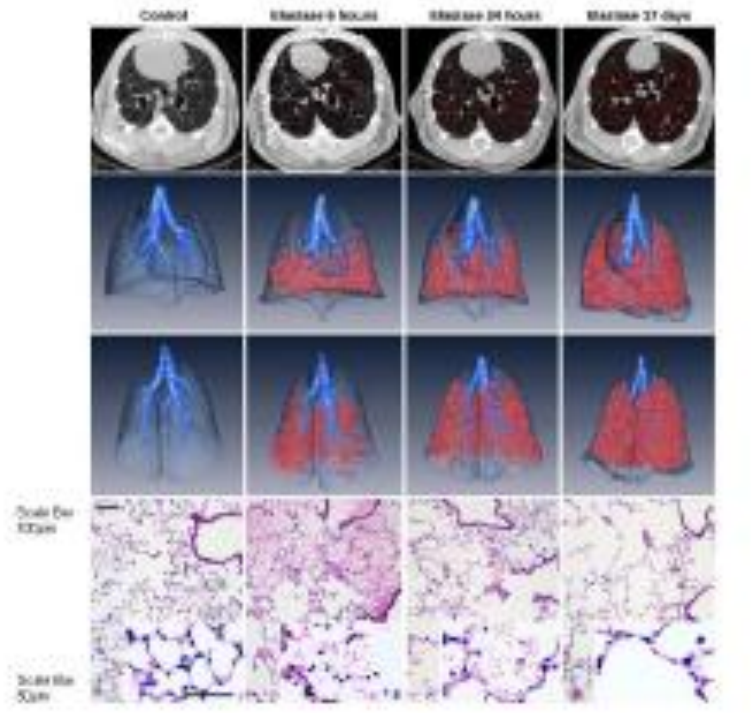
AASA (aminoadipic semialdehyde)

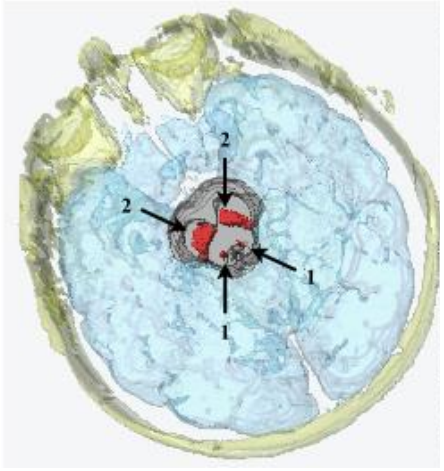
CEL (N-ε-(carboxyethyl)lysine)

CML (N-ε-(malondialdehyde)lysine)

MDAL (N-ε-(Carboxymethyl)lysine)

