




DeepScope

European Laboratory for Non-linear Spectroscopy

 A new microscopy paradigm for **quantitative** analysis of **3D** samples

TECHNOLOGY DESCRIPTION

We have devised a new concept of microscopic imaging, based on high-throughput optical methods and real-time image processing, to produce a semantic, quantitative and queryable representation of three dimensional biological samples.

Current microscopy solutions deliver just images – i.e. collection of pixels – leaving it up to the user to extract useful information. In our new paradigm, the microscope provides a semantic model of the specimen, where relevant information (e.g. cell morphology, position, etc.) is directly accessible.

This new imaging paradigm can lead to a quantitative revolution in bio-imaging, with important applications in the histological analysis of healthy and diseased samples.

Combining high-resolution light-sheet microscopy with deep learning to transform wet samples into *in silico* semantic models, amenable to quantitative analysis

Scalable morpho-chemical profiling of tissues for improved diagnostics and, beyond health, for intelligent microinspection in industrial settings

AREAS

Neuronal imaging | High-throughput microscopy
3D histology | Digital pathology





COMPETITIVE ADVANTAGES

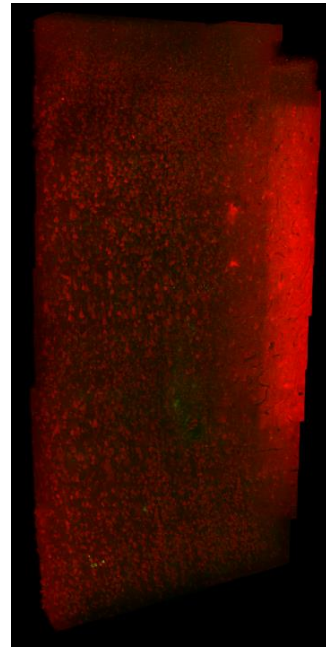
- High-resolution, fast, 3D imaging of tissue samples. Few hours needed to process 1 cm³ with 1 μm³ resolution
- The output of the system is not just a collection of pixels, but a semantic model where each cell is uniquely labeled. Market competitors only provide raw images
- User is not left alone with a huge quantity of raw data, as with current commercial solutions
- Allows systematic analysis of multiple tissue samples. While market alternatives provide high-throughput solutions, **DeepScope** is a high-output concept

DeepScope fosters reproducible and quantitative analysis of biological samples

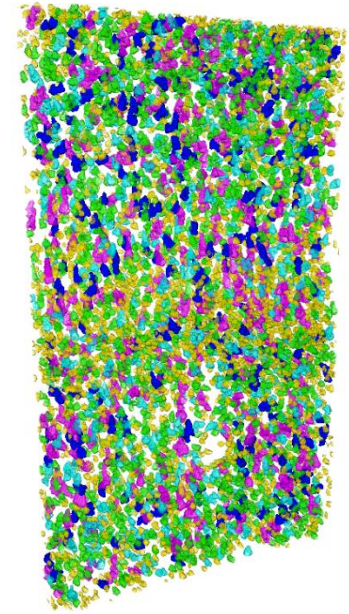
APPLICATION & MARKET POTENTIAL

- **Preclinical research:** quantitative and reliable quantification of drug effects at whole-organ scale
- **Personalized medicine:** improved assessment of drug efficacy on patient-derived organoids
- **Histopathological analysis** of human tissue for augmented diagnostic & prognostic power
- **Worldwide optical microscopy** market in 2018 is about 2 billions \$ and histopathology market about 3.5-4 billions \$
[source: marketsandmarkets.com, companiesandmarkets.com]

Final output of the system



Conventional microscope



DeepScope

TECHNOLOGY READINESS LEVEL



REFERENCES

- *Light-sheet microscope with embedded image analysis used within Human Brain Project*
- *Collaboration with a start-up company (Light4Tech, <http://www.l4t.it/>) for technology commercialization*
- *Collaboration with a start-up company (Bioretics, <http://www.bioretics.com/>) for high-end image analytics*
- *Collaboration with University of Florence and National Research Council for technology R&D*
- *Patent pending. PCT application PCT/EP2017/084057*

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