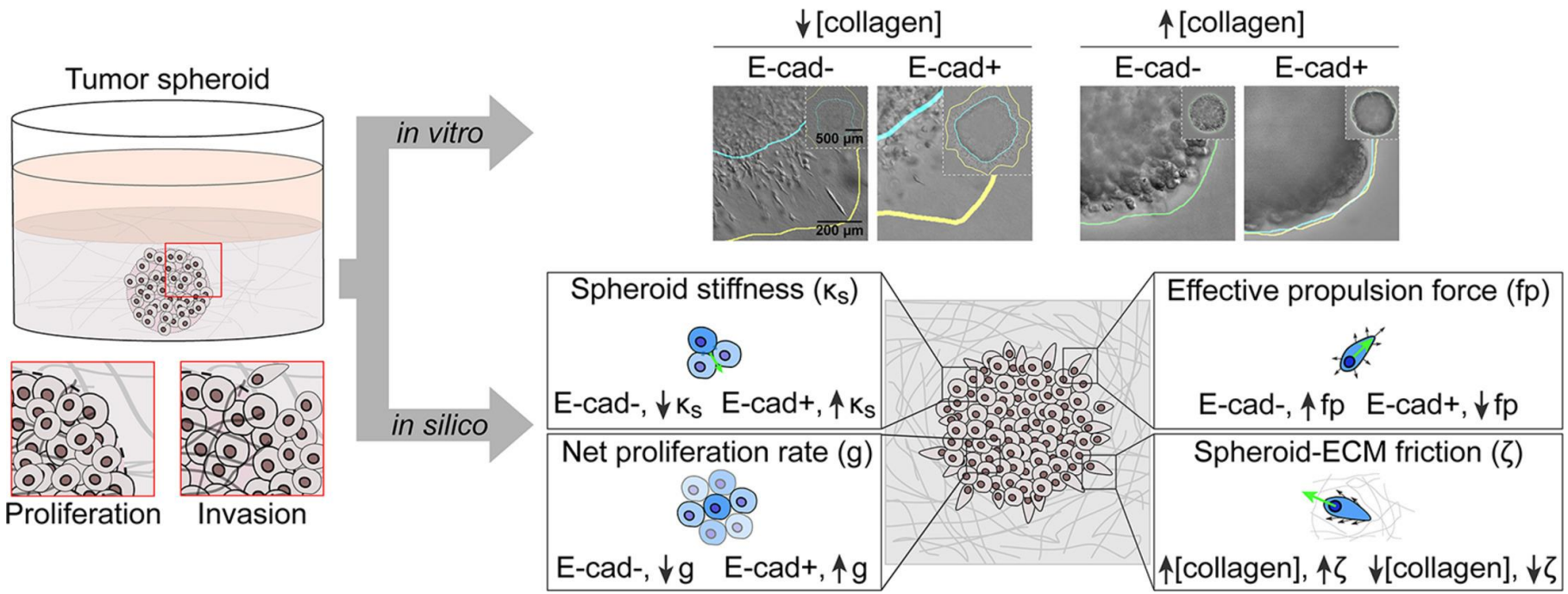
QUANTITATIVE RADIOLOGY





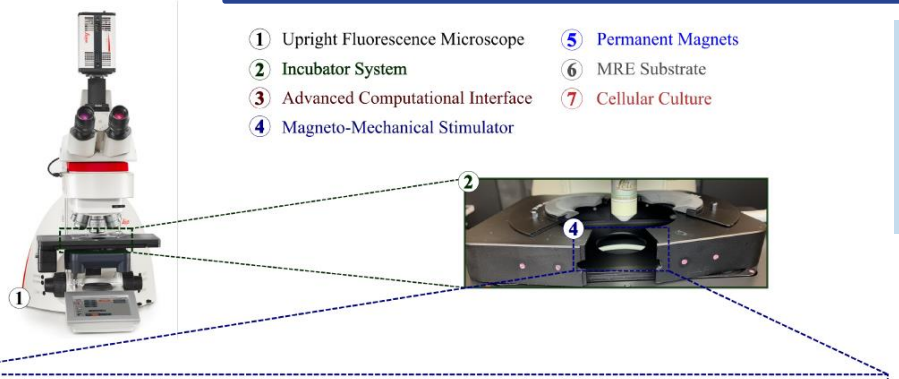
X. Artaechevarria et al., IEEE TMI, 2009
A. Muñoz-Barrutia et al., J Biomed Imaging, 2012
M. Ariz et al., IEEE TMI, 2019
X. Artaechevarria et al., Eur Rad, 2009
P. M. Gordaliza et al., Scientific Reports, 2018
R. D. Rudyanto et al., Med Imag Analysis, 2013

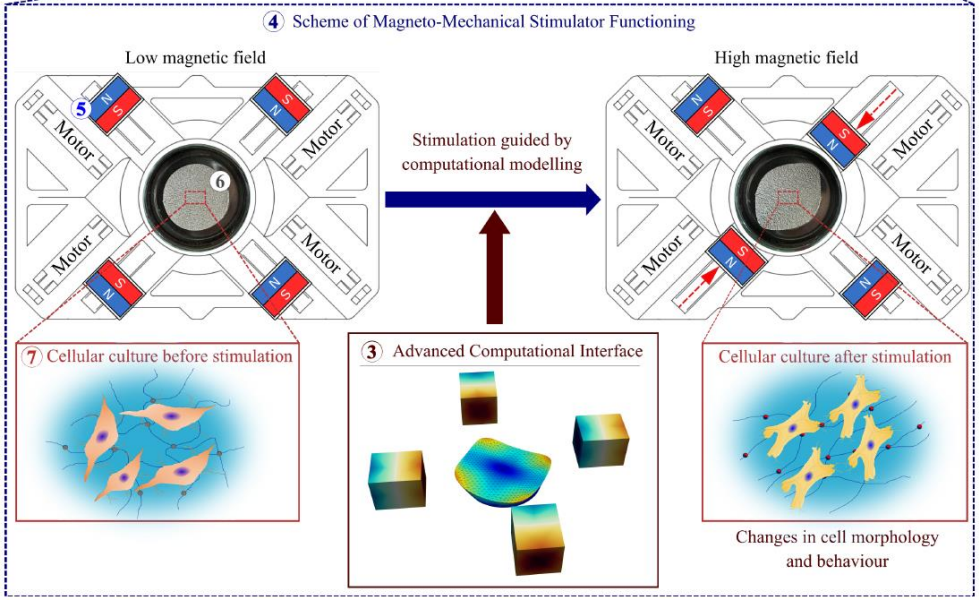
MODELING OF BIOLOGICAL SYSTEMS



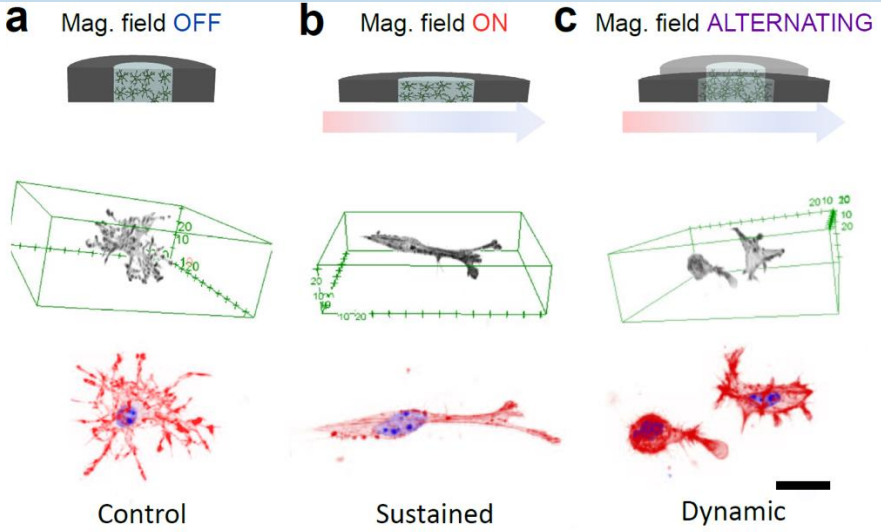
A. J. Crawford et al., Acta Biomaterialia (2024)
D. Garcia-Gonzalez & A. Muñoz-Barrutia, Extreme Mechanics Letters (2020)

COMPUTATIONAL BIOMEDICAL IMAGING





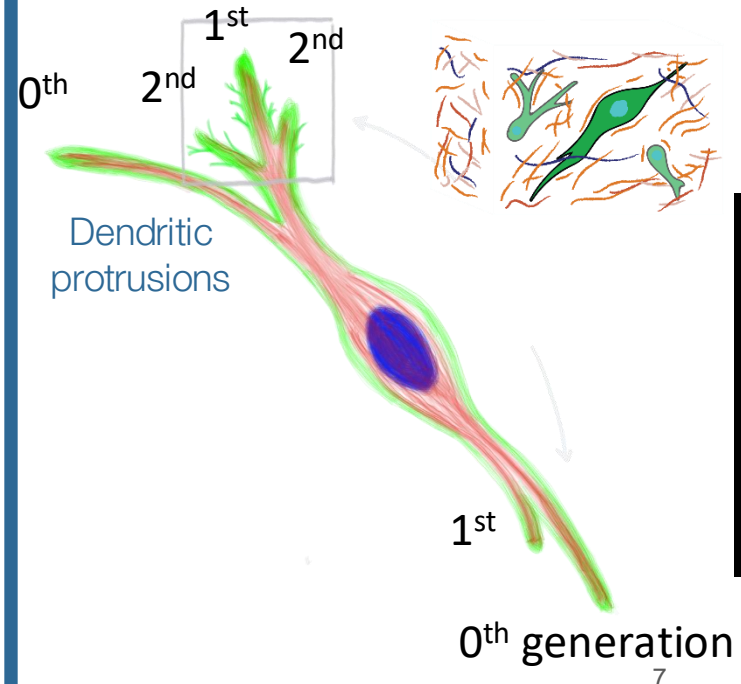
CHARACTERIZATION OF THE RESPONSE TO MECHANICAL PERTURBATIONS



Astrocytes cultured in 3D

C. Gomez-Cruz et al., Advanced Materials (2024)
M. A. Moreno-Mateos et al., Applied Materials Today (2022)

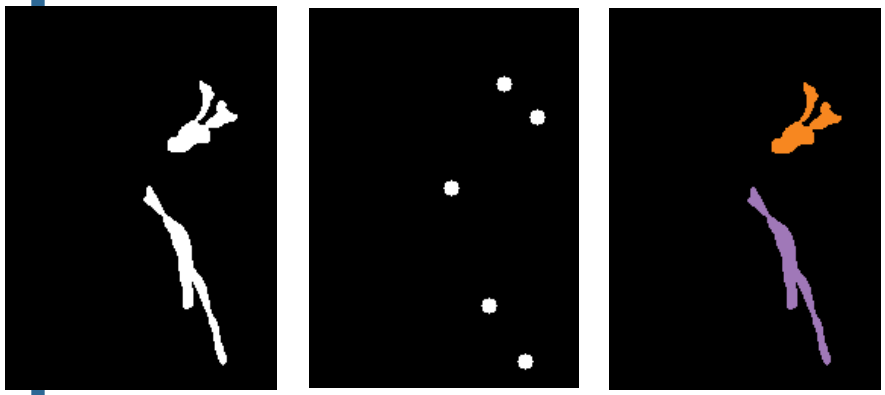
CHARACTERIZATION OF 3D MIGRATION

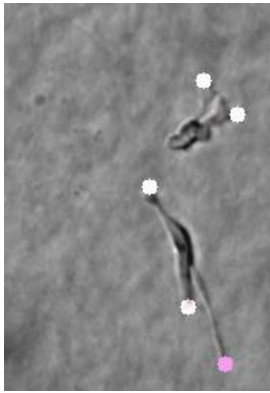


What is the role of cellular protrusions in 3D mesenchymal cell migration?

BioImage analysis

Cell segmentation | Protrusion detection | Cell tracking | Protrusion tracking

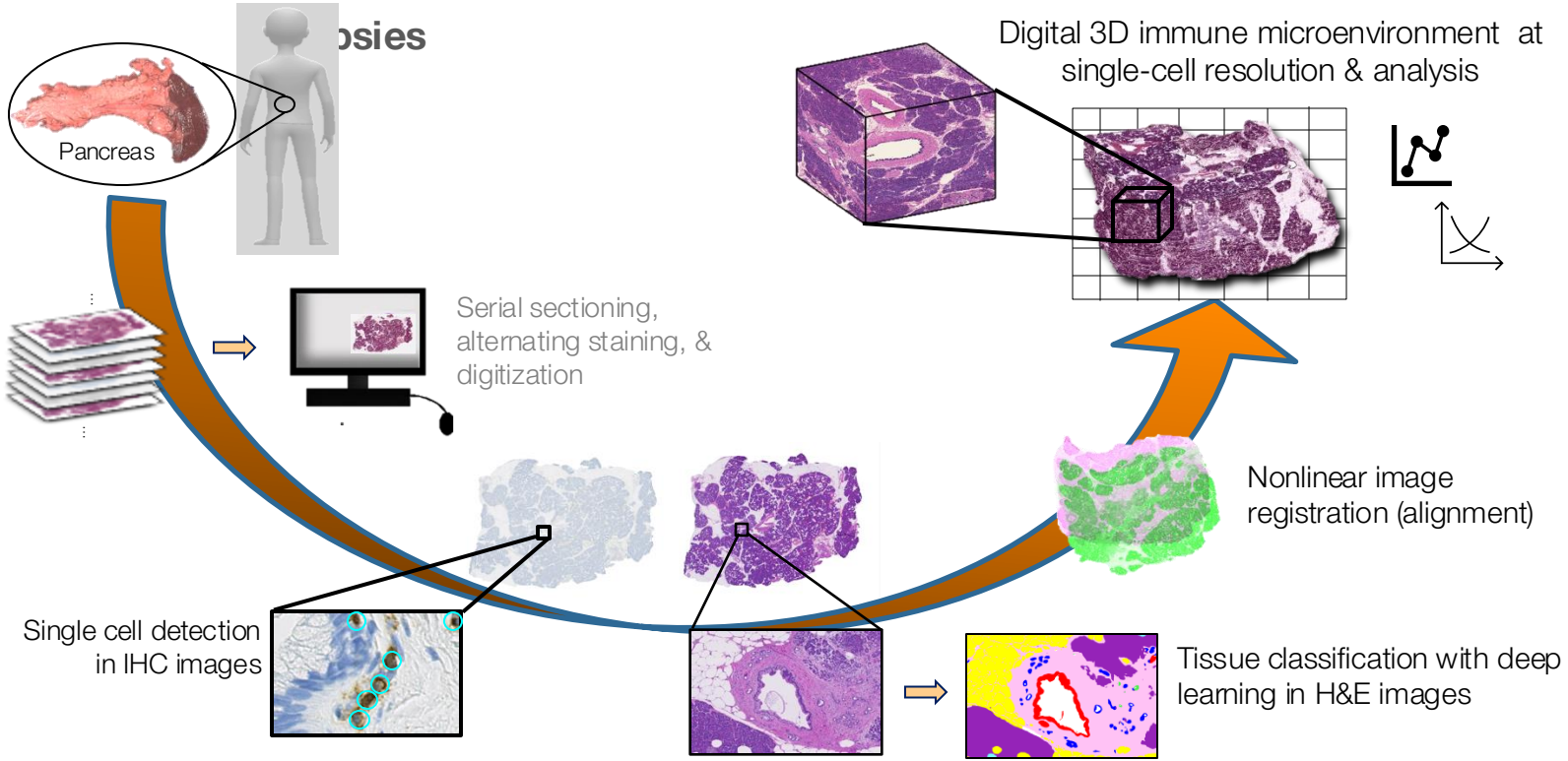




M. Maska et al., Nat Methods (2023)
P. R. Nair et al., Science Advances (2024)
E. Gomez-de-Mariscal et al., arXiv (2021)

QUANTITATIVE PATHOLOGY

DL enabling cellular and tissular quantification on whole

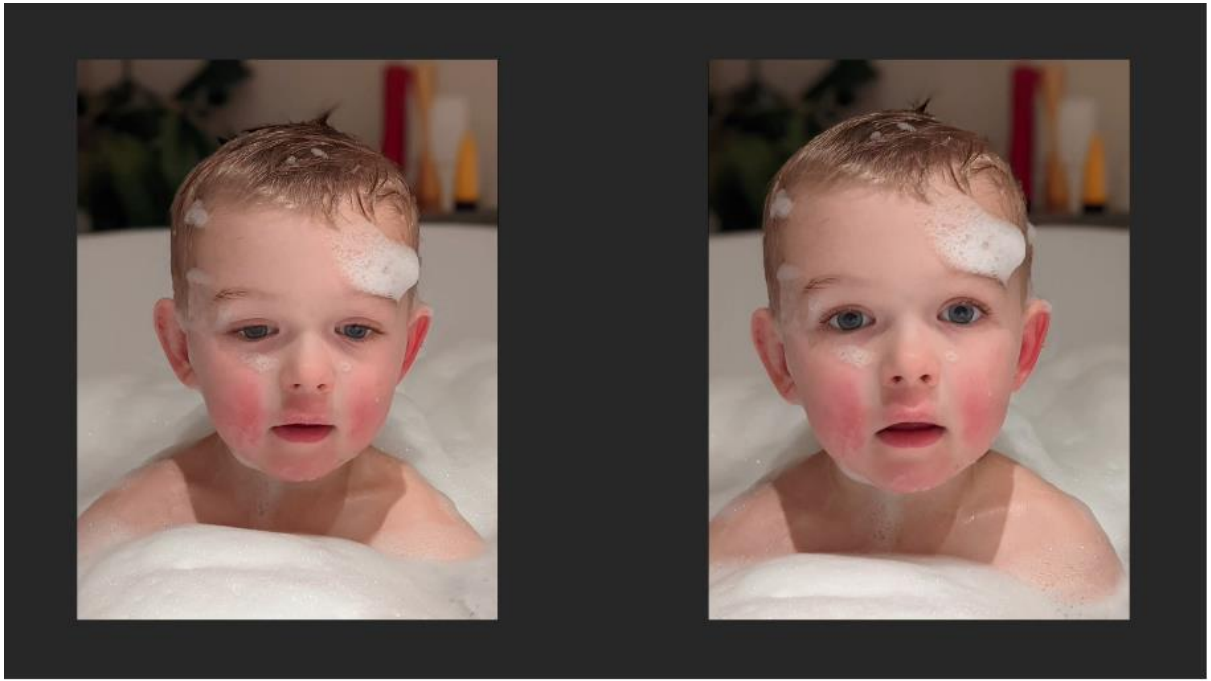


V. Matos-Romero et al., bioRxiv (2025)
A. L. Kiemen et al., bioRxiv (2024)

DL-based generative interpolation and restoration

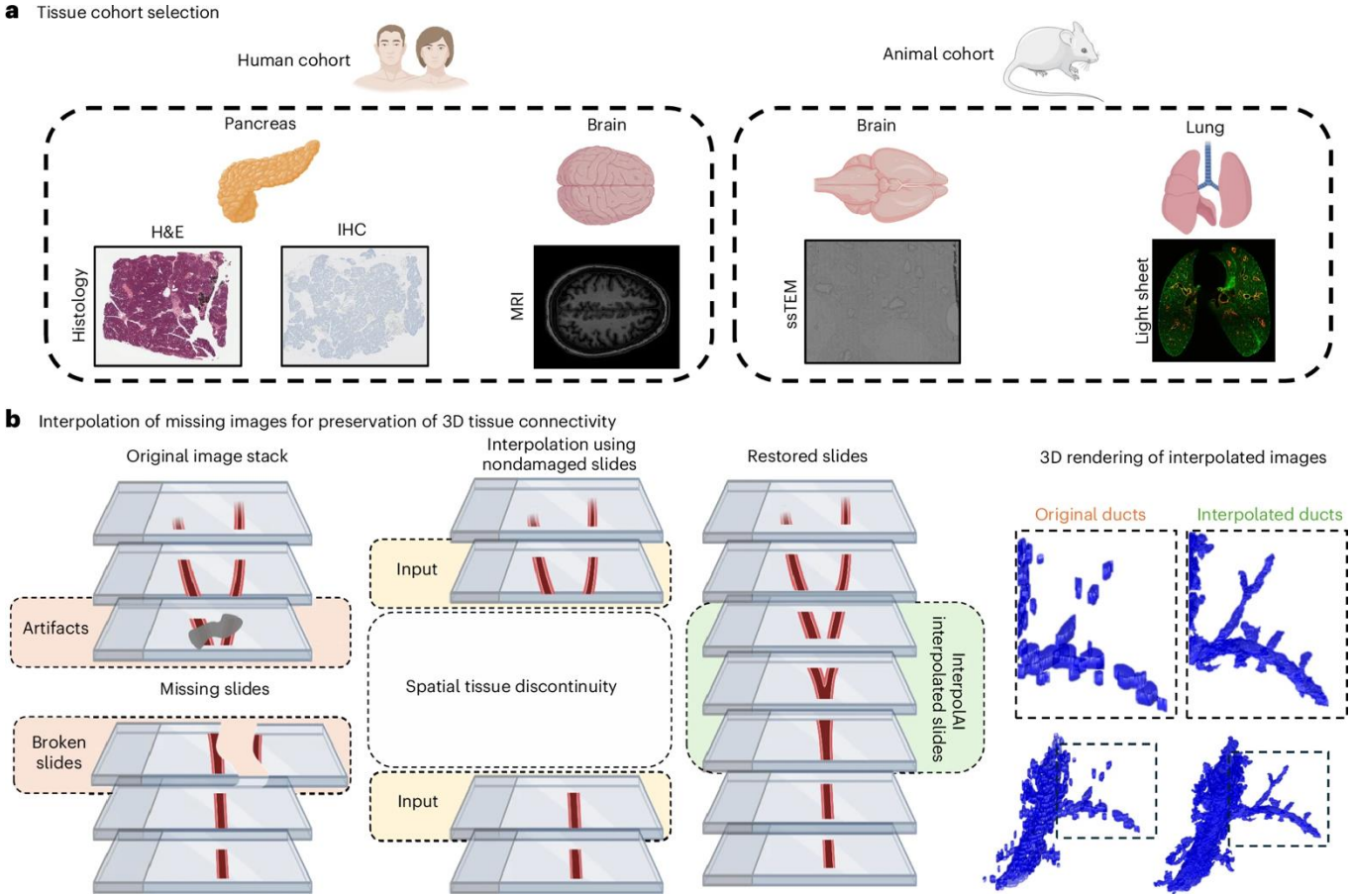
Frame Interpolation for Large Image Motion (FILM)

https://film-net.github.io/



F. Reda et al., bioRxiv (2022)

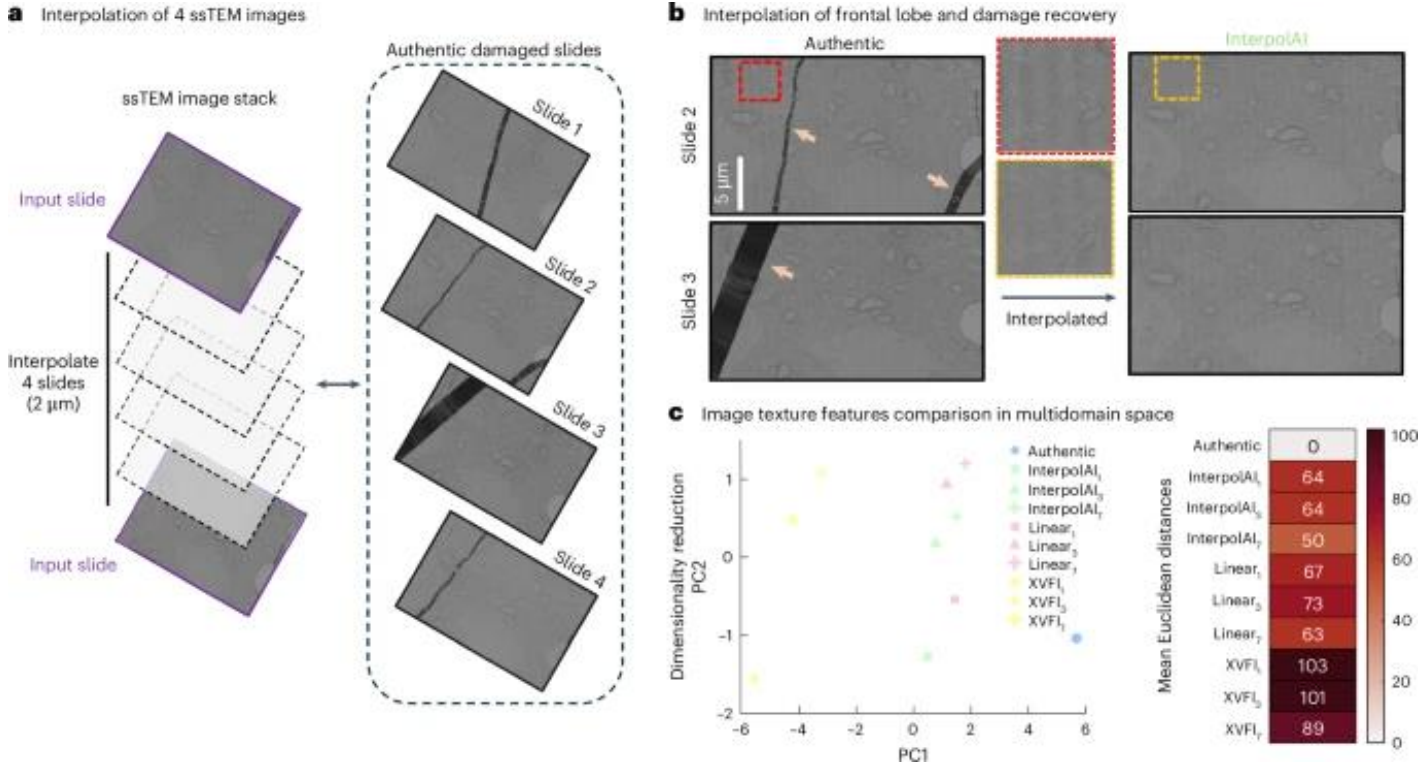
DL-based generative interpolation



S. Josi et al., Nature Methods (2025)

DL-based generative interpolation and restoration

The FILM



S. Josi et al., Nature Methods, 2025

FAIR DEEP LEARNING FOR BIOIMAGE ANALYSIS

The AI4Life approach

https://ai4life.eurobioimaging.eu

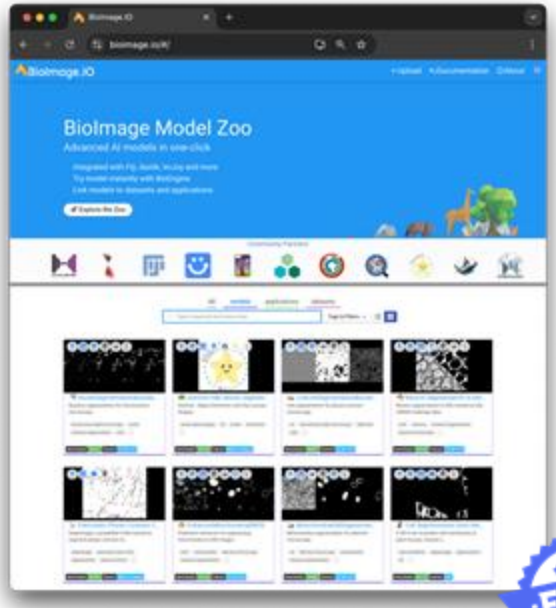
https://doi.org/10.1101/2022.06.07.495102

BioImage Model Zoo

An open-source repository for FAIR AI models

AI4Life

https://doi.org/10.1101/2022.06.07.495102



segmentation denoising image-reconstruction object-detection

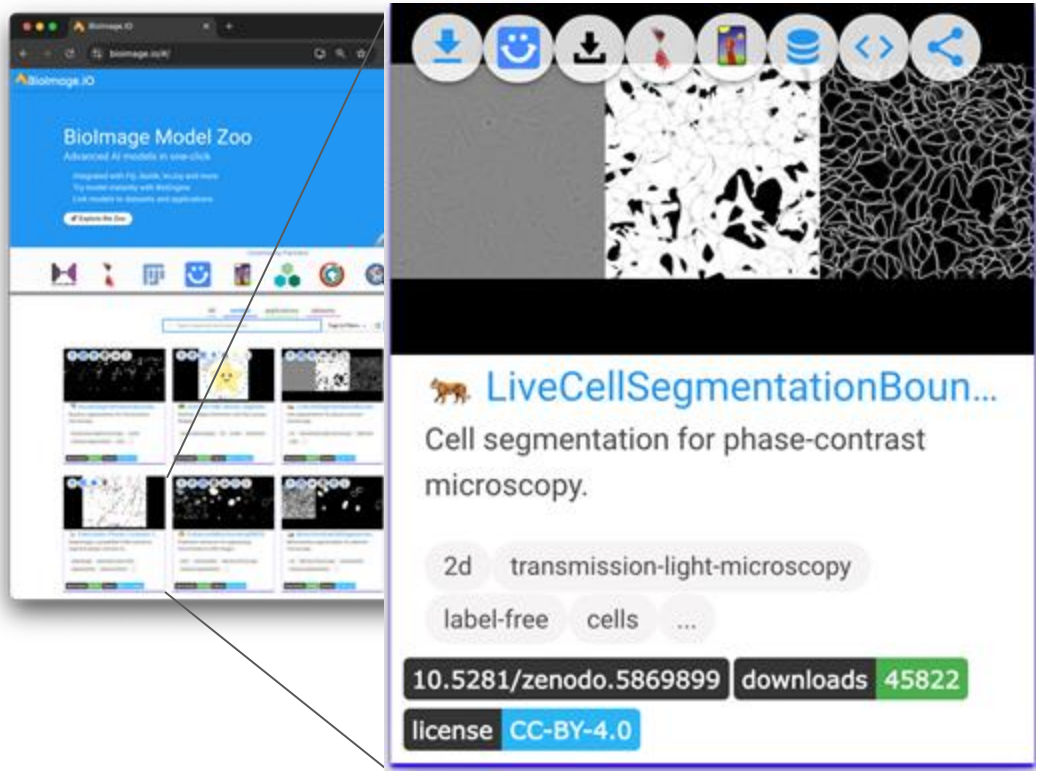
image-classification semantic-segmentation image-restoration

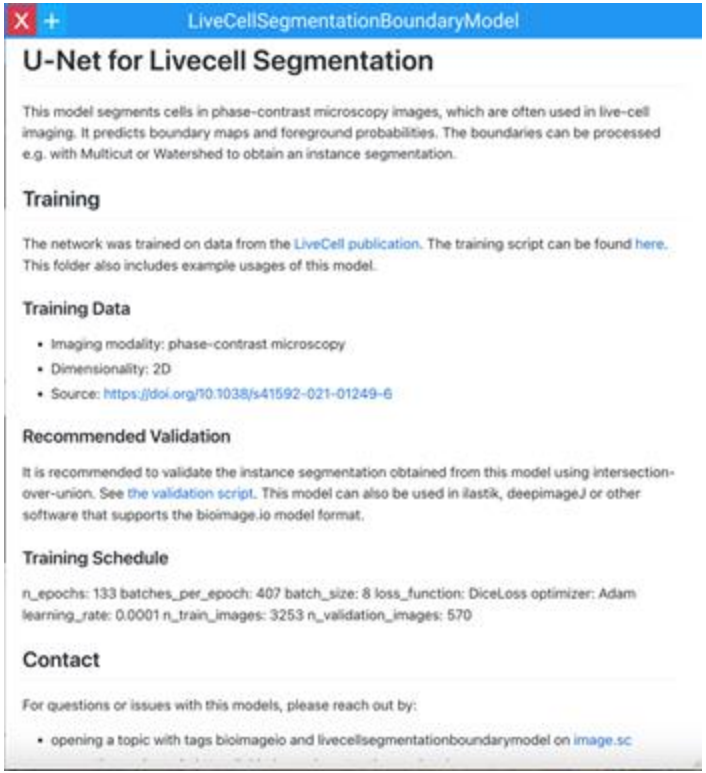
2d 3d pytorch tensorflow whole-slide-imaging

BioImage Model Zoo

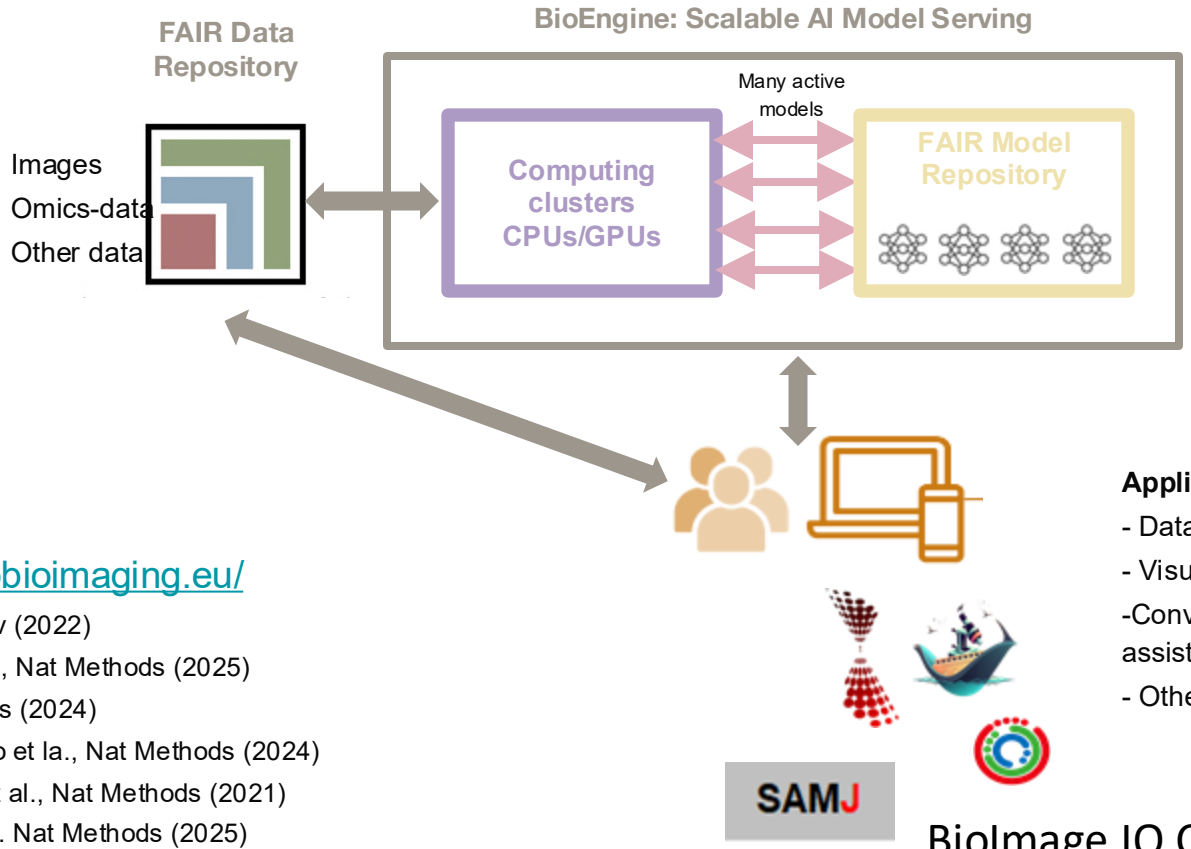
An open-source repository for FAIR AI models

AI4Life





The AI4Life Ecosystem Overview



Applications

- Data analysis
- Visualization
- -Conversational assistants
- Other operations

BioImage.IO Chatbot

https://ai4life.eurobioimaging.eu/

W. Ouyang et al., bioRxiv (2022)

T. Zulueta-Coarasa et al., Nat Methods (2025)

W. Lei et al., Nat Methods (2024)

C. Garcia-Lopez-de-Haro et la., Nat Methods (2024)

E. Gomez-de-Mariscal et al., Nat Methods (2021)

D. Franco-Barranco et la. Nat Methods (2025)

Potential Korea–EU Collaboration Ideas under Horizon Europe

- **AI-powered bioimage analysis** for biomarker discovery, supporting predictive and personalized medicine (HORIZON-HLTH-2026-01-TOOL-01).
- **Digital pathology workflows** and **spatial omics integration** for cancer and neurodegenerative diseases.
- Co-development of **FAIR and reusable AI workflows**, building on open-source tools (e.g., deepImageJ, BiaPy, BioImage.IO).
- Joint initiatives in **generative AI for biomedical imaging** (e.g., HORIZON-HLTH-2025-01-TOOL-03).
- Synergies in **mental and neurodevelopmental disorders**, combining multimodal data and interpretable ML.
- Collaborative projects on **resilient and sustainable health systems** using federated learning and high-performance computing.